U.S. Fish & Wildlife Service

Horse and Burro Management at Sheldon National Wildlife Refuge

Draft Environmental Assessment

Before Horse Gather, August 2004

After Horse Gather, August 2005

Front Cover: These photographs were taken one year apart at the same site, Big Spring Creek on Sheldon National Wildlife Refuge. The first photograph was taken in August 2004 at the time of a large horse gather on Big Spring Butte which resulted in the removal of 293 horses. These horses were placed in homes through adoption. The photograph shows the extensive damage to vegetation along the riparian area caused by horses. The second photo was taken one-year later (August 2005) at the same position and angle, and shows the response of vegetation from reduced grazing pressure of horses. Woody vegetation and other responses of the ecosystem will take many years for restoration from the damage. Additional photo comparisons are available from other sites.
Photo credit: FWS, David N. Johnson

Department of Interior
U.S. Fish and Wildlife Service

Environmental Assessment for Horse and Burro Management at Sheldon National Wildlife Refuge

April 2007

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Proposed Action: The U.S. Fish and Wildlife Service (Service) proposes to continue its ongoing, operational program of gathering, removing, and adopting out feral horses and burros from Sheldon National Wildlife Refuge, Denio, Nevada.

Type of Statement: Environmental Assessment (EA).

Lead Agency: U.S. Fish and Wildlife Service (Service).

Cooperating Agencies: U.S. Bureau of Land Management and
Nevada Department of Wildlife.

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Abstract: The Service has developed an EA for Feral Horse and Burro Population Management at Sheldon National Wildlife Refuge (Sheldon Refuge). The EA consolidates and fine-tunes the existing NEPA documentation (1977, 1980, 2000) developed for the Horse and Burro Management Plans that guide population management for feral horses and burros on the refuge. Sheldon Refuge encompasses 575,000 acres in northwestern corner of Nevada; established as a representative area of high-desert habitat for optimum populations of native plants and wildlife.

The current program objectives include: maintaining a manageable feral horse and burro population in balance with other wildlife species for the enjoyment of refuge visitors; stopping range deterioration, and improving wildlife habitat and watershed conditions, and reducing impacts on existing water resources; insuring that the Sheldon Refuge range provides ample forage for all wildlife populations endemic to the area; and reducing the spread of feral horses into key wildlife areas.

The purpose of this EA is to provide a reasonable, scientifically-grounded horse and burro population management program that will preserve Sheldon Refuge's purpose of conserving the pronghorn antelope and other native wildlife in the sagebrush steppe ecosystem.

The service has identified and evaluated five alternatives for managing the horse and burro program until the Comprehensive Conservation Plan for Sheldon Refuge is complete, including a No Action Alternative (Alternative A). The Alternatives are as follows:

- **Alternative A (No Action): The Refuge would discontinue the ongoing program of horse and burro population management.** There would not be any horse and burro gathers, care or management efforts, or adoption program on for Refuge.
- **Alternative B: Status Quo (Ongoing Program Management).** Continue current standard procedures for managing horses and burros to bring their numbers into line with refuge program objectives. Population objectives established in the 1980 EIS are to maintain horse population levels at 75-125 individuals and 30-60 burros. Current estimated numbers of horses (1,500) and burros (100) on the refuge far exceed the target levels and are causing environmental damage. Horses and burros will be gathered using helicopter/horseback riders, horse back riders alone, and baited traps. All animals will be processed with expert staff and a veterinarian. Horses and burros will be placed in good homes through adoption agents.

Standard practices will be followed for transporting animals and monitoring population levels and ecosystem response.

- **Alternative C: Adoption of Horses Through Individuals.** Refuge staff would facilitate horse care and adoptions instead of the current practice of contracting the service through adoption agents. Program objectives and all other aspects will be the same as Alternative B.
- **Alternative D: Conduct Horse Gathers by Horseback Techniques Only.** Horses and burros will not be gathered by the combination of helicopter and horseback riders. Burros will still be gathered with baited traps. Program objectives and all other aspects will be the same as Alternative B.

Alternative development was based on the internal and external scoping of issues. There will be a 30-day public comment period on the EA including a public comment meeting in Lakeview, Oregon.

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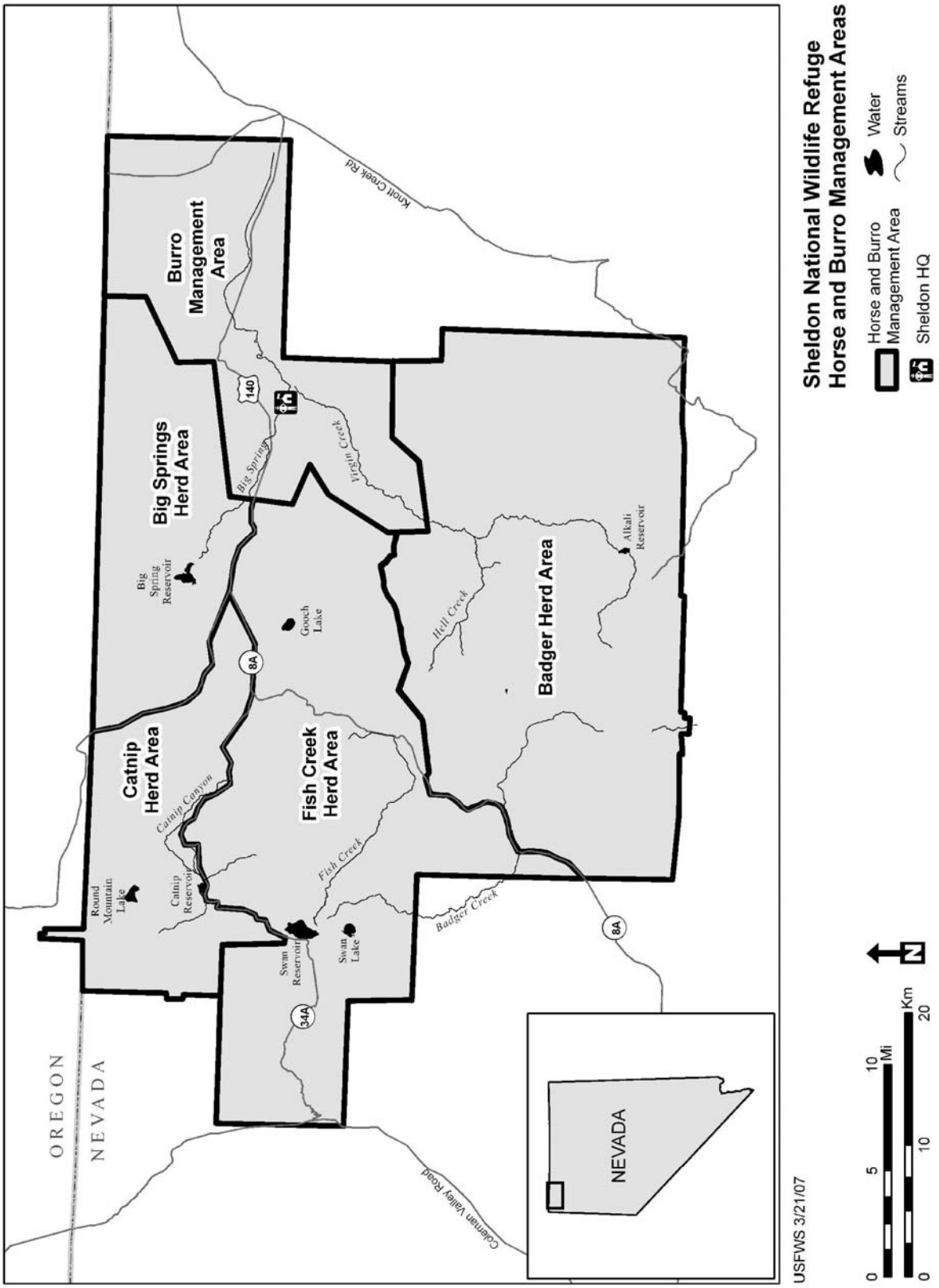


Figure 1. Map of Sheldon National Wildlife Refuge and Vicinity

Chapter 1: Purpose of and Need for Action

1.1 Proposed Action

On Sheldon National Wildlife Refuge (Sheldon Refuge or Refuge) in northwestern Nevada, the U.S. Fish and Wildlife Service (Service) proposes to continue current population management of feral horse and burros until completion of a Comprehensive Conservation Plan for the Refuge. The current program includes gathering of animals with the aid of helicopters, motor vehicles, and horseback riders, removal from the Refuge, and adoption with the aid of adoption agents. The program has been conducted periodically, based upon availability of funding. See subchapter 2.2 for a more complete description of the Refuge's feral horse and burro population management program.

1.2 Need for Action

Sheldon Refuge was established by Executive Order No. 5540 in 1931 signed by Herbert Hoover and the Executive Order No. 7178 in 1935 signed by Franklin D. Roosevelt. See Figure 1 for a map of Sheldon Refuge and the surrounding area. Applicable law, regulations, and policy guiding administration of national wildlife refuges directs the Service to give priority management attention to achieving refuge purposes and the mission of the National Wildlife Refuge System (NWRS) directed by the Executive Order No. 5540, Executive Order No. 7178, and Public Law 94-223 established by the 94th Congress in 1976. . For further information on the Executive Orders and the Public Law see the Sheldon National Wildlife Refuge Renewable Natural Resources Management Plan (Management Plan) Final EIS 1980, Appendix D. Native fish, wildlife, plants, and their habitats are the focus for management of the Refuge (see section 1.4 for refuge purposes). Refuge feral horse and burro population objectives are consistent with efforts to maintain and restore habitats for native fish, wildlife, plants, and their habitats. See subchapter 1.4 for more discussion of relevant management guidance; chapter 3 for descriptions of feral horses and burros, and native fish, wildlife, plants, and their habitats on the Refuge; and chapter 4 for assessments of the effects of implementing horse and burro control programs.

Presently, an estimated 1600 feral horses and burros wander freely, year-round across Sheldon Refuge. They consume forage and water, trample vegetation, compact soils, and otherwise directly and indirectly impact native fish, wildlife, plants, and their habitats. In the Refuge's high-elevation, semi-arid environment, conflicts among feral horses and burros, and native species are most severe during late summer and mid winter, and are prominent at the Refuge's limited water resources and adjacent meadows, wetland, and riparian zones. Gathering and removing feral horses and burros from across this large Refuge (more than one-half million acres) is very costly. Devoting the Refuge's very limited staff time and funding to management of feral horses and burros directly impacts the Refuge's ability to effectively manage native species and their habitats, and wildlife-dependent public uses, both of which are management priorities.

1.3 Purpose of Action

The purpose of the current feral horse and burro management program on the Refuge is to bring populations of horses and burros within levels consistent with conservation of refuge habitats. Existing refuge management plans and associated National Environmental Policy Act (NEPA) documents establish Refuge population objectives for horses at 75-125 individuals and for burros at 30-60 individuals (FWS, 1980 and FWS, 1977).

1.4 Applicable Laws, Regulations, Policies, Other Guidance, Plans, and NEPA Documents

Units of the NWRS are managed pursuant to a number of Federal statutes, regulations, policies, and other guidance. The core statute guiding refuge management (the NWRS' organic act) is the National Wildlife Refuge System Administration Act of 1966, as amended (NWRS Administration Act, 16 U.S.C. 668dd-668ee). The NWRS Improvement Act of 1997 (P.L. 105-57) made important amendments to the NWRS Administration Act. Among other things, the NWRS Improvement Act: provided the first-ever statutory mission statement for the NWRS; established a management hierarchy for refuges (wildlife first, compatible wildlife-dependent public uses second, and other uses last); required development of comprehensive conservation plans for all refuges; strengthened the requirements for refuge compatibility determinations; required the maintenance of the NWRS' biological integrity, diversity, and environmental health; required monitoring of refuge fish, wildlife, plants, and their habitats; and increased the requirements for coordination and consultation with State conservation agencies, refuge neighbors, and the general public. The NWRS Improvement Act further requires each refuge to be managed to fulfill the mission of the Refuge System and the specific purposes for which it was established. The purposes of Sheldon NWR include the following:

"…as a refuge and breeding ground for wild animals and birds…" (Executive Order 5540 dated January 26, 1931 signed by Herbert Hoover);

"…set apart for the conservation and development of natural wildlife resources and for the protection and improvement of public grazing lands and natural forage resources…" and "…the natural resources therein shall be first utilized for the purpose of sustaining in a healthy condition a maximum of three thousand five hundred (3,500) antelope, the primary species, and such nonpredatory secondary species in such numbers as may be necessary to maintain a balanced wildlife population…" (Executive Order 7522 dated December 21, 1936)

"…to conserve (1) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" 16 U.S.C. 1534 (Endangered Species Act of 1973);

"…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act of 1929).

The NWRS is a unique system of public lands. It has more units and greater acreage than the U.S. National Park System. In contrast with multiple-use lands managed by the U.S. Bureau of Land Management (BLM) and U.S. Forest Service (USFS), the NWRS is administered under a

primary- or dominant-use management philosophy. Consistent with the mission statement and other guidance contained in the NWRS Administration Act, the NWRS is managed first and foremost for the conservation and, where appropriate, restoration of native fish, wildlife, plants, and their habitats. Management principles associated with commodity production and sustained-yield management of commercial resources do not apply to the NWRS.

The Wild Free-Roaming Horses and Burros Act of 1971, as amended (16 U.S.C. 1331-1340) does not apply to units of the NWRS, except to the extent that feral horses and/or burros roam on and off refuges from adjacent public lands administered by BLM or USFS. Service management of resident feral horses and burros on refuges is directed by the NWRS Administration Act; and relevant Service regulations (including control and disposition of feral animals, 50 C.F.R. 30.11-30.12) and Service policies (including management of feral horses and burros, 7 RM 6; and maintenance of biological integrity, diversity, and environmental health, 603 FW 3). Also, beginning in fiscal year 2002 (Section 127 of the Department of the Interior and Related Agencies Appropriations Act, 2002; P.L. 107-63), Service acquired special legal authority to allow use of helicopters and motor vehicles to capture and transport horses and burros on Sheldon and Hart Mountain NWRs. This new authority superceded provisions of the Wild Horse Annie Act of 1959 which prohibited use of "aircraft or motor vehicles to hunt, for the purpose of capturing or killing, any wild, unbranded horse, mare, colt, or burro running at large on any of the public land or ranges" (P.L. 86-234, 18 U.S.C. 47).

Previous refuge management plans and NEPA documents have been developed which describe and evaluate the effects of feral horse and burro management at Sheldon Refuge. The *Sheldon Horse Management Plan, Environmental Impact Assessment* and associated finding of no significant impact (FONSI) were completed in November 1977. This management plan and environmental assessment includes: establishment of Refuge population objectives; description and assessment of the effects of implementing the Refuge gather and removal program, and alternatives to that program; and involvement of the public. In August 1980, the Service completed the *Sheldon National Wildlife Refuge Renewable Natural Resources Management Plan - Final EIS*. A record of decision (ROD) was signed shortly thereafter. This management plan and EIS was much more comprehensive; including: refuge management objectives for vegetation and priority native wildlife species, along with population objectives for feral horses and burros; description and assessment of the effects of implementing a broad range of Refuge management programs and alternatives to those programs, including the feral horse and burro gather and removal program; and involvement of the public. Finally, in June 2000, the Service signed the *Sheldon National Wildlife Refuge, United States Fish and Wildlife Service, Environmental Action Memorandum*. This environmental action memorandum (EAM) documented NEPA compliance for a refinement of the horse and burro gather and removal program. Prior to 2000, the Refuge sold captured feral horses and burros through public auction and disposed of unsold animals in a humane manner. The EAM established the following new requirements, "…the contractor chosen to carry out this project [gather and removal of feral horses and burros] will be required to arrange for adoption or otherwise provide for disposal of the horses captured in a manner that prevents slaughter for the meat market to the maximum extent possible and also prevents humane on-site euthanasia except in cases of debilitating injury or disease."

Recently, there has been renewed public interest in the Refuge's ongoing feral horse and burro population management program. In response to that heightened interest, the Service has

decided to develop this new EA addressing impacts of current feral horse and burro gathering and removal from the Refuge. The process for developing this EA will provide the public with a formal opportunity to share with the Service their concerns regarding the existing program and their suggestions for improving it.

Application of Adaptive Management Concept

Sheldon NWR employs an adaptive management approach to its operational programs – simply, techniques and strategy are adjusted to better achieve management objectives based upon new scientific information and best professional judgment of the refuge staff. Research and monitoring are important aspects of adaptive management. In an adaptive management program, the impacts of short-term actions are scientifically evaluated on a periodic basis. This approach incorporates monitoring, research and evaluation, which allows projects and activities to go forward in the face of some uncertainty regarding ultimate outcomes. Proceeding in this manner allows for accumulation of new information and responses to new data, which can affect direction, time frame, and actions taken in the future. The Refuge plans to use scientific information in an adaptive management context for managing feral horse and burro populations.

Sheldon Refuge is scheduled to initiate development of a refuge comprehensive conservation plan (CCP) in 2007. This upcoming effort and the associated NEPA document will comprehensively assess the Refuge's entire management program. It will also include a re-evaluation of the feral horse and burro population management program, including an analysis of cumulative effects of this program in the context of all other refuge management activities. The purpose of this EA is to cover feral horse and burro gathers and removal until completion of the Sheldon Refuge CCP and associated NEPA documentation.

1.5 Decisions to be Made and Lead/Cooperating Agencies

The Service decision-maker must decide how best to continue the Sheldon Refuge feral horse and burro management program. Options include periodic gathering, removal, and adoption of animals or implementing an alternative to that program.

The U.S. Bureau of Land Management (BLM) has been a cooperating agency for managing horses on Sheldon Refuge that are subject to the Wild Horse and Burro Act. BLM staff and information resources are periodically consulted because of their experience and expertise regarding horse and burro population management, including gathers, removal, and adoption. The Service coordinated with BLM on a pre-release draft of this EA.

