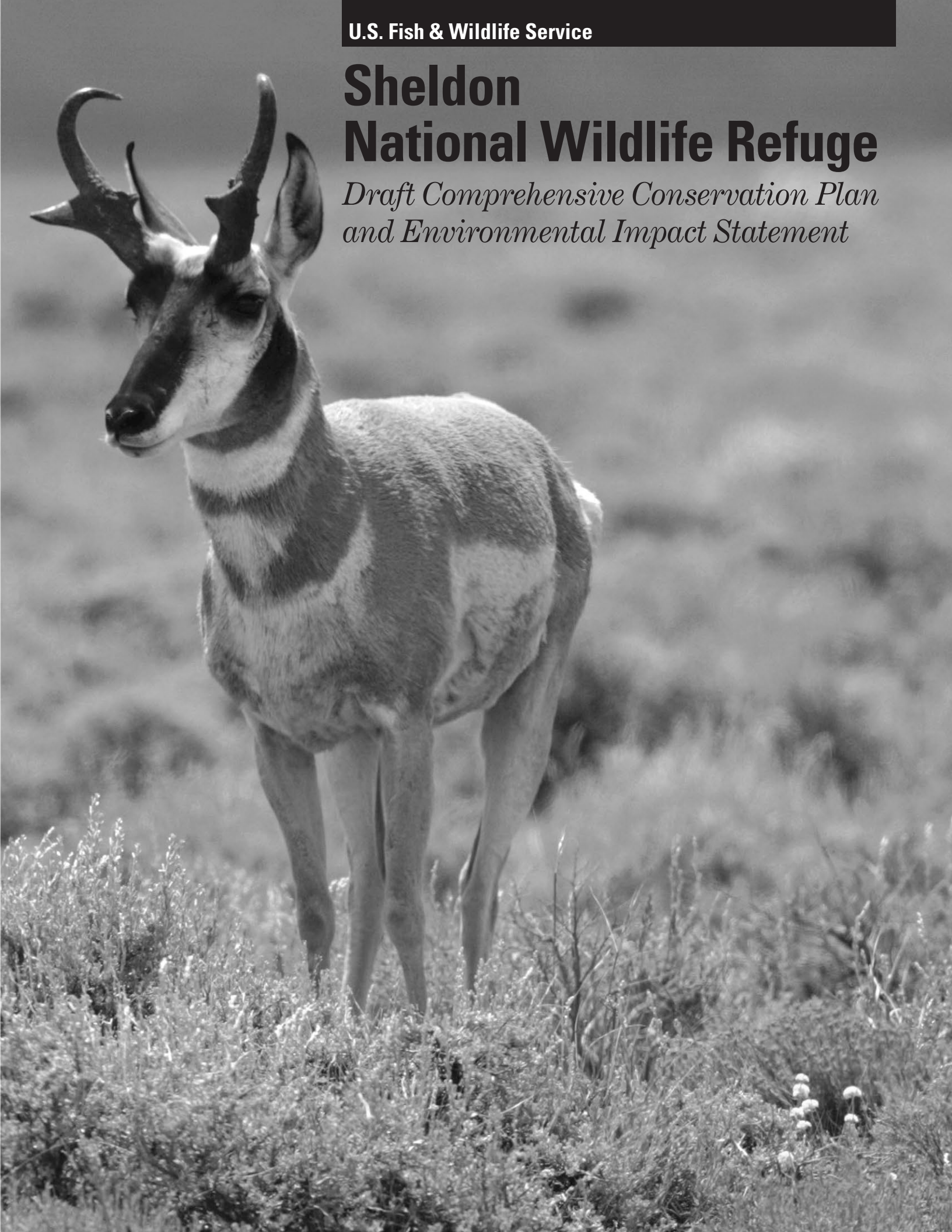
U.S. Fish & Wildlife Service

Sheldon National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Impact Statement



Our Vision for the Future

Sheldon National Wildlife Refuge will foster a strong land ethic and provide scientific leadership through collaboration with a diverse network of partners and utilize the highest principles of conservation. Sheldon Refuge will promote opportunities for people to actively seek and discover natural and cultural treasures in the vast and rugged high desert characterized by solitude, abundant wildlife, and wildlands free from human influences. Management will focus on Sheldon Refuge's wild character, biological integrity, and contribution within the larger landscape of the Great Basin as driven by natural ecological processes. As a result, Sheldon Refuge will perpetuate its unique cultural history and critical role in the preservation and study of the sagebrush-steppe ecosystem with its diverse and vital native species.

Comprehensive Conservation Plans provide long-term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

Sheldon National Wildlife Refuge
Draft Comprehensive Conservation Plan and Environmental Impact Statement

Humboldt and Washoe counties, Nevada and Lake County, Oregon

Type of Action:	Administrative
Lead Agency:	U.S. Department of the Interior, Fish and Wildlife Service
Responsible Official:	Robyn Thorson, Regional Director
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Abstract: We developed alternatives, including preferred and no action alternatives, as required by National Environmental Policy Act regulations, for the Sheldon National Wildlife Refuge. We addressed issues, opportunities, and Refuge management options in the alternatives. Summaries of the alternatives follow.

Alternative 1 (No Action). Under Alternative 1 we would maintain current Refuge management programs and where feasible, restore habitats, including maintaining populations of approximately 800 horses and 90 burros. Hunting, fishing, wildlife observation, photography, interpretation, environmental education, commercial outfitting and guiding, rock collecting, scientific research and study, camping, boating, backpacking, horseback riding, and vehicle use would continue. The area referred to as "Little Sheldon" and lands near the refuge headquarters at Dufurrena would remain closed to all hunting. In addition, Catnip and Big Springs reservoirs would remain closed to waterfowl hunting.

Alternative 2 (Preferred Alternative). Under Alternative 2 we would maintain current wildlife and habitat management, with the following improvements: Removal of all feral horses and burros within five years, removal of abandoned livestock developments, relocation of campgrounds away from riparian habitats and prehistoric cultural sites, restoration of riparian habitats, aggressive reduction of encroaching western juniper, and closure of some primitive unmaintained routes to motorized vehicle public uses. Improvements to wildlife-dependent public uses would include improving existing campground facilities, developing an accessible interpretive trail, designating a self-guided auto tour route, and relocating the visitor contact station.

Alternative 3. Under Alternative 3 we would maintain current wildlife and habitat management, with the following improvements: Removal of all feral horses and burros within 15 years, establishment or improvement of fuel breaks to allow greater use of wildland fire and less aggressive fire suppression, consolidation of campgrounds, discontinued stocking of non-native fish, and closure of additional primitive routes to public use of motorized vehicles. Improvements to wildlife-dependent public uses would include increased opportunities for solitude and primitive recreation.

Public Comments: We will accept comments from the public for a period of 60 days following publication of the Notice of Availability for the Sheldon Refuge Draft Comprehensive Conservation Plan and Environmental Impact Statement in the Federal Register.

Sheldon National Wildlife Refuge
Draft Comprehensive Conservation Plan and Environmental Impact Statement

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Executive Summary

This document is a summary of the combined Draft Comprehensive Conservation Plan and Environmental Impact Statement (Draft CCP/EIS) for long-term management of the Sheldon National Wildlife Refuge located in northwest Nevada. The U.S. Fish and Wildlife Service (Service) is required by the National Wildlife Refuge System Administration Act of 1966 (as amended) to develop and implement a CCP for the long-term management of all national wildlife refuges. This Draft CCP/EIS evaluates and compares three draft alternatives for the conservation of fish, wildlife, and plants within Sheldon National Wildlife Refuge (referred to here as Sheldon Refuge) primarily through monitoring of their populations, management and restoration of their habitats, and control of invasive and feral species. The three draft alternatives also include management of public uses such as wildlife observation and photography, hunting, fishing, environmental education, interpretation, and rock collecting in a manner that is compatible with the primary conservation purposes for Sheldon Refuge. The environmental consequences section of the Draft CCP/EIS evaluates the impacts from management activities and public uses on refuge resources, including wilderness and cultural resources and is the basis for determining the compatibility of public uses and the minimum administrative actions necessary for the management of the eight proposed wilderness areas within Sheldon Refuge. Appropriateness findings, compatibility determinations, and minimum tool analysis for public uses and activities that are part of the Service's preferred alternative (Alternative 2) are included with the Draft CCP/EIS as appendices.

The three draft alternatives presented are the outcome of a public planning process, which was initiated in 2007 and has involved thousands of individuals, non-profit organizations, state and local agencies, and tribal governments. Effects from the management activities and public uses under consideration are identified and evaluated, with attention to those effects that are potentially significant.

The Final CCP/EIS will be approved and a Record of Decision signed by the Service's Regional Director in Portland, Oregon. The Final CCP will guide management of Sheldon Refuge for the next 15 years.

Refuge Information and Background

Located in a remote area of northwestern Nevada, Sheldon Refuge encompasses 575,000 acres of sagebrush-steppe habitat within the Great Basin and is managed by the Service. Originally established in 1931 for the conservation and protection of the once-imperiled pronghorn (*Antilocapra americana*), Sheldon Refuge (along with its refuge complex companion, the Hart Mountain National Antelope Refuge) now conserves habitat for a number of additional native, rare, and imperiled species of fish, wildlife, and plants that depend upon the sagebrush-steppe ecosystem.

Blanketing high basalt tablelands and mountains, which average 6,000 feet in elevation, the vast expanses of sagebrush habitats are dotted with springs, pockets of aspen (*Populus* spp.), and isolated stands of mountain mahogany (*Cercocarpus ledifolius ledifolius*). Only at its edges does the refuge vary noticeably, with the pale rhyolite of Virgin Valley on the eastern edge, which holds highly prized black opal, and the high escarpment on the western edge where western juniper (*Juniperus occidentalis occidentalis*) dominates.

Beginning in the late 1800s and lasting until the mid-1990s, homesteading and ranching had a noticeable influence on habitats through ranching operations, livestock grazing, and wildland fire suppression. Influence from these activities remain in the form of abandoned water developments, feral horses, and continued fire suppression—all of which continue to influence habitat and natural conditions throughout Sheldon Refuge.

With the exception of a two-lane paved highway, a few scattered buildings, abandoned water troughs, and some primitive dirt roads, Sheldon Refuge appears today much as it has for the past 12,000 years or more that people have lived in this region. This long history of habitation is apparent throughout the refuge from the prehistoric stone tools, petroglyphs, and ancient campsites that remain. Today people continue to hunt, hike, and camp within Sheldon Refuge but for recreation rather than subsistence. Management of eight proposed wilderness areas continues to protect the remoteness, primitive character, and opportunities for solitude within 341,500 acres of Sheldon Refuge.

Wildlife observation and photography are two of the most popular activities enjoyed by nearly all visitors either by vehicle, or on foot in the refuge backcountry. A number of visitors also participate in hunting for big-game and upland birds during the fall seasons throughout much of Sheldon Refuge. Areas closed to hunting include approximately 34,000 acres in the western portion of the refuge, which represents the original refuge established in 1931, and the area surrounding the Refuge Headquarters at Dufurrena. Opportunities for waterfowl hunting exist but are constrained by the lack of habitat and limited areas of open water for hunting. Fishing at the Dufurrena Ponds, Catnip Reservoir, and at Big Spring Reservoirs (when water is available) is another activity popular with Nevada residents mostly during the summer months. During the spring and early summer, rock collecting is the primary public use activity within the Virgin Valley area of Sheldon Refuge.

Public uses throughout Sheldon Refuge are supported by various facilities, including 13 designated primitive, semi-primitive and developed campgrounds, informational kiosks, the Refuge Headquarters at Dufurrena, and a network of roads ranging from paved highway to rugged two-track routes suitable only for high-clearance four-wheel-drive vehicles. Hunting guides and outfitters provide additional visitor services under Special Use Permits from the Service.

As a large and relatively undeveloped area, Sheldon Refuge provides rare opportunities to study and research the fish, wildlife, and plants that occur in the sagebrush-steppe. Current and recent work conducted by the Service and in partnership with other federal agencies, the State of Nevada, universities, and non-profit organizations include studies of Greater sage-grouse (*Centrocerus urophasianus*) populations, American pika (*Ochotona princeps*) distribution, desert lizard populations, amphibian distribution, bat species distribution, feral horse and burro population movements and impacts, and effects from fire.

Refuge Purposes, Vision, and Management Goals

The primary purposes for Sheldon Refuge are:

- "...as a refuge and breeding ground for wild animals and birds..." Executive Order (EO) 5540 dated January 26, 1931

- "...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..." EO 7522 dated December 21, 1936

- "...to conserve (A) fish or wildlife which are listed as endangered species or threatened species....or (B) plants..." 16 United States Code (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)

The Service's vision for Sheldon Refuge included in the Draft CCP/EIS is stated as follows:

> *Sheldon National Wildlife Refuge will foster a strong land ethic and provide scientific leadership through collaboration with a diverse network of partners and utilize the highest principles of conservation. Sheldon Refuge will promote opportunities for people to actively seek and discover natural and cultural treasures in the vast and rugged high desert characterized by solitude, abundant wildlife, and wildlands free from human influences. Management will focus on Sheldon Refuge's wild character, biological integrity, and contribution within the larger landscape of the Great Basin as driven by natural ecological processes. As a result, Sheldon Refuge will perpetuate its unique cultural history and critical role in the preservation and study of the sagebrush-steppe ecosystem with its diverse and vital native species.*

This vision for Sheldon Refuge would be achieved through management toward the following goals as stated in the Draft CCP/EIS:

> **Goal 1:** Manage feral horse and burro populations consistent with the purposes for Sheldon Refuge, the National Wildlife Refuge System Administration Act, national wildlife refuge policy, and to protect and preserve a diverse assemblage of native plant and wildlife species, habitats, and naturally functioning systems characteristic of the Great Basin Ecosystem.
>
> **Goal 2:** Protect, maintain, and restore sagebrush-steppe and associated upland communities characteristic of the Great Basin Ecosystem.
>
> **Goal 3:** Restore, protect, and maintain the structure and function of riparian and aquatic habitats characteristic of the Great Basin Ecosystem.
>
> **Goal 4:** Protect unique and rare habitats, wildlife, and communities.
>
> **Goal 5:** Using an integrated approach, prevent, control, or eliminate non-native species that threaten Sheldon Refuge resources.
>
> **Goal 6:** Collect information and create partnerships necessary to support adaptive management decisions at a landscape scale.
>
> **Goal 7:** Provide an active fire management program.

Goal 8: Provide visitors of diverse interests and abilities with the opportunities to experience a variety of quality wildlife-dependent recreational and interpretive activities on vast, rugged, and remote high desert landscapes. These experiences will enhance visitors' understanding of and appreciation for the unique natural and cultural resources conserved by Sheldon National Wildlife Refuge and the National Wildlife Refuge System.

Goal 9: Protect and manage Sheldon National Wildlife Refuge Wilderness Study Areas to maintain wilderness character and values.

Goal 10: Protect and manage the prehistoric, historic, and paleontological resources of Sheldon Refuge to ensure present and future generations recognize the significance of the area's past.

Goal 11: Reduce illegal and unauthorized activities on Sheldon Refuge.

Management Issues

Development of the Draft CCP/EIS was driven primarily by the need to address several important management issues as identified by the Service, local tribal governments, state governments, other federal agencies and the public. The following major issues were identified and expressed by the public, various constituents, and Service staff, and have been analyzed and addressed during CCP development.

- Management of feral horses and burros
- Western juniper encroachment into adjacent sagebrush-steppe habitats
- Wildland fire and its management related to both lightning-caused and prescribed burning
- Control of invasive non-native plants
- Management of sport fishing
- Management of campgrounds
- Recommendations for proposed wilderness areas
- Public access, especially vehicle access

Management Alternatives

The Draft CCP/EIS includes three alternatives. Alternative 1 reflects the current management of Sheldon Refuge and would continue to implement applicable management direction from other existing management plans. Alternative 1 is the baseline against which the other alternatives are evaluated. Alternative 2 is the Service's preferred management alternative and is generally a more intensive approach to management of refuge resources when compared with current management under Alternative 1. The primary emphasis of Alternative 2 is the restoration of native habitats throughout Sheldon Refuge for the benefit of fish, wildlife, and plants. Alternative 3 is generally a less intensive management approach when compared with Alternative 1 or Alternative 2.

The Service has selected Alternative 2 as its preferred alternative because it would more likely restore degraded habitats throughout Sheldon Refuge currently being adversely impacted by: populations of feral horses and burros; the presence of abandoned and unnecessary commercial livestock developments; continued long-term suppression of lightning-caused wildland fire; the

introduction and rapid spread of invasive non-native weeds along road corridors; and designated camping areas located within riparian areas and/or prehistoric cultural sites.

Alternative 2 would best implement Service policy for the removal of feral horses and burros from Sheldon Refuge; for management for self-sustaining high quality sport fishing opportunities; and for designation of roads and motorized vehicle routes in support of wildlife-dependent public uses that minimize adverse impacts to refuge resources. The recommendation for proposed wilderness areas in Alternative 2 would allow intensive management and manipulation of habitats within those portions of Sheldon Refuge where action is most needed, while at the same time protecting and preserving wilderness values within those portions of the Refuge where only minimal manipulation of habitats or management activity is needed or anticipated.

Alternative 1 (the no action alternative). Populations of approximately 800 feral horses and 90 feral burros would continue to be maintained within Sheldon Refuge. Control methods would continue to include helicopter and horseback gathers, followed by shipment to private facilities for adoption or fertility control and release. Prescribed fire, mowing of sagebrush, and thinning of encroaching juniper and mountain mahogany would continue to be the primary management activities to maintain, restore, or improve habitats throughout Sheldon Refuge. The majority of water control structures would remain abandoned and unmaintained throughout Sheldon Refuge. Other water developments (primarily reservoirs, ponds, and rain-collecting guzzlers) would continue to be maintained for wildlife and recreation opportunity.

Nearly the entire Sheldon Refuge would continue to be available for public wildlife viewing and photography. Hunting and fishing harvest seasons and limits would continue to be coordinated with the Nevada Department of Wildlife, and reservoirs and ponds that support recreational fisheries would continue to be maintained and restocked with fish as needed. Environmental interpretation and outreach within Sheldon Refuge would continue to be conducted mostly through signs, brochures, and occasional volunteer projects. In addition, Sheldon Refuge would remain one of the only national wildlife refuges in the Refuge System where opportunities for surface collection of rocks and minerals are provided. Outstanding opportunities for solitude and primitive and unconfined wildlife-dependent recreation would remain available in the various proposed wilderness areas, as well as in other remote portions of Sheldon Refuge. All existing designated campgrounds and roads would continue to be maintained at their current locations.

Sheldon Refuge would continue to manage the existing 341,500 acres of proposed wilderness areas to protect and preserve their natural primitive character, solitude, opportunities for primitive recreation, and other special resource values. Occasional intrusions to provide fire suppression, and conduct fish, wildlife, and habitat management necessary to fulfill the primary purposes for Sheldon Refuge are anticipated. Management activities within the wilderness areas would include aerial population surveys, habitat monitoring, habitat restoration and rehabilitation, research studies and associated temporary structures, law enforcement activities, prescribed burning, and thinning of encroaching trees and shrubs.

Alternative 2 (Service's preferred alternative). The primary habitat management action under this alternative would be the removal of feral horses and burros from Sheldon Refuge. Other actions would rehabilitate and restore a variety of sites and small areas to improve habitat conditions, including the removal of abandoned livestock water developments from springs throughout Sheldon Refuge. In addition spring, springbrook, playa, wet meadow, and stream habitats throughout Sheldon Refuge would be restored to more natural conditions. A broad range of management tools

would be available for application including prescribed and natural fire, mechanical treatment, and water management as necessary to meet native wildlife life history requirements. In many cases, management would restore, maintain, or mimic natural ecosystem processes. Under this alternative, Sheldon Refuge would increase efforts to control, reduce, and remove feral, invasive, exotic, and noxious non-native species.

Wildlife-dependent public uses would be highlighted with opportunities for hunting, fishing, wildlife observation, photography, interpretation, and environmental education maintained or improved from present conditions. Rainbow trout (*Salmo gairdneri*) in Big Spring Reservoir and Virgin Creek would be replaced with trout indigenous to the region (i.e., Lahontan cutthroat trout [*Oncorhynchus clarki henshawi*] or redband trout [*O. mykiss* spp.]). Up to nine designated campgrounds would be relocated and some road segments realigned to reduce erosion and impacts to sensitive riparian areas, but the size, general location, or types of developments currently found at these campgrounds would remain unchanged.

Other actions would include relocation and enlargement of the visitor contact station, improvement of campground facilities, development of an accessible interpretive trail, the creation of a self-guided auto tour route, and improved signing of routes open to vehicle use. As part of this alternative, Sheldon Refuge would propose some existing primitive unmaintained routes be closed to public use by motorized vehicles to protect various refuge resources. Management action would be taken to reduce impacts from other existing routes. In addition, visitors would be required to register all off-highway vehicles for use on refuge roads and routes designated open to vehicle use.

Areas managed for wilderness values under Alternative 2 (preferred) would include those currently proposed for wilderness designation under Alternative 1 (no action) and additional areas for wilderness study as part of the 2009 Sheldon Refuge Wilderness Review. As a result, a larger portion of Sheldon Refuge (420,402 acres) would be managed for wilderness character than under the other alternatives in the short term. The areas recommended for wilderness designation by Sheldon Refuge are somewhat different in location and configuration than those currently proposed under Alternative 1 (no action), but the total area recommended is essentially the same (approximately 341,500 acres under Alternative 1 versus approximately 341,935 under Alternative 2).

Alternative 3 (emphasis on natural processes). Under Alternative 3, Sheldon Refuge would focus on management actions to mimic the effects of and restore natural processes such as fire, succession of native plant communities, flooding, and cycles or variation in wildlife populations needed to maintain or enhance native fish, wildlife, and plant diversity. Maintenance and/or restoration of shrub-steppe, riparian, wetland, woodland, grassland, and cliff-talus habitats would take place through protection of natural processes as opposed to active management.

As with Alternative 2, the primary habitat management action in Alternative 3 would be the removal of feral horses and burros from Sheldon Refuge, but removal would be accomplished within a longer period of time. Alternative 3 would result in less prescribed burning, mowing, and thinning when compared with Alternative 1 (no action) and Alternative 2 (preferred). Where such activities are conducted, the primary objective would be creating conditions where natural fire could be allowed while maintaining an acceptable level of safety and protection for people, property, and certain unique or critical resources. Management would focus on allowing natural fire, but constraints necessary to protect firefighter safety, public safety, and private property make the likelihood of such fires very small.