The Nevada Department of Wildlife has been invited to serve as a cooperating agency due to its experience and expertise regarding management of fish, wildlife, plants, and their habitats throughout the State of Nevada, and an ongoing partner with the Sheldon Refuge.

1.6 Issues

This subchapter describes issues associated with the management of feral horses and burros on Sheldon Refuge. These issues were identified through public comment received during the last 6

months, deliberations among the Service staff, and publications (e.g., Beever, 2003; Fisher, 1983; and Williams, 2006). These issues will be used as a tool to focus analysis in this EA.

1.6.1 Relevant Issues

The Service has identified the following issues associated with horses and burros and their population management at Sheldon Refuge. These issues will be addressed in the evaluation of effects of alternatives in this EA.

1.6.1.1 Horses and burros have direct and indirect effects on native fish, wildlife, plants, and their habitats on the Refuge

The increasing populations of feral horses and burros are impacting the ability of the Sheldon Refuge to meet the purpose for the Refuge establishment. Biological monitoring at Sheldon Refuge and a body of scientific literature provides information about the continued impacts of feral horses and burros on native wildlife, plants, and their habitats. Species of particular concern include sage grouse and passerine bird species that depend upon vegetation structure for nesting. Aquatic species are being impacted by feral horses and burros due to water quality issues, which also may affect future restoration efforts of Lahontan cutthroat trout at refuge sites. Additional information on these conflicts is available in section 3.2, and Chapter 4 of this EA.

1.6.1.2 The Refuge's horse and burro management program is costly

A high percentage of the funds of the Refuge budget are currently being used to control feral horses and burros instead of being applied to wildlife management practices. The high cost for capture, transport and adoption of each horse, and the large number of horses and burros on the Refuge, diverts critical funding and staff resources from other wildlife and public programs at Sheldon, Hart Mountain and other national wildlife refuges. This will be more-formally and completely discussed in Chapters 2 and 4.

1.6.1.3 There are concerns regarding humane treatment of horses and burros during gathers on the Refuge and following disposition by the Service

There are concerns expressed about the timing of gathers, especially pertaining to use of helicopters, handling of foals and pregnant mares, and vulnerability of Refuge horses and burros ending up in the slaughter market following disposition by the Service.

Refuge staff and the concerned public want to perform gathers at a time that will minimize the loss of unborn foals, be at the appropriate stage of pregnancy, be the appropriate age for foals, and that will avoid temperature extremes, disease, and inclement weather.

Refuge staff and some members of the public seek to improve the efficiency and safety of handling horses in the corral system at Sheldon NWR headquarters, including the water delivery system and configuration of pens in the corral system.

Some members of the public are concerned that helicopters are not the least impacting method of gathering; including speed of herding, distances moved, and general stress from the presence of the helicopter.

Refuge staff and the concerned public want foals and pregnant mares handled with the least impact; this includes preventing separation of mares and foals, preventing foals from being trampled during capture, and injuries resulting from processing and transporting.

Some members of the public are concerned that sending horses and burros in mass numbers to adopters will result in the increased opportunity that some of them will be sent to slaughter.

1.6.1.4 There has been a number of horse and burro – vehicle collisions on the State highway passing through the Refuge

There is a concern for human, burro, and horse safety. The refuge officer kept records of vehicle collisions with horses and burros between September 2005 and March of 2006. There were 12 horses and burros killed on Highway 140. Most of the collisions occurred between mileposts 102 and 110. The maintenance staff reported two additional horses killed that were not added to the files because they were not reported until later and the exact locations and dates were not known. This brings the total up to 14. Fortunately no human fatalities were associated with the collisions, but injuries and damage to personal property has occurred.

The area where most of the collisions occurred was north of Round Mountain. A herd of 60 to 80 horses were observed regularly in that area. The gather in June of 2006 concentrated on this location. Records will be kept during subsequent winters to see if the gather has a positive effect by reducing the number of horse/vehicle collisions.

Vehicles killed several burros in the winter of 2003-2004 between mileposts 90 and 95. Ninety-one burros were caught the following winter and the number of burros killed in vehicle collisions dropped dramatically.

1.6.1.5 Assertions have been made that horses and burros may be ranging from BLM lands to Refuge lands, and that management of these animals is subject to the Wild Horse and Burro Act

Most of the horse herds on Sheldon Refuge are located within the interior of the refuge and do not stray outside the refuge boundary. However, there are some areas on the periphery of the refuge boundary where horses and burros may move on and off the refuge when fences are broken. This activity has only been documented on a few locations on the northern boundary around Big Springs Butte. Horses and burros confirmed ranging from BLM to Refuge lands are managed in cooperation with the BLM consistent with the Wild Horse and Burro Act. Animals moving onto the refuge also present an increased impact (both directly and indirectly) upon native fish, wildlife, plants, and their habitats, just as do the resident herds inside the refuge. Management and removal of these trespass animals results in additional costs to the refuge and decreased funding for management of native species and habitats.

1.6.1.6 Some individuals request horse and burro gathers and adoptions on Sheldon NWR to be conducted by the Bureau of Land Management (BLM)

A number of people suggested the BLM should conduct the horse and burro gathers and adoptions on Sheldon NWR. This was posed because people considered all horses and burro on

Sheldon Refuge to be subject to the Wild Horse and Burro Act (see discussion in section 1.4), or because BLM has a good program and facilities. The issue was discussed with BLM program managers and is addressed in section 2.1.

1.6.2 Issues Considered but Eliminated from Further Analyses

Additional issues were explored and objectively evaluated, but eliminated from detailed study. Following is a brief explanation of these issues considered.

1.6.2.1 Concerns have been expressed that the removal of horses and burros from the Refuge is designed to increase populations of pronghorn and mule deer for hunters to harvest and the refuge to make money on hunting tags.

Some members of the public believe that the horse and burro management program at Sheldon Refuge, including gathers and adoption, is conducted to leave more forage and water available for pronghorn and deer for harvest by hunters. As further discussed in chapter 4, horses and burros directly and indirectly affect populations and health of refuge fish, wildlife, plants, and their habitats, including pronghorn, sage grouse, and deer. A reduction in horse numbers reduces the competition with native wildlife for forage, cover, and water, which should result in an increase in numbers and/or health of these wildlife species. The legislation that established the refuge identifies pronghorn, mule deer, and other native wildlife as priority management species at this Refuge. The populations of native wildlife are not managed solely or primarily for hunting, but consistent with relevant laws, policies, and plans. These species are managed for intrinsic values such as natural population fluctuations, healthy conditions, and wildlife diversity that result from a healthy ecosystem. In addition to hunting, a range of other human uses such as wildlife observation, photography, environmental education and interpretation, hiking and other wildlife dependent recreation are featured on national wildlife refuges where deemed compatible.

The Service authorizes and facilitates the hunting program at Sheldon Refuge, but the State of Nevada Department of Wildlife (NDOW) administers the issuance of tags and licenses, and the collection of fees. All proceeds from licenses and tags are collected and used by the state agency (not the Service) to support wildlife management throughout the state. The Service (federal) allows hunting on many national wildlife refuges in the U.S. when it is compatible with the purposes of the refuge and when populations and conditions allow for harvest of a species with minimal or positive impacts to the population. The Refuge Improvement Act directs the Service to provide public opportunities for wildlife-oriented recreation at Sheldon Refuge, including hunting, while maintaining a healthy sage steppe ecosystem and insuring that the activity is compatible with the purpose of the Refuge. The Service goal for hunting is to ensure a quality hunting experience. This is done in coordination and cooperation with NDOW, and is adjusted on an annual basis depending upon herd health and vigor. For example, in 2005, the Service allowed NDOW to issue hunt permits for 4 bighorn sheep, 65 pronghorn, and 197 mule deer. These tags are highly desired by hunters due to the high number of mature males in the population of these big game animals and the small number of tags issued for harvest. For bighorn sheep, 1,630 people applied for 4 tags and 4 animals were harvested. For pronghorn, 1,202 people applied for 65 tags and 53 animals were harvested. For mule deer, 2,480 hunters applied for 197 tags and 97 animals were harvested. NDOW received the direct revenue of these hunting licenses and permits (or tags). Sheldon Refuge received a minor amount of receipts from commercial hunting guides that operate under refuge special use permits. Other benefits

include the long-term public support that comes with having refuge visitors, local economic stimulus, and environmental education associated with hunting and fishing.

1.6.2.2 Concerns have been expressed that the removal of horses and burros from the Refuge is designed to support cattle grazing.

Domestic cattle and associated grazing was removed from Sheldon Refuge in the early 1990's. It was determined that grazing by domestic cattle and feral horses was having a serious negative affect on the health of refuge fish, wildlife, plants, and their habitats, including pronghorn and mule deer. The peak of grazing by cattle occurred in 1985 at 21,867 animal unit months (AUM's). At that time, the feral horse population added approximately 11,800 AUM's of impact to the Refuge. This high level of grazing was determined to have caused excessive impacts to wildlife and their habitats; hence, management actions were taken to remove livestock in an effort to benefit native wildlife. At the time cattle were removed from Sheldon Refuge, the funding was inadequate to remove feral horses. The horse population increased rapidly in response to additional available forage after cattle removal. The feral horse population removed approximately 27,000 AUM's of forage, and causes additional impacts to refuge resources besides just grass removal (e.g., soil compaction, spread invasive species). This intensity of grazing has been determined to have similar or more negative impacts to wildlife as the peak of grazing did in 1985. There are no plans to restore cattle grazing to the refuge, and current actions are aimed at restoring native habitats by reducing impacts by feral horses and burros.

1.6.2.3 Some individuals assert that Refuge horses and burros are native species and not feral animals

The issue as to whether horses and burros are native species and not feral animals is a point that continues to be debated and has been neither proved nor disproved. The purpose for the establishment of Sheldon Refuge did not include the management of horses and burros so these species continue to be managed as feral species. Limiting the size of horse and burro populations at Sheldon Refuge is an ongoing refuge management activity that is necessary for conservation of native plants and animals of the sagebrush steppe ecosystem. Horse and burro populations on Sheldon Refuge have caused severe damage to water and vegetative resources on the refuge, especially in riparian zones near springs, playa lakes, and streams. Specific examples include trampling of vegetation along stream banks and at springheads, physical exclusion of other species by dominant stud horses and burros, and water contamination from feces and urine. This damage is adversely affecting the capacity of the refuge to support native wildlife species and restore the native ecosystem. Monitoring information from 2002 concluded that 44 percent of all streams and 80 percent of the springs on the refuge are heavily or severely degraded by horses.

Managing feral horse populations on the Refuge, however, has been constrained by inadequate funding. At the same time, we are coordinating our activities with those of the BLM on adjoining public lands and will be funding fence construction and maintenance projects to reduce the intrusion of horses from off-refuge lands.

1.6.2.4 Some individuals believe that Refuge horses and burros are living cultural resources and therefore deserving of special consideration

The National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et seq.) requires Federal agencies to consider cultural resources as they administer their programs. The removal of feral horses from Sheldon Refuge would only affect cultural resources if the horses contribute to the significance of a historic property (site, district, or landscape). The Service has determined that there is no historic property present on Sheldon Refuge whose significance is derived from the presence of living herds of feral horses (Raymond and Parks, 2007). In other words, the feral horses do not contribute to the significance of a historic property. Therefore, the removal of feral horses from Sheldon Refuge will have no effect on cultural resources eligible to the National Register of Historic Places.

1.7 Federal, State, or Local Permits, Licenses, or other Consultation Requirements

Federally threatened and endangered species known to occur on Sheldon Refuge include the bald eagle and the Lahontan cutthroat trout. Small numbers of bald eagles (threatened) utilize low gradient wetlands on Sheldon Refuge during the spring and fall migrations. The Lahontan cutthroat trout (threatened) is described under Subsection 3.3 - Fish. Although there are no actions proposed in this EA that are expected to negatively affect these species, the opportunity for long-term benefits likely will occur with riparian and associated in-stream habitat improvements.

Chapter 2: Alternatives Including the Proposed Action

In this updated EA, the Service considered a range of reasonable alternatives to address the need for and purpose of managing populations of feral horses and burros on Sheldon Refuge (see chapter 1.2 and 1.3). These alternatives are described in this chapter and their effects are evaluated in chapter 4. A table summarizing this information is included in subchapter 2.3.

These alternatives were developed based on: in-house discussions among Service personnel familiar with horse and burro management on the Refuge; review of several scientific, planning, and NEPA documents developed by the Service, other agencies, and non-governmental parties (the most-important of which are referenced in Appendix B Literature Cited); the review of public comments received prior to and during this environmental analysis and horse-related web sites; and discussions with interested, affected, and knowledgeable parties. Fully developed alternatives for this EA are described in Section 2.2; those considered but eliminated are summarized in Section 2.1.

2.1 Alternatives Considered, but Eliminated from Detailed Study

The Service also considered other alternatives, but eliminated them from detailed study for the reasons described immediately below.

2.1.1 Remove all Horses and Burros from the Refuge

The 1980 Management Plan and EIS (FWS 1980) were approved by the Regional Director with an inconsistency to the refuge policy (7RM6.1) which requires removal of all feral horses and burros from Sheldon Refuge. The plan established population objectives of 75-125 horses and 30-60 burros to remain on Sheldon Refuge as a concession to horse enthusiasts. These groups negotiated to have a small number of the AUMs, allocated for domestic grazing animals, to be re-allocated for feral horses and burros. Since the approval of that plan in 1980, all domestic cattle have been removed from Sheldon Refuge. Although it is inconsistent with Service regulations and policy (30 C.F.R. 30.11-12, 7 RM 6, 604 FW 3) to allow feral animals to graze on Sheldon Refuge, no action has been taken to remove or change the level of horse grazing authorized under this plan. The purpose of this EA is to consolidate and improve the existing NEPA documentation (1977, 1980, 2000) developed for horse and burro management. However, this alternative does not achieve the management objectives of this program as laid out in the 1980 EIS (see subchapter 1.2 and 1.3), and therefore this alternative was eliminated. It may be examined in the CCP process.

2.1.2 Remove Refuge Horses and Burros Using Lethal Techniques

As further discussed below, managing feral horses and burros on the Refuge, including periodic gathering and adopting out these animals, diverts scarce staff time and public funds from higher-priority Refuge species and programs. As discussed in chapter 1.4, The Wild Free-Roaming Horses and Burros Act of 1971, as amended (16 U.S.C. 1331-1340) does not apply to management of horses and burros which range solely within Sheldon Refuge. Service regulations (30 C.F.R. 30.11-30.12) and Service policies (7 RM 6) provide guidance for management of feral animals, including horses and burros. Service policy (at 7 RM 6.9 A.)

provides specific authority for the destruction of surplus horses and burros on Sheldon Refuge. That said, use of this authority may only be exercised if other methods are determined not feasible and the Regional Director's approval is secured. The policy states that the preferred methods of managing feral horses and burros are biological control or live capture, conducted as humanely as possible. This alternative was eliminated from further study because many segments of society would find control of horses and burros with lethal techniques to be unacceptable.

2.1.3 Send Horses and Burros to Auction

Prior to the enactment of the 1977 Sheldon Horse Management Plan, horses were gathered by local ranchers and were disposed of by sale at public auction or by direct shipment to commercial processing plants. The 1977 and 1980 Sheldon National Wildlife Refuge Renewable Natural Resources Management Plans directed the Service to discourage animals being sold for slaughter by limiting the sale at public auction to 5 animals per buyer. The funds received from these sales were used to offset the costs of management of the horse and burro populations. However, in the June, 2000 Environmental Action Memorandum, the method of disposition of horses was modified to specify that contractors "will be required to arrange for adoption or otherwise provide for disposition of the horses captured in a manner that prevents slaughter for the meat market to the maximum extent possible and also prevents humane on-site euthanasia except in the case of debilitating injury or disease." The current removal and disposition program remains consistent with this philosophy and the Service remains committed to ensuring that these animals are adopted out to good homes and are not slaughtered for meat. See Appendix C for additional details on the adoption process.

2.1.4 Contraception Population Control

Use of an intrauterine device (IUD) for contraception in horses is currently being studied. It may be a cost effective technique to employ in horses to maintain or reduce horse populations at specified levels. Results of the study are not yet available to determine short and long-term efficacy in the field to limit population recruitment or the costs of implementation. In addition, the results of this study will be used to determine how the use of contraception might affect long-term population dynamics and ultimately the impacts of horses on habitats and ecosystem. Because it is a research project and not demonstrated or perfected as a tool, it is not yet considered a viable alternative. However, if it proves successful, it will be incorporated in the program through the adaptive management process.

2.1.5 Fence-off Sensitive Habitats Until Horse Population Management Levels are Reached

At current funding levels, it would take an estimated 9-10 years to reach the management level of 75–125 horses and 30–60 burros. To reduce damage to wildlife habitat and ecosystem function in the interim period, the most sensitive areas could be fenced to exclude horses. This would require the establishment of 54 miles of new fencing around 137 seeps, springs, and riparian habitats. When horse population levels reach the targeted number, these same fences would need to be removed to protect wildlife. It would cost $550,000 to establish 91 miles of exclosure fencing and $183,000 for removal of the same fencing. Annual maintenance of these fences would be about $110,000. While these fences would provide the benefit of protecting and restoring sensitive wetland habitats sooner, they would not protect upland vegetation (and

wildlife) from the impact of horses and burros, and also have negative consequences for certain wildlife species, such as pronghorn and sage grouse. The funds needed to establish, maintain, and remove fencing would equivalently reduce the funds available for wildlife management programs because the funds all come from the same source. Furthermore, there is an estimated 100 miles of interior fencing remaining from earlier grazing operations that require removal. Funding used on exclosure fencing would be better invested in more direct and efficient methods of accomplishing horse population objectives.

2.1.6 Engage the Bureau of Land Management (BLM) to Gather and Adopt Horses and Burros

The BLM has gathered and adopted horses and burros from public lands administered by BLM and the Forest Service (USFS) for many years following the requirements set forth in the Wild Horse and Burro Act. In situations where horses and burros on Sheldon Refuge are crossing the boundary between adjacent BLM lands to Sheldon Refuge, the Service works with BLM to capture those animals and handle them under BLM's program. Horses and burros that do not cross the boundary are subject to Service laws, regulations and policies. There are a number of reasons why it is not feasible for BLM to conduct all of the gathers and adoptions for Sheldon Refuge, including:

- BLM does not have the capacity in facilities, staff, budget, and program to accommodate the numbers required for of removal horses and burros from Sheldon. BLM's adoption market is also saturated.
- The vast majority of Sheldon horses are not subject to the Wild Horse and Burro Act. BLM does not have the facilities, staff or program capability to treat BLM/USFS animals separate from Sheldon animals. There are serious legal, policy, and programmatic implications for integrating animals that are managed under different authorities.
- Finally, it cost roughly twice as much for BLM to process a horse as the Service. Conducting operations through BLM will greatly increase the cost of the horse and burro operation, which will require delays in reaching management objective or a much higher rate of annual funding. Sufficient funding is not currently available to process Sheldon horses and burros under BLM.

2.2 Alternatives Considered

Alternative A: No Agency Action on Horse and Burro Management

Under Alternative A, the Refuge would discontinue the current program of horse and burro population management. Under Alternative A, the Refuge would not conduct any horse and burro gathers, care or management efforts, or horse and burro adoption program. Without these controls, horse and burro populations on the Refuge could double approximately every four years, severely impacting Refuge lands, water sources, wildlife habitats and associated fish, wildlife and plant populations, and posing a safety risk along major public roads. The impacts of Alternative A contrast sharply with the environmental effects of the action alternatives, B-D.

Alternative B: Status Quo (Proposed Action)

The core of this alternative is to continue the current interim horse and burro management program on the Refuge. Also included are minor refinements to the program to improve while a Comprehensive Conservation Plan for the Refuge is developed. This alternative is the Service' "Proposed Action."

Management Objectives

Under the Service grazing plan (FWS, 1980), a number of AUM's were allotted to feral horses and burros. Since horses and burros are not native species, they do not technically fall within the framework of the Service's goal at Sheldon Refuge to manage for a diversity of native plants and wildlife, except for inhibiting attainment of those goals. The intent of this environmental assessment on the Service's feral horse and burro population management program is to consolidate prior NEPA documentation and not change the management objectives (which will be addressed in the upcoming CCP). The Service opted in the 1980 EIS (FWS, 1980) to maintain feral horse and burro populations at levels which would not significantly compromise attainment of higher priority objectives for native species. In synopsis, the management objectives are as follows:

- To maintain a manageable horse and burro population (75-125 horses, 30-60 burros) in balance with other wildlife to assure a functioning natural landscape is available for the enjoyment of refuge visitors.
- To stop range deterioration and improve wildlife habitat and watershed conditions; to reduce adverse impacts on existing water resources.
- To insure that the Sheldon Refuge provides ample forage for all wildlife populations endemic to the area and reduce the spread of horses into key wildlife areas.

The current number of horses on Sheldon Refuge is more than 10-times the conservation population objectives, and burros about twice the objective level. Horses and burros have not been adequately managed because of insufficient funding. Horse and burro numbers would need to be reduced substantially for this alternative to be successful in stopping damage to natural resources, restoring native plant/animal communities, reducing vehicle collisions with horses and burros, and providing cost-effective strategies for managing horse and burro numbers. An analysis of horse/burro population estimates, effects of removal rates, and costs to implement alternative strategies was used to develop the best strategy which is discussed below. Management objectives for all resources will be reexamined under the Comprehensive Conservation Plan process, which will establish a new 15-year strategic management plan for the refuge. The Sheldon Refuge Comprehensive Conservation Plan is expected to be completed in 2009.

Herd Numbers

The horses and burros presently found on Sheldon Refuge are domestic animals gone wild and their offspring. The current horse population is approximately 1,500 animals. Horses will continue to be allowed in the Badger Herd area (See Figure 1 and map III-12 in 1980 EIS). Approximately 75-125 horses will be managed in this one area to increase public safety by keeping the herd as far away from US highway 140 as possible, limit impact from horses to one section of the refuge, and seek to limit the logistical challenge of horses occurring across the entire refuge. Since they are highly territorial, they would be expected to stay within their

respective areas as they have done historically. The current burro population is approximately 100 animals, and would be reduced to 30-60. These animals are being maintained in the Jackass Flat, Virgin Valley, and Bog Hot units, which border along US highway 140. The reduced numbers should also reduce potential for collisions with highway traffic.

Service personnel would inspect horses following capture (described below under Gathering). The most desirable individuals may be returned to the refuge to maintain a population of well-adapted animals with good conformation and colored animals. The majority of horses would be placed in good homes through adoption agents. The Service would dispose of debilitated animals (i.e., deformed, crippled, and infirm) on-site in a humane manner (see Standard Operating Procedures in Appendix C). This will be determined by the Refuge Manager, with a veterinarian available for consultation.

The rates at which the feral horses and burros are removed from the Sheldon Refuge are affected by several uncontrollable factors such as budget allocations, weather, horse ecology and availability of adoptable homes for placement. However, when the opportunity to accomplish removal efforts is presented, there are several different options that can be applied using the same procedures for gather and placement whether we remove 80 or 800 individuals per year. The numbers taken off in any single year will strongly affect the total number of animals to be removed over the long term because of the annual reproductive recruitment back into the herd by the animals remaining on the refuge. This will consequently also affect the total amount of funds needed to accomplish the task.

The most desirable option is to reduce the feral horse herd at the fastest rate possible, between 600 and 1,000 horses per year. This will minimize impacts to wildlife habitat, accelerate restoration of riparian habitats, improve water quality, maintain a safety corridor along Highway 140. It will also minimize impacts to horses - 1,000 fewer total horses will be removed at the higher removal rates – and will reduce chances of horse injury and stress, improve safety concerns to contractors and employees, and allow refuge employees to accomplish other important resource projects. Finally, cost savings to the public will result from higher rates of horse removal from the refuge.

Gathering

Methods proposed for use in gathering and transporting horses and burros from the Refuge incorporate a variety of features designed to reduce adverse impacts, and are summarized below and in Appendix C. Removal of horses would not be allowed during the main foaling season, February through May. While June is technically a reasonable period for gathering horses on Sheldon Refuge, it is unlikely gather operations will be conducted then to minimize risks to foals. Gather operations for horses and burros would occur primarily in the summer, fall, and winter. To avoid jeopardizing wild land qualities, development of roads into proposed wilderness areas would not be allowed. Additionally, traps would be removed immediately after use to preserve the existing wild character of the area. Gathering, holding and removal of horses would be supervised by Service personnel to insure that the animals were treated humanely. These activities may also be viewed by the public in designated areas (assuring safe distance for horses, staff and public).

Currently, the largest numbers of horses are gathered with the use of a helicopter and 1-2 horseback riders through a private contract. The contractor sets up a trap and horses are brought

to the trap by using a helicopter to push the animals. The contractor conducts the capture and transports the horses to the Sheldon holding facility. Use of helicopters for gathering has several advantages. First, a large number of horses can be gathered in a short time. Second, speed of horses can be adjusted as appropriate during gathers from walking to gallop, depending on distance, terrain, and number/age of young. Animals are typically herded less than five miles to the trap location. The disadvantage of this technique is a perceived increase in stress levels to horses and concerns of increased risk of injury.

Another capture method used is gathering horses by using horseback riders through a private contract. This technique is similar to the helicopter gather technique except that riders on horseback bring horses to the trap. The contractor conducts the capture and transports the horses to the Sheldon processing facility. Advantages include flexibility for catching smaller numbers of horses and a perceived reduction in stress levels and injury to horses. The disadvantage is that the animals are brought to the facility in smaller numbers, which creates an overall decrease in efficiency for processing and transporting the animals. A minimum of 50 animals usually need to be on site in holding facilities to justify the cost of processing horses for disease testing by the veterinarian and brand inspection before transport. The slower accumulation of animals requires keeping horses in the Sheldon facility for long periods of time which increases the opportunity for injury at the holding facilities. This also ties up valuable staff time for feeding and watering, and detracts from the primary duties of employees that were hired for other duties. This is also the most expensive technique on a per horse gathered basis.

Capturing animals using the bait trap method is accomplished by refuge staff. Portable panels are set up during the winter months and baited with hay. When an animal enters the trap, a trigger is released and the door closes. Traps are checked once or twice a day depending on horse/burro activity in the area. Refuge staff then transport the animals to the Sheldon facility. The advantage is that it is an effective way to catch burros. Disadvantages are that this method is very labor intensive, ineffective for catching horses, and animals are kept in the Sheldon facility for longer periods of time (until sufficient number of animals are obtain for processing and adoption).

Horses and burros that are documented to cross the refuge boundary onto and off of adjacent lands under the jurisdiction of the BLM are considered subject to the Wild Horse and Burro Act. These animals are managed cooperatively with BLM, and gathered and adopted through the BLM program. The Big Springs Herd Area (Figure 1) is the only affected area at this time.

Injury of horses and burros during gathering activities may occur, due to the rugged terrain and foals and mares may become separated. However, techniques are employed that focus on minimizing these problems.

Processing

Disease testing and processing of captured animals is done at the Sheldon facility (a corral system with various pen areas), following a week of rest after the gather. This consists of putting each animal in a working chute where blood is drawn to perform the Coggins disease test. A description of the animal is recorded with each animal assigned a number. A veterinarian is contracted for the processing and is assisted by the refuge staff and cooperators. The veterinarian also treats injured animals as appropriate. Animals are then sorted to ensure that

mares and foals are paired and are separated from studs, and are fed, watered, and allowed at least 24 hours rest before transporting.

Transportation
Horses and burros are transported from the Sheldon facility to the adoption agent through different methods. Professional haulers in semi-trucks transport the majority of the animals. If the distance is relatively short, refuge staff will haul animals using stock trailers behind pickup trucks or a semi-truck trailer borrowed from the BLM. Regulations require that animals being hauled for more than 24 hours must be rested. Animals are unloaded into a rented corral in route, and provided with 12 hours of rest, feed, and water before resuming transport. Before any animal is transported it must have a health certificate from the veterinarian, a brand inspection, and a cleared name and address of the recipient party.

Adoption Process
All adoptions are completed through adoption agents. The animals are shipped to the agents and then adopted out to their new homes. The agent is responsible for finding individuals that will give them a good home. They are also responsible for assuring that the animals do not go to a slaughter facility. Adoption agents are screened by the Service. All potential adopters must fill out a form describing their intended use of the animal and the facility where it will be kept. Other options are available to the agents such as requiring a reference from a veterinarian, or a signed affidavit. Additional detail is provided in Appendix C.

Improvements to the Program
As described in Section 1.4, the Service continues to improve the program through a process called adaptive management. This includes a variety of minor refinements or adoption of techniques as new information is discovered that improves end results, reduces costs, and reduces risk to horses and personnel. It also includes upgrading facilities. For example, in 2007, the Service intends to modify the corral system with an improved water delivery system and establish a number of smaller pens from large pen areas. The modifications are expected to increase the efficiency of holding and sorting horses, as well as reduce risk to animals and personnel.

Alternative C: Adoption of horses by individuals.

Refuge staff (instead of an adoption agent) would screen individuals and organizations for potential adoption of gathered horses, care for horses until they are picked up, coordinate brand inspections, secure health certificates, and facilitate horse transport. All other aspects of the program would remain the same as Alternative B. The current implementation of the program adopts horses out through several adoption agents. These agents conduct the screening of potential homes for horses, care for the horses in the intervening time, and coordinate transportation. Refuge staff have previously provided these services, but shifted to adoption agents to facilitate the process because of decreased staffing and funding. Application of this alternative, compared to Alternative B, would require additional refuge staff to accommodate the workload, veterinarian support, travel to inspect adoptee facilities and attend horse meetings, food and supplies for horses, and capitalization and maintenance costs for a new corral system (corral, well, hay storage). The new corral would be needed to provide a facility for care and to show horses while awaiting adoption. This facility is separate from existing corral that is used for holding and processing horses from gathers, which would likely occur while other horses are

still waiting for adoption. These costs are offset, in part, by the savings of adoption fees paid to agents and Service share of transport costs.

Alternative D: Conduct Horse Gathers by Only Horseback Techniques.

This alternative would propose to use only horseback riders to gather horses, and baited traps to gather burros, eliminating the use of the combined technique of aircraft and horseback riders. All other aspects of the program would remain the same as Alternative B. The advantage of horseback gathers is the potential for more flexibility to gather smaller dispersed numbers of horses and continuance of a traditional gather technique. There is variation in the techniques used by wranglers to capture horses, and effectiveness of their techniques. A trap corral is setup using available landform. Additional fencing, wings, are run from the trap corral to guide horses into the corral. Depending on individual technique, the horse-mounted wrangler either leads or drives horses into the trap corral. Horses captured by this technique are accumulated in the holding corral over a number of weeks until there are adequate numbers for processing by veterinarian and brand inspector. It is not clear that adequate numbers can be removed each year by this technique.

2.3 Summary of Alternatives and Effects

The tables below summarizes and contrasts the five alternatives (Figure 2) and effects (Figure 3). Details of the effects are provided in Chapter 4.

Figure 2: Summary of Alternatives for Horse & Burro Management at Sheldon National Wildlife Refuge.

Type of Horse & Burro Management Activity	**Alternative A No Action On Horse and Burro Management**	**Alternative B Status Quo Preferred Alternative**	**Alternative C Adoption by Individuals**	**Alternative D Use only Horseback & Trap Techniques**
Gather Technique	Not Applicable	Aircraft, bait traps, horseback riders	Aircraft, bait traps, horseback riders	Horseback riders, Bait traps
Use horse-back riders to gather	None	Conducted by contractor	Conducted by contractor	Conducted by contractor
Use helicopters & horseback riders to gather	None	Conducted by contractor	Conducted by contractor	None
Use "traps" to capture burros	None	Conducted by Service staff	Conducted by Service staff	Conducted by Service staff
Work with BLM for horse/burro removal	None	Only horses/burros subject to WHBA	Only horses/burros subject to WHBA	Only horses/burros subject to WHBA
Processing at onsite corrals with DVM	Not Applicable	Yes	Yes	Yes
Transport to adoption sites (agents or adoptees)	None	Contractor or Service Staff	Contractor, Service Staff, or Adoptee	Contractor or Service Staff
Adoption	None	Conducted by Adoption Agents thru agreement	Conducted by Service	Conducted by Adoption Agents thru agreement
Livestock Fencing	Maintain perimeter fence by Service & contractor	Maintain perimeter fence by Service & contractor	Maintain perimeter fence by Service & contractor	Maintain perimeter fence by Service & contractor
Horse/Burro Population Monitoring	Conducted by Service	Conducted by Service	Conducted by Service	Conducted by Service

Figure 3: Summary of Effects of Horse & Burro Management at Sheldon National Wildlife Refuge.

Environmental Consequences	Alternative A No Action On Horse and Burro Management	Alternative B Status Quo, Preferred Alternative	Alternative C Adoption by Individuals	Alternative D Use Only Horseback & Trap Techniques
Physical Effects	Deteriorating in Correspondence With Increasing Number of horses	Improving in Correspondence With decreasing Number of horses	Same as Alt. B	Same as Alt. B
Aquatic resources (water quality, silt, bacteria, nutrients)	Severe impact to water quality & resources	Improved water quality & resources	Same as Alt. B but delayed	Same as Alt. B but delayed
Soil compaction and surface crust	Increased soil compaction, degradation of biol. crust	Reduced soil compaction & improved biol. crust	Same as Alt. B but delayed	Same as Alt. B but delayed
Biological Effects	Deteriorating in Correspondence With Increasing Number of horses	Improving in Correspondence With decreasing Number of horses	Same as Alt. B but delayed	Same as Alt. B but delayed
Vegetation	Decreased species richness & distribution of cover	Improved species richness & distribution of cover	Same as Alt. B but delayed	Same as Alt. B but delayed
Invasive Species	Increased risk	Decreased risk	Same as Alt. B but delayed	Same as Alt. B but delayed
Migratory Birds	Decreased habitat quality & species richness	Increased habitat quality & species richness	Same as Alt. B but delayed	Same as Alt. B but delayed
Reptiles, Amphibians, Small mammals	Decreased habitat quality & species richness	Increased habitat quality & species richness	Same as Alt. B but delayed	Same as Alt. B but delayed
Large mammals	Habitat degradation & competition	Improved habitat & decreased competition	Same as Alt. B but delayed	Same as Alt. B but delayed
Endangered/candidate species	Decreased habitat potential	Improved habitat potential	Same as Alt. B but delayed	Same as Alt. B but delayed
Biodiversity (species richness of native species, biological integrity)	Severe degradation	Large improvement	Same as Alt. B but delayed	Same as Alt. B but delayed
Horses & Burros	Reduced risk from gather operations, Decreased habitat quality, Increased mortality, risk of large die-offs	Increased risk from gather operations, Improved habitat, Greater population stability	Same as Alt. B but delayed	Same as Alt. B but delayed
Social, Cultural, & Economic Effects	Positive & negative effects	Positive & negative effects	Positive & negative effects	Positive & negative effects
Wildlife-related Recreation	Generally decreasing	Generally increasing	Same as Alt. B but delayed	Same as Alt. B but delayed
Economic Impact to Communities	Increases & Decreases	Generally Increasing, but also decreases	Same as Alt. B but delayed	Same as Alt. B but delayed
Cultural Resources	Increasing damage	Decreasing damage	Same as Alt. B but delayed	Same as Alt. B but delayed
Estimated cost of reaching management objectives at 600 horses removed per year	Cannot accomplish mgmt. objectives	Horses: $3,019,000 Burros: $22,700	Horses: $3,090,000 Burros: $22,700	Horses: $3,401,000 Burros: $22,700
Time to accomplish management objectives	Cannot accomplish mgmt. objectives	3 years	4 years	7 years

Chapter 3: Affected Environment

This chapter presents the potentially affected environment (i.e., the physical, biological, wildlife, cultural, social, and economic values and resources) of the impact area as identified in the internal and external scoping process. This chapter provides the baseline for comparison of impacts described in Chapter 4. Chapter 3 is organized by affected resources.