Wildlife-dependent public uses, including hunting and fishing, would continue to be available although not emphasized; non-native fish stocking would be eliminated; and rock collecting would be more closely monitored and possibly regulated. There would be limited access, facilities, and interpretive visitor contact facilities or signs provided; instead, self-exploration of Sheldon Refuge resources would be emphasized. Similar to Alternative 2 (preferred), designated campgrounds would be relocated out of sensitive riparian habitats to reduce impacts. However, instead of merely moving existing campgrounds to a nearby location, campgrounds would be consolidated. This would result in fewer but larger campgrounds in order to maintain the same number of campsites as under Alternative 1 (no action) and Alternative 2 (preferred).

Alternative 3 would propose fewer miles of existing primitive routes be designated for public vehicle use than is proposed under Alternative 1 (no action) or Alternative 2 (preferred). When combined with the recommendation that a smaller number of acres be designated as wilderness, Alternative 3 (natural processes) would result in the least amount of vehicle-accessible area and the smallest area managed for wilderness values when compared with the other alternatives.

Environmental Consequences

Implementation of each alternative presented in the Draft CCP/EIS would be expected to cause both beneficial and adverse impacts to refuge resources, recreation opportunities, and local communities and their economies. The Draft CCP/EIS addresses these impacts, with the majority of discussion and detail focused on impacts that are potentially significant. The following briefly summarizes the various impacts anticipated from each of the three alternatives.

Alternative 1. Overall, we anticipate Alternative 1 would have the greatest long-term, adverse impact to the fish, wildlife, plants and their habitats, recreation opportunity, cultural resources, and wilderness values. These adverse impacts would result primarily from:

- The continued presence of approximately 800 feral horses and 80 feral burros
- The continued presence of non-native fish
- The spread of non-native invasive plants,
- The continued alteration of the natural fire regime and plant community succession from fire suppression and prescribed fire,
- Habitat fragmentation and wildlife disturbance from motorized vehicle routes and their use,
- Impacts to water flow and riparian habitats from the presence and/or maintenance of abandoned livestock developments,
- Impacts to recreation opportunity from the lack of adequate facilities,
- Trammeling of wilderness condition from repeated management activities and habitat manipulation.

Important beneficial impacts from Alternative 1 would be habitat improvement following removal of encroaching juniper and fire-fuel reduction to protect old-growth mountain mahogany, benefits to pronghorn from the continued maintenance of Swan Lake Reservoir and associated late-summer forage, benefits to quality sport-fishing opportunities from the continued maintenance of reservoirs and fish stocking, and preservation of opportunities for primitive and unconfined types of recreation.

Alternative 2. We anticipate Alternative 2 would have the greatest long-term beneficial impacts on fish, wildlife, plants and their habitats, recreation opportunity, and cultural resources, primarily as a

result of more intensive and aggressive management action to improve ecological integrity throughout Sheldon Refuge. We also anticipate those same management actions would have a number of short-term, but likely less intensive, adverse impacts. Beneficial impacts would be related primarily to:

- Improved ecological integrity from the removal of feral horses and burros
- Discontinued stocking of fish not indigenous to the region
- More directed and aggressive control of non-native invasive plants
- Removal of abandoned livestock developments, stream and playa restoration efforts
- Fire-fuel reduction to protect old-growth mountain mahogany
- More aggressive thinning and removal of encroaching juniper
- Relocation of camping areas out of riparian habitats and/or away from prehistoric cultural sites

Beneficial impacts to recreation opportunity would occur from improved campground and visitor contact facilities and indirectly from the removal of feral horses and burros. Beneficial impacts to wilderness values would occur following removal of livestock developments and from improved ecological conditions. Important adverse impacts include continued effects from invasive animal species (primarily non-native fish and bullfrogs), alteration of the natural fire regime and plant community succession from continued fire suppression and prescribed fire, and trammeling of wilderness condition from management activities to restore ecological integrity.

Alternative 3. Alternative 3 is expected to result in both adverse and beneficial impacts to a variety of resources. Many of these impacts represent a trade-off between actions to achieve one management goal at the expense of another. Overall, we anticipate long-term impacts from Alternative 3 would be more beneficial to refuge resources when compared with Alternative 1 but less beneficial when compared with Alternative 2. Beneficial impacts from Alternative 3 would include improved ecological integrity from the removal of feral horses and burros and consolidation of designated camping areas. Wilderness solitude would improve as a result of fewer management activities and lesser use of mechanized and motorized tools and equipment. Adverse impacts from Alternative 3 would include:

- Increased risk for larger more intense wildland fires from fewer and/or less effective fire-fuel breaks and encroaching juniper removed from fewer acres
- Poor or insufficient recovery of springs following removal of livestock developments
- Fewer opportunities for sport fishing as maintenance of ponds and reservoirs are discontinued
- Fewer public access opportunities as maintenance of Virgin Valley road is discontinued
- Fewer opportunities for primitive recreation with increased motorized access

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Chapter 1. Introduction, Purpose of and Need for Action

1.1 Introduction and Background

Located in a remote area of northwestern Nevada, the Sheldon National Wildlife Refuge (referred to here as Sheldon Refuge) encompasses 575,000 acres of sagebrush-steppe habitat within the Great Basin (Figure 1.1) and is managed by the U.S. Fish and Wildlife Service (the Service). Originally established in 1931 for the conservation and protection of the once-imperiled pronghorn (*Antilocapra americana*), Sheldon Refuge (along with its refuge complex companion Hart Mountain National Antelope Refuge) now conserves habitat for a number of additional native, rare, and imperiled species of fish, wildlife, and plants that depend upon the sagebrush-steppe ecosystem.

Blanketing high basalt tablelands and mountains, which average 6,000 feet in elevation, the vast expanses of sagebrush habitats are dotted with springs, pockets of aspen, and isolated stands of mountain mahogany. Only at its edges does the refuge vary noticeably, with the pale rhyolite of Virgin Valley on the eastern edge, which holds highly prized black opal, and the high escarpment on the western edge where western juniper (*Juniperus occidentalis occidentalis*) dominates.

With the exception of a two-lane paved highway, a few scattered buildings, abandoned water troughs, and some primitive dirt roads, Sheldon Refuge appears today much as it has for the past 12,000 years or more that people have lived in this region. This long history of habitation is apparent throughout the refuge from the prehistoric stone tools, petroglyphs, and ancient campsites that remain. Today people continue to hunt, hike, and camp within Sheldon Refuge, but for recreation rather than subsistence.

This document is a combined Draft Refuge Comprehensive Conservation Plan and Environmental Impact Statement (Draft CCP/EIS). This Draft CCP/EIS evaluates and compares three draft alternatives for the conservation of fish, wildlife, and plants within Sheldon Refuge primarily through monitoring of their populations, management and restoration of their habitats, and control of invasive and feral species. The three draft alternatives also include management of public uses such as wildlife observation and photography, hunting, fishing, and rock collecting in a manner that is compatible with the primary conservation purposes for Sheldon Refuge. The three draft alternatives presented are the outcome of a public planning process, which was initiated in 2007 and has involved thousands of individuals, non-profit organizations, state and local agencies, and tribal governments. Effects from the management activities and public uses considered in the draft alternatives are identified and evaluated, with attention to those effects that are potentially significant.

The Final CCP/EIS will be approved and a Record of Decision signed by the Service's Regional Director in Portland, Oregon. The Final CCP will guide management of Sheldon Refuge for the next 15 years.

1.2 Proposed Action

The Service is proposing to adopt and implement a comprehensive conservation plan for Sheldon National Wildlife Refuge. This document is a Draft Comprehensive Conservation Plan and Environmental Impact Statement (Draft CCP/EIS) for Sheldon Refuge. The CCP sets forth management guidance for Sheldon Refuge over the next 15 years, as required by the National

Wildlife Refuge System Administration Act of 1966 (16 U.S. Code [U.S.C.] 688 dd-688 ee, as amended by the National Wildlife Refuge System Improvement Act of 1997) to address significant problems that may adversely affect the populations and habitat of fish, wildlife, and plants and the actions necessary to correct or mitigate such problems. The Improvement Act mandated that a CCP be developed for each refuge in the National Wildlife Refuge System.

The proposed action in the Draft CCP/EIS is to implement Alternative 2, which has been identified as the Service's Preferred Alternative. This Draft CCP/EIS explores this option along with two other options (alternatives) for the CCP and discloses anticipated effects for each alternative, pursuant to the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321-4347). Alternatives are presented in Chapter 2, and effects are analyzed in Chapter 3, 4, 5, and 6. Appendices provide supporting information.

The actions under Alternative 2 best achieve the purpose and need for the CCP while maintaining balance among the varied management needs and programs. Alternative 2 addresses the issues and relevant mandates, and is consistent with principles of sound fish and wildlife management. Alternative 2 is consistent with the mission of the National Wildlife Refuge System and the goals of the National Wilderness Preservation System.

1.3 Purpose and Need for the Comprehensive Conservation Plan

The purpose of the CCP is to provide reasonable, scientifically grounded guidance for improving Sheldon Refuge's shrub-steppe, riparian, wetland, woodland, grassland, and cliff-talus habitats, for the long-term conservation of pronghorn, native plants and animals, and migratory birds. The CCP will identify appropriate actions for protecting and sustaining the biological features of Sheldon Refuge's pronghorn, Greater sage-grouse (*Centrocerus urophasianus*), California bighorn sheep (*Ovis canadensis*), and pygmy rabbit (*Brachylagus idahoensis*) populations and threatened, endangered, or rare species. The Decision Record for the 2008 Sheldon National Wildlife Refuge Horse and Burro Management Environmental Assessment (EA) stated feral horses and burros would be managed to maintain population levels that existed at that time. However, this Decision Record also stated this management direction would be re-evaluated as part of the Sheldon Refuge CCP. A final purpose of the CCP is to provide guidance for providing high-quality public use programs in hunting, fishing, wildlife observation, photography, camping, environmental education, and interpretation.

Not only are CCPs for all national wildlife refuges required under the National Wildlife Refuge System Improvement Act, a CCP for Sheldon Refuge is needed for a variety of reasons. Primary among these is the need to identify and deal with key threats to the above habitats, including invasive plants and animals, altered fire regimes, and altered hydrological regimes. There is a need to address Sheldon Refuge's role in the conservation of Greater sage-grouse and pygmy rabbits and their habitats because these species use certain refuge habitats for all life history needs. There is also a need to address the contributions of Sheldon Refuge to the biodiversity of the Great Basin. There is a need to address public concern about feral horse and burro populations that negatively impact refuge habitats.

There is a need to analyze public use programs for the Refuge System's "Big Six" uses and to determine what improvements or alterations should be made in the pursuit of higher quality programs. The Big Six wildlife-dependent uses are hunting, fishing, wildlife observation,

photography, environmental education, and interpretation (See Section 1.5.3 for more on the Big Six uses.)

There is also a need to determine whether and how Sheldon Refuge should continue to offer camping and other non-wildlife-dependent uses, including horseback riding, rock collecting, and off-highway vehicles (OHVs). There is a need to address strategies to better prevent use of refuge lands for illegal uses including off-road use and poaching. Finally, there is a need to describe the steps that should be taken to better protect cultural resources.

1.4 Content and Scope of Plan

This CCP provides guidance for management of refuge habitats and wildlife and administration of public uses on refuge lands and waters. An outline of the key information in the CCP follows.

- An overall vision for Sheldon Refuge and the role in the local ecosystem (Chapter 1).
- Updated and revised management direction in the form of goals and objectives for specific conservation targets and public use programs, as well as strategies for achieving the objectives (Chapter 2).
- A description of the conservation targets, their condition and trends on Sheldon Refuge and within the local ecosystem, a presentation of the key desired ecological conditions for sustaining the targets, and a short analysis of the threats to each conservation target (Chapter 2).
- A description of the physical, biological, and social environments that exist within Sheldon Refuge (Chapters 3, 4, and 5).
- An overview of Sheldon Refuge's public use programs and facilities, a list of desired future conditions for each program, and other management considerations (Chapters 2 and 5).
- An analysis of the environmental effects associated with implementing the management actions prescribed under each alternative (Chapters 3, 4, and 5).
- An analysis of the environmental consequences of the proposed action, including cumulative effects (Chapter 6).
- An inventory of Sheldon Refuge wilderness resources, including a recommendation of Refuge lands suitable for wilderness designation (Appendix F).
- Draft compatibility determinations for existing and proposed public and economic uses (Appendix D).
- An outline of the projects, staff, and facilities needed to implement the alternatives considered (Appendix E).

A list of species known or suspected to occur on Sheldon Refuge, with information about their state and Federal conservation status (Appendix B).

1.5 Planning and Management Guidance

The U.S. Fish and Wildlife Service, an agency within the Department of Interior, is the principal Federal agency responsible for conserving, protecting, and enhancing fish, wildlife and plants and their habitats for the continuing benefit of the American people. The Service manages the 96-million-acre National Wildlife Refuge System, which encompasses 545 national wildlife refuges, thousands of small wetlands, and other special management areas.

Refuges are guided by various Federal laws and executive orders, Service policies, and international treaties. Fundamental are the mission and goals of the National Wildlife Refuge System (NWRS or Refuge System) and the designated purposes of the refuge unit as described in establishing legislation, executive orders, or other documents establishing, authorizing, or expanding a refuge.

Key concepts and guidance of the Refuge System derive from the National Wildlife Refuge System Administration Act of 1966 as amended (16 U.S.C. 668dd-668ee), the Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4), as amended, Title 50 of the Code of Federal Regulations, and the Fish and Wildlife Service Manual. The National Wildlife Refuge System Administration Act is implemented through regulations covering the National Wildlife Refuge System, published in Title 50, subchapter C of the Code of Federal Regulations. These regulations govern general administration of units of the Refuge System.

1.5.1 U.S. Fish and Wildlife Service Mission

The mission of the Service is "working with others, to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people." National natural resources entrusted to the Service for conservation and protection include migratory birds, endangered and threatened species, inter-jurisdictional fish, wetlands, and certain marine mammals. The Service also manages national fish hatcheries, enforces Federal wildlife laws and international treaties on importing and exporting wildlife, assists with state fish and wildlife programs, and helps other countries develop wildlife conservation programs.

1.5.2 National Wildlife Refuge System

The National Wildlife Refuge System is the world's largest network of public lands and waters set aside specifically for conserving wildlife and protecting ecosystems. From its inception in 1903, the Refuge System has grown to encompass 545 national wildlife refuges in all 50 states, and waterfowl production areas in 10 states, covering more than 96 million acres of public lands. More than 36 million visitors annually fish, hunt, observe, and photograph wildlife, or participate in environmental education and interpretive activities on these national wildlife refuges.

1.5.3 National Wildlife Refuge System Mission and Goals

The mission of the Refuge System is "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended)(16 U.S.C. 668dd-668ee).

Wildlife conservation is the fundamental mission of the Refuge System. The goals of the National Wildlife Refuge System, as articulated in the Mission Goals and Purposes Policy (601 FW 1) are to:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and inter-jurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.

- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

Management of Sheldon Refuge is directed, in large part, by the legislation that created and established purposes for Sheldon Refuge and by the goals described later in this chapter. However, other laws, regulations, and policies also guide the management of Sheldon Refuge. This section identifies the acts and policy guidance that are integral in the development of this CCP.

1.5.3.1 Legal Guidance

Operation and management of Sheldon Refuge is influenced by a wide array of laws, treaties, and executive orders. Among the most important are the National Wildlife Refuge System Administration Act, as amended by the National Wildlife Refuge Improvement Act, the Refuge Recreation Act, and the General Mining Act of 1872. These acts are described briefly in Appendix J along with other acts and legal guidance that influence management of Sheldon Refuge.

1.5.3.2 Policy Guidance

Programmatic guidance and policy documents provide additional direction for the management of national wildlife refuges throughout the System. These documents include the following:

- Fish and Wildlife Service Manual chapters
- Director's orders
- National policy issuances
- Handbooks
- Director's memoranda
- Regional directives

Among the more important policies relating to management of Sheldon Refuge are Service policies for biological integrity, diversity, and environmental health; compatibility; and wilderness stewardship. These policies are described briefly in Appendix J along with other important policies and guidance that influence management of Sheldon Refuge.

1.5.4 Refuge Management Direction

A number of previous planning efforts have been completed for Sheldon Refuge. These various plans provide the current management direction for Sheldon Refuge. This CCP will substantially revise or replace this existing management direction to reflect revised and updated Service policies and guidelines, new resource information and research findings, and to address issues identified through the scoping process.

The Sheldon National Wildlife Refuge Renewable Natural Resources Management Plan Final Environmental Impact Statement (referred to here as simply the Sheldon Natural Resource Plan) was completed and released to the public on August 18, 1980. The plan was a detailed and valuable document covering location, history, environment, resources, administration, land status, agreements and permits, and management direction.

In addition, several smaller "step-down" plans (plans addressing one program or resource) have been developed for Sheldon Refuge including:

- Virgin Valley Winter Grazing Plan and Environmental Assessment (amended the Sheldon Natural Resource Plan) (1989)
- Fisheries Management Plan (1990)
- Western Juniper Control Project Plan and Environmental Assessment (2001)
- Feral Horse and Burro Management Plan (amended the Sheldon Natural Resource Plan) (2008)
- Fire Management Plan (2009)

With the exception of the Fire Management Plan, the Final Record of Decision for the Sheldon Refuge CCP/EIS will supersede the previous planning decisions and management direction listed above in their entirety. The Fire Management Plan will be updated to reflect any additional or revised management direction included in the CCP/EIS Final Record of Decision.

1.5.5 Future Step-down Management Plans

The CCP will be revised every 15 years or earlier if monitoring and evaluation determine that changes are needed to achieve Sheldon Refuge purposes, vision, goals, or objectives. The CCP provides guidance in the form of goals, objectives, and strategies for refuge program areas but may lack some of the specifics needed for implementation. Step-down management plans will therefore be developed for individual program areas, as needed, following completion of the CCP. Step-down plans require appropriate NEPA compliance. The following step-down management plans will be revised or completed in accordance with the CCP management goals, objectives, and strategies following the Final Record of Decision:

- Minerals and Mining Management Plan
- Wilderness Stewardship Plan
- Transportation Management Plan
- Visitor Services Plan
- Law Enforcement Plan
- Cultural Resources Management Plan
- Cold-water Fisheries Management Plan
- Habitat Management Plan
- Integrated Pest Management Plan

1.6 Refuge Establishment, Refuge Purposes, Refuge Goals

The purpose for which a refuge was established or acquired is of key importance in refuge planning. Purposes must form the foundation for planning and management decisions. The purposes of a

refuge are specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.

Unless the establishing law, order, or other document indicates otherwise, purposes dealing with the conservation, management, and restoration of fish, wildlife, and plants, and the habitats on which they depend take precedence over other purposes in the management and administration of any unit. Where a refuge has multiple purposes related to fish, wildlife, and plant conservation, the more specific purpose will take precedence in instances of conflict. When an additional unit is acquired under an authority different from the authority used to establish the original unit, the addition takes on the purpose(s) of the original unit, but the original unit does not take on the purpose(s) of the newer addition.

By law, refuges are to be managed so as to achieve their purposes. When a conflict exists between the System mission and the purpose of an individual refuge, the refuge purpose may supersede the System mission.

Refuge purposes are also the driving force in the development of the refuge vision statements, goals, objectives, and strategies in the CCP and are critical to determining the compatibility of all existing and proposed refuge uses. The purposes for Sheldon Refuge have been established through a series of congressional acts, presidential executive orders, and public land orders as follows.

This section includes a list and brief description of the establishing and acquisition authorities for Sheldon Refuge. A comprehensive history of the establishment of Sheldon Refuge is included in Appendix I.

1.6.1 Sheldon Refuge Purposes

"...as a refuge and breeding ground for wild animals and birds..." Executive Order (EO) 5540 dated January 26, 1931

"...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..." EO 7522 dated December 21, 1936

"...to conserve (A) 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)

1.6.1.1 Establishing and Acquisition Authorities

Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715r):

> "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds…" and "…to conserve and protect migratory birds in accordance with treaty obligations…and other species of wildlife found thereon, including species that are listed…as endangered species or threatened species, and to restore or develop adequate wildlife habitat"

Charles Sheldon Wild Life Refuge, Nevada (EO 5540, January 26, 1931):

> "…reserved and set apart for…use…as a refuge and breeding ground for wild animals and birds.…"

Enlarging Charles Sheldon Wildlife Refuge, Nevada (EO 7364, May 6, 1936):

> "…in order to effectuate further the purposes of the Migratory Bird Conservation Act …withdrawn from settlement, location, sale, entry, or other form of appropriation and reserved and set apart…as an addition to the existing Charles Sheldon Wildlife Refuge…."

Charles Sheldon Antelope Range, Nevada (EO 7522, December 21, 1936):

> "…withdrawn from settlement, location, sale, or entry and reserved and 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…."

National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee), including the Game Range Act of 1976 (Public Law 94-223, 90 Stat. 199):

> "…for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans"

Nevada—Prior Amendment of Executive Order No. 7522; Prior Revocation of Public Land Order No. 5497; Consolidation of Charles Sheldon Antelope Range and Charles Sheldon Wildlife Refuge; Change of Name to Sheldon National Wildlife Refuge; Clarification of Administration and Management Under National Wildlife Refuge System Administration Act (Public Land Order [PLO] 5634, April 25, 1978):

> Consistent with, "The Act of February 27, 1976 (Public Law 94-223, 90 Stat. 199) [a.k.a. the Game Range Act] which amended…the National Wildlife Refuge System Administration Act of 1966 …the Charles Sheldon Antelope Range, shall be administered by the Secretary of the Interior exclusively through the United States Fish and Wildlife Service…;" and "The operation and administration of the Charles Sheldon Antelope Range, including grazing…is now being administered, in accordance with the National Wildlife Refuge System Administration Act…;" and "…the lands and interests in land comprising the Charles Sheldon Wildlife Refuge…and the adjoining Charles Sheldon Antelope Range…are hereby consolidated into one administrative unit…designated and known as the Sheldon National Wildlife Refuge"

Mineral Withdrawal of a Portion of the Sheldon National Wildlife Refuge; Nevada (PLO 6849, April 15, 1991):

> "…withdraws approximately 445,766 acres of the Sheldon National Wildlife Refuge…from mining location…to protect the wildlife habitat and unique resource values of the refuge lands"

1.6.2 Refuge Vision Statement

Sheldon National Wildlife Refuge will foster a strong land ethic and provide scientific leadership through collaboration with a diverse network of partners and utilize the highest principles of conservation. Sheldon Refuge will promote opportunities for people to actively seek and discover natural and cultural treasures in the vast and rugged high desert characterized by solitude, abundant wildlife, and wildlands free from human influences. Management will focus on Sheldon Refuge's wild character, biological integrity, and contribution within the larger landscape of the Great Basin as driven by natural ecological processes. As a result, Sheldon Refuge will perpetuate its unique cultural history and critical role in the preservation and study of the sagebrush-steppe ecosystem with its diverse and vital native species.