3.1 Physical Environment

Location and Size
Sheldon National Wildlife Refuge (Sheldon Refuge), administered by the Service, is located in the northern portions of Washoe and Humboldt counties in northwestern Nevada and in the southeast portion of Lake County, Oregon (Figure 1). The total area within Sheldon's boundaries is 575,813 acres, with 575,186 acres in Nevada and 627 acres in Oregon. The closest towns of any size are Lakeview in Lake County, Oregon, Winnemucca in Humboldt County, Nevada and Alturas in Modoc County, California. The land surrounding Sheldon Refuge is owned primarily by the Federal Government and managed by the BLM through three districts; Lakeview District to the north, Winnemucca District to the east and south and Susanville District to the south and west.

Physiography
Sheldon Refuge is part of the High Desert. The High Desert is characterized by wide-open spaces and a variety of landforms. The two most common landforms include narrow canyons that empty into rolling valleys with no drainage outlet to the ocean, and broad flat tables that end abruptly in vertical cliffs. The elevation of these landforms ranges from a high of 7,294 feet on Catnip Mountain to a low of approximately 4,200 feet on the northeastern boundary. The area generally decreases in altitude from west to east.

Geology
Three rock units dominate the Sheldon Refuge landscape. The oldest unit, a layer of Rhyolite flows called Canyon Rhyolite, commonly forms the bedrock upon which the two other rock units on Sheldon Refuge are laid. The most prominent exposures of Canyon Rhyolite on are McGee Mountain in the extreme east and the walls of Virgin and Thousand Creek Canyons. Above the Rhyolite, with thickness up to 1200 feet, is the High Rock Sequence. This formation is composed primarily of volcanic tuff and stream and lake sediments. The Virgin Valley Formation and Thousand Creek Beds are considered to be part of the High Rock Sequence and is the largest portion of this rock unit exposed on the Refuge. They comprise the area of the Virgin Valley and part of the outcrops east and west of Railroad Point, both of which are located in the northeastern part of Sheldon. The Virgin Valley formation and Thousand Creek Beds are important because the soils, which originate from them, are fragile, erode easily and support vegetation somewhat different from the surrounding area. The Virgin Valley Formation is also the only area with mineral production on Sheldon Refuge (USGS and Bureau of Mines, l978). The third unit is comprised of extensive basalt flows up to 100 feet thick, which form large broad tables and cap most of the mountains. Wherever the flows end or have been cut by erosion, natural barriers in the form of rim rock have been created. This rim rock is usually steep enough to restrict livestock access onto the tables. Some of the larger basalt tables on Sheldon Refuge

include Railroad Point, Big Spring Table, Rock Spring Table, Fish Creek Table, and Gooch Table.

Climate
Sheldon Refuge is influenced by climatic forces that restrict water supply and vegetation. Annual precipitation on the area, because of long, cold winters, occurs mainly in the form of snow and averages about six inches on the east side and 13 inches on the west side. High summer temperatures, especially in lower elevation areas, result in significant evaporation and contribute to a scarcity of surface water and available soil moisture during the summer months. The probable occurrence of frost during any month restricts the growing season to the summer season.

Water
On Sheldon Refuge, water is scarce during the summer months, and the most consistent water sources (and therefore the most important) are natural springs. The Refuge contains 137 Springs/seeps, 117 miles of perennial streams that flow most years, and 146 reservoirs, ponds, and playas that hold water early in the season of most years. Most of the springs flow water year-round and have the potential of providing good quality water. Other water sources such as streams, lakes and reservoirs rely on average precipitation to flow or fill; and even with above average precipitation they are not reliable for late season water. For example, the largest streams are Hell, Virgin, Thousand, Fish, Wall and Badger Creeks; with only Hell and Virgin Creeks flowing consistently each year. Reservoirs such as Swan, Big Spring, Rock Spring and Alkali often do not fill and are sometimes dry. Natural lakes such as Swan Lake and Gooch Lake hold water year-round except during drought years.

Soils
Soils in northwest Nevada are semiarid, very young, and poorly-developed. Chemical and biological soil development processes, such as rock weathering, decomposition of plant materials, accumulation of organic matter, and nutrient cycling proceed slowly in this environment. Soil recovery processes are also slow; therefore, disruption of soil can lead to long-term changes in ecology and productivity. In many areas, natural or geologic erosion rates are too fast to develop distinct, deep soil horizons. The soils of Sheldon Refuge are complex and diverse.

Management practices may affect soils' ability to maintain productivity by influencing disturbances such as displacement, compaction, erosion, and alteration of organic matter and soil organism levels. When soil degradation occurs in semiarid, high desert regions, natural processes are slow to return site productivity. Prevention of soil degradation is far more cost-effective and time-effective than remediation or waiting for natural processes. Any activities that remove vegetative cover increase the erosion rate. Some soils are particularly vulnerable to soil erosion. If the surface layers of these soils are washed or blown away, the productivity potential is lost for a geologic time span. (BLM Resource Management Plan EIS, 2003)

3.2 Biological Environment

Biological integrity, diversity, and environmental health
Landscapes dominated by sagebrush (*Artemesia* spp.) extend across large portions of 11 states in the Intermountain West and constitutes the most extensive habitat type on Sheldon Refuge. The

sagebrush steppe ecosystem evolved with low densities of large bodied grazers. This period began with the Pleistocene extinctions of key mammals (including equines) from 10,000-14,000 years ago and continued until the introduction of the European horse breeds and other livestock more than 180 years ago (Beever 2003, Mack and Thompson 1982). Today, sage-brush steppe constitutes one of North America's most imperiled and neglected ecosystems (Noss and Peters 1995, Mac et al. 1998) due to the profound, ecologically transformative influences of livestock grazing, followed by alteration of natural fire regimes and consequent invasion of exotic plant species (Bock et al. 1993, Fleischner 1994, Saab et al. 1995, Rotenberry 1998, Young and Sparks 2002).

The Refuge Administration Act, as amended, clearly establishes that wildlife conservation is the singular National Wildlife Refuge System mission. House Report 105-106 accompanying the National Wildlife Refuge System Improvement Act of 1997 states ". . . the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first." Biological integrity, diversity, and environmental health are critical components of wildlife conservation. Biological integrity, diversity, and environmental health can be described at various landscape scales from refuge to ecosystem, national, and international. Each landscape scale has a measure of biological integrity, diversity, and environmental health dependent on how the existing habitats, ecosystem processes, and wildlife populations have been altered in comparison to historic conditions. Sheldon Refuge is the largest in-tact piece of land representative of the shrub-steppe ecosystem in the nation that is ungrazed by domestic livestock. It contains diverse plant and animal constituents that are mostly native, and strongly dependent upon the biotic and abiotic components that they have co-evolved with.

Vegetation

Sheldon Refuge is the largest contiguous block of land in the Great Basin that is free of domestic livestock grazing. Livestock were removed from the Refuge in 1994 to allow restoration of upland and riparian habitats after decades of over-grazing and fire suppression.

Records of species occurrence for the Refuge indicate 499 plant species within 58 families. Forbs and graminoids (e.g., grasses, rushes, sedges) dominate the floral diversity and they comprise 76% of the species. A rare plant survey was conducted on Sheldon Refuge in 1996 by The Nature Conservancy (TNC) (Nachlinger, 1996). This survey identified three "plant species of concern" (as defined by TNC) that included *Ivesia rhypara* var. *rhypara, Hackelia ophiobia,* and *Lomatium roseanum.* Two separate populations of the *Ivesia* were located and contained 165,356 individuals which represents 86% of the known population in Nevada, and 85% of the total global distribution. The other two species *(Hackelia* and *Lomatium)* were determined to be secure and without threat on Sheldon Refuge, as long as disturbance such as grazing in these areas is prevented.

A comprehensive vegetation mapping effort on Sheldon Refuge was completed prior to the 1980 Management Plan and was updated in 1993. This effort used a method that classified vegetation based on range sites. A range site is a section of land with a distinct combination of soi1, topography, climate, vegetation, and wildlife, all of which determine how an area should be managed. A 1977 study (Anderson, 1977) identified 28 range sites on Sheldon Refuge, as well as the Virgin Valley Hills Formation. As a follow-up on the 1977 identification of range sites, a 1978 study compared 1964 range site data with 1978 data. Two important vegetative trends were identified on Sheldon Refuge (Anderson, 1978):

1. Ecological condition of most range sites has remained static or only improved slightly since 1964, and,
2. The vigor of key forage species (grasses, forbs, and some shrubs) on Sheldon Refuge is generally low.

Ecological condition is a measurement of the stage of plant community evolution in relation to its potential or climax. It is usually broken down into four categories: poor, fair, good, or excellent. An area in poor ecological condition generally has less than 25% of its potential plant composition, whereas an area in excellent condition has from 75% to 100% of its original plant community. Climax plant communities in the High Desert are more diversified than lower successional stages. Therefore improving ecological condition of a site increases vegetation density and generally, species diversity.

Details on 13 of the 28 range sites and vigor and ecological condition trend information that occur on Sheldon Refuge (including the Virgin Valley Hills) can be found in the 1980 Management Plan (FWS, 1980). These 13 range sites were chosen because of the number of acres they occupy or the habitat they provide, such as food or cover, are important for wildlife and are in the areas affected by feral horses and burros.

Invasive Species

Approximately thirty species of plants are introduced, non-native, and often noxious varieties that have infested native vegetation types on the Sheldon Refuge. Many of them were introduced during the livestock grazing era, while others have invaded as a result of road construction and refuge visitors serving as unknowing vectors by bringing seeds in the undercarriage of their vehicles and on their clothing. Most concentrations appear along roadsides and water courses where seeds are more likely to become established.

3.3 Wildlife

To date, approximately 200 vertebrate species have been recorded on Sheldon Refuge. Avian and mammalian species collectively comprise 93% of the Refuge vertebrate wildlife. Wildlife use of the Refuge differs on a seasonal basis among taxonomic groups of wildlife. Only two of the 200 wildlife species recorded on Sheldon Refuge are federally listed as threatened or endangered under the Endangered Species Act of 1973.

Fish

During the summer of 1978, a fisheries inventory was initiated. Although fish habitat is limited on Sheldon, 11 species were identified and located (Williams and Storm, l978). One species, Lahontan cutthroat trout, was originally found in Virgin and Hell Creeks, but was eliminated in the recent past. Lahontan cutthroat trout is on the Federal list of threatened species. It has been introduced into Catnip Reservoir as brood stock for restocking other Nevada localities. Two other species, Tui chub and Alvord chub, are native to the area. The remaining eight species have been introduced. One of the introduced species is in fact a hybrid of introduced rainbow trout and native cutthroat trout. The study did not find any pure strains of native cutthroat despite further investigation in 1979. The Tui chub found on Sheldon Refuge is an undescribed subspecies distinct from the Tui chub in the Catlow Valley of Oregon. It is restricted to a section of drainage unaltered by man's activities.

Reptiles and Amphibians

A two-year study and inventory of amphibians and reptiles was initiated in 1978. Three amphibians and fifteen reptiles were found (Williams and Storm, 1978). One species of amphibian, the bullfrog, is not native to Sheldon Refuge but is confined to the warm spring pool at Virgin Valley campground and the Virgin Ranch. The Great Basin spadefoot toad is widespread and utilizes pools in permanent or intermittent streams, stock ponds, lakes or reservoirs for breeding. The Pacific tree frog is the most abundant and widespread amphibian on Sheldon. Its larvae occurred in almost every type of water checked at all elevations. The 1978 inventory shows that reptiles most commonly occur in the Virgin Valley, Thousand Creek Valley and Bog Hot area. Several species of lizard (collared, leopard, desert horned, and western whiptail) occur only in this area. Of the total number of species of reptiles on Sheldon, only two did not exist in Virgin Valley. They are the short-horned lizard, which was found near Catnip Reservoir, North Lake, and Fish Creek Mountain, and the rubber boa, sighted near Badger Mountain, Swan Lake Reservoir and Bald Mountain Lake. No threatened or endangered species of amphibian or reptile were found in 1978 or 1979.

Other snake species observed on Sheldon Refuge include: Western rattlesnake, racer**,** gopher snak*e***,** long-nosed snake**,** and Western terrestrial garter snake, night snake, and striped whipsnake**.** The ringneck snake is suspected of occurring on the refuge, but not observed or documented.

Lizard species found on Sheldon Refuge include: Great Basin collard lizard, long-nosed leopard lizard, short-horned lizard, sagebrush lizards, Western fence lizard, desert horned lizard and northern side-blotched lizard. Other species suspected to occur there, but undocumented include Western skink and Great Basin whiptail.

Birds

Sage Grouse

Figure 4. Sage grouse on Sheldon NWR.

Historical accounts describe early settlers gathering buckets of sage grouse eggs for camp fare. If these accounts are true, sage grouse were once very plentiful. Estimates of sage grouse numbers and production trend have been maintained for many years by conducting spring lek counts. This information has been used as a general trend index for known populations. Recent trends appear to suggest that most populations have stabilized, while a few are actually increasing. One of the biggest concerns for sage grouse populations all across the West is the potential of West Nile Virus (WNV) outbreak. Recent research has demonstrated that sage grouse are highly susceptible to this virus and have extremely high mortality rates approaching 100% (Clark et al., 2006), with recent monitoring showing small outbreaks in a number of locations of the sagebrush steppe ecosystem (Diearauf, 2006). There is concern that this disease may appear in the future with devastating consequences for this species. The US Geological Service, National Wildlife Health Center is conducting on-going research on this virus to determine if horses can act as an alternative host for this disease. More than 700 blood samples have been collected from feral horses over the past 3 years, and to date, all of these samples have resulted in a negative test

result for WNV. Based on current information, horses are not considered a viable host for virus transmission of WNV to other species (USDA 2004).

During winter (October through April) sage grouse are almost completely dependent on sagebrush for cover and food (sage grouse lack a muscular gizzard containing stones so must depend on soft materials for food. (Paterson 1952). For this reason the primary winter use areas on Sheldon Refuge are low-lying big sagebrush communities (primarily arid loamy terrace sites) such as Sage Hen Hills and the area west of IXL Ranch. In early spring, sage grouse move toward higher elevations and are found in the vicinity of leks. In summer and early fall forbs and insects become an important food source, especially for chicks. Meadows in good or excellent condition are the best areas on Sheldon Refuge for forbs and insects. However, feeding sage grouse will avoid rank stands of meadow vegetation and prefer meadows with surface water available (Oakleaf 1969, Savage 1971). Since many of the meadows associated with springs are in poor ecological condition and have lowered water tables, there is a need to improve their condition for sage grouse. Sage grouse are one of the easiest birds for visitors to view and as such create a great deal of interest and contribute to public viewing.

California Quail, Mountain Quail, Chukar Partridge and Gray Partridge
California and mountain quail are native to Sheldon Refuge. California quail is common although populations are not large, while mountain quail are uncommon and rarely seen. Willows are extremely important for both species and the elimination of woody species due to grazing may be the limiting factor on populations. Weather conditions and water availability also pose a challenge to these species. Chukar and Gray partridge are not native to Sheldon Refuge, and are not considered a management priority. While gray partridge is uncommon, Chukar is common at lower elevations on the refuge. Hunting of these species is permitted in coordination with Nevada regulations.

Waterbirds
Ten species of ducks nest on Sheldon Refuge including mallard, Northern pintail, gadwall, Northern shoveler, American wigeon, ruddy duck, redhead, common goldeneye, green winged and cinnamon teal. Great Basin Canada geese are common, and are yearlong residents except during extremely harsh winters. Swans do not nest in the area but may be seen during spring or fall migration. Nesting pairs of greater sandhill cranes are rare and are seen only during wet years in IXL meadows, on one portion of Virgin Creek and around the Dufurrena Ponds on Thousand Creek. Because of limited water areas, wading and shorebird species are normally seen only during spring and fall migrations. Killdeer, Virgina rail, common snipe and coots nest locally around permanent water area. All water and marsh areas are used by water birds at some time during the year. Bog Hot Springs, Dufurrena ponds, Catnip Reservoir and Virgin Valley are areas with sufficient water to receive consistent use during most years. Intermittent water areas include Alkali, Swan and Big Spring Reservoirs, Smith and Onion Lakes, and the IXL ponds. Winter use is confined to Bog Hot Springs and Dufurrena Ponds where hot springs keep water areas open.

Raptors
Numerous rocky cliffs and outcroppings occur on Sheldon Refuge, which creates ideal nesting habitat for golden eagles, prairie falcons and red-tailed hawks. Other raptors such as kestrels, northern harriers, and several species of owls are relatively common and nest in suitable habitats.

Small numbers of bald eagles (Federal list of threatened species) utilize low gradient wetlands on Sheldon Refuge during the spring and fall migrations.

Passerines
The predominance of bird species found on the refuge are in the Order Passeriformes, which includes perching birds and song birds such as jays, blackbirds, warblers, and sparrows. Approximately 56 native land bird species are highly associated breeding species in shrub-steppe habitats (Altman and Holmes, 2000). Several of these species are only found in shrub-steppe vegetation which is common on Sheldon Refuge, including sage sparrow, sage thrasher, and Brewer's sparrow. Some examples of non-obligate species include: loggerhead shrike, lark sparrow, vesper sparrow, and Western meadowlark. Approximately 97 native land bird species are also highly associated breeding species in riparian habitats. In contrast to shrub-steppe, riparian habitat typically supports the greatest diversity of land bird species. Examples of species affected by removal and trampling of vegetation in this vegetation type include: song sparrow, yellow warbler, yellowthroat, willow flycatcher, spotted towhee, and Bullock's oriole.