1.6.3 Refuge Management Direction: Goals

1.6.3.1 Habitat and Wildlife Goals

Goal 1: Manage feral horse and burro populations consistent with the purposes for Sheldon Refuge, the National Wildlife Refuge Improvement Act, national wildlife refuge policy, and to protect and preserve a diverse assemblage of native plant and wildlife species, habitats, and naturally functioning systems characteristic of the Great Basin Ecosystem.

Goal 2: Protect, maintain, and restore sagebrush-steppe and associated upland communities characteristic of the Great Basin Ecosystem.

Goal 3: Restore, protect, and maintain the structure and function of riparian and aquatic habitats characteristic of the Great Basin Ecosystem.

Goal 4: Protect unique and rare habitats, wildlife, and communities.

Goal 5: Using an integrated approach, prevent, control, or eliminate non-native species that threaten Sheldon Refuge resources.

Goal 6: Collect information and create partnerships necessary to support adaptive management decisions at a landscape scale.

1.6.3.2 Fire Management Goal

Goal 7: Provide an active fire management program.

1.6.3.3 Public Use Goal

Goal 8: Provide visitors of diverse interests and abilities with opportunities to experience a variety of quality wildlife-dependent recreational and educational activities on vast, rugged, and remote high desert landscapes. These experiences will enhance visitors' understanding of and appreciation for

the unique natural and cultural resources conserved by Sheldon National Wildlife Refuge and the National Wildlife Refuge System.

1.6.3.4 Wilderness Resource Goal

Goal 9: Protect and manage Sheldon National Wildlife Refuge Wilderness Study Areas to maintain wilderness character and values.

1.6.3.5 Cultural Resource Goal

Goal 10: Protect and manage the prehistoric, historic, and paleontological resources of Sheldon Refuge to ensure present and future generations recognize the significance of the area's past.

1.6.3.6 Law Enforcement Goal

Goal 11: Reduce illegal and unauthorized activities on Sheldon Refuge.

1.7 Relationship to Other Ecosystem Planning Efforts

When developing a CCP, the Service considers the goals and objectives of existing national, regional, and ecosystem plans; state fish and wildlife conservation plans; and other landscape-scale plans developed for the same watershed or ecosystem in which the refuge is located. Where appropriate, the CCP is expected to be consistent with the existing plans and assist in meeting their conservation goals and objectives (602 FW 3.3). This section summarizes some of the key plans reviewed by members of the core team while developing the CCP.

1.7.1 State Plans

The Nevada Department of Wildlife (NDOW) recently completed the Nevada Wildlife Action Plan (Wildlife Action Plan Team 2006), which incorporates the agency's special expertise in the management and conservation of Nevada's native wildlife and habitats. The Nevada Wildlife Action Plan is designed to provide scientific support for CCP development, input on impact analyses, and support for implementation of management actions. Partnerships and close coordination between NDOW and the Service are key to incorporating the Nevada Wildlife Action Plan into the CCP process.

Other NDOW plans include the Nevada Partners in Flight, Nevada Management Plan for Mule Deer, Big Game Status, Elk Species Management, Bat Conservation, Pronghorn Antelope Ecology, Management and Conservation, and Greater Sage-grouse Conservation.

1.7.2 Migratory Bird Plans

Birds of Conservation Concern (USFWS 2002a): Based on the efforts and assessment scores of three major bird conservation efforts (Partners in Flight, the U.S. Shorebird Conservation Plan, and the North American Waterbird Conservation Plan), this report identifies, by Service region and by Bird Conservation Region, the bird species most in need of conservation attention.

Partners in Flight (PIF), Sheldon Refuge Plan: The primary goal is to ensure long-term maintenance of healthy populations of native landbirds. Specific management activities and strategies are recommended.

North American Waterfowl Management Plan: The North American Waterfowl Management Plan, signed by the United States and Canada in 1986 and by Mexico in 1994, provides a strategy to protect North America's remaining wetlands and to conserve waterfowl populations through habitat protection, restoration, and enhancement. The plan contains population goals for several species and groups of species by season or life stage. The plan was updated in 2004 with an emphasis on strengthening the biological foundation, using a landscape approach and expanding partnerships. Additional strategic guidance was provided in a 2004 update, with specific population objectives by species. Implementation of this plan is accomplished at the regional level by partnership, within 11 Joint Venture areas. The Sheldon Refuge is located within the area of the Intermountain West Joint Venture. The document, 2004 Strategic Guidance (North American Waterfowl Management Plan, 2004), a 15-year plan, does contain species-specific population objectives as a step-down from the North American Waterfowl Plan and evaluations of whether the continental population is currently short or over the target. There are also flyway goals for production by species. The Sheldon Refuge is recognized as one of 67 areas of continental significance to waterfowl, but the plan did not target population objectives for wintering or migratory waterfowl by area.

Pacific Flyway Plans: Flyway management plans are the products of Flyway Councils, developed to help state and Federal agencies cooperatively manage migratory game birds. These plans typically focus on populations. The Pacific Flyway Council has prepared 26 management plans to date in either draft or final form (Pacific Flyway Council 2010). The following flyway management plans pertain to Sheldon Refuge and the CCP:

- Canada Geese: Lesser and Taverner's, Pacific Western, Rocky Mountain, Western, Depredation Control.
- Greater White-fronted Geese: Pacific, Tule.
- Snow Geese: Wrangel Island Lesser, Western Canadian Arctic Lesser Ross' Geese.
- Swans: Pacific Trumpeter, Rocky Mountain Trumpeter, Western Tundra, Eastern Tundra.
- Sandhill Cranes: Pacific Coast, Central Valley.
- Mourning Dove: National Mourning Dove Plan.

Intermountain West Regional Shorebird Conservation Plan (Oring et al. 2006): According to this plan, the Intermountain West is North America's most important inland area for maintaining the continent's shorebird population. The plan identifies major shorebird issues in the region and outlines regional goals and objectives in the areas of habitat management, monitoring and assessment, research, outreach, and planning. Key issues identified in the plan include water quality and quantity; maintenance and enhancement of populations of long-billed curlew (*Numenius americanus*), mountain plover (*Charadrius montanus*), and upland sandpiper (*Bartramia longicauda*); depredation of eggs and young; regional coordination, agriculture-shorebird interface; and wintering sites. Concern ranking scores are provided for each of the 34 shorebird species breeding or moving through the region. Species ranked as critically important include western snowy plover (*C. alexandrines*), black-necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra americana*), long-billed curlew, long-billed dowitcher (*Limnodromus scolopaceus*), and Wilson's phalarope (*Steganopus tricolor*).

1.8 Planning and Issue Identification

1.8.1 Description of the Planning Process

A core planning team, consisting of the Sheldon-Hart Mountain Refuge Complex project leader, deputy project leader, natural resource planner, biologist, fire management officer, and the Sheldon Refuge manager began developing the CCP in 2007. A list of core planning team members and their experience is located in Appendix K. An extended team assisted in development of the Draft CCP, particularly in providing comments at key milestones. The extended team consisted of various professionals from other Federal agencies, NDOW, and within the Service.

Early in the planning process, the extended planning team considered other planning efforts (see Section 1.7) and cooperatively identified the top priority species, groups, and communities for Sheldon Refuge. These priorities were also called conservation targets, and most of the biological emphasis of the CCP is focused on protecting and restoring these targets.

Planning for compatible wildlife-dependent public uses and rock collecting centered on developing goals, objectives, and strategies for secondary supporting uses and facilities such as vehicle access, campground facilities, and water developments.

Public scoping began in spring and summer of 2008. Scoping meetings were held in Lakeview, Oregon, Winnemucca, Nevada, and Denio, Nevada, in May 2008 and Alturas, California, and Reno, Nevada, in June 2008. Public commentary was also solicited through distribution of three planning updates to more than 4,000 individuals on the Sheldon Refuge mailing list and meetings with key stakeholder groups. A number of comments and suggestions were made through this process, which informed further development and refinement of the CCP alternatives, including the preferred alternative. Public involvement is further discussed in Appendix A.

An internal draft was distributed to Service Region 1 reviewers, members of the extended team, NDOW, and Oregon Department of Fish and Wildlife (ODFW) representatives. In addition, a consultation meeting was held with the Summit-Lake Paiute Tribal Council to discuss the preliminary alternatives and resource concerns. All changes that were requested and all the resulting changes that were made to the Draft CCP/EIS were documented.

1.8.1.1 Planning Issues

The following major issues were identified and expressed by the public, various constituents, and Service staff, and have been analyzed and addressed during CCP development.

- **Feral Horses and Burros:** Management of feral horses and burros has been identified as the most important issue affecting the ability of the Service to fulfill the purposes for Sheldon Refuge. A detailed environmental assessment was prepared (USFWS 2008a), which described a number of direct adverse impacts to biological integrity, diversity, and environmental health within Sheldon Refuge from feral horses and burros (Photo 1.1). These impacts from populations of approximately 800 horses and 90 burros were determined not likely to be significant over the short term until the CCP for Sheldon Refuge could be completed and include long-term management direction for feral horses and burros within Sheldon Refuge. As part of the CCP it is necessary for the Service to evaluate impacts from

continued management of approximately 800 horses and 90 burros over the long term in addition to other alternatives for long-term management consistent with Service policy, the mission of the Refuge System, and the purposes for Sheldon Refuge. In addition, it is necessary for the Service to consider the full range of available methods and tools for accomplishing each alternative.

Photo 1.1 Damaging effects from feral horses and burros (as shown outside the fence exclosure in the left side of the photo) are well documented within Sheldon Refuge (Photo Gail Collins).

- **Juniper Encroachment:** Over the past hundred years or so, western juniper has been steadily encroaching on large areas of sagebrush-steppe habitat in the western United States (Photos 1.2 and 1.3). This encroachment is the result of grazing management, which has reduced understory vegetation, and fire management, which has increased the density of juniper and further reduced understory vegetation and the natural influences from fire. There is concern that these effects are reducing the amount and quality of habitat for important wildlife such as pronghorn, Greater sage-grouse, mule deer (*Odocoileus hemionus*), and pygmy rabbit within Sheldon Refuge, and that these impacts could increase if additional management action is not taken.

Photo 1.2 West entrance to Sheldon Refuge in 1961.

Photo 1.3 The expansion of western juniper has occurred in recent times. The expansion into the lower elevation slopes in the western portion of Sheldon Refuge (shown at the center of this 2001 photo) occurred within 40 years.

- **Wildland Fire:** Past fire management has successfully extinguished the majority of lightning-caused fires or significantly reduced the intensity, and size of such fires leading to several habitat changes such as juniper encroachment discussed previously. At the same time, the frequency of fire has increased within certain habitats through prescribed burning (Photo 1.4). This past approach to fire management has resulted in an increasing amount of vegetation and increasing risk for fires burning more intensely and over larger areas of sagebrush habitat than historically would have occurred. This issue is further complicated by grazing from feral horses, the potential for cheatgrass invasion following fire, and the safety risks and hazards associated with attempting to maintain or restore a more natural fire regime. There is a need to explore other options for using fire to meet habitat management objectives and in turn meeting wildlife management objectives for Sheldon Refuge while at the same time maintaining public safety and an acceptable level of risk.

Photo 1.4 Prescribed fire is now more frequently used to manage meadow habitats within Sheldon Refuge.

- **Invasive Species:** In addition to feral horses and burros, and widespread cheatgrass invasion following fire, a number of other invasive plants and animals either currently occur or are known to already be in areas near Sheldon Refuge (Photo 1.5). Presently there is no systematic or strategic effort to identify, control, or remove these species before they become widespread and very difficult or impossible to manage. There is a need for the Service to identify specific strategies for minimizing the impacts from species already occurring within Sheldon Refuge and to greatly reduce the potential for such species occurring in the future.

Photo 1.5 Disturbance from regular grading along road shoulders spreads and creates ideal growing conditions for many non-native invasive plants such as Russian thistle, *Halogeton*, and cheatgrass.

- **Sport Fishing:** There are three primary areas managed for sport fisheries within Sheldon Refuge. Continuing to maintain these fisheries has been raised as an issue due to water being impounded and not available to downstream wildlife habitats; the time, money, and other resources needed for maintenance and repairs, which detract from other higher priority wildlife management projects and programs; and because the current practice of periodically restocking non-native rainbow trout (*Salmo gairdneri*) is incompatible with Service policy.

  Several non-native species of warm-water fish were historically stocked to the Dufurrena Ponds in the Virgin Valley. These ponds continue to provide fishing opportunities, but the ponds are not restocked, and the likelihood that these fish could escape into Thousand Creek or Virgin Creek is considered very low. However, occasional flooding does require maintenance of the ponds and creates conditions where fish could escape into adjacent streams.

  Both Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*; native to nearby areas) and rainbow trout (not native to nearby areas) are periodically stocked to Catnip Reservoir, but the reservoir has become shallow through siltation and the earthen dam is beginning to fail. To maintain this fishery, trout will need to be periodically restocked, Catnip Reservoir will need to be dredged, and the dam will need to be repaired or replaced at the considerable cost of several million dollars.

  Big Spring Reservoir is currently dry, but in wetter years it was restocked with rainbow trout, which is preferred by some anglers because it is more vigorous, hardy, faster growing, and ultimately more sporting to catch than the locally indigenous Lahontan cutthroat or redband trout (*Oncorhynchus mykiss gairdnari*). However, restocking non-native fish to waters within a national wildlife refuge to provide sport-fishing opportunity is incompatible with Service policy.

- **Designated Campgrounds:** Overnight camping within Sheldon Refuge is allowed only at designated campgrounds or in the backcountry by Special Use Permit. Due to the remoteness and size of Sheldon Refuge, overnight camping is allowed to facilitate and support wildlife-dependent uses such as fishing, hunting, wildlife observation, and photography which many visitors would not be able to participate in otherwise. While the number of designated campgrounds has diminished, the remaining semi-primitive and primitive campgrounds are located at or near springs and affect riparian areas through trampling, water pollution, and the disturbance and displacement of wildlife from these important water sources.

  Virgin Valley Campground has been developed and includes several outhouses, potable water, fire rings, and a bathhouse and swimming area heated by geothermal springs (Photo 1.6). These amenities make the campground the most popular destination within Sheldon Refuge, and the level of use during the summer often exceeds capacity, causing overcrowding, user conflicts, and unauthorized use of adjacent areas outside the campground. A large proportion of visitation and use of the Virgin Valley Campground is associated with commercial mining of precious opal at mining claims scattered throughout Virgin Valley. There is concern that the non-wildlife-dependent use associated with mining is causing conflict with other visitors participating in higher priority, appropriate wildlife-dependent uses.

  The Service needs to consider options for the long-term management of camping within Sheldon Refuge that will minimize impacts to important habitats and at the same time facilitate public use and enjoyment of the fish and wildlife resources it seeks to conserve.

Photo 1.6 Virgin Valley Campground is the most popular recreation site within Sheldon Refuge, but its popularity is mostly related to the developed hot springs and nearby opal mining opportunities—not wildlife-dependent recreation (Photo Gail Collins).

- **Wilderness Review:** Currently 341,500 acres within Sheldon Refuge have been proposed by the President for wilderness designation by Congress. Consistent with Service policy,

Sheldon Refuge will continue to manage all proposed wilderness as wilderness until Congress takes action on the original 1974 proposal. However, this same policy also requires a wilderness review be conducted as part of this CCP. The wilderness review identifies lands and waters that meet the minimum criteria for wilderness, evaluates those areas identified to determine if they are suitable, and then determines if those suitable areas should be recommended for designation as wilderness.

Sheldon Refuge should consider a range of alternatives for potential wilderness recommendations that would be consistent with other management objectives and strategies under other alternatives, potential future management needs and activities, and long-term conservation of fish, wildlife, and their habitats. Given the current wilderness proposal for the majority of lands within Sheldon Refuge, an "all wilderness alternative" and a "no wilderness alternative" were determined not to be within a reasonable range of alternatives for this CCP.

- **Public Access, Roads, and Transportation:** Over time, hundreds of miles of primitive motorized routes and trails have been pioneered throughout Sheldon Refuge (Photo 1.7). In addition, several maintained roads have also been established across Sheldon Refuge and are maintained under agreement, permit, or right-of-way with the respective county and state agencies. This existing network of roads, routes, and trails is traveled by high clearance four-wheel-drive vehicles, but primarily by four-wheelers, motorbikes, or other OHVs. This use has resulted in adverse impacts to wildlife, habitats, cultural and historic resources, wilderness character, and primitive recreation opportunities. Despite the fact that many publications, brochures, and maps show these routes and trails, the Service has not officially designated these areas open to motorized use as required by Executive Order 11644 and 50 CFR 27.31. Through this CCP the Service will evaluate the adverse impacts from these routes and trails and will consider a range of alternatives that minimizes damage to soils, harassment of wildlife, or significant disruption of wildlife habitats, or other existing wildlife-dependent recreational uses.

1.8.1.2 Issues Outside the Scope of the CCP/EIS

A number of issues were raised during scoping which are considered to be outside the scope of the CCP/EIS. These issues were not analyzed during the CCP process.

- **Allowing Livestock Grazing:** All assignments of Special Use Permits and privileges for commercial livestock grazing were purchased by a private organization at fair market value in 1994. At the request of the owner of these assignments, all associated grazing privileges were canceled by the Service in 1995. For this reason Sheldon Refuge cannot issue permits for commercial livestock grazing unless such use is determined necessary to fulfill the purposes for Sheldon Refuge and the management objectives in this CCP.

Photo 1.7 Hundreds of miles of four-wheel drive routes and trails are located throughout Sheldon Refuge, with the highest concentration in Virgin Valley for access to mining prospects and claims (Photo Gail Collins).

- **Mining Management:** A renewal of the 1991 Public Land Order for withdrawal of the mineral estate from location of mineral claims is being completed outside the scope of the CCP because of its short time requirements for filing. A framework for managing mining claims, mining operations, access to valid claims, and regulations specific to Sheldon Refuge is being explored with Service resource managers, experts, and the USFWS Solicitor's office (which provides legal guidance and advice) because of its complex nature and the longer timeframe expected for its completion. This framework and regulations will be represented in a Minerals Management Plan to be developed for Sheldon Refuge following completion of the Sheldon CCP/EIS.

- **Withdrawing Public Lands between Sheldon and Hart Mountain National Wildlife Refuges from Public Domain to be Included in the Refuge System:** Sheldon Refuge is working to develop partnerships with the Bureau of Land Management (BLM), private landowners, and state agencies to research habitat use by wildlife and conduct habitat improvements between and around the two refuges.

1.9 Plan Amendment and Revision

Service policy directs that Sheldon Refuge review the CCP annually to assess the need for change. We revise the CCP when significant new information becomes available, when ecological conditions change, or when the need to do so is identified during the review. If major changes are proposed, public meetings may be held and new environmental assessments and environmental impact statements may be necessary. Consultation with appropriate state agencies, tribal governments, and the public would occur during any future revisions. Full review and revision of the CCP will occur every 10 to 15 years or more often if necessary.

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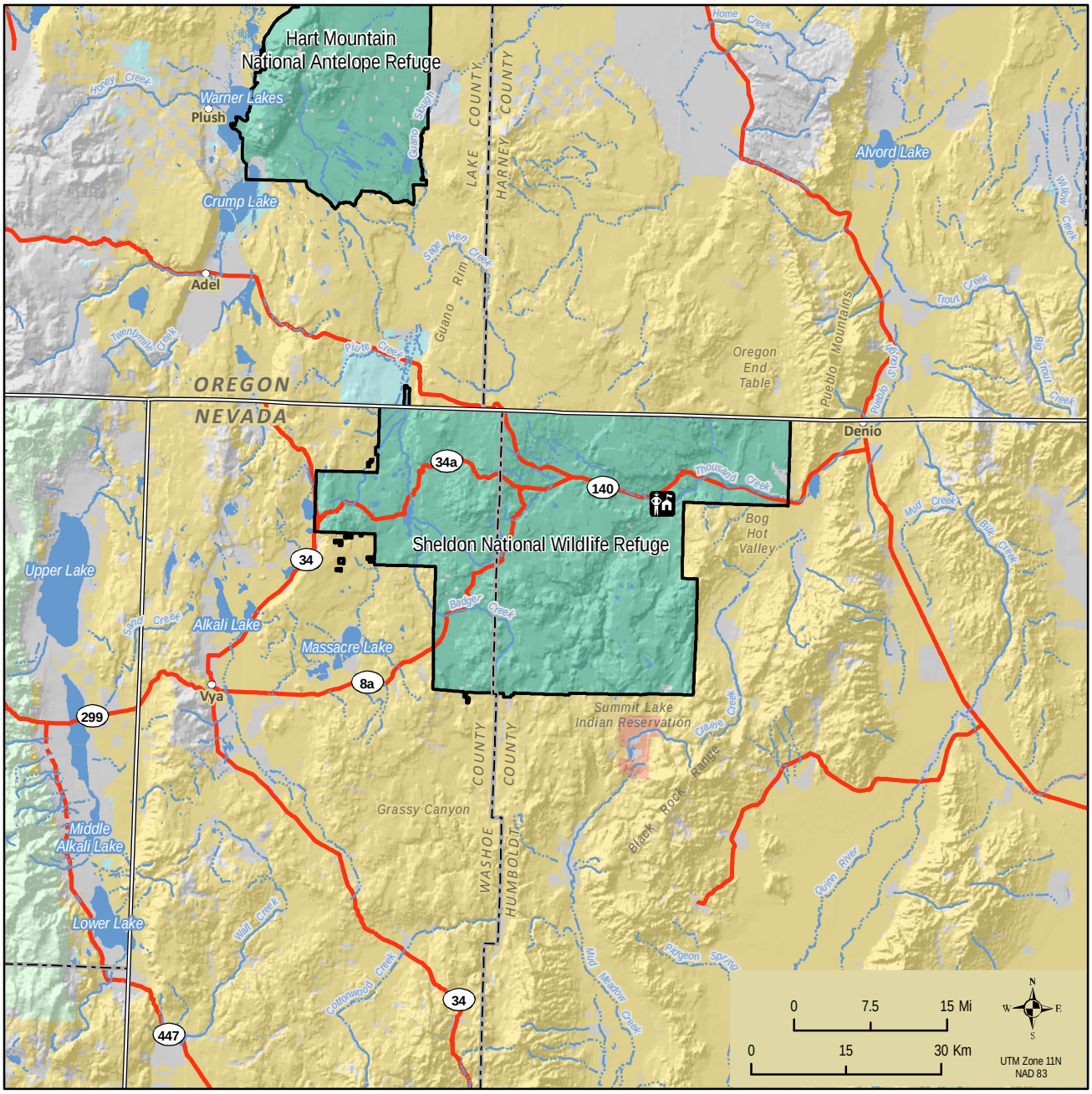
Figure 1.1 Sheldon National Wildlife Refuge Location

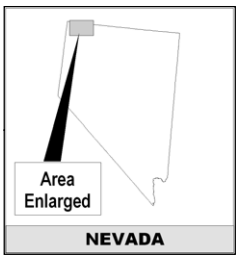


LEGEND

- Refuge Headquarters
- Sheldon NWR Approved Boundary
- County Boundary
- State Line
- Intermittent Stream
- Perennial Stream
- Highway
- City/Town

Land Ownership

- Bureau of Indian Affairs
- Bureau of Land Management
- State Lands
- US Fish and Wildlife
- US Forest Service
- Private/Unclassified



Produced by USFWS Region 1
Refuge Information Branch
Portland, Oregon
Map Date: 3/14/2011
File: 10-064-1.mxd

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Chapter 2. Alternatives, Goals, Objectives, and Strategies

2.1 Alternative Descriptions

A general description of the alternatives of this CCP/EIS is presented below. This description is followed by a table that is organized by goal with details about the differences among the alternatives (Table 2.1).

2.1.1 Alternatives Considered but Not Evaluated in Further Detail

A number of alternative approaches to the issues raised during scoping were considered, but were not analyzed in further detail. The reasons these alternatives were not analyzed further as part of the CCP process are listed below:

Eliminating the Virgin Valley Campground: The campground can be brought to public use standards and incorporate wildlife-related activities (e.g., educational kiosks and interpretative programs), as presented in the CCP alternatives.

Eliminating Rock Collecting: Rock collecting has previously been found to be a compatible use within Sheldon Refuge. During the scoping process for this CCP, both the Service and the public expressed concerns about unintentional collection of cultural artifacts and vertebrate fossils, as well as vehicle trespass associated with rock collecting. After an initial evaluation, Sheldon Refuge found the use currently does not conflict with wildlife-dependent uses of Sheldon Refuge, and a range of management actions would likely be effective in reducing or eliminating unintended resource impacts.

Leaving Horses and Burros Unmanaged: This was analyzed in the 2008 Horse and Burro Management Environmental Assessment and was determined to be contrary to Service statutes, policy, and refuge purposes.

Lethal Control as a Last Resort to Meet Horse and Burro Population Objectives: In developing the CCP alternatives, comments suggested including lethal control as an option of last resort should other methods prove ineffective. After further consideration, the Service determined the use of lethal control would be unnecessary to meet horse and burro population objectives and could have other unintended and potentially negative consequences. As a result, the inclusion of such an option is unnecessary for a reasonable range of alternatives.

Allowing Wilderness Therapy Concessionaires: Because this use has previously been found incompatible with refuge purposes, it was not considered. Alternatives in the CCP evaluate other commercial economic uses to fulfill refuge purposes.

Developing a Trail through Thousand Creek Gorge: Important biological resources within Thousand Creek Gorge have repeatedly been identified as being sensitive to human disturbance or development. Wildlife surveys have identified rare and sensitive species within the gorge that would likely be adversely affected by increased public use or access. The CCP includes a range of alternatives for public access, including trails, which would have less impact on sensitive wildlife and plant resources.

Recommending No Areas for Wilderness Designation, or Recommending All Suitable Areas for Wilderness Designation: Because approximately 341,500 acres of Sheldon Refuge have been proposed for wilderness designation and have been managed for wilderness character since 1974, the consideration of an alternative in detail that would recommend no lands for wilderness designation is contradictory to previous wilderness studies, has not been determined necessary for continued management of Sheldon Refuge, and is considered unreasonable. However, the final wilderness proposal for Sheldon Refuge included key areas not originally recommended, and as a result some management actions and activities have not been implemented or allowed to occur as intended. Consideration of an alternative in detail that would recommend all 388,802 acres of the refuge determined suitable for wilderness study would also be inconsistent with the original refuge wilderness recommendation and current management direction, which recognizes a need for certain management activities, habitat manipulation, and mechanized use in key areas of the refuge.

Opening Sheldon Refuge to Sport Hunting of Additional Wildlife Species: Sport hunting of pronghorn, California bighorn sheep, mule deer, chukar (*Alectoris graeca*), California quail (*Lophortyx californicus*), Greater sage-grouse (in support of population data collection), geese, ducks, and coots consistent with state and Federal regulations has been determined to be a compatible wildlife-dependent public use within Sheldon Refuge. Additional wildlife species such as coyote (*Canis latrans*), bobcat (*Felis rufus*), or mountain lion (*Felis concolor*) may be utilized for sport hunting or trapping within a National Wildlife Refuge (50 CFR 31). However, the populations and wildlife requirements for these additional species have not been determined and are insufficient to determine what level of sport hunting, if any, would be compatible with the mission of the Refuge System and the purposes for Sheldon Refuge. We anticipate information gathered to meet management objectives identified in this CCP would be sufficient to make such a compatibility determination in the future.

2.1.2 Features Common to All Alternatives

All alternatives would contain some common features, which are presented below rather than as individual management objectives or specific strategies to reduce length and redundancy of the individual alternative descriptions.

Integrated Pest Management (IPM) Strategies: In accordance with 517 DM 1 and 7 RM 14, an IPM approach will be utilized, where practicable, to eradicate, control, or contain pest and invasive species (herein collectively referred to as pests) on Sheldon Refuge. IPM would involve using methods based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to non-target species and the refuge environment. Regional management direction for implementing IPM strategies has been adopted as part of this CCP (Kilbride 2010). Refuge staff would continue to work with cooperators to develop pesticide use proposals consistent with this IPM guidance. Mechanical, biological, chemical, and physical methods are commonly used techniques to combat invasive and encroaching plants in a variety of habitats. Biological and chemical control methods are also being investigated. Pesticides may be used where physical, cultural, and biological methods or combinations thereof are impractical or incapable of providing adequate control, eradication, or containment. If a pesticide would be needed on Sheldon Refuge, the most specific (selective) chemical available for the target species would be used unless considerations of persistence or other environmental and/or biotic hazards would preclude it.

Most proposed pesticide uses on refuge lands would be evaluated for potential effects to Sheldon Refuge biological resources, environmental quality, and where applicable, wilderness resource

values. Pesticide uses with appropriate and practical best management practices (BMPs) for habitat management as well as cropland/facilities maintenance would be approved for use on refuge lands where there likely would be only minor, temporary, and localized effects to species and environmental quality based upon non-exceedance of threshold values in chemical profiles. However, pesticides may be used on refuge lands where substantial effects to species and the environment are possible (exceed threshold values) in order to protect human health and safety (e.g., mosquito-borne disease).

Maintenance and Updating of Existing Facilities: Periodic maintenance and updating of Sheldon Refuge buildings and facilities will be necessary regardless of the alternative selected. Maintenance and updating of facilities is necessary for safety and accessibility and to support staff and management needs and is incorporated in the Service Asset Maintenance Management System.

Coordination with Tribal, State, and County Governments: Regular communication with Native American Tribes that are affected or that have an interest in the management of Sheldon Refuge will continue to occur under all alternatives. Tribes that Sheldon Refuge would coordinate and consult with on a regular basis regarding issues of shared interest include the Burns Paiute Tribe, Fort Bidwell Paiute Tribe, Cedarville Rancheria Paiute Tribe, Fort McDermitt Paiute and Shoshone Tribe, and Summit Lake Paiute Tribe.

Similarly, under all alternatives, the Service would continue to maintain regular discussions with Washoe and Humboldt county commissioners, the State of Nevada, and to a lesser degree Lake County and the State of Oregon. State agencies include NDOW, Oregon Department of Fish and Wildlife, and Nevada Department of Transportation. Key topics for discussion would include road maintenance, wildlife monitoring, big-game management, hunting and fishing seasons and regulations, and endangered species management.

Partnerships and Volunteer Opportunities: Under all alternatives Sheldon Refuge would actively seek opportunities for partnerships with other agencies and organizations that share a common vision and goals for Sheldon Refuge and the resources that the refuge conserves. We view opportunities for groups and individuals to actively participate in resource conservation through volunteer activities as a vital component of natural resource stewardship, public appreciation for Sheldon Refuge, and support for future refuge management.

Participation in Planning and Review of Regional Development Activities: The Service would actively participate in planning and studies for ongoing and future off-refuge industrial development, contamination, and potential concerns that may adversely affect refuge resources, wildlife, and habitats. The Service would cultivate working relationships with pertinent county, state, and Federal agencies to stay abreast of current and potential developments, and would utilize outreach and education as needed to raise awareness of refuge resources and dependence on the local environment.

Refuge Economic Uses: Economic uses within Sheldon Refuge include rights-of-way for power lines, access to private lands and construction projects, highways, and gravel pits for highway maintenance. These rights-of-way have been found appropriate and compatible with the purposes for Sheldon Refuge, and appropriate permits have been issued for their use. It is the policy of the Service to discourage the types of uses embodied in right-of-way requests (340 FW 3.3). Future economic uses will be authorized by permit only if the use is determined to contribute to, and be compatible with, the purposes for Sheldon Refuge or the Refuge System (50 CFR 29).

Management of Areas Proposed for Wilderness Designation: In 1974 the President submitted a proposal to Congress for designation of certain lands within Sheldon Refuge as wilderness under the Wilderness Act of 1964 (see Figure 2.4), but Congress has taken no action on this proposal. Under Service policy these lands are considered proposed wilderness areas and are managed as wilderness until such time as Congress takes additional action. This CCP includes alternatives to the current wilderness proposal, but the Final Record of Decision for the Sheldon Refuge CCP/EIS will have no effect on the management or location of areas currently proposed for wilderness designation. Under all alternatives these areas will continue to be managed as wilderness.

Develop Appropriate Step-down Plans: A series of step-down plans will be developed following completion of the CCP under all alternatives. These include, but are not limited to the Minerals and Mining Management Plan, Wilderness Stewardship Plan, Transportation Management Plan, Visitor Services Plan, Law Enforcement Plan, Cultural Resources Management Plan, Fisheries Management Plan, Habitat Management Plan, and Integrated Pest Management Plan.

Implementation Subject to Funding Availability: Under each alternative, actions would be implemented over a period of 15 years as funding becomes available. Project priorities are in Appendix E.

2.1.3 Description of the Alternatives

2.1.3.1 Alternative 1: Continue Current Management

Alternative 1 is the no action alternative required by the National Environmental Policy Act (NEPA). Sheldon Refuge would continue to implement applicable management direction contained in the 1980 Sheldon Refuge Natural Resource Plan, the 1989 Virgin Valley Grazing Plan, the 1990 Fisheries Management Plan, the 2001 Western Juniper Control Project Plan, the 2008 Feral Horse and Burro Management Plan, and the 2009 Fire Management Plan. These programs would continue at current levels as described in other sections of this CCP. Specifically, Sheldon Refuge would maintain, and where feasible, restore habitat for federally listed threatened and endangered species; rare and sensitive species (e.g., prairie falcon); and indicator and/or sagebrush-obligate species (e.g., pronghorn, Greater sage-grouse, pygmy rabbit). Existing compatible public uses would continue and include hunting, fishing, wildlife observation and photography, environmental education, interpretation, backpacking, horseback riding, rock collecting, and camping.

Continued management of feral horses and burros

Management of feral horses and burros under Alternative 1 (no action) would require action by the Service Director to exempt Sheldon Refuge from current policy, which would then allow populations of approximately 800 feral horses and 90 feral burros to be maintained within Sheldon Refuge. Control methods would continue to include helicopter and horseback gathers of at least 130 horses and 13 burros each year, followed by shipment to private facilities for adoption or fertility control and release back onto Sheldon Refuge. The refuge boundary fence would continue to be maintained as part of all alternatives and would continue to deter emigration and immigration of horses and burros. Maintaining populations of feral horses or burros would not only conflict with the purposes for Sheldon Refuge and the mission of the Refuge System and the Service, but would likely have major, long-term, adverse impacts on native fish, wildlife, plants, and their habitats throughout Sheldon Refuge and somewhat lesser impacts on wildlife-dependent public uses. These impacts would likely be significant.

Continued management of habitats

Under Alternative 1 (no action), prescribed fire, mowing of sagebrush, and thinning of encroaching juniper and mountain mahogany (*Cercocarpus ledifolius ledifolius*)would continue to be the primary management activities to maintain, restore, or improve habitats throughout Sheldon Refuge. Under this alternative, the use of prescribed burning is expected to continue the trend of smaller, more frequent, and less intense fires than would naturally occur within Sheldon Refuge.

The majority of water control structures would remain abandoned and unmaintained throughout Sheldon Refuge. Other water developments (primarily reservoirs, ponds, and rain collecting guzzlers) would continue to be maintained for wildlife habitat and recreation opportunity. It is estimated that implementation of this alternative would leave up to 90 stock ponds, small earth dams, windmills, and spring developments scattered throughout Sheldon Refuge. These developments would continue to effect natural hydrology and the health of riparian habitats (see Section 3.3).

All existing designated campgrounds and roads would continue to be maintained at their current locations. It is anticipated the various impacts to sensitive riparian habitats associated with certain campgrounds, increased soil erosion from poorly aligned road segments, and the spread of invasive non-native plants from the repeated grading of road shoulders would continue.

Continued management of public uses

Under Alternative 1 (no action) there are few actions which would alter when, where, or how public uses are allowed to occur within Sheldon Refuge. Nearly the entire Sheldon Refuge would continue to be available for public wildlife viewing and photography. Hunting and fishing harvest seasons and limits would continue to be coordinated with NDOW, and reservoirs and ponds that support recreational fisheries would continue to be maintained and restocked with fish as needed. In addition, Sheldon Refuge would remain one of the only national wildlife refuges in the System where opportunities for surface collection of rocks and minerals are provided. Outstanding opportunities for solitude and primitive and unconfined wildlife-dependent recreation would remain available in the various proposed wilderness areas, as well as in other remote portions of Sheldon Refuge.

Environmental interpretation and outreach within Sheldon Refuge would continue to be conducted mostly through signs, brochures, and occasional volunteer projects. Public contact with Sheldon Refuge staff would remain very limited and intermittent due to vast distances, remoteness, and the small number of Sheldon Refuge employees. Opportunities for people to obtain additional information while visiting Sheldon Refuge would remain largely dependent on kiosks, brochures, the availability of volunteers, and the limited shared space (about 100 square feet) in the Sheldon Refuge Office (Dufurrena). Despite continue improvement of outreach and education programs and facilities over the past several years, facilities generally do not and would not meet the quality expected by the visiting public.

With the exception of Virgin Valley Campground, the 12 other designated campgrounds within Sheldon Refuge would remain semi-primitive or primitive and consist mostly of metal campfire rings, tables, and information signs. Maintenance of existing secondary (gravel) roads within Sheldon Refuge would continue on a seasonal basis.

Continued management of wilderness

Sheldon Refuge would continue to manage the existing 341,500 acres of proposed wilderness areas to protect and preserve their natural primitive character, solitude, opportunities for primitive recreation, and other special resource values. Ongoing efforts to remove abandoned and unnecessary fences, water troughs, and other facilities combined with additional wilderness boundary signs and increased enforcement of vehicle regulations should improve the overall natural appearance of the wilderness areas. With the exception of water control structures, exterior boundary fence lines, and temporary fence exclosures to mitigate impacts from feral horses and burros; only occasional intrusions to provide fire suppression, and conduct fish, wildlife, and habitat management necessary to fulfill the primary purposes for Sheldon Refuge are anticipated. Management activities within the wilderness areas would include aerial population surveys, habitat monitoring, habitat restoration and rehabilitation, research studies and associated temporary structures, law enforcement activities, prescribed burning, and thinning of encroaching trees and shrubs.

Continued management of cultural and historic resources

Alternative 1 (no action) would continue to provide a basic level of inventory, monitoring, and protection for cultural and historic resources within Sheldon Refuge. Inventories would continue to be conducted primarily in response to other planned management activities or proposals. Protection of these resources would remain limited to occasional random law enforcement patrols and removal of burnable vegetation to maintain defensible space for protection during a fire.

2.1.3.2 Alternative 2: Emphasis on Management for Native Biodiversity and Wildlife-Dependent Public Uses

Under Alternative 2 (the Service's preferred alternative), Sheldon Refuge would manage for a natural mosaic of Great Basin habitat types and the native species that depend on them. A broad range of management tools would be available for application including prescribed and natural fire, mechanical treatment, and water management as necessary to meet native wildlife life history requirements. In many cases, management would restore, maintain or mimic natural ecosystem processes. Habitat for rare or sensitive species and other native flora and fauna would be maintained, or where appropriate, restored, including shrub-steppe, riparian, wetland, woodland, grassland, and cliff-talus habitats. Under this alternative, Sheldon Refuge would increase efforts to control, reduce, and remove feral, invasive, exotic, and noxious non-native species. Wildlife-dependent public uses would be highlighted with opportunities for hunting, fishing, wildlife observation, photography, interpretation and environmental education maintained or improved from present conditions.

Management of feral horses and burros

Alternative 2 (preferred) would improve habitat conditions and create consistency with existing policy, the mission of the Refuge System and the Service, and the purposes for Sheldon Refuge by removing all feral horses and burros. Implementation of this alternative would require the removal of at least 200 horses and 20 burros each year to completely remove horses and burros within five years. Methods for gather and removal would be as described under Alternative 1 (no action), but sale or auction could be implemented if methods described under Alternative 1 (no action) prove to be ineffective. Once horses and burros are removed, it is anticipated the condition of native habitats throughout Sheldon Refuge would improve, resulting in significant long-term benefits to fish, wildlife, plants and wildlife-dependent public uses.

Management of habitats

The primary habitat management action in Alternative 2 (preferred) would be the removal of feral horses and burros from Sheldon Refuge. Other actions would rehabilitate and restore a variety of sites and small areas to improve habitat conditions when compared to Alternative 1 (no action). In the short term, fence exclosures would be constructed to mitigate impacts from horses and burros, but would not be necessary over the long term following removal of horses and burros and habitat recovery. Under this alternative abandoned livestock water developments would be removed from springs throughout Sheldon Refuge. In addition spring, springbrook, playa, wet meadow, and stream habitats throughout Sheldon Refuge would be restored to more natural conditions.

Under Alternative 2, up to nine designated campgrounds would be relocated and some road segments realigned. These actions are expected to reduce erosion and impacts to sensitive riparian areas when compared with Alternative 1 (no action), but would not change the size, general location, or types of developments currently found at these campgrounds.

Other habitat management actions such as the use of prescribed fire, mowing of sagebrush, and thinning of western juniper and thinning of vegetation adjacent to mountain mahogany under Alternative 2 (preferred) would be similar to those under Alternative 1 (no action). However, under this alternative, greater emphasis would be placed on the removal of western juniper where it is encroaching upon sagebrush habitats. These actions would occur primarily in the western portions of Sheldon Refuge.

Management of public uses

As with Alternative 1 (no action), Alternative 2 (preferred) would continue to provide wildlife observation and photography opportunities throughout most of Sheldon Refuge and would continue coordination of fish and wildlife harvest seasons and limits with NDOW. One difference from Alternative 1 (no action) would be the replacement of non-native trout in Big Spring Reservoir and Virgin Creek with trout indigenous to the region (i.e., Lahontan cutthroat trout or redband trout). Replacement would occur gradually through periodic stocking and is not anticipated to affect the quality of recreational fishing opportunities.

Alternative 2 (preferred) would expand existing opportunities and provide new opportunities for wildlife-dependent public uses primarily through the expansion, relocation, and construction of public use facilities and the conversion of some historic structures for public use. The most substantial changes are expected to result from the relocation and enlargement of the visitor contact station, improvement of campground facilities, development of an accessible interpretive trail, the creation of a self-guided auto tour route, and improved signing of routes open to vehicle use. Overall, facilities provided under this alternative would expand the range of recreation opportunities both within Sheldon Refuge and throughout the Region by providing additional developed and accessible opportunities when compared with the remote, undeveloped and primitive opportunities typical throughout the region and under Alternative 1 (no action).

Under Alternative 2 (preferred) a new visitor contact station would be constructed to replace the existing visitor contact space of about 100 square feet co-located with the Sheldon Refuge Office (Dufurrena). The new facility would be larger, would be located along Highway 140 to provide more convenient access, and would be regularly staffed with volunteers and employees (see Figure

5.1 for approximate location). These changes are expected to greatly increase opportunities and quality of environmental interpretation and outreach when compared with Alternative 1 (no action).

A self-guided auto tour route would be designated for visitors traveling along Highway 140 and along primary routes connected to Highway 140. The route would provide site-specific information to enhance wildlife viewing opportunities, increase environmental education and knowledge of Sheldon Refuge, and complement other opportunities in the region such as the Barrel Springs Back Country Byway and the historic Applegate-Lassen Emigrant Trail. Information for the auto tour route would be provided primarily through the visitor contact station, the internet, or other off-site media with only the minimal signage necessary along the route itself. Along shorter and more developed portions of the route (i.e., Virgin Valley), some on-site interpretive signs and vehicle pullouts would be constructed.

Additional facilities such as new campsites, potable water, shade structures, kiosks, and dedicated volunteer sites would be constructed at Virgin Valley, Catnip Reservoir, and Big Spring Reservoir campgrounds (see Figure 5.1). These facilities would provide developed camping opportunities that are not commonly available within Sheldon Refuge or the region. However, these improved facilities would only be sustainable over the long term through campsite fees to support volunteers, maintenance, and replacement.

Under Alternative 2 (preferred), improved gravel roads within Sheldon Refuge would be maintained more frequently. All routes open to the public use of vehicles would be adequately signed and marked (as opposed to marking and signing all closed routes under Alternative 1 [no action]). As part of this alternative, Sheldon Refuge would propose that some existing primitive unmaintained routes be closed to public use of motorized vehicles to protect various refuge resources. Management action would be taken to reduce impacts from other existing routes (see Figure 2.2). The alternative also identifies key routes that would be re-opened to public vehicle use should the revised wilderness recommendation be approved (see following paragraph). When combined with the Sheldon Refuge proposal to adjust the location and configuration of wilderness area boundaries, Alternative 2 (preferred) would result in vehicle access to more areas of the refuge and about the same amount of area to be managed for wilderness values when compared with Alternative 1 (no action) (see Figures 2.1 and 2.2). In addition, visitors would be required to register all OHVs for use on refuge roads and routes designated open to vehicle use. It is anticipated these actions would improve the quality of the transportation system and deter vehicle violations while requiring only minimal law enforcement presence.