Mammals

Small Mammals
A diversity of small mammals use the shrub-steppe ecosystem at Sheldon Refuge including species such as: deer mouse, pinyon mouse, grasshopper mouse, desert wood rat, sagebrush vole, Ord's kangaroo rat, Great Basin pocket mouse, kangaroo pocket mouse, Northern pocket gopher, least chipmunk, white-tailed antelope ground squirrel, Belding's ground squirrel, black-tailed jack rabbit, Nuttall's cottontail rabbit, and pygmy rabbit (Columbia Basin segment of population is listed as endangered).

Pronghorn
A biological unit is an area that contains all the necessary requirements for a species to survive including food, water, and cover. Sheldon Refuge is only a portion of the biological unit for an interstate herd of pronghorn that includes areas in both Nevada and Oregon as far north as Hart Mountain National Antelope Refuge (HMNAR). Within the biological unit are two separate summer pronghorn herds, one that centers on Sheldon Refuge and one that centers on HMNAR in Oregon. The summer population of the Sheldon Refuge herd has fluctuated annually with an average of about 870 animals. However, peak populations occur in the winter when pronghorn from the Hart Mountain herd and herds in between migrate to wintering areas on Sheldon Refuge. Annual pronghorn kid production on Sheldon Refuge shows an even greater fluctuation than total population figures, with a low of 8 kids per 100 in 1971 and a high of 99 per hundred in 1957. Pronghorn distribution during the spring, summer and fall depends on weather and forage. Normally on Sheldon Refuge, the Round Mountain-Horse Heaven to Fish Creek-Bitner Creek Area supports 50-60% of the summer herd. Other areas include Gooch Table south to Badger Mountain, Rock Spring Table, and land around Big Spring Reservoir. Most of these areas are low sagebrush communities that are usually broad, open, and flat. Pronghorn concentrate in these locations because their good eyesight and speed in these open areas allow them to evade predation.

The shrubby rolling hills site is important to pronghorn in the late summer and fall when the protein content of grasses decline and the protein content of bitterbrush reaches a peak. Depending on the amount of snow, pronghorn winter primarily on Gooch and Big Spring Tables.

These two plateaus are dominated by big and low sagebrush communities which provide about 90% of the pronghorn's winter diet. When snow covers Gooch Table, the herd moves to Big Spring Table. Food is usually available on Big Spring because there is less snow due to high winds that keep the area barren. It is during this time that pronghorn from Hart Mountain National Antelope Refuge and areas in between migrate to their traditional wintering area on Big Spring Table.

Mule Deer

Mule deer populations on Sheldon Refuge and throughout the entire geographic range of the species have shown a decline since the early 1960's. Although there are indications that the population has stabilized on Sheldon Refuge and might be slightly increasing, more time is needed to confirm the recent trend. The immediate causes for the decline are thought to be deficiencies in habitat that kept fawn survival at low levels. Mule deer use areas differ from pronghorn use areas on Sheldon Refuge except in the autumn when bitterbrush becomes preferred forage. In the spring, the mountain swale site is important for deer fawning because of the protection from predation provided by its dense cover. Summer-autumn use areas are generally on higher elevation mountains within the shrubby rolling hills and mahogany rock land range sites. These two sites include Badger Mountain which supports about 40% of the deer herd; Catnip Mountain, 15%; Bald Mountain, 15%; Fish Creek and Devany Mountains, 15%; and other areas, 15%. The dominant plant in the shrubby rolling hills site, bitterbrush, provides an important food source for mule deer, and mountain mahogany stands provide cover. Severe winter weather forces deer into primary wintering areas such as Upper Virgin Valley, Big Mountain, McGee Mountain, the southwest end of Guano Valley, between Gooch Table and Hell Creek, and areas south of Sheldon Refuge. The wide scattering of deer during winter is partially attributable to the fact that many of these areas are in poor ecological condition and provide marginal habitat. For example the area between Gooch Table and Hell Creek is mostly arid rolling hills site in poor condition. The major shrub, big sagebrush, provides adequate cover and a sufficient quantity of forage, but is of relatively poor qua1ity. Improving ecological condition of deer wintering areas is an important step in restoring mule deer populations to their former levels

California Bighorn Sheep

California bighorn were restored to Sheldon Refuge after disappearing for more than half a century. Remains of California bighorn sheep have been found at numerous locations throughout Sheldon Refuge. The last record of bighorn sheep in the area (prior to their restoration) was a band of about 24 animals seen during the late 1920's on McGee Mountain. The reasons bighorn sheep disappeared are not clearly understood, but the general consensus is that encroachment by domestic sheep, introduced diseases, and poaching were responsible for their demise. In 1968, eight California bighorn sheep were restoreded on Sheldon Refuge into a 1,700-acre enclosure in the Hell Creek drainage, and today the refuge supports a population of approximately 170 animals.

The arid rolling hills site is ideal habitat for bighorn sheep because of its ruggedness and close proximity to escape cover. The steep south exposure site (this site was not discussed in the vegetation section) is important for bighorns in winter because it is the first to be free of snow. Bighorns utilize both these sites in and around the enclosure on Hell Creek. Big Mountain, the adjacent Idaho Canyon in the southeastern section of Sheldon Refuge, and the slopes around

Rock Spring Table are predominantly arid rolling hills with steep south exposure sites that have excellent potential for bighorn sheep habitat.

Predatory Mammals
Mountain lions are found on the refuge, but are very limited in numbers. Bobcats and badgers are widespread but not abundant. Coyotes exist in moderate to high populations throughout Sheldon Refuge. Predator control has not occurred on Sheldon Refuge since 1967.

Feral Horses and Burros

Figure 5. Feral horses on Sheldon NWR.

Horses and burros existed on Sheldon NWR prior to its establishment in1931. Historically, local ranchers managed these horse herds by mixing desirable modern domestic stock with the original Spanish horses that had migrated up throughout the Great Basin after the Pueblo wars in the 1500's. The region was a Cavalry Re-Mount area, where quality Thoroughbred, Quarter Horse, Morgan, and Draft stallions were deliberately released for the purpose of capturing and selling the offspring to the U.S. and European Cavalries for the various wars during the late 1800's and early 1900's. Ranchers living in the area now designated as the Sheldon Refuge managed these horses for about 100 years and enforced a rigid breeding program that favored the bigger stronger bloodlines of the European breeds. These bloodlines, combined with many generations of harsh natural selection and rigid culling by ranchers has resulted in a breed that is large, colorful, and sturdy, with a good conformation and very good feet. Today, this breed shows little resemblance of the Spanish stock that was thought to have occurred here before the European stock became prevalent. The Sheldon horses are reported by many adopters to have an unusually good disposition as well.

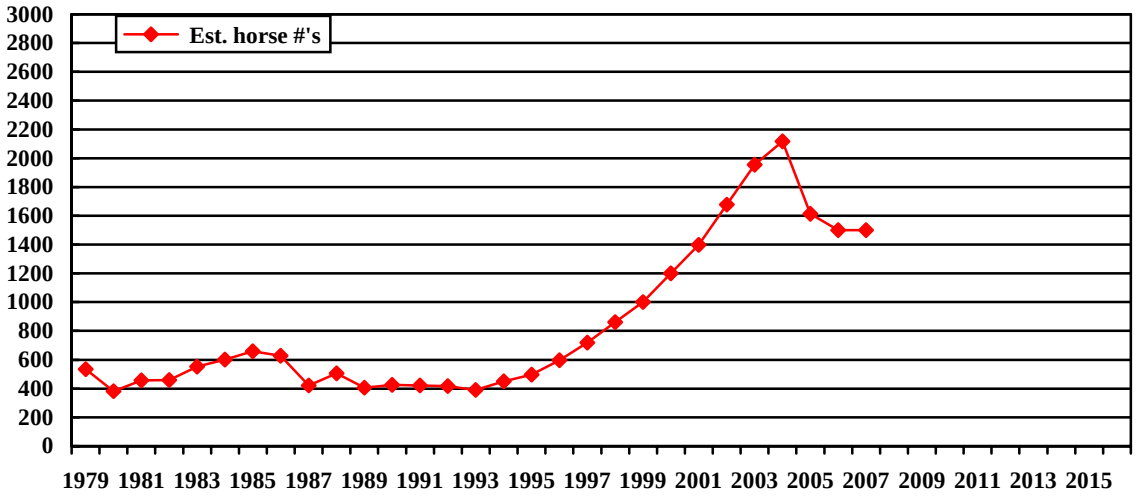
Livestock grazing occurred on the refuge up through the early 1990s. At that time, it was permanently removed from Sheldon NWR because of conflicts with wildlife. Nonetheless, the 1980 Management Plan and EIS (FWS 1980) set out management objectives for wildlife, livestock and feral horses and burros. In the plan, “a certain number of AUM's would be allotted to feral horses and burros.” Since these animals are not native species, they do not technically fall within the framework of the Service's objective at Sheldon to manage for a diversity of native plants and wildlife. However, as a result of public input to an environmental assessment on the Service's feral horse control program, the Service allowed a small proportion of the grazing allotment for horses and burros. But if their populations were left unchecked, they could seriously interfere with achievement of management objectives for native wildlife species. Therefore, the Service opted in 1980 to maintain feral horse and burro populations at levels which would not seriously compromise attainment of higher priority objectives for native species. Due to the explosive growth of the feral horse population and the associated damage that horses were causing to range resources, the Service initiated corrective action with a 1977 plan to reduce the horse population to 75-125 animals - a population level that was believed to be compatible with native wildlife and plant species. To maintain this population level, periodic

control is required, approximately every three to four years. The plan also stated that burro populations were reduced to a level of 30 animals in 1977. The Service would seek to maintain populations at between 30 and 60 individuals - a level that would not jeopardize native species. These animals are being maintained in the Jackass Flat and Bog Hot units.

The population of feral horses was much smaller (200-300 animals) in the early 1990s and the impact was not as severe. However, the population has increased significantly in the past 15 years and habitat damage is now occurring at an unacceptable level. Figure 6 shows the estimated number of horses (based upon field surveys and horses removed from the refuge). The Service has managed these herds for more than 70 years, and the current program to control horse and burro populations a continuation of that effort. Horses are gathered as funding permits, during the period of 1980 to 2006, approximately 2,996 horses and 300 burros were gathered and removed from the refuge. Gathering of horses is accomplished by both helicopter and horseback. The latter technique is more difficult and more expensive than helicopter gathers, but provides the refuge with flexibility in gather times and quantities. The Service has conducted gathers in the spring, summer and fall to meet population reduction targets that are required for the benefit of native plants and wildlife. Although horses can have foals almost any time of year, spring horse gathers on the refuge have been conducted after the peak of foaling (March, April and May), so that the majority of foals were at least 1-3 months of age when the gather occurred. Gather techniques were adjusted to reduce the risk of mares and foals being separated. Burros are primarily gathered in baited traps.

Careful consideration is given to the horses to ensure their well-being during horse removal efforts, including onsite support by a veterinarian and horse experts. The injury rates on horses during the roundup have been less than one percent, and deaths have been even lower. The gathers are scheduled in such a way as to take advantage of more reasonable temperatures. If daytime temperatures are in the 90s (^{o}F), operations are modified to lessen the chance of heat stress.

Figure 6. Estimate of peak annual horse numbers on Sheldon NWR (post foaling and before gathers).



Horses and burros on Sheldon NWR have no natural predators except for an occasional mountain lion, and their populations increase at a very high rate when compared to populations of deer, antelope and other native species for which the refuge was established. The herd's growth rate is very strong, averaging between 17-23% net increase per year. The current population of horses is approximately 1,500 animals and for management purposes are classified into 4 different groups based on the area they are most frequently seen (see Figure 1 for map of herd areas). These areas include Catnip, Big Springs, Fish Creek, and Badger. With the current population, 240-280 animals must be removed each year just to keep the current population stable. During the past 10 years, the feral horse populations have increased to a level more than 10-times that of the management target, causing damage to upland areas and water sources on the refuge. For this reason, the Service has undertaken at least two gathers per year to decrease the total population.

The horse population level on Sheldon is causing negative impacts to native wildlife and their habitats. Conflicts over scarce water in this desert environment include trampling of vegetation along stream banks and at spring heads, physical exclusion of other species by dominant stud horses and burros, and contamination from feces and urine. Horses also cause habitat degradation by removal and trampling of vegetation in the upland areas. These areas provide important habitat for native species such as pronghorn, mule deer, bighorn sheep, sage-grouse, waterfowl, and many species of native songbirds, mammals, reptiles, amphibians, plants and invertebrates. Removal of natural cover allows predators to more easily locate and kill the species that depend upon that cover to hide, especially during the fawning and brooding seasons. The impact horses and burros have on habitat and species threaten the biological integrity, diversity and environmental health of Sheldon refuge and its contribution to conservation in the Great Basin ecosystem and the Refuge System. This is discussed in chapter 4.

3.4 Social, Cultural, and Economic Environment

Social and Economic Environment

The local Counties of Lake, Humboldt, and Modoc combined contain over 22,000 square miles of surface area. According to the 2000 census Lake County, Oregon has a population of 7,722, Modoc County, California has a population of 9,449, and Humboldt County, Nevada has a population of 16,106; totaling 32,977. Most of the population is clustered in three large towns: Lakeview (Lake County), Winnemucca (Humboldt County), and Alturas (Modoc County). The economies of Lake, Humboldt, and Modoc Counties can best be described as narrow-based with a high dependency on government and agriculture for employment.

Recreation on Sheldon Refuge is associated primarily with wildlife/wildlands observation; other popular activities include driving and hiking through the refuge, picnicking, camping, and rock hounding. About 21% of visitors participate in hunting and fishing activities. Because of the travel time involved in reaching Sheldon Refuge, many users camp overnight. Sheldon Refuge received an estimated 22,000 visits in 2006.

The visiting public provides economic benefits to the local communities including the use of hotels, restaurants, grocery stores, and gas stations.

The positive contributions of the recent manage of feral horses and burros include providing the public with an opportunity to own a horse or burro, opportunity for feral horse and burro

viewing, and providing private contractors with income through involvement with feral horse and burro removal from Sheldon Refuge.

The negative impacts from the feral horses and burros include horse/burro-automobile collisions on Highway 140, decreased income to local horse ranchers by flooding the horse-owning market with horses from Sheldon Refuge and other federal adoption programs, and decreased quality of wildlife recreation on Sheldon Refuge (described above).

Cultural Resources

Cultural resource identification was limited to a review of the existing cultural resource records for Sheldon Refuge (Raymond and Parks, 2007). The purpose was to determine if previously recorded cultural resources occur in or near the area of potential effect (APE), i.e., places where horses are known to concentrate.

The review indicated that among the 9 locations known for their horse concentrations, archaeologists previously surveyed 7. Among the areas that were surveyed by archaeologists all contain at least one prehistoric archaeological site. This is not surprising; people, like wildlife and feral horses, are attracted to water. The areas surveyed were Big Springs Reservoir, Catnip Reservoir, Martinez Spring, Ten Mile Spring, Horse Canyon Spring, Hell Creek, and Virgin Creek. The site records for Big Spring Reservoir, Martinez, and Ten Mile springs are archaeological sites that are eligible to the National Register of Historic Places.

Two areas, Big Spring Creek and Catnip Creek have never been surveyed by archaeologists. Given their proximity to permanent water, we suspect that these places also contain prehistoric archaeological sites.

Chapter 4: Environmental Consequences

This section analyzes the impacts of Alternatives A-D to those resources described in the Affected Environment section above. The environmental impacts of the Alternatives will be analyzed in terms of their impacts to the physical, biological, wildlife, horses and burros, cultural, social, and economic values and resources. Key issues that will be analyzed include: horse and burro effects on native fish, wildlife, plants, and their habitats; impacts of management verses no management on horses and burros; and impacts to cultural, social, and economic resources. The majority of information available in scientific literature characterized the impact of horses on the environment. In some cases, studies or scientific reviews addressed livestock in general or other livestock species (e.g., cattle or sheep). Very few studies were found that addressed the impact of burros in the sagebrush steppe ecosystem. The best available information was applied to the analysis. Chapter 4 is organized by Alternatives. All resource impacts from a single alternative appear under the discussion of that alternative or are referenced if summarized elsewhere in the chapter. These effects are also summarized in Figure 2.

The sagebrush steppe ecosystem evolved with low densities of large bodied grazers, such as horses and burros. Feral horses have been found to negatively affect the Great Basin sagebrush steppe ecosystem through direct and indirect impacts on aquatic resources, soils, plants, habitats, invertebrates, and vertebrates (Beever 2003). Impacts of feral burros on plant communities, soils, wildlife, and water quality in the desert ecosystems of the western United States have been described in numerous papers (Carothers et al. 1976, Douglas and Hurst 1993, Stubbs 1998).

4.1 Alternative A: No Agency Action on Horse and Burro Management

This section analyzes how eliminating active management of Refuge feral horses and burros would impact aquatic resources, soils, vegetation, wildlife, horse, burro, social, economic, and cultural values and resources.

4.1.1 Physical Effects

Aquatic Resources

Streams, springs, and riparian area health will continue to deteriorate with Alternative A.

On Sheldon NWR, horses are intensively utilizing riparian habitats, and have a variety of affects upon water resources. Indirect affects by horses include reducing vigor of plants and loss of plants by grazing and trampling, which may result in compaction or disturbance to floodplain soils, increased erosion, entrenchment and instability of stream banks, and lowered water tables.

Riparian habitat on Sheldon NWR was monitored in 2002 and 2001, including 20 stream reaches and 16 springs (Barnett 2002). Percentage of reaches were classified to intensity of horse use of streams, with 44% receiving heavy to severe use, 22% receiving light to moderate use, and 33% with no to slight use. Reaches receiving no to slight use were either dry or had no access for horses. Springs received intensive use by horses with 80% classed as heavily to severe (springs with water or accessible to horses). Moderate to intensively used streams and springs on the

Refuge had extensive trampling of vegetation and bare ground with many feces piles, which would likely result in degraded water quality from siltation and nutrient loading. Trampling and fecal contamination by feral horses was the single biggest factor for deteriorated water quality on the refuge.

Erosion and high levels of turbidity caused by horse concentrations are the most common water-related problems on Sheldon. Most springs and adjacent meadows on Sheldon Refuge have not been fenced in the past, and as a result, livestock and horses have trampled spring sources, vegetation has been weakened, and erosion and head cutting has occurred in the associated meadows. Without plants and soil to hold water in place, the water table has dropped and big sage, primarily on the periphery, has invaded meadows. Examples of these deteriorated conditions can be observed at Big Spring, Fish, Badger, Swan Lake, Sagebrush, and Virgin creeks and Butler crossing. It is important to have these meadows in good ecological condition because they provide important habitat elements for a diversity of native wildlife species. Almost all of the meadows adjacent to springs on Sheldon Refuge have deteriorated from misuse in the past and current over use by horses. These meadows and streams are in need of rehabilitation. Another water-related problem is low water quality in Hell and Virgin creeks. The problem cannot be corrected in lower Virgin Creek below Virgin Valley Ranch because the highly erodible soi1s of the Virgin Valley Land Form naturally cause excessive levels of turbidity. Water quality in upper Virgin Creek and Hell Creek could be improved if riparian vegetation, destroyed by overgrazing, were restored.

More than 90% of the flowing waters and associated riparian habitat of the sage steppe ecosystem have been compromised by domestic livestock, feral horses and agricultural development (Chaney et al. 1990, Ohmart 1994). Many streams that once flowed year-round now flow intermittently; many others have disappeared in their entirety (Dobkin and Sauder 2004). Coffin (1996) described heavily grazed streams in the Great Basin as wide and shallow, with unstable, partially vegetated streambanks, lacking quality pools, seasonally elevated water temperatures, and large temperature fluctuations during the summer. A review article on the influence of livestock on stream and riparian ecosystems in the arid western United States concluded that livestock grazing negatively affected water quality and seasonal quantity, stream channel morphology, hydrology, soils, instream and streambank vegetation, and aquatic and riparian wildlife (Belsky et al. 1999).

Soils

The soils resource will continue to deteriorate under Alternative A.

The coincident deterioration of soils and vegetation is evident at numerous locations at Sheldon NWR due to horse impacts (e.g., Barnett 2002). Horses are heavier and the surface area of their hooves is larger than native ungulates, which results in potentially greater trampling of vegetation and compaction of soils than native species (Beever 2003). This was demonstrated in a study by Beever and Herrick (2005) at 12 locations in the western Great Basin where sites were compared between either grazed by feral horses or having had horses removed for the last 10-14 years. Sites were selected for similar aspect, slope, fire history, grazing pressure by cattle, and dominant vegetation (sagebrush). Sites where horses were removed evinced 3.0-15.4 times lower penetration resistance in soil surfaces. The intensity of soil compaction (penetration resistance) was positively correlated with horse use (measured by horse defecations across the

site). The study also found an interrelationship among horse use, soil condition, and vegetation. Horse occupied sites showed significantly lower grass abundance and cover, lower shrub cover, lower total vegetative cover, lower plant species richness across the site, and less continuous shrub canopy. Beever et al. (2006) found an inverse relationship between intensity of grazing from cattle and feral burros and soil stability – increase in grazing intensity was associated with a decrease in soil stability. In a review of feral burro literature, Douglas and Hurst (1993) characterized burro affects on soils as accelerating soil erosion and inhibiting plant growth in trampled areas, and cause severe soil compaction on burro trails.

Horses, and other non-native grazers, can be detrimental to biological soil crusts (Belnap et al., 2001). Biological soil crusts are found between sparse vegetation in arid and semi-arid lands including Sheldon NWR. They are comprised of highly specialized organisms, a complex mosaic of cyanobacteria, green algae, lichens, mosses, microfungi, and other bacteria. They are an important contribution to species diversity and function as living mulch, stabilizing soil surface, retaining soil moisture, discouraging invasive plant establishment and spread, reduce wind and water erosion, fix atmospheric nitrogen, and add to soil organic matter. Biological soil crusts evince complex interactions with nutrients, moisture, mycorrhyzae, and vascular plants (resulting in higher nutrient content in vascular plants, and consequently food value).

4.1.2 Biological Effects

Vegetation

Vegetation will continue to deteriorate under Alternative A.

A management study was completed that examined the impact of horses on upland and riparian habitats on Sheldon NWR (Barnett 2002). Upland transects ranged from no use (0-5% utilization) through moderate use (40-60% utilization) with the overall pattern emphasizing slight use (6-20%). Results from the riparian sampling characterized 44% of stream reaches and 80% of springs with heavy use (61-80% utilization) to severe use (81-100%). Intensively used areas had a higher density of horse hoof prints and percent bare ground. Small exclosures were placed at a number of riparian sites to compare vegetation heights. In 2002, vegetation inside exclosures was 2-11.5 times taller than adjacent vegetation open to grazing.

These patterns of habitat impact are consistent with observations on habitat use by horses. In south-central Wyoming, feral horses showed preference for streamsides, bog/meadows, and mountain sagebrush habitats. In contrast, they avoided lowland sagebrush (dominated by Wyoming big sagebrush), and showed no apparent selection for grassland and coniferous forest habitats (Crane et al. 1997). In other words, feral horses selectively used water-associated habitats. While not streamside, burros in the Sonoran Desert exhibited the greatest grazing pressure within 2.5 km of water (Hanley and Brady, 1977).

Feral horses, burros, and other livestock can impact vegetation directly through consumption and trampling of plants, or indirectly by soil compaction, disturbance of soil crust, soil erosion, seed dispersal of invasive species, soil nutrient shifts, and differential grazing (e.g., Belsky and Gelbard, 2000, Douglas and Hurst, 1993). A number of studies have characterized the specific changes in vegetative structure and plant communities. Beever and Herrick (2006) studied sites occupied by horses and other locations where horses were removed 10-14 years previously. In

the sagebrush dominated communities of the Great Basin, horse occupied sites had lower abundance and cover of native grasses, lower and less continuous shrub cover, lower total vegetative cover, lower species richness. Beever and Brussard (2000) used exclosures in the Great Basin to compare impacts of horses and horses/cattle combined at springs and meadows. They found horse excluded-springs exhibited greater plant species richness along with greater percent cover and abundance of native grasses and shrubs. Meadows with all grazers excluded showed maximum vegetation heights 2.8 times higher than plots grazed by horses alone, and 4.5 times greater than vegetation grazed by horses and cattle. The greatest difference in species richness was observed between plots ungrazed (highest) versus sites with both horses and cattle grazing (lowest). Additional studies noted the impact of burros on vegetation in the Sonoran Desert, especially within 2.5 km of water (Hanley and Brady 1977) and plant communities of the Mojave Desert (Stubbs 1998).

Vigor of key forage species is an indicator of the combined effects of grazing pressure, fire, insects, disease, and climatic conditions during the recent past. It foretells the direction that the trend in ecological condition will likely take if such conditions continue. Besides drought, the most common cause of low vigor is continuous grazing during the entire growing season. Continuous grazing limits the plants' ability to maintain an adequate root system; this in turn delays or slows spring growth, reduces herbage and seed production, and reduces plant residues. The chances of frost damage and heaving, soil erosion, and evaporation of soil moisture becomes greater if vigor remains static or declines. Although no cattle grazing has occurred since 1994 on Sheldon NWR, the season-long grazing by feral horses and burros continues to prevent improvement of ecological conditions on most of these sites.

Feral horse grazing continues to be a perturbation factor on the refuge, which is preventing recovery and restoration efforts in riparian and upland habitats. Feral burros have been documented to damage to desert plant communities on numerous sites (reviewed in Douglas and Hurst, 1993), and also expected to cause negative impacts on Sheldon NWR.

Invasive Plant Species

Livestock, including horses and burros, are implicated in increasing the vulnerability of native plant communities to invasive plant species by disturbing soils and vegetation directly, and ecosystem processes such as nutrient cycling (Belsky and Gelbard, 2000). In their review article, Belsky and Gelbard (2000) identified the following disturbance factors to contribute to the invasibility of plant communities: selective grazing of native plants over weed species, trampling vegetation and compacting soils, impacts on biological soil crusts, impacts on mycorrhizael fungi, impacts on soil nitrogen, and impacts on fire regimes. Horses and burros can also act as direct dispersal agents of weed seeds that are transported in fur, on their feet, and intestinal system and deposited in dung. Couvrer et al. (2004) were able to germinate 31 species of plants from seeds taken from the fur of burros and 18 species from horses. Horses and burros also create a favorable seed bed through disturbance. Hoof action, over grazing, and concentrations around watering areas provide disturbed conditions that allow establishment of weeds such as cheatgrass, whitetop, tumble mustard, hoary cress, Canada thistle, and Russian thistle. Native ungulates may also provide some opportunity for weed spread, but the smaller hooves, lower numbers, and avoidance of concentrations at water holes reduces the prospect. Once established, invasive species are very difficult and expensive to control and often exclude native species of vegetation that support native species of wildlife.

Wildlife

Alternative A will result in considerable adverse effects upon wildlife.

Invertebrates
In a study comparing horse occupied sites with those where feral horses were removed 10-14 years previously, Beever and Heerick (2006) observed significantly greater abundance (2.2 to 8.4 times) of ant mounds on sites without horses. Furthermore, they also found that ant species richness was higher on sites free of horses. Other impacts from horses were noted in this study included increased soil compaction and decreased vegetation structure and plant species richness. Although not examined, it is likely there were differences in other invertebrate fauna through direct or indirect effects from feral horses.

Fish and Aquatic Resources
Coffin (1996) summarized the impact of livestock grazing on arid riparian systems and potential adjustment of grazing management strategies to support viable habitat conditions for in-stream species, specifically the Lahontan cutthroat trout. These recommendations included restricting use to less than 25% and remove grazers during the hot season. Both of these conditions have been violated in recent years with the large number of feral horses, and occupying the sites year-round. The impact to the in-stream was documented by Barnett (2002), and likely has had detrimental affects to aquatic resources, including native fish species. It is not known at this time if horses and other livestock have caused permanent damage to stream function, riparian habitat quality, and the potential to fully restore the riparian communities.

Reptiles and Amphibians
In a comparison of locations where horses were removed versus horse occupied sites in the Great Basin, Beever (2004) documented greater species richness of reptiles and greater abundance for seven of nine species in areas removed of horses. The springs and water sources deteriorated by horses and burros may inhibit reproduction of juvenile amphibians.

Birds
The effect of grazing on avian communities occurs when plant species composition and structure of herbaceous and understory vegetation is altered. More specifically, changing vegetation would likely affect birds by changing viability of nesting sites, suitability of foraging sites, food availability, and vulnerability to predators. Earnst et al. (2005) examined changes in riparian songbird abundance on Hart Mountain and Sheldon National Wildlife Refuges ten-years after cattle were removed. This was also the period of time that horses were removed from Hart Mountain. Of the bird species with sufficient data, 71 percent exhibited a positive trend in abundance after cessation of cattle grazing. Twenty-one species exhibited a change in abundance, where 76 percent of these increased. Increases were seen among species associated with aspen and willow plant communities, ground/low cup nesters and high cup nesters, and birds foraging in ground/understory, overstory, and aerial layers. The authors were able to ascribe the changes in bird abundance to habitat improvements after removal of grazing, by comparing regional trends of bird populations. Another study examined the impact of horses on birds in a grass steppe ecosystem (Zalba 2004). This study showed a significant decrease in bird species richness in intensively grazed areas. A significant increase of nest predation was observed between areas excluded of horses (12.5% predated) versus in grazed areas (70%).

One of the most serious impacts by horses on Sheldon NWR appears to be the damage to riparian habitats where extensive reduction of both herbaceous and shrubby vegetation along streams and at springs/seeps causes deteriorated habitat conditions for wildlife. These areas are known to be important for sage grouse during brood rearing and late season use when herbaceous vegetation in the upland areas has matured and declines in protein values. The reduction of herbaceous vegetation by feral horses in upland sagebrush habitats (Barnett 2002) could also affect sage grouse by reducing vegetative cover used by sage grouse to protect the birds from predators (like coyotes and raptors) and potentially affecting the quality of foraging habitat.

Miller and Eddleman (2001) report that poor livestock grazing practices can have a large negative impact on sage grouse habitat. The most significant long-term adverse impact of excessive grazing on sage grouse is the degradation of sagebrush, meadow, and riparian communities. Poor grazing practices change the proportion of the shrub, grass, and forb functional groups, increase opportunity for invasion and dominance of introduced annuals, shorten the growing season, and can cause an overall decline in site potential through loss of topsoil.

Small Mammals

Beever and Brussard (2004) found differences in small mammal communities in the Great Basin between sites occupied by feral horses and locations where horses were removed 10-14 years previously. No difference was found in species richness between horse occupied and unoccupied sites, but small mammal communities were found to be lower in community completeness (biotic integrity, or species observed relative to those that could occur at a site based on ecological and geographic factors). The authors also found $\leq$7.4 greater abundance of deer mice (*Peromyscus maniculatus*) on horse occupied sites, because this species is a generalist commonly successful on disturbed sites. Vegetation at study sites were dominated by sagebrush, and not riparian habitats. In another study using horse exclosure in spring and meadow habitats, Beever and Brussard (2000) observed greater species richness and abundance of small mammals in ungrazed sites. With horse-induced soil compaction and reduced vegetation observed in spring and riparian habitats on Sheldon (Barnett 2002), it is likely that small mammal communities in these habitats evinced an even greater impact from horses. Carothers et al. (1976) found high species diversity and density of small mammals on sites where feral burros were excluded. Ivey (1996) identified several studies where small mammals responded positively to release from livestock grazing in riparian habitats. Similar impacts on small mammals may be expected from burros on Sheldon Refuge.

Large Mammals

A number of studies have looked at the relationship of feral horses and burros to other ungulates of the Great Basin, including pronghorn antelope, mule deer, elk, big horn sheep, and cattle. Hanley (1982) examined nutrition as a basis for food selection and niche adaptations in ungulates. Factors such as body size, type of digestion (cecal or ruminant), rumino-reticular volume to body weight ratio, and mouth size affect physiological constraints, types of food (example grasses versus forbs), and how selective they feed on plant parts.

Hanson and Anthony (1999) studied diets of ungulates on Sheldon and Hart Mountain National Wildlife Refuges. Samples were taken from animals in the same localities (i.e., all animals occurred with potentially overlapping territories). They found diet of pronghorn antelope

consisted primarily of browse (e.g., sagebrush) and forbs, although grasses were important in spring. Similarly, mule deer consumed about half browse and the remainder of forbs and grasses (forbs during winter, grasses in spring, forbs in summer and fall). Big horn sheep diet was dominated by grasses, with forbs representing the next highest component (highest during winter and late spring). Feral horses consumed primarily grasses followed by forbs (dominant in fall and/or winter). Finally, diet of feral burros was dominated by grasses, with the remainder including shrubs and forbs. The greatest similarity in diet was observed between feral horses and burros, and big horn sheep. However, forbs were an important component in the diet of all five ungulates during the year.

Other studies showed similar patterns. Feral horse diets are comprised 80-95% of annual and perennial grasses, 59% forbs, and 1-12% shrubs on a year-round basis (Vavra and Sneva 1978, Hanley and Hanley 1982). Principal grasses in diets included wheatgrass, bluegrass, squirreltail, and needlegrass. Peak use of forbs occurs during spring and summer; Meeker (1979) found that forbs comprised 23% of feral horse diets on low sagebrush range of the Sheldon NWR during summer. In a study in Red Desert, Wyoming, Olsen and Hansen (1977) found that a large percentage of the horses, cattle, and elk ingest the same species of grasses and sedges – dominated by wheatgrass and needlegrass. Pronghorn consumed primarily sagebrush. Crane et al. (1997) found that the diet of horses consisted mostly of graminoid species with small and variable components of forbs and shrubs. *Carex, Agropyron* and *Stipa* genera were the most important groups of grasses in the diet of horses through all the seasons. Horses showed preferences for ridge tops and elevated areas with no seasonal shifts in home ranges observed (Ganskopp & Vavra 1986).

There are conditions under which these ungulates (pronghorn, mule deer, big horn sheep, feral horses and burros) may not be directly competing. This is based on dietary separation, and assumptions of rangelands (or habitat) is maintained in good condition where a balance of shrub, grass, and forb cover exists, environmental conditions remain constant and that populations are maintained below carrying capacity (Yoakum and O'Gara 1990). However, competition between species with dissimilar diets may occur during poor vegetation conditions, especially during drought or severe winter conditions (e.g., Yoakum and O'Gara 1990).

Figure 7. Pronghorn on Sheldon NWR.

At Sheldon NWR, several factors increase the potential for competition between horses and pronghorn (pronghorn are a focal species because of the establishing purpose of the Refuge). First, horse numbers are very high (Figure 6) with visible damage to sensitive habitats (Barnett 2002), and expected to increase under this alternative. Second, horse and pronghorn distribution and habitat use overlap substantially. Low sagebrush is the primary habitat used by both horses and pronghorn within this region, with water sources being a key habitat element for both (though infrequent and dispersed). Habitat conditions in low sagebrush are less than ideal for late succession (i.e., shrub cover is excessive), and consequently, the potential for forb and grass competition is

increased despite differences in diet selection among species (Yoakum and O'Gara 1990). Furthermore, horses may disturb pronghorn does during fawning and early fawn rearing, and through use of water during drought (Yoakum and O'Gara 1990). Under current habitat conditions, the level of horse-pronghorn competition is related to the size of horse populations on the Refuge; the larger the horse population, the greater the potential for competition. Management guidelines developed by Salwasser (1980) suggested that horses either be removed or kept at low densities to avoid competition with pronghorn on principal winter and spring ranges.