Alternative 2 identifies specific routes that would be re-opened to motorized use should the wilderness recommendation be approved. Additional existing routes could be re-opened if, after an evaluation of the public use benefits, resource impacts, and appropriate NEPA documentation, it is determined such use would not interfere with or detract from the purposes for Sheldon Refuge and would not adversely affect the natural, aesthetic, or scenic values of the refuge (EO 11644).

Management of wilderness

Areas managed for wilderness values under Alternative 2 (preferred) would include those currently proposed for wilderness designation under Alternative 1 (no action) and additional areas for wilderness study as part of the 2009 Sheldon Refuge Wilderness Review (Appendix F). As a result, a larger portion of Sheldon Refuge (420,402 acres) would be managed for wilderness character than under the other alternatives in the short term.

Under Alternative 2 (preferred) the areas recommended for wilderness designation by Sheldon Refuge are somewhat different in location and configuration than those currently proposed under Alternative 1 (no action), but the total area recommended is essentially the same (approximately 341,500 acres under Alternative 1 [no action] versus approximately 341,935 under Alternative 2 [preferred]). Because the previous recommendation for wilderness designation has been approved, and submitted to Congress, the Service cannot alter or adjust the current wilderness proposal. If the new recommendation in Alternative 2 is forwarded through the wilderness proposal process and approved by Congress, it is anticipated Alternative 2 (preferred) would have three important differences from Alternative 1 (no action) over the long term.

First, areas recommended under the preferred alternative would have less evidence of human development and disturbance and therefore appear more natural overall than areas currently proposed under Alternative 1 (no action).

Second, areas recommended are those where fewer repeated management activities and intrusions (e.g., habitat manipulations, mechanized equipment, motorized vehicles, temporary structures, etc.) are expected to be necessary for restoring and maintaining biological integrity, diversity, and environmental health; fulfilling the primary purposes for Sheldon Refuge; and accomplishing the mission of the Service when compared with Alternative 1 (no action).

Third, the recommendation includes areas that provide the best opportunities for solitude and primitive and unconfined recreation. At the same time, the recommendation does not include those areas that have traditionally received the greatest amounts of public use and historically had higher densities of vehicle routes (most of which remain apparent today and continue to be used illegally by vehicles for recreation and for Sheldon Refuge administrative purposes).

Under Alternative 2 (preferred) the overall quality of the wilderness resource (as measured by naturalness, untrammeled character, opportunity for solitude, and opportunities for primitive or unconfined types of recreation) is expected to be greater than under the other alternatives.

Management of cultural and historic resources

Under Alternative 2 (preferred) more information would be gathered about prehistoric, historic, and paleontological resources than under other alternatives. Consequently, the level of protection and the quality of interpretation would increase as new sites are discovered and more complete information becomes available. Overall, the increased law enforcement, protection of sites, and in some cases restoration proposed as part of Alternative 2 (preferred) would result in better long-term preservation of historic resources than other alternatives. The value of some structures determined not to have historic significance would continue to be preserved through conversion to public or administrative use.

2.1.3.3 Alternative 3: Emphasis on Natural Processes for Native Biodiversity and Minimal Development for Public Uses

Under Alternative 3 (natural processes), Sheldon Refuge would focus on management actions to mimic the effects of and restore natural processes such as fire, succession of native plant communities, flooding, and cycles or variation in wildlife populations needed to maintain or enhance native fish, wildlife, and plant diversity. Maintenance and/or restoration of shrub-steppe, riparian, wetland, woodland, grassland, and cliff-talus habitats would take place through protection of natural

processes as opposed to active management. Wildlife-dependent public uses, including hunting and fishing, would continue to be available although not emphasized; non-native fish stocking would be eliminated and rock collecting would be more closely monitored and possibly regulated. There would be limited access and interpretive visitor contact facilities or signs provided; instead, self-exploration of Sheldon Refuge resources would be emphasized.

Management of feral horses and burros

As under Alternative 2 (preferred), Alternative 3 (natural processes) would improve habitat conditions and create consistency with existing policy, the missions of the Refuge System and the Service, and the purposes for Sheldon Refuge by removing all feral horses and burros. However, instead of removal occurring within five years (as proposed under Alternative 2), removal would occur within 15 years. A large number of horses would receive contraception and would be released back onto Sheldon Refuge, with those surviving after 10 to 15 years eventually being removed altogether. This longer timeframe for removal is expected to result in at least 400 horses and burros remaining on Sheldon Refuge for at least 10 years and likely until nearly the end of the 15-year timeframe.

Management of habitats

As with Alternative 2 (preferred), the primary habitat management action in Alternative 3 (natural processes) would be the removal of feral horses and burros from Sheldon Refuge, but removal would be accomplished within a longer period of time. Alternative 3 would focus management efforts on allowing natural processes to operate largely free from management activities or manipulations. It is anticipated that some areas within Sheldon Refuge would require restoration or rehabilitation efforts in order to restore natural processes over the long term. Alternative 3 (natural processes) would result in less prescribed burning, mowing, and thinning when compared with Alternative 1 (no action) and Alternative 2 (preferred). Where such activities are conducted, the primary objective would be creating conditions where natural fire could be allowed while maintaining an acceptable level of safety and protection for people, property, and certain unique or critical resources.

With the exception of Catnip and Swan Lake reservoirs, IXL wetlands, and a small number of other selected facilities, most water control structures within Sheldon Refuge (including the Dufurrena Ponds, which support recreational fisheries) would not be maintained and would gradually disappear over time through natural processes of weathering, decay, and erosion. Developments would be removed from a number of springs throughout Sheldon Refuge, but these sites would not be further rehabilitated or restored. A small number of additional structures would likely require removal or some modification to protect public safety and private property from catastrophic failure or to protect certain rare or key habitats.

Similar to Alternative 2 (preferred), designated campgrounds would be relocated out of sensitive riparian habitats to reduce impacts. However, instead of merely moving existing campgrounds to a nearby location, campgrounds would be consolidated. This would result in fewer but larger campgrounds in order to maintain the same number of campsites as under Alternative 1 (no action) and Alternative 2 (preferred).

Natural habitat conditions have been altered through large-scale activities such as grazing, wetland and water resource development, road construction, and fire suppression within Sheldon Refuge. Allowing natural processes of plant community succession, fire, flooding, erosion, and weathering to

occur under Alternative 3 (natural processes) is not expected to result in more natural conditions in all cases or as anticipated under Alternative 2 (preferred). Management action would focus on allowing natural fire, but constraints necessary to protect firefighter safety, public safety, and private property make the likelihood of such fires very small. When natural fires are not fully suppressed and allowed to burn under certain conditions, these fires are expected to burn larger areas and in greater intensity than would otherwise occur under natural conditions due to encroachment of shrubs and trees into certain habitats. In addition, erosion, plant colonization (including spread of non-native species), and plant community succession would continue after natural or prescribed fires with no efforts to restore or rehabilitate burned areas unless there is a threat to public health, safety, or a unique or critical resource.

It is anticipated natural hydrologic and riparian plant conditions would return very slowly if at all where water control structures and development have substantially altered soil condition, water flow rates, and water distribution. In cases where highly invasive non-native plants populations cannot be controlled before becoming well established or sufficiently large, allowing the natural processes of plant competition and population expansion would likely result in changes to native plant communities throughout large portions of Sheldon Refuge.

Management of public uses

As with Alternative 1 (no action) and Alternative 2 (preferred), Alternative 3 (natural processes) would continue to provide wildlife observation and photography opportunities throughout most of Sheldon Refuge and would continue coordination of fish and wildlife harvest seasons and limits with NDOW. As under Alternative 2 (preferred), non-native rainbow trout in Big Spring Reservoir would be replaced with fish indigenous to the region, such as Lahontan cutthroat trout or redband trout. However, unlike Alternative 2 (preferred), the trout population would not be maintained through restocking. Given that Big Spring Reservoir has no trout spawning habitat and occasionally becomes completely dry, Big Spring Reservoir would not support a trout population or recreational fishery over the long term.

Without continued maintenance and upkeep, the Dufurrena Ponds would become completely filled with vegetation and silt over time. As a result, recreational fishing opportunities at these ponds would eventually disappear as well.

Under Alternative 3 (natural processes), the collection of rocks and minerals would be allowed as a recreational activity. However, a management threshold for the number of violations associated with rock collecting would be established and Special Use Permits required should this threshold be exceeded. This management direction is consistent with management of other national wildlife refuges and would result in fewer recreation opportunities at Sheldon Refuge, but would eliminate most accidental collection of prehistoric stone artifacts or vertebrate fossils by uninformed rock collectors, which is expected to continue under Alternative 1 (no action) and to a lesser degree under Alternative 2 (preferred).

Roads and routes open to the public for vehicle use would be marked and signed as under Alternative 1 (no action). Only existing primary roads (State Highway 140, County Road 8A, County Road 34A, the Dufurrena Road to Virgin Valley Campground, and the Summit Lake/Badger Road) would be maintained, resulting in fewer maintained routes than under either of the other alternatives. Under Alternative 3, two routes would be closed, and one route would not be re-opened if the wilderness recommendation is approved because public use and benefit is considered minimal, adverse impacts

are considered excessive, and impacts could not be minimized without intensive management action such as realignment or re-routing. As a result, Alternative 3 (natural processes) would propose fewer miles of existing primitive routes be opened to public vehicle use than is proposed under Alternative 1 (no action) or Alternative 2 (preferred). When combined with the recommendation that a smaller area be designated as wilderness, Alternative 3 (natural processes) would result in the least amount of vehicle-accessible area and the smallest area managed for wilderness values when compared with the other alternatives.

Alternative 3 identifies specific routes that would be re-opened to motorized use should the wilderness recommendation be approved. Additional existing routes could be re-opened if after an evaluation of the public use benefits, resource impacts, and appropriate NEPA documentation, it is determined such use would not interfere with or detract from the purposes for Sheldon Refuge and would not adversely affect the natural, aesthetic, or scenic values of the refuge (EO 11644).

Management of wilderness

Alternative 3 (natural processes) would recommend 236,791 acres be designated as wilderness; this acreage represents the most primitive, pristine, and naturally appearing portions of Sheldon Refuge. If Congress were to accept this recommendation, Alternative 3 (natural processes) would provide less long-term protection and preservation of wilderness values than the other alternatives and would have the least conflict with management activities and intrusions (e.g., habitat manipulations, mechanized equipment, motorized vehicles, temporary structures, etc.) determined necessary for restoring and maintaining the biological integrity, diversity, and environmental health; fulfilling the primary purposes for Sheldon Refuge; and accomplishing the mission of the Service.

Management of cultural and historic resources

Alternative 3 (natural processes) would provide the least amount of protection and preservation of historic resources when compared with the other alternatives. Natural processes of weathering, decay, erosion, and fire would be allowed to gradually eliminate most historic structures from Sheldon Refuge. Except for certain structures with national significance (e.g., Last Chance Ranch), restoration of structures and removal of burnable vegetation to provide a defensible space for protection during fires would not be conducted as proposed under the other alternatives.

Table 2.1 Summary of Alternatives

Issue	Alternative 1 (no action)	Alternative 2 (preferred alternative)	Alternative 3 (natural conditions)
Habitat Management			
How would the refuge manage and maintain wildlife habitats?	*Maintain percentage of habitats within management objective thresholds (primarily through management of feral horses and burros):* • 15%-30% of big and low sagebrush-steppe and shrubland, salt desert scrub, and greasewood flats habitats. • 15%-30% of montane sagebrush-steppe, mountain big sagebrush/ bitterbrush habitats. • 15%-30% semi-desert grassland, and Great Basin wildrye habitats. • 10%-20% of emergent marshes and wet meadow habitats. • 75%-85% of cliff, canyon, talus slope, and barren land habitats. • 10%-30% of deciduous woodland and shrublands habitat. • 60%-80% of mountain mahogany and western juniper woodlands.	*Maintain percentage of habitats within management objective thresholds (primarily through removal of feral horses and burros):* • At least 60% of big and low sagebrush-steppe and shrubland, salt desert scrub, and greasewood flats habitats. • At least 80% of montane sagebrush-steppe, mountain big sagebrush/ bitterbrush habitats. • At least 60% of semi-desert grassland, and Great Basin wildrye habitats. • At least 60% of emergent marshes and wet meadow habitats. • 85%-95% of cliff, canyon, talus slope, and barren land habitats. • At least 50% of deciduous woodland and shrublands habitat. • 80%-95% of mountain mahogany and western juniper woodlands.	*Maintain percentage of habitats within management objective thresholds(primarily through removal of feral horses and burros):* • 30%-60% of big and low sagebrush-steppe and shrubland, salt desert scrub, and greasewood flats habitats. • 30%-80% of montane sagebrush-steppe, mountain big sagebrush/ bitterbrush habitats. • 30%-60% of semi-desert grassland, and Great Basin wildrye habitats. • 30%-60% of emergent marshes and wet meadow habitats. • 75%-85% of cliff, canyon, talus slope, and barren land habitats. • 30%-50% of deciduous woodland and shrublands habitat. • 60%-80% of mountain mahogany and western juniper woodlands.
	Stabilize habitat conditions by removing annual increases to maintain relatively stable populations of 800 horses and 90 burros.	Improve habitat conditions by removing all feral horses and burros within 5 years.	Improve habitat conditions by removing all feral horses and burros within 15 years.

Issue	Alternative 1 (no action)	Alternative 2 (preferred alternative)	Alternative 3 (natural conditions)
	Control horse and burro populations through gathers, adoption, sanctuary, and contraception.	*Continue Current Management and:* Control populations through sale or auction only if other control methods are impractical or ineffective.	*Continue Current Management*
How would the refuge manage western juniper and sagebrush encroaching into other habitats?	Use mechanical treatments and prescribed fire to remove juniper and sagebrush from 400 acres per year.	Use mechanical treatments to remove juniper and sagebrush from 1,500 acres per year.	Allow natural fire to remove juniper and sagebrush (10-100 acres per year).
How would the refuge restore emergent marshes and wet meadows for the benefit of native wildlife?	Conduct mechanical treatments and prescribed fire on 1,200 acres per year.	Resume current management following removal of horses and burros.	Allow natural fire to restore habitats (10-100 acres per year).
How would the refuge restore and rehabilitate developed springs, springbrooks, and stream habitats?	• Remove spring developments from less than 20% of springs and less than 30% of stream habitat • Allow designated campgrounds to remain at current locations. • No management action to restore stream headcuts.	• Remove developments and restore 45%-65% of springs and at least 60% of stream habitat. • Relocate designated campgrounds and access routes. • Realign vehicle routes and use erosion control structures, vegetation planting, etc. to rehabilitate stream headcuts. • Rehabilitate at least one mile of Virgin Creek.	*Continue Current Management and:* • Allow 22%-45% of springs and more than 60% of stream habitat to naturally recover. • Relocate designated campgrounds and access routes. • Allow stream headcuts to recover naturally following removal of horses and burros.
How would the refuge manage playa habitats?	Restore 5%-10% of playa habitats.	Restore at least 20% of playa habitats.	Allow playas to naturally recover (less than 5% of playa habitats).
How would the refuge manage reservoirs and artificial marsh habitats?	Maintain 434 acres (see Objective 3d).	*Continue Current Management*	Maintain 215 acres (see Objective 3d).
How would the refuge manage artificial wet meadow habitats?	Maintain 1,700 acres (see Objective 3e).	*Continue Current Management*	
How would the refuge manage artificial water sources (guzzlers)?	Maintain 18 guzzlers.	*Continue Current Management*	No management action to maintain guzzlers.

Issue	Alternative 1 (no action)	Alternative 2 (preferred alternative)	Alternative 3 (natural conditions)
How would the refuge protect mountain mahogany and western juniper woodlands?	Use mechanical treatments and prescribed fire in adjacent habitats to reduce fuel loads and the potential for wildland fire.	*Continue Current Management*	No management action to reduce fuel loads.
How would the refuge protect rare and sensitive plants, wildlife, and microbiotic soil crusts?	Conduct minimum inventory and monitoring necessary on a case-by-case basis.	Increase inventory and monitoring in collaboration with partners.	*Continue Current Management*
Weed Management			
How would the refuge control invasive non-native plants (weeds)?	• Treat 50-100 acres opportunistically on a site-by-site basis. • Document weed locations when found.	• Treat 1,000 acres primarily along road corridors and newly detected populations • Conduct systematic weed inventories.	• Treat 50-100 acres—primarily newly introduced and small populations • Conduct systematic weed inventories.
Wildland Fire Protection and Restoration			
How would the refuge protect life and property and restore habitats adversely impacted by wildland fire?	• Maintain fire suppression capabilities and use appropriate management response for all wildland fires. • Develop natural fuel breaks utilizing existing features and natural fire. • Use mowing and cutting to extend or connect natural fuel breaks. • Conduct active restoration and rehabilitation.	*Continue Current Management except:* • Use only native seed and plants for restoration.	*Continue Current Management except:* • No mechanical means used to extend or connect natural fire fuel breaks. • Allow burned areas to naturally restore and rehabilitate.

Issue	Alternative 1 (no action)	Alternative 2 (preferred alternative)	Alternative 3 (natural conditions)
Public Use Management			
How would the refuge manage hunting?	• In coordination with Nevada Dept. of Wildlife, allow a limited harvest of certain game species consistent with population objectives. • Permit up to 10 commercial operators to guide and outfit hunters.	*Continue Current Management*	
How would the refuge manage fishing?	• Allow sport fishing and restock reservoirs with trout.	*Continue Current Management, except:* • Only restock trout indigenous to the region (not rainbow trout).	*Continue Current Management, except:* • Do not restock Big Spring Reservoir.
How would the refuge manage wildlife observation and photography?	• Provide basic information to visitors.	*Continue Current Management and:* • Develop brochures, interpretive trails, and off-refuge opportunities.	*Continue Current Management and:* • Develop brochures and off-refuge opportunities.
How would the refuge manage rock collecting?	Allow limited rock collection.	*Continue Current Management and:* • Increase law enforcement and visitor information.	*Continue Current Management and:* • Require Special Use Permits if the management objective threshold for violations is exceeded.
How would the refuge provide visitor facilities?	• Maintain Sheldon Refuge Headquarters at Dufurrena. • Maintain information kiosks at key locations. • Provide 13 developed, semi-primitive, and primitive campgrounds.	• Replace the Sheldon Refuge Headquarters with Headquarters and Visitor Contact Station along Hwy 140. • Build additional kiosks, trails, and interpretive sites. • Increase development and collect fees at developed campgrounds. • Relocate up to nine semi-primitive and primitive campgrounds to reduce resource impacts.	*Continue Current Management and:* • Consolidate up to four semi-primitive and primitive campgrounds to reduce resource impacts.

Issue	Alternative 1 (no action)	Alternative 2 (preferred alternative)	Alternative 3 (natural conditions)
How would the refuge manage access for public use?	• Allow motorized vehicle use on 365 miles of existing roads and routes for wildlife-dependent recreation. • Continue to maintain primary access roads. • Improve road information signs, brochures, and maps. • Improve marking of closed roads and routes on the refuge. • Allow backcountry camping by Special Use Permit. • Allow horseback riding.	*Continue Current Management and:* • Allow motorized vehicle use on 300 miles of existing roads and routes, and identify 38 miles of to be re-opened for vehicle use if the wilderness recommendation is approved. • Increase maintenance of primary access roads. • Mark and sign open roads and routes on the refuge. • Re-route and realign 12 miles of roads and routes to avoid or minimize resource impacts. • Close duplicate routes. • Designate an auto-tour route. • Require registration for off-highway vehicles.	*Continue Current Management and:* • Allow motorized vehicle use on 289 miles of existing routes, and identify 33 miles of to be re-opened for vehicle use if the wilderness recommendation is approved. • Re-route and realign 4 miles of roads and routes to avoid or minimize resource impacts. • Do not maintain roads in Virgin Valley beyond the Virgin Valley Campground.
Wilderness Recommendations			
What areas would the refuge recommend for wilderness designation?	Recommend 341,500 acres currently proposed for designation.	Recommend 341,935 acres for designation—excluding some areas currently proposed, but including other areas.	Recommend 236,791 acres for designation.
Historic and Cultural Resources			
How would the refuge protect and use historic and cultural resources?	• Minimum inventory, protection, and restoration of historic and cultural resources necessary. • Historic buildings used for administrative purposes only.	*Continue Current Management, and:* • Increase inventory and protection of historic and cultural resources. • Restore up to three additional historic buildings. • Allow public use of selected historic buildings.	*Continue Current Management*

2.2 Goals, Objectives, and Strategies

2.2.1 Goal 1: Manage feral horse and burro populations consistent with the purposes for Sheldon Refuge, the National Wildlife Refuge Improvement Act, National Wildlife Refuge policy, and to protect and preserve a diverse assemblage of native plant and wildlife species, habitats, and naturally functioning systems characteristic of the Great Basin Ecosystem.

Objective 1a: Feral Horse and Burro Populations			
Reduce feral horses and burros to a population level that is consistent with Refuge System policy and the purposes for which Sheldon Refuge was established, and that allows for the attainment of refuge biological goals and objectives.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)		√	√
Remove annual increases to maintain relatively stable horse and burro population at 800 horses and 90 burros.	√		
Within five years of the final decision for the CCP, remove all feral horses and burros from Sheldon Refuge.		√	
Within 15 years of the final decision for the CCP, remove all feral horses and burros from Sheldon Refuge. Contraception and release back onto Sheldon Refuge anticipated to result in management of at least 400 horses for the next 15 years.			√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
With partners, maintain standard four-strand wildlife-friendly fence along Sheldon Refuge boundary to prevent entry of wild horses or burros from surrounding BLM Herd Management Areas (HMAs).	√	√	√
Investigate and monitor impacts of feral horses and burros to habitats and wildlife.	√	√	√
Populations controlled through gathers, adoption, sanctuary, and contraception.	√	√	√
Populations controlled through sale or auction only if other control methods are impractical or ineffective.		√	
Work with BLM to remove wild horses that enter Sheldon Refuge from surrounding HMAs.	√	√	√
Rationale: The U.S. Fish and Wildlife Service Refuge Manual 7 RM 6 states horse and burro populations will not be maintained on Sheldon National Wildlife Refuge, will be removed in accordance with 50 CFR 30.12, and are defined as feral when roaming on certain refuge lands in the western United States (including Sheldon Refuge). The population objective under Alternative 1 (no action) is explicitly an interim management objective to remain in effect only until a long-term management objective is approved			

as part of this CCP. As described in Chapter 4, the presence of feral horses and burros has caused significant adverse impacts to the ecological integrity of Sheldon Refuge. These impacts have reduced the health and function of native habitats necessary to support priority species such as pronghorn and Greater sage-grouse as well as a number of other wildlife and plant species. Removal of feral horses and burros under Alternative 2 (preferred) would likely result in substantial recovery and restoration of ecological health, natural processes, and natural conditions throughout much of Sheldon Refuge, and has been identified as the most important management strategy necessary for the achievement of refuge purposes, goals, and objectives.