Biodiversity

Biodiversity will continue to deteriorate under Alternative A.

The single biggest factor preventing habitat restoration of Sheldon NWR to historic conditions of environmental health, biological diversity and integrity is the continued perturbations induced by feral horses and burros. Feral horses and burros have an affect on the Great Basin sagebrush steppe ecosystem that is varied, with direct and indirect impacts on aquatic resources, soils, plants, invertebrates, and vertebrates (e.g., Beever 2003, Douglas and Hurst 1993). The conflicts between feral equines and native wildlife are numerous and prevent restoration of degraded elements of biological integrity, diversity, and environmental health at the Refuge. Sheldon NWR makes a critical contribution to conservation efforts in the sagebrush steppe ecosystem. The Refuge is the largest contiguous piece of land in the sage steppe ecosystem that is currently not being grazed by domestic cattle, or impacted by agricultural practices. It has also been the source of animals and plants for restoration of species and sites for conservation purposes. With horse and burro populations at levels well above current management objectives under Alternative A, the contribution of the Refuge to the sagebrush steppe ecosystem will be severely degraded, placed at risk to other disturbances (drought, fire, severe winters, invasive species), and not meet the purpose for establishing the Refuge.

Horses and Burros

Under this alternative, horses and burros will not be removed from Sheldon NWR. The absence of horse and burro gathers will remove the temporary stress that they undergo as a result of being captured, transported, and adopted. The small number of injuries and deaths related to gather operations will not occur.

The current population level of horses and burros (estimated 1,200 horses and 100 burros in July 2006) is showing a pronounced impact on elements of the ecosystem, especially wetlands. Without removal of horses and burros, their populations are expected to increase rapidly until environmental and biological factors (reduced reproduction and increased mortality) significantly alter rates of increase in the population (BLM 1999). These factors include increased competition for forage and water, lower reproductive rates, poor body condition, increased winter mortality, increased competition for space, and increased mortality on highways. The increased numbers of horses and burros will have a pronounced detrimental impact on habitat quality for horses, burros, and native plants and animals.

4.1.3 Social, Cultural, and Economic Effects

There will be positive and negative effects from eliminating the horse and burro management program.

Opportunities lost include providing the public with an opportunity to own a horse or burro and providing private contractors with income through involvement with feral horse and burro removal from Sheldon Refuge.

The negative impacts from increased populations of feral horses and burros include increased horse-automobile collisions on Highway 140 and decreased watershed and vegetation health reducing opportunities for wildlife oriented recreation. A large negative response would be expected from the public based upon the deteriorated ecological condition of the habitat, and subsequent physical condition of wildlife, horses and burros. This would be emphasized if there are die-offs resulting from severe winter weather or drought.

If the natural environment on Sheldon Refuge is degraded by the overpopulation of horses and burros resulting in an undesirable visitor experience there may be fewer visitors. This may result in a reduced economic benefit to the local community including hotels, restaurants, grocery stores, and gas stations.

On the positive side, eliminating the adoption of Sheldon Refuge horses and burros reduces the number of horses competing in the sales market possibly increasing horse sales for horse ranchers and BLM adoptions.

4.1.4 Cultural Resources Effects

Alternative A will probably degrade archeological and historical sites the greatest in comparison to the other Alternatives. An increase in the number of horses and burros due to lack of management will probably cause an increase in the destruction of archeological and historical resources.

For this EA a cultural resource review was limited to the existing identified cultural resource records for Sheldon Refuge (Raymond and Parks, 2007). The purpose was to determine if previously recorded cultural resources occur in or near the area of potential effect (APE), i.e., places where horses are known to concentrate, trample, and erode the soil.

The review indicated that among the 9 locations known for their horse concentrations, archaeologists previously surveyed 7. Among the areas that were surveyed by archaeologists all contain at least one prehistoric archaeological site. The areas surveyed were Big Springs Reservoir, Catnip Reservoir, Martinez Spring, Ten Mile Spring, Horse Canyon Spring, Hell Creek, and Virgin Creek. The site records for Big Spring Reservoir, Martinez, and Ten Mile springs specifically note that trampling and erosion from horses has impacted and threatens to continue impacting archaeological sites that are eligible to the National Register of Historic Places.

Following a wildfire, archaeologist conducted a site evaluation at Ten Mile spring because the erosion from horse grazing was considered a serious threat. The site records for Catnip

Reservoir, Horse Canyon Spring, Hell Creek, and Virgin Creek documents impacts to sites from grazing.

Two areas, Big Spring Creek and Catnip Creek have never been surveyed by archaeologists. Given their proximity to permanent water, we suspect that these places also contain prehistoric archaeological sites.

4.2 Alternative B: Ongoing Management Program (Status Quo and Proposed Action)

This section analyzes the impacts of the Proposed Action to those resources described in the Affected Environment section above. The Proposed Action (Alternative B) is continuing the current feral horse and burro management program on the Refuge pending development of a Comprehensive Conservation Plan.. The environmental impacts of the Proposed Action will be analyzed in terms of their impacts to physical, biological, wildlife, horse and burro, cultural, social, and economic values and resources. The costs and projected time to reach management objectives are summarize in Figure 3.

4.2.1 Physical Effects

Aquatic Resources

Streams, springs, and riparian area health will improve with Alternative B. Bringing Refuge horse and burro numbers within management levels under Alternative B would likely reduce the intensity of adverse impacts on springs, riparian areas, and streams on Sheldon, allowing revegetation of these sites, improved stability of stream banks and riparian soils, reduced fluctuation in water levels and temperatures, and higher water quality (reduced silt and nutrient loads).

Soils

Soils will improve with Alternative B. Reduction of horse and burro numbers to the targeted management level within 2-3 years under Alternative B is expected to improve habitat conditions by reducing soil compaction, soil erosion, and improve vegetation. A positive response would be expected from biological soil crusts, and subsequent benefits to soils and the plant communities of Sheldon NWR.

4.2.2 Biological Effects

The majority of habitat restoration and associated costs will be accomplished by reducing horse and burro populations to management levels, and maintaining them at that level. Vegetation, physical environmental factors, and wildlife species will respond favorably without the grazing and physical impacts of horses and burros.

Vegetation

Vegetation will improve the Alternative B. Reduction of feral horse and burro populations to management objective levels within 2-3 years are expected to improve vegetative structure and species assemblages to better represent native plant communities of the sagebrush steppe ecosystem.

Invasive Plant Species
Reduction of horse and burro populations to management objective levels within 2-3 years should reduce the vulnerability of plant communities found on Sheldon NWR to invasive species, which in turn, will reduce the degradation of habitat for other native plant and animal species.

Wildlife

Wildlife viability the greatest with Alternative B.

Invertebrates
Reduction of horse and burro populations to management objective levels within 2-3 years on Sheldon NWR should improve habitat conditions for native invertebrate species and communities.

Fish and Aquatic Resources
Reduction of horse and burro populations to management objective levels within 2-3 years should improve the habitat conditions for fish and other aquatic resources.

Reptiles and Amphibians
Reduction of horse and burro populations to management objective levels within 2-3 years on Sheldon NWR should improve habitat conditions for reptile and amphibian species and communities.

Migratory Birds
Reduction of horse and burro populations to management objective levels within 2-3 years on Sheldon NWR should improve habitat conditions for migratory birds.

Sage Grouse
Reduction of horse and burro populations to management objective levels within 2-3 years is expected to result in re-growth of vegetation in riparian habitats and a coincident increase in the abundance of birds associated with riparian habitats, such as sage grouse.

Small Mammals
Reduction of horse and burro populations to management objective levels within 2-3 years and subsequent restoration of riparian and upland habitats, small mammal communities will likely result in better representation of species that could be found in those community types and on Sheldon NWR.

Large Mammals
Reduction of horse and burro populations to management objective levels within 2-3 years is expected to restore riparian and upland habitats and reduced competition between feral equines and native ungulates (especially during severe environmental conditions).

Biodiversity

Biodiversity will improve with Alternative B. With the reduction of horse and burro populations to management objective levels within 2-3 years and subsequent restoration of the various community types will improve the contribution of Sheldon NWR to biodiversity in the landscape and its resiliency to major disturbance factors (e.g., extended drought, severe winters, wild fire, and invasive species).

Horses and Burros

Under this alternative, horse and burro populations would be reduced on Sheldon NWR to be within management objective levels. The current population level of horses and burros (approximately 1,200 horses and 100 burros in July 2006) is currently showing a pronounced impact on elements of the ecosystem, especially wetland systems. Decreased horse and burro populations would result in improved environmental and biological factors. The impacts on horses and burros include decreased winter mortality, competition for space, mortality on highways, and competition for forage and water, and improved reproductive rates and body condition. The decreased numbers of horses and burros will have a pronounced improvement on habitat quality for horses, burros, and native plants and animals.

The U.S. Fish and Wildlife Service has managed these herds for more than 70 years and 26 years under the most recent EIS (FWS 1980), and the current program to control horse and burro populations is simply a continuation of that effort. Horses and burros are gathered as funding permits. Gathering of horses and burros is accomplished by helicopter, bait traps, and horseback, which are standard practices in federal programs and private ranches. The latter technique is both more difficult and expensive than helicopter gathers, but provides the refuge with flexibility in gather times, locations, and quantities of horses. Hansen and Mosely (2000) found there were no significant differences in horse behavior and reproduction between three study groups, including undisturbed horses on the range, horses gathered by helicopter and placed in homes through adoption, and horses that were herded by helicopter but not captured.

Injury and/or mortality to horses during gathering activities may occur due to the rugged terrain and risks typical with handling livestock during gathers, processing activities (sorting, tagging, Coggins test, etc.), and transport between facilities. Management practices are established to minimize these risks. During the last number of years, significant injury to horses has been 1% or less. There is a potential for foals to become separated from their mares. Every effort would be made to prevent this from happening and to reunite the foal with its mother. Minor injuries such as scrapes, bites, and bruises are likely to occur while sorting and processing horses, typical of livestock handling. During management operations, a veterinarian would be on site or on call to address significant injuries. Processing of animals (aging, sexing, marking, Coggins testing) would be conducted by a veterinarian and horse experts. Small foals and other horses/burros with special handling requirements will be separated from the others to reduce risk of injury.

Transporting horses and burros has the potential to cause injury, but will be transported in a manner that reduces risk to the animals and is compliant with state laws.

The Service seeks to place horses and burros in good homes through our adoption agents. Reasonable controls are in place and continue to improve to ensure adoption agents and adoptees are adequately screened to provide responsible care and prevent animals from going to slaughter. However, it is possible that when animals are beyond the span of control of the Service, they may end up at a processing plant. When this happened in the past, the Service and its adoption agents interceded to purchase the animals and place them back in the adoption process.

Reducing the number of burros and horses on the Refuge is expected to improve the quality of habitat for wildlife species. There will be improved vegetative structure and species assemblages that will better represent native plant communities of the sagebrush steppe ecosystem providing better habitat. Revegetation of springs, riparian areas, and streams will improve the stability of stream banks and riparian soils, reduce the fluctuation in water levels and temperatures, and improve water quality (reduced silt and nutrient loads). A positive response would be expected from biological soil crusts, and subsequent benefits to soils and the plant communities. There will be reduced vulnerability of plant communities to invasive species, which in turn, will reduce the degradation of habitat for other native plant and animal species. Increased biodiversity in the landscape is expected, improving resiliency to major disturbance factors (e.g., extended drought, severe winters, wild fire, and invasive species).

4.2.3 Social, Cultural, and Economic Effects

There will be positive and negative effects from reducing the horse and burro populations under this alternative.

Opportunities include providing the public with an opportunity to adopt a Sheldon Refuge horse or burro and providing private contractors with income through involvement with feral horse and burro removal from Sheldon Refuge.

The positive impacts from decreased populations of feral horses and burros include decreased horse-automobile collisions on Highway 140 and increased watershed and vegetation health increasing opportunities for wildlife oriented recreation.

With expected improvements to the natural environment on Sheldon Refuge from reduction of horses and burros, it may result in a more desirable visitor experience resulting in more visitors. This may result in a greater economic benefit to the local community including hotels, restaurants, grocery stores, and gas stations.

On the negative side, the adoption of Sheldon Refuge horses and burros increases the number of horses competing in the sales market possibly decreasing horse sales for horse ranchers and BLM adoptions.

4.2.4 Cultural Resources Effects

Alternatives B will probably degrade archeological and historical sites less than Alternative A. A decrease in the numbers of horses and burros may decrease the destruction of archeological and historical resources due to decreased hoof action.

4.3 Alternative C: Adoption of Horses Through Individuals

This section analyzes how adopting horses directly to individuals, instead of allowing adoption agents to fulfill the role, will impact aquatic resources, soils, vegetation, wildlife, horse, burro, social, economic, and cultural values and resources.

The primary factor that differs between Alternatives B and C is that adoption of horses would be conducted from facilities on Sheldon NWR and with refuge staff. This would require new staff and facilities, and further contribution from current staff. Commitment of significant additional staff time and resources from a currently limited staff and budget detracts from other aspects of the refuge programs; such as managing the horse program, conducting facility maintenance, working and meeting with the public, support for wildlife monitoring and studies, support for fire management, and law enforcement. In general, the effects on wildlife habitat under Alternative C would be same as Alternative B, but not realized as quickly and it would have a higher funding cost to implement (Figure 3).

With this Alternative there would have to be a new well to provide water. The present well could not handle both the corrals and the headquarters with the increase in horse and burro holding time.

This Alternative would require a lot more hay and other supplies while horses are held in refuge corrals. A hay shed would need to be built to keep the hay out of the weather.

The most difficult aspect to this alternative is the remoteness of the holding facility. People, that have adopted a horse or burro in the past, have been unwilling and/or unable to make the remote trip to pick up the animal. The Service ended up hauling the animals to them. It was costly due to the necessity of hauling only one or two animals at a time.

There are two choices as to what to do with the unadoptables. They can either be turned back out on the refuge or kept in long-term holding facilities. Housing horses or burros in long-term holding facilities is costly. Turning them back out on the refuge would contribute to environmental degradation and add to operational costs. During every subsequent gather, there is a probability of catching the released animals again. It has been demonstrated that the more times they are caught the harder they become to catch; and they teach this to the other horses. This adds to recapture costs.

One other relatively small cost would be the fact this alternative would require a vet to come out regularly. The closest one is in Lakeview and would not always be available.

4.3.1 Physical Effects

Implementation of this Alternative would have the same physical effects as Alternative B, but not realized as quickly or have a higher funding cost to implement.

4.3.2 Biological Effects

Implementation of this Alternative would have the same biological effects as Alternative B, but not realized as quickly or have a higher funding cost to implement.

4.3.3 Social, Cultural, and Economic Effects

Implementation of this Alternative would have the same social, cultural, and economic effects as Alternative B, but not realized as quickly or have a higher funding cost to implement.

4.3.4 Cultural Resources Effects

Implementation of this Alternative would have the similar Cultural Resource effects as Alternative B, but not realized as quickly or have a higher funding cost to implement. Additional facilities required for this alternative would have to be located at a site to minimize impact to archaeological resources.

4.4 Alternative D: Conduct Horse Gathers by Only Horseback Techniques

This section analyzes how gathering horses with horseback riders, which excluding aircraft, will impact aquatic resources, soils, vegetation, wildlife, horse, burro, social, economic, and cultural values and resources.

The principal difference between Alternatives B and D is that this alternative does not employ aircraft as a gather technique. This results in higher costs to reach management objectives (Figure 3), and unlikely that horse and burro numbers can be reduced to the target level within 2-3 years. In general, the delay in reaching management objectives will also delay the realization of beneficial effects. The higher costs will also detract resources from other refuge programs as discussed in Alternative C. Other specific differences are discussed below.

4.4.1 Physical Effects

The physical environment would be subject to higher physical impacts than under Alternatives B,C, and E. The ability of horseback contractors to move horses over larger distances is decreased, and more trap sites would be necessary. This would increase the need for roads and access points for transportation once caught. Also, contractors would need to have access on a daily basis to secondary roads, creating additional impacts to these areas.

4.4.2 Biological Effects

Implementation of this Alternative would increase the impacts to wildlife in comparison to Alternatives B,C, and E. The increased attendance of riders, placement of additional trap sites, and extended time needed for gather would create increased opportunity for harassment of

wildlife. The presence of people over a period of months would likely create more displacement of wildlife than a helicopter gather lasting two days.

Horses and Burros

The effects that this alternative would have on horses and burros is strongly dependent upon the techniques and effectiveness of the contractor performing the job. Horses gathered under this alternative would be subject to longer periods of harassment due to the inefficiencies associated with this gather technique. It takes much more effort and time to "guide" the horses into the trap using this technique than using a helicopter, and gathers would have to occur over much longer periods of time. Past observations indicate that horses would be subject to the same concerns as using a helicopter gather method: such as separation of mares and foals, injury due to rough terrain, attempts to get out of the trap, and transportation associated injury. Increased opportunity for injury associated with holding and processing would also be a concern, as animals would need to be kept in the corrals for longer periods of time until sufficient animals were collected to allow for disease testing and transportation. Horses used by the contractors to gather these wild animals would be subject to increased opportunity of injury due to rough terrain and extensive riding. Horse back gathering of burros has not been effective in the past unless coupled with roping them. This technique creates higher stress to the burros, and has been less humane than using bait traps or helicopter methods.

4.4.3 Social, Cultural, and Economic Effects

Implementation of this Alternative would have the same social, cultural, and economic effects as Alternative B, but not realized as quickly or have a higher funding cost to implement.

4.4.4 Cultural Resources Effects

Implementation of this Alternative would have a greater concern for Cultural Resources than Alternatives B and C. Each additional trap site would need to be checked for cultural resources, as well as any roads leading to them to ensure protection of these resources.

Appendix A: Glossary

Most Definitions are taken from "A Glossary of Terms Used in Range Management" developed through the Society for Range Management. If a definition has been slightly modified it is marked with an *. Other definitions are from Grazing Administration Regulations Code of Federal Regulations, Chapter 43, Sec. 4100.0-5 or Bureau of Land Management Technical Reference. Definitions also include meanings that were developed by the Northeastern Great Basin Resource Advisory Council to understand their intent in the Standards and Guidelines.

Abiotic - Refers to the non-living components of an ecosystem e.g., soils, climate, water,
AUM - Animal Unit Month. An animal unit month (AUM) is the amount of forage needed to feed a cow, or its equivalent, for one month. The equivalent of a cow for forage purposes is one horse or five sheep.
Biological Diversity - The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and communities and ecosystems in which they occur.
Biological Integrity - Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities.
Biotic - Refers to living components of an ecosystem, e.g., plants and animals.
BLM - U.S. Bureau of Land Management.
Canopy - (1) The vertical projection downward of the aerial portion of vegetation, usually expressed as a percent of the ground so occupied. (2) The aerial portion of the overstory vegetation.
Canopy Cover - The percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants. Small openings within the canopy are included.
CCP - Comprehensive conservation plan.
Climax Community - Relatively stable plants and animals living together in equilibrium with their environment and with good reproduction of the dominant species.
Climate - The average or prevailing weather conditions of a place over a period of years.
Conservation - The use and management of natural resources according to principles that assure their sustained economic and/or social benefits without impairment of environmental quality.
Distribution (Grazing) - Dispersion of grazing animals within a management unit or area.
EA - Environmental assessment (NEPA document).
EAM - Environmental action memorandum (NEPA decision document).
Ecological Site - The kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in its ability to produce vegetation and to respond to management.
Edaphic - Refers to the soil.
Environmental Health - Composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment.
EIS - Environmental impact statement (NEPA document).

Equine body conditioning –
1. Poor. Extremely emaciated; spinal processes, ribs, tailhead, tuber coxae and ischii projecting prominently, no fatty tissue can be seen.
2. Very Thin. Emaciated; slight fatty covering over base of spinal processes; transverse processes of lumbar vertebrae feel rounded; spinal processes, ribs, tailhead, tuber coxae and ischii prominent; withers, shoulders, and neck structure faintly discernible.
3. Thin. Fat buildup about halfway on spinal processes; transverse processes cannot be felt; slight fat covering over ribs; spinal processes and ribs easily discernible; tailhead prominent, but individual vertebrae cannot be identified visually; tuber coxae appear rounded but easily discernible, tuber ischii not distinguishable; withers, shoulders, and neck accentuated.
4. Moderately Thin. Slight ridge along back; faint outline of ribs discernible; tailhead prominence depends on conformation – fat can be felt around it; tuber coxae not discernible; withers, shoulders and neck not obviously thin.
5. Moderate. Back is flat (no crease or ridge); ribs not visually distinguishable but easily felt around tailhead and area beginning to feel spongy; withers appear rounded over spinal processes; shoulders and neck blend smoothly into body.
6. Moderately Fleshy. May have slight crease down back; fat over ribs spongy; fat around tailhead soft; fat beginning to be deposited along the side of withers, behind shoulders, and along sides of neck.
7. Fleshy. May have crease down back; individual ribs can be felt, but noticeable filling between ribs with fat; fat around tailhead soft; fat deposited along withers, behind shoulders and along neck.
8. Fat. Crease down back; difficult to feel ribs; fat around tailhead very soft; area along withers filled with fat; area behind shoulder filled with fat; noticeable thickening of neck; fat deposited along inner thighs.
9. Extremely Fat. Obvious crease down back; patchy fat appearing over ribs; bulging fat around tailhead, along withers, behind shoulders, and along neck; fat along inner thighs may rub together, flank filled with fat.

Erosion - (v.) Detachment and movement of soil or rock fragments by water, wind, ice or gravity. (n) The land surface worn away by running water, wind, ice, or other geologic agents, including such processes as gravitational creep.

Exotic - An organism or species which is not native to the region in which it is found. Synonym non-native.

Feral horses and burros - "Non-indigenous, unbranded, unclaimed descendents of domestic horses and burros which roam free on certain refuge lands in the western United States" (7 RM 6.5 A.).

Foal - Young horse or burro of either sex.

FCC - Federal Communications Commission.

FONSI - Finding of no significant impact (NEPA decision document for an EA).

Service - U.S. Fish and Wildlife Service.

Grazing - For the purposes of this document grazing refers to the removal of vegetation by domestic livestock and feral horses and burros.

Ground Cover - The percentage of material, other than bare ground, covering the land surface. It may include live and standing dead vegetation, litter, cobble, gravel, stones and bedrock. Ground cover plus bare ground would total 100 percent.

Ground Water - Subsurface water that is in the zone of saturation. The top surface of the ground water is the "water table". Source of water for wells, seepage, springs.

Guidelines - Guidelines are livestock management practices (e.g. tools, methods, strategies and techniques) designed to achieve healthy public lands as defined by Standards and portrayed by Indicators. Guidelines are designed to provide direction, yet offer flexibility for local implementation through activity plans and grazing permits. Activity plans may add specificity to the Guidelines based on local goals and objectives as provided for in adopted manuals, handbooks and policy. Not all Guidelines fit all circumstances. Monitoring or site specific evaluation will determine if significant progress is being made towards achieving the standards, and if the appropriate guidelines are being applied.
Habitat - The natural abode of a plant or animal, including all biotic, climatic, and edaphic factors affecting life.
Herd Management Area - Herd Area or portion of a Herd Area that has been designated through the planning process where horses and/or burros can be managed as a component of the BLM public lands.
Historic Conditions. Composition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human related changes to the landscape.
HMNAR - Hart Mountain National Antelope Refuge.
Horse and Burro Act - The Wild Free-Roaming Horses and Burros Act of 1971, as amended (16 U.S.C. 1331-1340).
Indicators - Indicators are observations or measurements of physical, chemical or biological factors used to evaluate site conditions or trends, appropriate to the potential of the site. Indicators will be used to determine whether or not Standards are being met.
Infiltration - The flow of a fluid into a substance through pores or small openings. It connotes flow into a substance in contradistinction to the word percolation.
Infiltration Rate - Maximum rate at which soil under specified conditions can absorb rain or shallow impounded water, expressed in quantity of water absorbed by the soil per unit of time, e.g., inches/hour.
Intensity (Grazing) - A reference to grazing density per unit of time.
Invasive Species – Harmful non-native plants, animals, and diseases.
Litter - The uppermost layer of organic debris on the soil surface; essentially the freshly fallen or slightly decomposed vegetal material.
Management Objective - The objectives for which refuge and refuge resources are managed which includes specified uses accompanied by a description of the desired vegetation and the expected products and/or values.
Management Plan - A program of action designed to reach a given set of objectives.
Marsh - Flat, wet, treeless areas usually covered by standing water and supporting a native growth of grasses and grass-like plants.
Monitoring - The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives.
Morphology - The form and structure of an organism, with special emphasis on external features.
Native - "With respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem" (603 FW 3.6E.).
Native Species - A species which is a part of the indigenous fauna or flora of the area in question.

NEPA - National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321-4347).
NDOW - Nevada Department of Wildlife.
NWR - National Wildlife Refuge.
NWRS - National Wildlife Refuge System.
NWRS Administration Act - National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 669dd-668ee).
Overstory - The upper canopy or canopies of plants. Usually refers to trees, tall shrubs and vines.
Percolation - The flow of a liquid through a porous substance.
Plant Cover - (1) The plants or plant parts, living or dead, on the surface of the ground. Vegetative cover or herbage cover is composed of living plants and litter cover of dead parts of plants. (2) The area of ground cover by plants of one or more species.
Proper Functioning Condition - Riparian-Wetland areas are functioning properly when adequate vegetation, land-form, or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve flood-water retention and ground-water recharge; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. [BLM Technical Reference 1737-9]
Range Improvement - Range improvement means an authorized physical modification or treatment which is designed to improve production of forage; change vegetation composition; control patterns of use; provide water; stabilize soil and water conditions; restore, protect and improve the condition of rangeland ecosystems to benefit livestock, wild horses and burros, and fish and wildlife. The term includes but is not limited to, structures, treatment projects, and use of mechanical devices or modifications achieved through mechanical means.
Riparian - Referring to or relating to areas adjacent to water or influenced by free water associated with streams or rivers on geologic surfaces accupying the lowest position of a watershed.
ROD - Record of decision (NEPA decision document for an EIS).
RM - Refuge Manager
Refuge - Sheldon National Wildlife Refuge.
Service - U.S. Fish and Wildlife Service
Sheldon Refuge - Sheldon National Wildlife Refuge.
Sheldon Refuge-RNRMP- Sheldon National Wildlife Refuge Renewable Natural Resources Management Plan
Successional Stage – The composition of vegetation in a certain location at a certain time.
Seep - Wet areas, normally not flowing, arising from an underground water source.
Soil - (1) The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. (2) The unconsolidated mineral matter on the surface of the earth that has been subjected to and influenced by genetic and environmental factors of parent material, climate (including moisture and temperature effects), macro- and micro-organisms, and topography, all acting over a period of time and producing a product - soil - that differs from the material

it was derived in many physical, chemical, biological, and morphological properties and characteristics.
Species - A taxon or rank species; in the hierarchy or biological classification, the category below genus.
Species Composition - The proportions of various plant species in relation to the total on a given area. It may be expressed in terms of cover, density, weight, etc. Synonym Vegetative composition.
Spring - Flowing water originating from an underground source.
T & E - Threatened and Endangered Species.
TNC - The Nature Conservancy.
Trend - The direction of change in ecological status or resource value rating observed over time. Trend in ecological status should be described as toward, or away from the potential natural community, or as not apparent. Trend in a resource value rating for a specific use should be described as up, down or not apparent. Trends in resource value ratings for several uses on the same site at a given time may be in different directions, and there is no necessary correlation between trends in resource value ratings and trend in ecological status. Some agencies use trend only in the context of ecological status. Syn. range condition trend.
USFS - U.S. Forest Service.
USGS - U.S. Geological Survey
Utilization - The proportion of current year's forage production that is consumed or destroyed by grazing animals. May refer either to a single species or to the vegetation as a whole.
Watershed - (1) A total area of land above a given point on a waterway that contributes runoff water to the flow at that point. (2) A major subdivision of a drainage basin.
Wetlands - Areas characterized by soils that are usually saturated or ponded, i.e., hydric soils that support mostly water loving plants (hydrophytic plants).
WNV - West Nile Virus.

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Appendix C: Standard Operating Procedures

Gathers would be conducted by utilizing contractors or U.S Fish and Wildlife Service (Service) personnel. The following procedures for gathering and handling horses and burros would apply whether contractors or Service personnel conduct a gather.

Prior to any gathering operation, the Service will provide for a pre-capture evaluation of existing conditions in the gather area(s). The evaluation will include animal conditions, prevailing temperatures, drought conditions, soil conditions, road conditions, and a topographic map with wilderness boundaries, cultural resources, 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 on site presence of a veterinarian during operations, versus on call. If it is determined that capture operations necessitate the services of a veterinarian, one would be obtained before the capture would proceed. If applicable, 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 primary capture methods used in the performance of gather operations include:

1. Helicopter Drive Trapping. This capture method involves utilizing a helicopter to herd horses and burros into a temporary trap.
2. Helicopter Assisted Roping. This capture method involves utilizing a helicopter to herd horses or burros to ropers.
3. Horse-back Gather. This capture method uses horse-back wranglers to draw or drive horses into a temporary trap.
4. Bait Trapping. This capture method involves utilizing bait (water or feed) to lure primarily burros into a temporary trap (may include horses).

Capture Methods used in the Performance of Gather Contract Operations

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

    All trap and holding facility locations must be approved by the Refuge Manager (RM) prior to construction. The title Refuge Manager covers the Project Leader, Deputy Project Leader and the Refuge Manager. The Contractor may also be required to change or move trap locations as determined by the RM. All traps and holding facilities not located on public land must have prior written approval of the landowner.

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

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

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

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

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

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

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

4. No modification of existing fences will be made without authorization from the RM. The Contractor shall be responsible for restoration of any fence modification that he has made.

5. 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.

6. Alternate pens, within the holding facility shall be furnished by the Contractor to separate mares or jennies with small foals, sick and injured animals, 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 procedures. In these instances, a portable restraining chute may be necessary and will be provided by the Contractor. Alternate pens shall be furnished by the Contractor to hold animals if the specific gathering requires that animals be released back into the capture area(s). In areas requiring one or more satellite traps,

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

7. 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. Animals held for 10 hours or more in the traps or holding facilities shall be provided good quality hay at the rate of not less than two pounds of hay per 100 pounds of estimated body weight per day. An animal that is held at a temporary holding facility after 5:00 p.m. and on through the night, is defined as a horse/burro feed day. An animal that is held for only a portion of a day and is shipped or released does not constitute a feed day.

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

9. The Contractor shall restrain sick or injured animals if treatment is necessary. The RM will determine if injured animals must be destroyed and provide for euthanasia of such animals in a humane fashion. A veterinarian will be available on site or on call for consultation or treatment of animals as needed. The Contractor may be required to humanely euthanize animals in the field and to dispose of the carcasses as directed by the RM.

10. Animals shall be transported to final destination from temporary holding facilities within 24 hours after capture unless prior approval is granted by the RM for unusual circumstances. Animals to be released back onto the Refuge following gather operations may be held up to 21 days or as directed by the RM. 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 RM. 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 RM.

Capture Methods That May Be Used in the Performance of a Gather

1. Capture attempts may be accomplished by utilizing bait (feed or water) to lure animals into a temporary trap. If the contractor selects this method, the following applies:

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

    b. All trigger and/or trip gate devices must be approved by the RM prior to capture of animals.

    c. Traps shall be checked a minimum of once every 24 hours.

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

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

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

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

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

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

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

Use of Motorized Equipment

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

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

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

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

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

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

   11 square feet per adult horse (1.4 linear foot in an 8 foot wide trailer);
   8 square feet per adult burro (1.0 linear foot in an 8 foot wide trailer);
   6 square feet per horse foal (.75 linear foot in an 8 foot wide trailer);
   4 square feet per burro foal (.50 linear feet in an 8 foot wide trailer).

7. The RM 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 RM shall provide for any brand and/or inspection services required for the captured animals.

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

Safety and Communications

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

   a. The proper operation, service and maintenance of all contractor furnished property is the responsibility of the Contractor. The Service reserves the right to remove from service any contractor personnel or contractor furnished equipment which, in the opinion of the RM 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 RM or his/her representative.

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

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

2. Should the contractor choose to utilize a helicopter the following will apply:

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

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

Requirements for Adoption Agents and Adoptees

All potential adoption agents must have a favorable background check conducted and contract/cooperative agreement established before receiving any horses or burros. Background checks will include the following:

1. A site visit will be completed by refuge staff to assure that facilities are adequate to prevent escape or injury to the animals or visitors during holding, viewing, feeding, loading and unloading.
2. A determination will be made by the Refuge Manager as to whether or not the agent has the necessary skills and knowledge of horses and burros to safely handle, feed, and load and unload them.
3. A list of adopters will be required and certification and follow up will be conducted by Refuge Staff to ensure proper placement.
4. Refuge staff will also conduct phone interviews with at least two character witnesses and receive a recommendation from a local veterinarian regarding the Agent's ability to accomplish the adoption process.

Adoption agents are required to prevent horses and burros from going to slaughter and to screen potential adoptees for good homes. This is specified in legally binding contract/cooperative agreements between the adoption agent and the U.S. Fish & Wildlife Service. Agents will screen potential adoptees for appropriate facilities, adequate expertise to handle the horses and conscientious attitude towards the care and well being of horses and burros. Potential adopters must sign an agreement with the agent that states standard stipulations for care and preventing the horse/burro from going to slaughter. Agents must meet all state regulations for transport and exchange of livestock. The agent must also be willing to take the animal back if significant problems develop with the adoptee for up to one year from adoption.

Archaeological and Historical Site Clearances

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

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

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

Animal Characteristics and Behavior

Releases of horses and burros would be near available water. If the area is new to them, a short-term adjustment period may be required while the horses/burros become familiar with the new area.

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 staff/contractors and the animals being gathered. The public must adhere to guidance from the on-site Service representative. It is Service policy that the public will not be allowed to come into direct contact with horses or burros being held in Service facilities. Only authorized Service personnel or its contractors may enter the corrals or directly handle the animals. The general public may not enter the corrals or directly handle the animals at anytime or for any reason during Service operations. In most cases, safe viewing areas will be setup for the public.

Responsibility and Lines of Communication

Lakeview Office – Project Leader
Paul Steblein
Lakeview Office - Deputy Project Leader
David Johnson
Sheldon Refuge – Refuge Manager
Brian Day

The RM has the direct responsibility to ensure the Contractor's compliance with the contract stipulations. The RM will take an active role to ensure the appropriate lines of communication are established between the field and the Lakeview Office. All employees involved in the gathering operations will keep the best interests of the animals and safety of personnel at the forefront at all times.

All publicity, formal public contact and inquiries will be handled through the Project Leader. This individual will be the primary contact and will coordinate the contract to ensure animals are being transported from the capture site in a safe and humane manner and are arriving in good condition.

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

Should the Contractor show negligence and/or not perform according to contract stipulations, they will be issued written instructions or issued a stop work order.