Based upon recent supply and demand for horse adoption, it is likely auction of some animals would be necessary to meet the population management objective under Alternative 2 (preferred). Auction would only be used as a last resort if methods of control in Alternative 1 (no action) are shown to be impractical or ineffective. Stipulations for auction agents would be similar to those required for adoption agents. These stipulations are included in Appendix H, Standard Operating Procedures for the control of horses and burros within Sheldon Refuge. Implementation of Alternative 2 (preferred) has also been determined necessary to fully implement Objectives 2a, 2b, 3a, 3b, 3c, 4a, 4b, 4c, 4d, 4e, and 5a. See also Sections 4.1.1 and 4.2.

2.2.2 Goal 2. Protect, maintain, and restore sagebrush-steppe and associated upland communities characteristic of the Great Basin Ecosystem.

Objective 2a: Conserve sagebrush-steppe communities representative of historic Great Basin habitats (see Figures 4.2, 4.3, and 4.4)

Big sagebrush steppe: Protect and maintain **at least 60%[1] (80,000 acres [2])** of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) habitat for the benefit of a diverse assemblage of native species including migratory birds (e.g., sage thrasher [*Oreoscoptes monatus*]), mammals (e.g., pygmy rabbit), and other sagebrush-obligate species on Sheldon Refuge. The desired condition for basin big sagebrush habitat is characterized by the following:

- 5%-30% canopy cover dominated by mature (11-50 inches tall) basin big sagebrush
- <10% western juniper cover and <4 trees/acre density
- Deep friable soils suitable for burrowing
- <10% invasive plant cover

Big sagebrush shrubland: Protect and maintain **at least 60% (80,000 acres [see footnote 1])** of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) habitat for the benefit of a diverse assemblage of native species including resident and migratory birds (e.g., Greater sage-grouse) and other sagebrush-obligate species on Sheldon Refuge. The desired condition for Wyoming big sagebrush habitat is characterized by the following:

- 10%-20% canopy cover (above snow) dominated by mature Wyoming big sagebrush
- 10-40 inches for sagebrush height

[1] The percentage and acreage figures presented under each habitat management objective primarily reflect differences in feral horse and burro management among the three alternatives.
[2] This acreage figure includes both big sagebrush steppe and big sagebrush shrubland habitat types, which are not differentiated in the satellite imagery used for the calculation.

- 15%-20% cover of native bunchgrasses and forbs
- <10% invasive plant cover (e.g., cheatgrass)
- Presence of microbiotic crust with appropriate abiotic conditions

Low sagebrush shrubland and steppe: Protect and maintain **at least 60% (20,000 acres)** of low sagebrush (*Artemesia arbuscula*)shrubland and steppe habitat for the benefit of a diverse assemblage of native species including resident and migratory birds (e.g., Greater sage-grouse), mammals (e.g., pronghorn), and other sagebrush-obligate species on Sheldon Refuge. The desired condition for low sagebrush habitat is characterized by the following:

- >20% canopy cover dominated by mature (<30 inches tall) low sagebrush
- >20% native perennial grass and forb cover
- <10% western juniper cover and <4 trees/acre density
- <10% invasive plant cover
- Presence of microbiotic crust with appropriate abiotic conditions
- Minimal human disturbance

Salt desert scrub and greasewood flats: Protect and maintain **at least 60% (20,000 acres)** of salt desert scrub and greasewood flat habitat for the benefit of a diverse assemblage of native species including migratory birds (e.g., loggerhead shrike [*Lanius ludovicianus*]), mammals, and reptiles on Sheldon Refuge. The desired condition for salt desert scrub and greasewood flat habitats is characterized by the following:

- <25% canopy cover of mature, tall (>3 feet tall) shrubs including greasewood (*Sarcobatus vermiculatus*), shadscale saltbrush (*Atriplex confertifolia*), or winterfat (*Krascheninnikovia lanata*) with patchy distribution
- <20% native herbaceous cover
- >20% bare ground[3]
- <10% invasive plant cover.
- Minimal human disturbance

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√) or the alternative is modified by replacing bolded type above with the text in this row	15%-30%	√	30%-60%
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Investigate/research potential management strategies to maintain these habitats.	√	√	√
Where appropriate, utilize mechanical or prescribed fire treatments to create conditions protective from wildfire.	√	√	√
Minimize ground-disturbing activities and management activities that disturb the soil surface (e.g., grading of road shoulders or use by OHVs).		√	

[3] The upper limit of bare ground will vary considerably within this habitat type but would not be great enough to meet the "largely unvegetated" criteria which defines the cliff, canyon, talus slope, and barren lands habitat type (see Goal 4).

Rationale: These communities were naturally subjected to relatively infrequent and unpredictable disturbances including severe drought (approximately every 70 years), flooding (approximately every 100 years), and fire (approximately every 35 to 1,000 years), depending on composition. It is generally agreed that the thresholds included in the objective when applied across the habitat type reflect healthy natural conditions necessary to support dependent fish and wildlife species. This includes priority species such as pronghorn, Greater sage-grouse, and a host of other dependent wildlife (see wildlife and habitat matrix in Appendix B). By managing habitats within the stated objective thresholds, the necessary ecological integrity would be provided to maintain diverse, healthy wildlife populations within the natural range of variability. Because disturbance is a widely variable component of these habitats, many of these communities are being protected from large-scale natural fire until appropriate management actions can be identified. Currently, the precise conditions of habitats throughout Sheldon Refuge have not been quantified, but based on the results of vegetation surveys and site visits, the primary factors currently influencing habitat conditions within Sheldon Refuge are feral horses and burros. The differences in management alternatives for horses and burros are reflected in the percentage of each habitat type that would meet the stated objective. Other management actions include creating fire breaks, as well as the early detection, rapid response, and control of invasive species.

Photo 2.1 Sagebrush-steppe and shrubland habitats cover more than 50% of Sheldon Refuge and provide necessary habitat for many wildlife species, including Greater sage-grouse.

Objective 2b: Restore sagebrush-steppe and associated plant communities (see Figures 4.2, 4.3, and 4.4)

Montane sagebrush steppe: Enhance, protect, and/or maintain the natural condition and processes in **more than 80% (146,000 acres)** of late-successional mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) habitat for the benefit of a diverse assemblage of native species including birds (e.g., Greater sage-grouse) and other sagebrush-obligate species on Sheldon Refuge. Mountain big sagebrush habitat is characterized by the following:

- 15%-25% canopy cover of mature (15-31 inches tall) mountain big sagebrush
- Range of bitterbrush (*Purshia* spp.) canopy cover
- ≥25% native bunchgrass and forb cover (>7 inches tall)
- <10% western juniper cover and <4 tree/acre density

- <10% invasive plant cover

Mountain big sagebrush/bitterbrush complex: Enhance, protect, and/or maintain natural condition and processes throughout the mountain big sagebrush/bitterbrush complex for the benefit of a diverse assemblage of native species including resident and migratory birds and mammals (e.g., mule deer) on Sheldon Refuge. This habitat complex is characterized by the following:

- 15%-25% canopy cover of mountain big sagebrush (15-31 inches tall)
- >10% canopy cover of bitterbrush
- ≥25% cover of native bunchgrasses and native forbs (>7 inches tall)
- <10% canopy cover of trees with western juniper density <4 trees/acre
- <10% cover of invasive plants (e.g., cheatgrass)

Semi-desert grasslands and steppes: Restore, protect, and/or maintain **more than 60% (22,000 acres)** semi-desert grassland and steppe habitats for the benefit of a diverse assemblage of native species including resident and migratory birds (e.g., western burrowing owl), mammals, and reptiles on Sheldon Refuge. This semi-desert grassland habitat is characterized by the following:

- Sparse (<40%) to moderately dense (>40%) native grass and forb cover
- <15% native shrub cover
- 40%-70% bare ground cover
- <10% invasive plant cover

Great Basin wildrye: Restore, protect, and/or maintain all Great Basin wildrye (*Leymus cinereus*) habitat for the benefit of a diverse assemblage of native species including migratory birds, mammals (e.g., pronghorn), and reptiles on Sheldon Refuge. This habitat is characterized by the following:

- >40% cover of native grasses (e.g., Great Basin wildrye) and native forbs
- <5% cover of native shrubs
- <10% cover of invasive species

Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√) or the alternative is modified by replacing bolded type above with the text in this row	15%-30%	√	30%-80% (montane sagebrush steppe); 30%-60% (semi-desert grasslands and steppes)
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Use appropriate management response for natural fire suppression, including allowing natural fire when appropriate.	√	√	√
Restore habitats to more natural conditions on an average of 400 acres per year using mechanical treatments and prescribed fire designed to mimic natural disturbance.	√		
As a priority, emphasize mechanical control of juniper and sagebrush		√	

encroachment to mimic natural disturbance and restore a maximum average of 1,500 acres of habitat per year.			
Natural fire anticipated to restore 10 to 100 acres per year.			√
Rehabilitate stream channel headcuts by reducing impacts from feral horses and burros and vehicle use, placement of structures, planting shrubs or other vegetation, or using other reliable methods to restore hydrogeological processes and function and to stabilize soils.		√	
Investigate and apply other appropriate restoration techniques for degraded mountain big sagebrush, bitterbrush, and Great Basin wildrye sites in addition to mechanical or prescribed fire treatments.		√	
Rationale: Previous grazing regimes, fire suppression, and ongoing utilization by feral horses and burros have severely degraded a proportion of these habitats and converted a significant portion of formerly bunchgrass-dominated stands (i.e., Great Basin wildrye) to shrub-dominated habitats. Historically, these communities were naturally subjected to relatively frequent disturbances including fire, insects, disease, winter kill, rodent outbreaks, and drought. A reduction in disturbance events has increased encroachment into these communities from western juniper (e.g., into mountain big sage stands) or shrubs (e.g., into Great Basin wildrye stands). The crowns of larger juniper trees often limit grass and other vegetative growth beneath them, thereby reducing the fuel necessary to carry fire into the tree, fireproofing the crown and stem (Agee 1993; Gedney et al. 1999). As a result, fire can no longer be used to restore natural ecological condition or function where encroaching juniper is essentially fireproof. It is generally agreed that the thresholds included in the objective, when applied across the habitat type, reflect healthy natural conditions necessary to support dependent fish and wildlife species. This includes priority species such as pronghorn, Greater sage-grouse, and a host of other dependent species (see wildlife and habitat matrix in Appendix B). By managing habitats within the stated objective thresholds, the necessary ecological integrity would be provided to maintain diverse, healthy wildlife populations within the natural range of variability. Precise conditions of habitats throughout Sheldon Refuge have not been quantified, but based on the results from vegetation surveys and site visits, the primary factors currently influencing habitat conditions within Sheldon Refuge are feral horses and burros and long-term suppression of natural fire. The differences in management alternatives for horses and burros are reflected in the percentage of each habitat type that would meet the stated objective. Additional management for removal of encroaching sagebrush and western juniper that mimics natural disturbance (i.e., wildfire) is intended to restore a mosaic of plant communities and seral stages needed to support shrub-steppe and semi-desert grassland dependent species across a larger supporting landscape.			

Photo 2.2 Natural fire is one of the primary tools for managing sagebrush habitats within Sheldon Refuge.

Photo 2.3 Prescribed burning is one of the primary tools for managing sagebrush habitats within Sheldon Refuge.

Photo 2.4 Mowing is one of the primary tools for managing sagebrush habitats within Sheldon Refuge.

Photo 2.5 Cutting of juniper is one of the primary tools for managing sagebrush habitats within Sheldon Refuge.

2.2.3 Goal 3. Restore, protect, and maintain the structure and function of riparian and aquatic habitats characteristic of the Great Basin Ecosystem.

Objective 3a: Emergent Marshes and Wet Meadows (see Figure 4.2)

Emergent marshes and wet meadows: Manage **more than 60% (2,000 acres)** of wet meadow habitat for the benefit of a diverse assemblage of native species including resident and migratory birds (e.g., shorebirds, passerines, and Greater sage-grouse), mammals, amphibians, and invertebrates. These habitats are defined by the following attributes:

- Seasonally flooded meadows or shallow freshwater floodplains
- <5% cover of tall, dense deciduous shrubs or, where shrubs are present, an interspersion of deciduous shrub patches and herbaceous openings where neither is <25% or >70% of the total cover of the area
- ≤90% cover of native herbaceous species (e.g., sedges [*Carex* spp.], rushes [*Juncus* spp.])
- <10% cover of encroaching sagebrush in transitional zones
- <10% cover of invasive plants (e.g., Russian olive [*Elaeagnus angustifolia*], cheatgrass [*Bromus tectorum*])

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√) or the alternative is modified by replacing bolded type above with the text in this row	10-20%	√	30-60%
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Where appropriate use mechanical treatments or prescribed fire to mimic natural disturbance, reduce litter, and increase herbaceous vigor.	√	√	√
Conduct mechanical treatments and prescribed fire on a maximum average of 1,200 acres per year.	√		
Within five to 15 years (following removal of horses and burros), resume mechanical treatments and prescribed fire on a maximum average of 1,200 acres per year.		√	
Within five to 15 years (following removal of horses and burros), natural fire anticipated to restore 10 to 100 acres per year.			√
Investigate and employ wetland restoration techniques (e.g., gabions, plantings, bank stabilization).		√	
Remove water control structures, diversions, or other developments that alter natural hydrology.		√	
Reduce disturbance by relocating designated campgrounds and re-routing roads.		√	√

Rationale: Wet meadow habitats are of high importance for conservation of biodiversity and priority species and provide habitat for approximately 80% of all species representative of the Great Basin. Wet meadows are among the most altered and impacted habitats on Sheldon Refuge as a result of water development, prior grazing regimes, and current utilization by feral horses and burros. In addition, these sites are impacted by recreational camping use. Currently precise conditions of habitats throughout Sheldon Refuge have not been quantified, but based on the results from vegetation surveys and site visits, the primary factors currently influencing habitat conditions within Sheldon Refuge are feral horses and burros and long-term suppression of natural fire. The differences in management alternatives for horses and burros, relocation of campsites, and re-routing of roads and are reflected in the percentage of each habitat type which would meet the stated objective. Until horse and burro population management

objectives are reached, the continued use of prescribed fire and mechanical treatments within these habitat types is not necessary and may be detrimental. Once horse and burro grazing is removed, management activities to restore natural fire or to mimic the effects of natural fire would resume where necessary to achieve habitat objectives.

Objective 3b: Springs, Springbrooks, and Streams (see Figure 4.2)

Spring, springbrooks, and streams: Manage springs, springbrooks, and stream habitats for the benefit of a diverse assemblage of native species including birds, mammals, amphibians, fish, and endemic invertebrates on Sheldon Refuge. These habitats are defined by the following attributes:

- Water temperatures ranging from cold (<75˚F) to thermal (>86˚F)
- Substrates dominated by vegetation, with associated boulders, fines, sand, cobble, or gravel
- Stabilizing bank vegetation
- <10% invasive plant cover

Cold perennial springs: Restore (where necessary), protect, and maintain **45%-65% (65-95)** of cold, perennial springs and associated springbrooks on Sheldon Refuge for the benefit a diverse assemblage of native species including desert fish (e.g., Alvord chub [*Gila alvordensis*]), birds, mammals, amphibians, and endemic invertebrates on Sheldon Refuge. These habitats are characterized by the following:

- Perennial
- Water temperatures <86°F
- Presence of benthic and free-swimming organisms
- Vegetative cover
- <10% cover of invasive plants

In-channel habitat: Restore (where necessary), protect, and maintain **more than 60% (125 miles)** of in-channel habitat within cold-water streams for the benefit of a diverse assemblage of native species including desert fish (e.g., Sheldon tui chub [*Gila bicolor eurystoma*]), amphibians, and endemic invertebrates on Sheldon Refuge. This in-channel habitat within cold-water streams is characterized by the following:

- Water temperatures <78°F
- Soft-bottom sediments
- Stabilizing bank vegetation (e.g., rushes)
- <10% cover of invasive plants

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√) or the alternative is modified by replacing bolded type above with the text in this row	<22% of springs and <30% of springbrook and stream habitat	√	22%-45% of springs and 30%-60% of springbrook and stream habitat
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Remove spring developments over the next 10 to 15 years.	√		
Remove developments and completely restore springs over the next 10 to 15 years.		√	

Remove developments from springs. Allow springs to recover naturally (>15 years).			√
Reduce disturbance by relocating designated campgrounds and re-routing roads.		√	√
Protect from new introductions of non-native fish and amphibians. Examine potential to control existing non-native populations.		√	√
Rationale: Springs, springbrooks, and streams are rare in the Great Basin, support rare or unique endemic species, and are important sources of water for wildlife. On Sheldon Refuge, most of the hydrologic processes at these sites have been materially altered by livestock use and by previous water development efforts for livestock, including spring boxes, dams, diversion canals, pipelines, troughs, and dug-out water catchments. In addition, these sites are impacted by recreational visitors, introduced non-native fish, and exotic amphibian species (e.g., guppies [*Poecilia reticulata*] and bullfrogs [*Rana catesbeiana*]). Restoration efforts related to the objective could include a wide range of methods, tools, and techniques, which are determined by individual site characteristics including soils, the percentage of native vegetation present, the type of existing development, and the amount of ground disturbance necessary to remove the development. Because the majority of locations for these water sources are within proposed wilderness, the most likely range of tools and techniques to be used has been evaluated through the Minimum Tool Analysis (MTA) included in Appendix G. Past habitat restoration efforts within Sheldon Refuge have been successful in restoring more natural conditions in only a few years. By comparison, observation of habitat exclosures indicate that without active management, natural recovery of these habitats would take several decades—and in some cases may not occur at all. The combination of removal and complete restoration of the most heavily damaged areas as proposed under Alternative 2 (preferred) would be the quickest and most certain method of restoring natural function and condition to these habitats necessary to fulfill the purposes for Sheldon Refuge.			

Photo 2.6 Springs, springbrooks, and stream habitats represent a small portion of Sheldon Refuge but are extremely important for biological health, integrity, and diversity.

Objective 3c: Playas, Salt Flats, and Mudflats

Ephemeral wetlands: Manage **more than 20% (1,400 acres)** of ephemeral wetland habitat (e.g., playa, salt flat, mudflat) for the benefit of a diverse assemblage of native species including migratory birds (e.g., shorebirds), invertebrates, amphibians, and reptiles on Sheldon Refuge. Natural characteristics of these habitats are defined by the following:

- Alkaline and saline to hypersaline water quality with depths ranging from saturated soil to 4 feet
- Unvegetated to sparsely vegetated (e.g., shrubs, saltgrass (*Distichlis spicata*), other herbaceous cover)
- Associated habitats include fringes surrounding salt flats, mudflats, and playas of shrubs interspersed with native bunchgrasses (total cover <25%)
- <10% cover of invasive plants (e.g., cheatgrass)
- Facilitates natural processes; saturates via overland flow or groundwater discharge
- Shallow swales with basin topography

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√) or the alternative is modified by replacing bolded type above with the text in this row	5%-10%	√	<5%
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Fully restore one playa to natural condition within 10 years.	√		
Fully restore at least 20% of playas to natural conditions within 15 years.		√	
Allow all playas to naturally recover (>50 years).			√
Refurbish and actively maintain other existing playa water developments and maintain playa dug-outs through periodic excavations.	√		
Conduct and monitor management experiments to determine appropriate restoration techniques of natural hydrologic function. Apply techniques to additional acres if successful.		√	
Minimize recreational and management activities that disturb the soil surface (e.g., OHV use).		√	√

Rationale: Ephemeral wetlands such as playas, salt flats, and mudflats provide habitat for a diverse assemblage of native and desert aquatic species adapted to life in ephemeral, saline, or geothermal habitats, thus, contributing to biodiversity in the Great Basin. On Sheldon Refuge, most of the hydrologic processes at these sites have been materially altered by previous water development efforts for livestock, specifically dug-outs. This has affected the natural ecological processes (e.g., rates of evaporation) and has likely impacted the physical, chemical, and biological condition at these sites; consequently, wildlife that depend on these sites have also been impacted. In addition, these areas are impacted by OHV use, which contributes to soil erosion, soil compaction, and vegetation removal.

Playas are rather complex, highly alkaline but poorly understood basin ecosystems (up to a few hundred acres in size within Sheldon Refuge) that depend on periodic shallow flooding. When flooded, these habitats teem with invertebrates, which have sometimes remained dormant for many years. This rich aquatic life provides valuable forage for migratory birds. Deep depressions or "dug-outs" were excavated in many playas throughout Sheldon Refuge to concentrate water for livestock. Because the water is concentrated in the dug-out area, the playa no longer floods with water and the ecological integrity of the

habitat has been lost. Many ecologists assert that once the alkaline layers of the playa have been altered by excavation, restoration may not be possible. Strategies to restore at least 20% of these playas habitats for the benefit of migratory birds and other wildlife are probably realistic, but allowing these habitats to recover naturally over time would occur very slowly, if at all.

Objective 3d: Artificial Emergent Marshes and Reservoirs (see Figure 4.2)

Maintain Catnip Reservoir, Big Spring Reservoir, Dufurrena Ponds, and other existing managed ponds and emergent marshes for the benefit of migratory birds (e.g., wading birds and waterfowl), fish (e.g., Lahontan cutthroat trout) and native amphibians on Sheldon Refuge. The desired state of these habitats is characterized by the following:

- Diverse array of native wetland plants including emergents (e.g., cattail [*Typha* spp.], bulrush [(*Scirpus* sp., *Schoenoplectus* spp.]), sedges, and moist-soil plants (e.g., smartweed [*Polygonum* spp.])
- 30%-90% native residual vegetation with a diverse array of native wetland plants including emergents, sedges, and moist soil plants
- Water depths of 9-10 inches in emergent plant zone
- >50% cover of open water (>3 feet in depth) with native submergent plants (e.g., pondweeds [*Potamogeton* spp.])
- <10% invasive plant cover (e.g., Canada thistle [*Cirsium arvense*], cheatgrass, pepperweed [*Lepidium* spp.])

Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Acres managed to meet Objective 3d	434	434	215
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Maintenance of artificial habitats primarily for fish, wildlife, and plants and secondarily to provide wildlife-dependent public use opportunities.	√	√	√
Actively maintain the dam and dredge the 22-acre Catnip Reservoir to provide sufficient water depth for Lahontan cutthroat trout.	√	√	√
Actively maintain the headgate and dam for the 212-acre Big Spring Reservoir to impound available water for migratory birds and trout.	√	√	
Actively maintain headgates, culverts, and dikes at Dufurrena Ponds to retain water for approximately 193 acres of artificial pond, wetland, and wet meadow habitat.	√	√	√
Remove structures and restore Pond 13 (7 acres) to natural conditions.	√	√	
Allow Pond 13 to revert to natural conditions (>100 years).			√
Control emergent vegetation and maintain early successional communities in artificial ponds including mechanical removal, disking, prescribed fire, and herbicides.	√	√	
Manage disturbance and impacts associated with recreational use.		√	

Rationale: Because of altered hydrology and continued degradation of many of the natural wetlands and water sources on Sheldon Refuge, these artificial environments can provide important habitats for native fish and wildlife. In addition, these artificial habitats provide recreation opportunities.

Currently Catnip Reservoir provides suitable habitat and a potential source of genetic stocks for federally threatened Lahontan cutthroat trout populations in areas surrounding Sheldon Refuge. However, the reservoir continues to fill with silt, and the dam impounding Catnip Reservoir has been compromised by burrowing animals and is leaking progressively increasing amounts of water. In order to maintain sufficient water to support this fishery, Sheldon Refuge would need to conduct substantial maintenance and dredging in the near future. Cost estimates for dredging and repairs are approaching $3 million and would only increase the longer action is delayed.

Photo 2.7 Artificial emergent marshes, reservoirs, and the Dufurrena Ponds (shown here) continue to be maintained to benefit migratory birds and support wildlife-dependent public uses.

Objective 3e: Artificial Wet Meadows (see Figure 5.1)

Manage 1,700 acres of seasonal wetland–wet meadow habitat complex for the benefit of wildlife and migratory birds (e.g., pronghorn and waterfowl) at Swan Lake Reservoir and IXL Ranch on Sheldon Refuge. The desired state of these habitats are characterized by the following:

- Diverse array of native wetland plants including emergents (e.g., cattail, bulrush), sedges, and moist-soil plants (e.g., smartweed)
- 30%-90% native residual vegetation with a diverse array of native wetland plants including emergents, sedges, and moist-soil plants
- <10% invasive plant cover (e.g., Canada thistle, cheatgrass, pepperweed)

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√

Strategies Applied to Achieve Objective	Alt 1	Alt 2	Alt 3
Maintenance of artificial habitats primarily for fish, wildlife, and plants and secondarily to provide wildlife-dependent public use opportunities.	√	√	√
Operate and maintain Swan Lake Reservoir and impoundment dam to provide approximately 1,200 acres as a vital source of moisture for quality late summer pronghorn forage.	√	√	√
Secondary to management for Swan Lake, maintain water control infrastructure at IXL Ranch and release surplus water from Swan Lake Reservoir to provide approximately 500 acres of migratory bird stop-over habitat.	√	√	√
Manage disturbance and impacts associated with recreational use.		√	

Rationale: Because of altered hydrology and continued degradation of many of the natural wetlands and water sources on Sheldon Refuge, these artificial environments can provide important habitats for native fish and wildlife. In addition, these artificial habitats provide recreation opportunities.

The purposes for Sheldon Refuge are to serve as a refuge and breeding ground for wild animals and birds, for the conservation and development of natural wildlife resources and for the protection and improvement of natural forage resources. Efforts to maintain the existing facilities at both IXL Ranch and Swan Lake further these purposes by maintaining waterfowl resting and breeding habitat at IXL Ranch and important pronghorn forage areas at Swan Lake. The 1960s-era water control infrastructure at IXL Ranch was reconstructed in cooperation with Ducks Unlimited, NDOW, and the Nevada Waterfowl Association to provide waterfowl habitat. IXL Ranch was historically flooded by water held within Swan Lake and Catnip reservoirs but is currently dependent upon quantity and periodicity of runoff water. The priority is to retain water in Swan Lake Reservoir to benefit habitats directly associated with Swan Lake itself. Water retained in Swan Lake Reservoir provides habitat for summering pronghorn moving off of fawning grounds, and Swan Lake provides a vital source of quality forage as the water naturally evaporates into late summer and fall.

Photo 2.8 Guzzlers have been constructed for bighorn sheep and to increase numbers of chukar for hunting.

Objective 3f: Artificial Water Sources			
Maintain the function of other artificial water developments to support the protection and maintenance of other natural habitats.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Number of artificial water developments to be maintained under Objective 3f	18	18	0
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
In cooperation with NDOW, maintain existing wildlife water guzzlers.	√	√	
Within five years of the final decision for the CCP, prioritize and repair up to 10% of non-functioning artificial water source developments necessary to fulfill Sheldon Refuge purposes.		√	
Evaluate the benefits and consequences of intensively managed water developments versus restoring natural hydrological processes.		√	√
Rationale: Guzzlers were constructed at various locations within Sheldon Refuge under the assumption that artificial sources of freestanding water are necessary for healthy populations of chukar, bighorn sheep, and other wildlife. An increasing number of studies have demonstrated that wildlife will utilize these water sources when available and they may provide some benefit, but that they are not biologically necessary for bighorn, mule deer, pronghorn, and other native wildlife, which are well adapted to the dry arid climate of Sheldon Refuge (see Chapter 6). Furthermore, the past construction of water impoundments for commercial livestock grazing has likely created more sources of freestanding water throughout Sheldon Refuge and the surrounding landscape than has existed at any time in the past several hundred years, and the construction of any additional artificial sources of freestanding water cannot be justified for maintaining healthy wildlife populations or natural ecological conditions. Unless compelling scientific evidence is provided which demonstrates guzzlers are biologically necessary for healthy populations of native wildlife within the expected range of natural population variability, Sheldon Refuge will not consider construction of additional water guzzlers. Existing structures are unlikely to cause additional adverse impacts to wilderness character, and future maintenance would be completed by volunteers and in cooperation with NDOW. Therefore, we are proposing to allow these permanent structures to remain within the proposed wilderness areas while higher priority habitat improvement strategies (removal of feral horses and burros, restoration of springs, etc.) are implemented.			

2.2.4 Goal 4. Protect unique and rare habitats, wildlife, and communities.

Objective 4a: Cliffs, Canyons, Talus Slopes, and Barren Lands (see Figure 4.5)
Cliff, canyon, talus slope, and barren lands: Protect and maintain the ecological integrity of **85%-95% (8,500-9,000 acres)** of cliff, canyon, talus slope, and barren land habitats for the benefit of a diverse assemblage of native species including mammals (e.g., California bighorn sheep, American pika [*Ochotona princeps*], bats), migratory birds (e.g., prairie falcon [*Falco mexicanus*]), reptiles, and talus-slope dependent plants (e.g., rattlesnake stickweed [*Hackelia ophiobia*]) on Sheldon Refuge. The desired characteristics of these habitats are as follows: • Well-sheltered crevices, cavities, bluffs, high walls, and rocky ledges and slopes • Largely unvegetated (widely scattered native trees and shrubs) • <4 western juniper trees/acre under <150-year age class with a long fire-return interval and an absence of understory fuels

• <10% cover of invasive plants (e.g., cheatgrass) • Minimal human disturbance			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√) or the alternative is modified by replacing bolded type above with the text in this row	75%-85%	√	75%-85%
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Conduct treatments to control encroaching western juniper, including mechanical removal and prescribed fire.	√	√	
Manage natural fires to reduce encroachment of western juniper as appropriate management response would allow.			√
Evaluate acceptable types of wildlife-dependent public uses and manage to minimize impacts.	√	√	
Conduct baseline surveys to identify wildlife and plant resources that need further inventory, monitoring, and/or research. Primary focus would be bats, reptiles, amphibians, and rare plants.		√	
Actively seek additional funding through partnerships and grants to research and monitor these areas.		√	
Rationale: Cliffs, canyons, talus slopes, and barren lands, including volcanic tuff habitats, are sparsely scattered and add to the topographic diversity of Sheldon Refuge. These areas provide important habitat for a host of wildlife species, including many that are particularly sensitive to human disturbance, but in general appear to be stable and in good condition. It is generally agreed the thresholds included in the objective, when applied across the habitat type, reflect healthy natural conditions necessary to support dependent fish and wildlife species. This includes priority species such as American pika, California bighorn sheep, mountain lion and bobcat (*Felis rufus*), a number of bat and reptile species, and many other dependent species (see wildlife and habitat matrix in Appendix B). By managing habitats within the stated objective thresholds, the necessary ecological integrity would be provided to maintain diverse, healthy wildlife populations within the natural range of variability. Currently precise conditions of habitats throughout Sheldon Refuge have not been quantified, but based on the results from vegetation surveys and site visits, the primary factors currently influencing habitat conditions within Sheldon Refuge are feral horses and burros and long-term suppression of natural fire. The differences in management alternatives for horses and burros and the control of western juniper expansion are reflected in the percentage of each habitat type which would meet the stated objective.			

Photo 2.9 The dramatic cliffs along Thousand Creek Gorge provide habitat for raptors, bats, and other dependent wildlife.

Objective 4b: Deciduous Woodlands and Shrublands (see Figure 4.6)

Deciduous woodlands and shublands: Restore (where appropriate) and maintain **more than 50% (>140 acres)** of all deciduous woodland and shrubland habitat including aspen stands (*Populus* spp.), for the benefit of a diverse assemblage of native species including migratory birds (e.g., yellow-breasted chat [*Icteria virens*]), mammals, and amphibians on Sheldon Refuge. The desired state of riparian woodland is characterized by the following:

- Patchy shrub layer dominated by deciduous shrubs interspersed with openings of native herbaceous species
- 30%-80% canopy cover of mature (3-12 feet tall) woody vegetation
- <10% invasive plant cover

Aspen stands: Restore (where appropriate) and maintain all aspen stands for the benefit of a diverse assemblage of native species including resident and migratory birds (e.g., woodpeckers, raptors), mammals, and amphibians on Sheldon Refuge. The desired condition of aspen stands can be characterized by the following habitat attributes:

- Range of successional stages including early and mid-to-late
- Small (<10 inches dbh [diameter at breast height]), medium (>10 inch dbh), to large aspen trees (>20 inches dbh)
- 40%-80% tree canopy closure
- >1.5 live trees/acre
- >1.5 snags/acre
- Naturally fragmented patches
- Understory shrub cover ranging from present (>10% cover; aspen seedlings, willow [*Salix* spp.] alder [*Alnus* spp.], chokecherry [*Prunus virginiana* var. *melanocarpa*], currant [*Ribes* spp.], snowberry [*Symphoricarpos* spp.], *Ceanothus* spp.) to absent (<10% understory shrub cover)
- <10% cover of invasive plants

Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√) or the alternative is modified by replacing bolded type above with the text in this row	10%-30%	√	30%-50%
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Conduct treatments to mimic natural disturbance regimes and control encroaching western juniper and sagebrush, including mechanical removal and prescribed fire.	√	√	
Conduct treatments (including the use of natural fire when consistent with appropriate management response) to restore natural disturbance regimes and maintain natural abundance and distribution of western juniper and sagebrush.			√
Fence for grazing protection and plant native species to restore woody vegetation.		√	
Inventory, assess, and prioritize restoration potential of individual stands.		√	

Rationale: On Sheldon Refuge, many of these communities occur within isolated snowpockets, although others are dependent upon a natural hydrologic regime, including annual to episodic flooding. While these habitats represent a very small percentage of the entire refuge, they are essential for maintaining ecological integrity. Throughout the northern Great Basin region, the protection and restoration of aspen and other deciduous woodland habitats have been identified as necessary long-term conservation strategies. Fire is an important factor in facilitating the long-term presence and health of riparian woodlands across the landscape. A determination will be made as to where this community type historically occurred within Sheldon Refuge, what species were represented, and, if feasible and necessary, where supplemental plantings may accelerate recovery of the system. Overgrazing has removed most younger shoots and stems from areas of deciduous woodland and shrubland habitats and if not addressed could lead to extirpation of aspen stand clones. Currently precise conditions of habitats throughout Sheldon Refuge have not been quantified, but based on the results from vegetation surveys and site visits, the primary factors currently influencing habitat conditions within Sheldon Refuge are feral horses and burros and long-term suppression of natural fire. The differences in management alternatives for horses and burros and the control of western juniper expansion through mechanical removal and prescribed fire are reflected in the percentage of each habitat type which would meet the stated objective. It is expected that even under Alternative 2 (preferred), protective temporary fencing would be necessary to prevent severe overgrazing, which would take many years to naturally recover, or which could require active restoration to fully recover. Once horse and burro management objectives are reached, protective fences would be removed.

Objective 4c: Mountain Mahogany and Western Juniper Woodlands (see Figures 4.5 and 4.7)

Mountain mahogany woodlands: Protect and maintain **80%-95% (7,200-8,600 acres)** of mountain mahogany woodlands for the benefit of a diverse assemblage of native species including resident and migratory birds (e.g., raptors) and mammals (e.g., mule deer) on Sheldon Refuge. These mountain mahogany woodlands are characterized by the following:

- Discrete bands of mature mountain mahogany trees found on slopes, ridges, rimrock, and canyons
- Limited to higher elevations
- 10%-55% mature stand canopy cover
- <10% cover of invasive plants

Western juniper woodlands: Protect **80%-95% (3,900-4,600 acres)** of late-successional (i.e., old-growth) western juniper woodlands for the benefit of a diverse assemblage of native species including resident and migratory birds (e.g., landbirds, raptors) and mammals (e.g., mule deer) on Sheldon Refuge. Mature western juniper woodlands are characterized by the following:

- Mature western juniper trees (>200 years old; >20 in dbh, >30 feet tall)
- Range of young western juniper trees for recruitment (>3 inches dbh, <9 feet tall)
- Range of western juniper canopy closure (<1% to >50% cover)
- Range of midstory shrub canopy cover (<40% to 80%)
- <10% cover of invasive plants
- Generally situated in "fireproof" locations (e.g., rocky outcroppings, bare areas, talus slopes)

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√) or the alternative is modified by replacing bolded type above with the text in this row	60%-80%	√	60%-80%

Strategies Applied to Achieve Objective	Alt 1	Alt 2	Alt 3
Protect existing stands from fires that would cause major adverse impacts and other large-scale disturbances.	√	√	√
Conduct mechanical treatments and prescribed fire in areas adjacent to woodlands to reduce fuel loads.	√	√	
Restore woodlands after stand-replacing fire or other large-scale disturbance (e.g., native seeding and planting).	√	√	
Rationale: Mountain mahogany and late-successional western juniper stands provide unique and often irreplaceable biological and ecological values. All stands of mountain mahogany are sensitive to stand-replacing fire, do not easily resprout after fire, and are difficult to establish from seed. Late-successional western juniper stands also naturally occur in areas protected from fire, and large-scale fires are historically rare. Because of decreased seedling establishment in older juniper stands, the maintenance of some early and mid-successional western juniper stands are important for recruitment and would be provided through the following: as a fringe around late-successional stands and from recruitment within existing stands. It is generally agreed the thresholds included in the objective, when applied across the habitat type, reflect healthy natural conditions necessary to support dependent fish and wildlife species. This includes priority species, such as mule deer, and a host of other dependent species (see wildlife and habitat matrix in Appendix B). By managing habitats within the stated objective thresholds, the necessary ecological integrity would be provided to maintain diverse, healthy wildlife populations within the natural range of variability. Currently precise conditions of habitats throughout Sheldon Refuge have not been quantified, but based on the results from vegetation surveys and site visits, the primary factors currently influencing habitat conditions within Sheldon Refuge are feral horses and burros and long-term suppression of natural fire. The differences in management alternatives for horses and burros are reflected in the percentage of each habitat type which would meet the stated objective. In addition, we anticipate an increased percentage of each habitat type meeting the stated objective as a result of horse and burro removal under Alternative 3 would be offset by a corresponding decrease from continued reliance on wildfire suppression without treatment to reduce fuel loads in adjacent areas or post-fire restoration. Therefore, the percentages of each habitat type meeting the stated objectives are the same under both Alternative 1 and 3.			

Photo 2.10 Unlike western juniper, mountain mahogany stands are not expanding and are susceptible to fire.

Objective 4d: Rare and Sensitive Plants			
Identify, maintain, and expand the populations of rare and sensitive plant taxa.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Conduct periodic monitoring and conduct inventories on a site-by-site basis in response to project proposals and management activities.	√	√	√
Routinely conduct inventories in areas not yet surveyed for rare plant species and periodically monitor known sites.		√	
Actively seek additional funding through partnerships and grants for research.		√	
Work with partners to collect locally indigenous seeds and plant material to provide stock for restoration activities.			√
Rationale: The Sheldon Refuge population of grimy ivesia (*Ivesia rhypara* var. *rhypara*) represents 86% of the known individuals within Nevada and 85% of all globally known plants. Rattlesnake stickweed has been documented occurring at the base of steep gorge walls, in rocky areas below the walls, and occasionally along ledges in the rock walls on Sheldon Refuge. This species is considered limited in its distribution and a potential species of concern. The population on Sheldon Refuge was the largest documented to date and at that time represented 96% of the total known individuals. Rose biscuitroot (*Lomatium roseanum*) is another rare plant documented within Sheldon Refuge. These examples illustrate the amount of knowledge that can be gained through basic inventory efforts included as part of Objective 4d, which can then be used to make more informed management decisions to better conserve plants and their habitats within Sheldon Refuge.			

Objective 4e: Microbiotic Soil Crusts			
Inventory microbiotic crust and protect from conflicting public use and land management practices.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Conduct periodic monitoring and conduct inventories on a site-by-site basis in response to project proposals and management activities.	√	√	√
Conduct inventories to document range and condition of microbiotic crust to provide information for adaptive management.		√	
Minimize ground-disturbing activities and management activities that disturb soil surfaces.		√	√
Actively seek additional funding through partnerships and grants for research.		√	
Rationale: Biological soil crusts (i.e., microbiotic crusts) are an integral component of rangeland soils; however, little is known regarding its current condition across Sheldon Refuge. Protection from livestock, OHVs, and other disturbances can assist in the recovery of these communities, resulting in an increase in the percentage of soil surface covered with crust, and conversely a decrease in the percentage of bare soil.			

Objective 4f: Rare, Sensitive, and Key Indicator Wildlife Species			
Inventory and monitor federally listed species, rare and sensitive species (e.g., prairie falcons), and indicator and/or sagebrush-obligate species (e.g., pronghorn, Greater sage-grouse, pygmy rabbit, and American pika).			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Evaluate existing research and monitoring data to identify scientific information gaps and priority research needs.	√	√	
Actively seek funding, grants, and partnerships to conduct research and monitoring.	√	√	
Conduct habitat and wildlife inventories to fill scientific information gaps.		√	
Prepare an inventory and monitoring plan for priority species using standardized protocols.		√	√
Rationale: Inventory and monitoring of listed, sensitive, and indicator species is critical to conserving the biological integrity, diversity, and environmental health of Sheldon Refuge. Inventory and monitoring is required to assess the effects of management actions, to both prevent adverse effects to wildlife species and to assess whether Refuge objectives are being met.			

2.2.5 Goal 5. Using an integrated approach, prevent, control, or eliminate non-native species that threaten Sheldon Refuge resources.

Objective 5a: Noxious Weeds and Other Invasive Plants			
Control, reduce, and, where possible, eliminate noxious weeds and other highly invasive plant species from Sheldon Refuge.			
Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Acres treated under Objective 5a (includes all habitat types)	50-100	1,000	50-100
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Accomplish treatments through partnerships, grants, and co-op agreements. Emphasize opportunistic treatment on a site-by-site basis.	√		
Implement a more proactive approach by emphasizing treatment along road corridors, eradication of small infestations, and long-term containment/control of large infestations.		√	
Reduce noxious weeds and other invasive through an emphasis on early detection and eradication of new and/or small infestations.			√
Continue to document populations of noxious weeds and other invasive plants on an opportunistic basis and in response to project proposals and activities.	√		
Implement a systematic inventory and monitoring program to measure changes in invasive plant populations over time and responses to management activities.		√	√
Control relatively small populations of noxious weeds and other highly invasive non-native plants using a variety of methods and tools—primarily reseeding and planting, mowing and other mechanical methods, and the use of herbicides.	√	√	
Focus on early detection and rapid response using a variety of methods to aggressively control and/or remove newly introduced non-native plants and small infestations where eradication is most likely.			√
Slow the spread of well-established and/or large populations of invasive plants (i.e., cheatgrass) by limiting the amount of prescribed burning and other disturbance in highly susceptible areas and through reseeding and planting following fire and other disturbances.	√	√	
For well-established or large populations, allow natural processes to occur and avoid projects or activities that would increase the rate of spread or area infested.			√
Increase public awareness and participation in control efforts through directed outreach, education, and volunteer events.		√	
Increase voluntary use of certified weed-free feed by visitors through education. Require weed-free feed if pack stock are determined to be a continued source of invasive plants introduced to Sheldon Refuge.		√	
Discontinue grading along road edges within Sheldon Refuge, which promotes the spread and persistence of invasive plants.		√	

Use native seed and plantings only in relatively small areas most at risk following fire or other disturbances.			√

Rationale: While noxious weeds and other non-native plants are not as widespread when compared with surrounding areas, these plants are degrading habitats for native fish, wildlife and plants within Sheldon Refuge. Without increased efforts to detect and control newly introduced non-natives plants and at least control existing plants, impacts are expected to become much worse. Effective management of these plants would require Sheldon Refuge to dedicate staff, funding, and resources for quicker detection followed by a wide variety of control methods and tools—even within wilderness areas managed for naturalness and primitive character. The range of tools and techniques to implement Objective 5a under Alternative 2 (preferred) within the eight proposed wilderness areas were evaluated through a Wilderness Minimum Tool Analysis (see Appendix G). Actions to implement the objective in areas of Sheldon Refuge not proposed as wilderness could include the full range of tools and techniques available, but would most commonly include mechanical mowing and herbicides. The Region 1 IPM Strategies have been evaluated and are adopted and incorporated in this CCP by reference (Kilbride 2010). Implementation of Alternative 2 (preferred) has also been determined necessary to fully implement Objectives 2a, 2b, 3a: 3b: 3c, 4a, 4b, 4c, 4d, and 4e.

Objective 5b: Harmful and Invasive Wildlife

Manage, control, or remove fish and wildlife populations that may be detrimental to Sheldon Refuge resources or public safety.

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Take no management action for self-sustaining, non-native species determined to have negligible impact to native species or habitats (see strategy for Objective 8a).	√	√	√
Investigate techniques to mitigate impacts from non-native species determined to be detrimental to a native species or habitats.	√	√	
Replace non-native trout with native substitutes if viable (see strategy for Objective 8a).		√	

Rationale: Several non-native wildlife species have been introduced to Sheldon Refuge, including largemouth bass (*Micropterus salmoides*), white crappie (*Poxomis annularis*), pumpkinseed sunfish (*Lepomis gibbosus*), yellow perch (*Perca flavescens*), rainbow trout, guppy, bullfrog, California quail, chukar, Hungarian (gray) partridge, and potentially beaver (*Castor canadensis*). Some of these species can have significant impacts to native wildlife and habitats (e.g., guppy, bullfrog), while the effects of others are more benign (e.g., California quail). As populations expand, some species may cause adverse effects on habitat biodiversity, habitat connectivity, and plant community stability; facilitate the expansion of non-native invasive species; become a nuisance to the general public; and/or increase threats to public safety. Adverse effects can also include displacement and predation of other wildlife species, as well as disease transmission.

Current Service policy does not allow for the introduction of species on refuges outside of their historical range unless it is essential for the survival of the species. However, no action is required to reduce or eradicate self-sustaining populations of non-native, noninvasive species unless those species interfere with the accomplishment of refuge purposes or objectives (601 FW 3). The continued presence of non-native

rainbow and rainbow hybrid trout within Sheldon Refuge would interfere with the objective included as part of Alternative 2 (preferred) and would be replaced with fish indigenous to the region (e.g., Lahontan cutthroat trout and/or redband trout).

2.2.6 Goal 6. Collect information and create partnerships necessary to support adaptive management decisions at a landscape scale.

Objective 6a: Watershed Restoration			
Within five years of the final decision for the CCP, conduct an assessment and initiate restoration of the Virgin Creek watershed.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Miles of Virgin Creek habitat restored under Objective 6a	none	1 or more	none
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Conduct a health and function assessment of watersheds for determination of restoration priorities.	√	√	√
Develop a watershed restoration plan to include identification and priority areas for restoration.	√	√	
Assess topographic and hydrological variables and determine the impacts of mining and water development activities in the Virgin Valley.	√	√	
Following removal of horses and burros, begin efforts to restore and rehabilitate habitat along Virgin Creek.		√	
Rationale: A number of watersheds on Sheldon Refuge have been significantly altered and/or degraded by development, including water diversion, mining activities, invasive species, livestock grazing, and contaminants. Virgin Valley in particular has undergone dramatic alteration due to mining activities and intense grazing by livestock (including feral horses and burros). Long-term soil and water retention are directly affected by vegetative ground cover and soil compaction, which, in turn, increase surface runoff, stream sedimentation, and erosion. A key factor in improving deteriorated riparian areas is understanding the balance between watershed condition and riparian health. Restoration efforts would be largely ineffective as long as feral horses and burros remain within Sheldon Refuge. Until these animals are removed from Sheldon Refuge and Virgin Valley, no active restoration work would take place.			

Objective 6b: Wildlife Population Dynamics			
Determine key population characteristics of priority species and develop management actions.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Initiate additional monitoring and/or research to determine population trends, distribution, and migratory patterns (where applicable) for priority species including pronghorn, Greater sage-grouse, and other	√	√	√

sagebrush-obligate species.			
Investigate appropriate and compatible management actions to mitigate limiting factors.		√	
Apply adaptive management actions to maintain or restore declining or extirpated populations.		√	
Evaluate requirements and potential for restoration of native desert trout.		√	
Evaluate impacts of public use on native wildlife and associated habitats. Implement seasonal area closures as appropriate.		√	

Rationale: Many of the priority wildlife species that occupy Sheldon Refuge have ranges that extend beyond refuge lands, including pronghorn, mule deer, California bighorn sheep, mountain lion, bobcat, coyote, Greater sage-grouse, and a long list of migratory birds. Pronghorn management provides an example of how adaptive management strategies can be applied to meet this objective.

In the mid- to late 1990s there was concern that pronghorn populations within the nearby Hart Mountain Refuge were at risk of decline. Early data from studies initiated at that time suggested predators were responsible for the majority of pronghorn fawn mortality. However, pronghorn fawn survival improved coincidental with suspension of livestock grazing and release from a drought. Planned predator control efforts were postponed indefinitely. Both the Hart Mountain Antelope Refuge and Sheldon Refuge pronghorn populations have since substantially increased (Collins 2008a), and current data indicate populations are within normal ranges of population variability. This indicates predation was not likely the primary limiting factor. Indeed, additional data have since demonstrated that both the fawn's date of birth and previous summer's precipitation are highly important factors in pronghorn fawn survival (Whittaker 2008).

This example illustrates the complexity of wildlife management and how refuge management has constantly adapted through additional investigation and monitoring that identified likely explanations for changes in pronghorn fawn survival other than predation. Sheldon Refuge intends to implement further study of pronghorn migration, population trends, and predator-prey interactions to create a more complete understanding of factors influencing this priority wildlife species so that future management can continue to adapt.

Organizations and individuals have requested the Service open Sheldon Refuge to the sport hunting and trapping of additional wildlife species (i.e., coyote, mountain lion, and bobcat) consistent with Nevada state hunting regulations. However, the lack of population monitoring data for these species raises a number of conservation concerns. Sport hunting combined with removal of predators from areas adjacent to Sheldon Refuge is ongoing, and it is uncertain what effects, if any, these control efforts have had upon populations which depend upon Sheldon Refuge. The collection of baseline predator population trends, distribution, and movements along with refuge-specific predator-prey interaction studies would allow Sheldon Refuge to make an informed decision as to whether sport hunting of predators is compatible with the Refuge System mission and the purposes for Sheldon Refuge.

There is also the potential to assist in the recovery of locally extirpated species, such as Alvord cutthroat trout, or other species affected by climate change and threats to the sagebrush ecosystem. Sheldon Refuge would collect data to inform future decisions for the management of wildlife populations within natural densities and levels of variation, including naturally fluctuating population cycles, while ensuring that densities of endangered or otherwise rare species are sufficient for maintaining viable populations. A range of tools would be used, including:

- Aerial or ground surveys to estimate numbers, population trend, and/or sex/age composition
- Tracking studies, including radio and satellite marking to estimate distribution and ranges
- Habitat availability and food habit studies
- Predator-prey interaction studies
- Disease monitoring
- Genetic viability estimates
- Standard management techniques that increase/decrease population numbers (e.g., reintroductions, contraception, removal of individuals, supplemental seeding or stocking)

Photo 2.11 Additional research is needed to determine population trends, distribution, and migratory patterns for key species such as pronghorn (Photo Gail Collins).

Objective 6c: Adaptive Management			
Monitor habitat conditions, treatments and projects to evaluate effectiveness, and inform future management decisions—i.e., adaptive management.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Continue to establish monitoring photopoints for prescribed fire habitat treatments.	√	√	√
Conduct periodic riparian assessments.	√	√	√
Continue periodic vegetation mapping.	√	√	√

Continue to monitor the condition of springs.	√	√	√
Maintain research partnerships to monitor habitat treatment and wildfire effects.	√	√	√
Using a systematic approach, implement quantitative monitoring to evaluate short- and long-term effects of natural and prescribed fire.		√	
Implement monitoring to evaluate results from habitat restoration experiments.		√	
Rationale: Past inventory and monitoring of habitat treatment projects within Sheldon Refuge have been inconsistent. For areas where monitoring has been conducted, the level of detail and quantifiable results are generally not sufficient to inform future management actions. A more systematic and quantitative approach is necessary to provide the information necessary to measure management effectiveness and support defensible management decisions.			

Objective 6d: Research			
Seek partnerships for landscape-level research and conservation projects.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Develop a conservation planning partnership with cooperative agencies and other groups.	√	√	√
Seek funding to implement projects to achieve common wildlife and habitat objectives in partnership with others.	√	√	√
Seek partnerships and coordinate research on sagebrush-steppe ecosystem to provide information for management actions.	√	√	√
Work with cooperators to investigate the interactions of environmental stress factors, patterns of climate change, wildlife and ecosystem responses, and management actions in the Great Basin.		√	√
Create a catalogue of habitat monitoring sites within Sheldon Refuge.		√	√
Rationale: The sagebrush-steppe landscape extends across large portions of 11 states in the Intermountain West, but very little of the sagebrush biome remains undisturbed or unaltered from its condition prior to European settlement. Therefore, many of the challenges facing Sheldon Refuge are also issues at the larger landscape scale across the Great Basin (e.g., western juniper encroachment, invasive species expansion, horse management, energy development). Partnership development with other Federal agencies, state agencies, local working groups, and concerned citizens is vital to implementing priority habitat restoration and adaptive management at a larger scale. Coordination among land managers is likely the only way conservation can be accomplished for species with shifting ranges as a result of potential climate change.			

Objective 6e: Land Protection
Seek and develop partnerships for land protection efforts.

Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Develop partnerships to purchase Sheldon Refuge inholdings from willing sellers.	√	√	√
Consider outholding management options in partnership that are consistent with refuge policies and regulations.		√	
Seek partnerships and evaluate opportunities for land exchanges in support habitat protection and refuge purposes.		√	√
Rationale: The Service is responsible for managing the fish and wildlife resources of Sheldon Refuge to benefit current and future generations of Americans. The Service does not, however, own nor have management authority over all of the land within the administrative boundary of Sheldon Refuge. As such, activities on private lands can affect resources on adjacent refuge habitats. Land acquisition and exchange are habitat protection methods that aid the Service in achieving its management objectives (i.e., recovery, restoration, enhancement) for species where habitat loss or degradation is a major cause of decline or where buffers are needed to protect sensitive areas. Partnerships with inholding owners could accomplish several habitat goals, such as invasive species control, fire suppression, or habitat improvements. Inholding development also has the potential to increase Service management costs due to expenses for surveys or fencing, or result in degradation of conservation value for surrounding lands.			

Photo 2.12 Development of private inholdings indirectly affects the surrounding area of Sheldon Refuge (Photo Gail Collins).

2.2.7 Goal 7. Provide an active fire management program.

Objective 7a: Fire Protection			
Conduct fire management for the protection of life, property, and the enhancement of Sheldon Refuge resources.			
Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Maintain a fire suppression program capable of performing aggressive initial and extended attack on natural fires.	√	√	√
Use appropriate management response to determine most efficient, safe, and cost-effective fire response.	√	√	√
Review, update, and execute cooperative fire suppression agreements with interagency cooperators.	√	√	√
Maintain public safety, protect property, and create defensible space around structures and other important resources by removing vegetation through prescribed burning, mowing, thinning, or other methods.	√	√	√
Develop fuel breaks utilizing past burn locations, riparian zones, age breaks with vegetation, and natural fire as appropriate management response allows.	√	√	√
In addition to other methods, use mechanical means (e.g., cutting and mowing) to develop fuel breaks.	√	√	
Complete an MTA to determine what activities and equipment generally prohibited under the Wilderness Act would be appropriate for fire suppression within proposed wilderness and Wilderness Study Areas (WSAs).	√	√	
Except for the protection of life and property in the case of emergency, conduct fire suppression within WSAs using primitive tools and equipment not prohibited by the Wilderness Act.			√
Rationale: Although a natural process that shaped Sheldon Refuge ecosystem, natural fire can be a threat to the safety of the public, and natural and cultural resources, as well as the continued existence of the present ecosystem. The historical natural fire regime has been altered by human influences (e.g., fire suppression, historical cattle grazing, non-native invasive species, and development). In some areas characteristic fire-return intervals are now much longer as a result of fire suppression and the loss of fine fuels to livestock grazing. The introduction of livestock grazing and exclusion of natural fire have contributed to expansion and density of juniper and big sagebrush. Without natural disturbance, much of the sagebrush-steppe is in a late seral stage. Natural fire now has the potential to burn more intensely, more rapidly, and over larger areas than if overgrazing and continued fire suppression had not occurred—making fire management more difficult. Under some circumstances, these sorts of natural fires can completely eliminate an existing native plant community. Fires can foster the spread and density of unwanted, non-native invasive species, primarily cheatgrass, which further alters the natural fire regime. Having adequate fire suppression resources available to contain and extinguish natural fires before they become large and			

burn under undesirable conditions is critical to the long-term preservation of the natural, cultural, and native biological resources of Sheldon Refuge. Meeting Objective 7a includes corresponding alternative natural and prescribed fire strategies under habitat management Objectives 2a, 2b, 3a, 3d, 4a, 4b, 4c, 5a, and 6c.

Objective 7b: Emergency Stabilization and Rehabilitation			
Implement emergency stabilization and rehabilitation of fire and fire suppression impacts.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Use heavy equipment only on existing roads and routes except where necessary for the protection of life or property.	√	√	√
Implement emergency stabilization and rehabilitation actions following fires causing major adverse impacts, including soil stabilization, cultural resource inventory and protection, non-native species control, native grass and shrub seeding and planting, grazing control, and effectiveness monitoring.	√	√	
Allow areas to naturally recover following fire or other disturbances except for disturbances caused by fire suppression activities, or when necessary for emergency stabilization, or to restore unique or critical biological/cultural resources.			√
Coordinate closely with fire teams during and after large fire events to ensure Sheldon Refuge priorities are incorporated into stabilization and rehabilitation plans.	√	√	√
Use native and non-indigenous plants for stabilization and restoration.	√		√
Use native, site-appropriate seed genetically similar to plants within Sheldon Refuge for stabilization and rehabilitation activities.		√	
Work with partners and cooperating agencies to develop seed sources.		√	
Rationale: Fires that burn outside the historical range of intensity, size, severity, and frequency could threaten native plant communities, facilities, and cultural resources on Sheldon Refuge. Associated fire suppression activities further contribute to resource damage. Utilizing appropriate emergency stabilization and rehabilitation techniques following a fire is critical to reduce long-term negative effects of fire and fire suppression.			

Photo 2.13 Aerial seeding is one technique to give native plants an edge over invasive weeds after a fire.

2.2.8 Goal 8. Provide visitors of diverse interests and abilities with opportunities to experience a variety of quality wildlife-dependent recreational and interpretive activities on vast, rugged, and remote high desert landscapes. These experiences will enhance visitors' understanding of and appreciation for the unique natural and cultural resources conserved by Sheldon National Wildlife Refuge and the National Wildlife Refuge System.

Objective 8a: Recreational Hunting (Waterfowl, Upland Birds, and Big Game)			
In coordination with NDOW, annually review and set hunting harvest regulations that provide high-quality recreation opportunities.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Continue to coordinate with NDOW to set tag limits and conduct surveys to monitor population trends for big game, waterfowl, and upland game birds.	√	√	√
Rationale: Hunting is a very popular activity and a priority, compatible, wildlife-dependent public use within Sheldon Refuge. Hunting within Sheldon Refuge is managed to emphasize the quality of the recreational experience (as defined by Service policy) rather than maximize harvest. Season dates, bag limits, and number of harvest tags for mule deer, pronghorn, California bighorn sheep, and Greater sage-grouse, are managed by the State of Nevada in coordination with Sheldon Refuge staff. Chukar and California quail harvest is allowed, per State regulation, in all areas open to hunting while waterfowl hunting is allowed in only a few areas on Sheldon Refuge. Because hunting activities are managed cooperatively with the State of Nevada, ongoing coordination is required to ensure that hunter numbers and restrictions are consistent with Sheldon Refuge purposes, biological goals and objectives, and standards for			

recreation quality.

Wildlife species such as coyote, bobcat, or mountain lion may be utilized for sport hunting or trapping within a national wildlife refuge (50 CFR 31). However, the populations and wildlife requirements for these species have not been determined, and existing data are insufficient to determine what level of sport hunting, if any, would be compatible with the mission of the Refuge System and the purposes for Sheldon Refuge. We anticipate information gathered to meet Objective 6b would be sufficient to make such a compatibility determination in the future.

Objective 8b: Cold-water Recreational Fisheries (see Figure 5.1)

Manage cold-water fisheries consistent with Service policy and habitat management objectives to maintain high-quality semi-primitive recreation opportunities.

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)		√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Within five years of the final decision for the CCP, develop a cold-water fisheries plan.	√	√	√
Maintain Lahontan cutthroat trout in Catnip Reservoir.	√	√	√
Continue stocking sterile rainbow trout in Big Spring Reservoir.	√		
Replace rainbow trout with Lahontan cutthroat or redband trout in Big Spring Reservoir.		√	
Replace non-native trout species in Virgin Creek with regionally indigenous trout fishery.		√	
Replace current sterile rainbow trout population in Big Spring Reservoir with Lahontan cutthroat or redband trout; discontinue stocking and allow to self-sustain (would persist only as long as initially stocked fish survive and rainfall is sufficient to maintain water level in the reservoir).			√

Rationale: Fishing is a priority, compatible, wildlife-dependent public use on Sheldon Refuge. Historically, management of cold-water fish on Sheldon Refuge has been conducted by NDOW with minimal involvement by refuge staff. NDOW has proposed to replace the current Lahontan cutthroat trout population in Catnip Reservoir (Independence and Pilot Peak strain Lahontan cutthroat trout) with the Quinn River/Blackrock strain of Lahontan cutthroat trout. The Quinn/River Blackrock strain is a rare strain that is native to the Quinn River and Blackrock watersheds in northwest Nevada. Currently, there are only a few remaining populations of this strain existing in approximately five streams located just east of Sheldon Refuge. The overall population size of this strain is fairly low and thus, ongoing recovery efforts are complicated. It would be beneficial to have a large, stable population of this strain in the event other populations are compromised. Once this population of Lahontan cutthroat trout is established, NDOW would capture juvenile trout and transport them to recovery streams as needed.

The current put-and-take stocking program in Big Spring Reservoir is not consistent with Service policies. Lahontan cutthroat trout in Catnip Reservoir are designated as an experimental and non-essential

population. Sheldon Refuge would continue to consult with NDOW to determine the appropriate cold-water fishery to retain at Catnip and Big Spring reservoirs.

Photo 2.14 When water is available, Big Spring Reservoir and Campground are popular destinations for Nevada anglers.

Objective 8c: Warm-Water Recreational Fisheries			
Provide opportunity for high-quality warm-water fishing at Dufurrena Ponds 19 and 20 and McGee Pond consistent with habitat management objectives.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Maintain artificial ponds and facilities to allow for a self-sustaining recreational warm-water fishing opportunity (see also Objective 3d).	√	√	
Establish a kiosk and/or brochure to educate the public about native desert fishes and invertebrates, and risks associated with spreading exotic species.		√	
Allow system to revert to natural conditions. Provide no active management and allow ponds to naturally fill with sediment and vegetation.			√
Rationale: Dufurrena Ponds 19 and 20 and McGee Pond are extremely popular with northern Nevada anglers. These ponds provide opportunities to catch non-native warm-water species such as large-mouth bass, white crappie, pumpkinseed sunfish, and yellow perch. The fish populations in these ponds are currently isolated from the Thousand Creek/Virgin Creek system, are self-sustaining, and do not require restocking by NDOW. These populations can be allowed to remain under Service policy.			

Objective 8d: Wildlife Observation and Photography
Within five years of the final decision for the CCP, prepare and implement a visitor services plan that addresses refuge public uses and facilities, including facilities for wildlife observation and photography.

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Publish and periodically update a general information brochure for Sheldon Refuge.	√	√	√
Develop a site plan for the Virgin Valley and Highway 140 focus area.		√	√
Develop educational brochure to provide self-guided observation opportunities.		√	√
Develop at least one interpretive trail with wildlife observation decks and other opportunities.		√	
Implement seasonal area closures for sensitive species and habitat protection.		√	√
Develop off-refuge wildlife viewing opportunities (e.g., remote web-based cameras, web postings of Sheldon Refuge wildlife projects).		√	√
Rationale: Most public use within Sheldon Refuge focuses on hunting, fishing, and rock collecting—similar to public use of surrounding public lands. Refuge staff have noted that relatively few visitors understand the mission of the Service or appreciate the differences between the purposes for Sheldon Refuge and those of surrounding BLM lands. The development of wildlife observation and photography opportunities and related environmental interpretation would bring visitor attention to these differences and promote compatible wildlife-dependent recreation opportunities, which are lacking not only within Sheldon Refuge, but throughout the region as well. The addition of observation decks and trails in specific locations would enhance the public's opportunity to see key representative species; however, other visitors may feel that these physical improvements are not necessary and could potentially take away from the overall primitive recreational experience. In addition, these improvements have the potential to affect wildlife behavior and can be detrimental to some species.			

Objective 8e: Environmental Education			
Within five years of the final decision for the CCP, develop volunteer and partner support to promote an outdoor education program.			
Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Use volunteer support and partnerships to develop outdoor education curriculum and programs to support local youth education opportunities.		√	
Seek partnerships with non-profit agencies to provide an environmental education coordinator.		√	

Rationale: Environmental education has been an underutilized program at Sheldon Refuge; however, it is a priority, wildlife-dependent public use under the National Wildlife Refuge System Administration Act, as amended, and a key mechanism to establish support for Sheldon Refuge. Through on-site programs demonstrating wildlife needs and requirements, visitors would learn how to practice proper wildlife viewing etiquette and the importance of our management actions in maintaining wildlife populations. Off-site education curriculum and programs could build a connection with local and remote schools.

Objective 8f: Visitor Facilities (see Figure 5.1)

Within five years of the final decision for the CCP, develop a site plan to identify public facilities and infrastructure that would improve visitor services.

Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)		√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Maintain current visitor contact space at Sheldon Refuge Office (Dufurrena).	√		
Develop a site plan for the Virgin Valley and Highway 140 focus area that improves the visitor experience.		√	√
Relocate and reconstruct Sheldon Refuge visitor contact station from Dufurrena to Highway 140. Install additional kiosks, trails, and interpretive sites if determined to be needed.		√	
Install additional kiosks, trails, and interpretive sites if determined to be needed.		√	

Rationale: The overall interpretive philosophy strategy proposed for the Sheldon Refuge is to maintain the "untouched" wild nature of Sheldon Refuge and limit signage and interpretation to preserve that character. At present, overall interpretive use is low, so impact is also presumed to be low. However, there is opportunity to design an environmental program that fosters recreation/education opportunities for the public, and long-term understanding of the National Wildlife Refuge System and the importance of conservation. Currently, the main visitor contact is at the Sheldon Refuge Office (Dufurrena). Replacement of this facility with a Refuge Headquarters Office and visitor contact station may better serve refuge visitors and motorists on Highway 140 while providing education and interpretation about the Sheldon Refuge. Also, a more focused visitor contact presence could mitigate some visitation issues with additional orientation potentially being performed by volunteers, partners, or other agencies.

Objective 8g: Public Participation and Support

Foster partnerships and develop public participation opportunities.

Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Increase recruitment of volunteers and implement additional volunteer projects.	√	√	√

Develop additional facilities to support resident volunteers and volunteer projects.		√	
Promote development of a "coalition of partners" to help meet Sheldon Refuge conservation goals.		√	√
Develop a volunteer cadre and/or provide additional Sheldon Refuge staff to facilitate public outreach.		√	√
Rationale: Sheldon Refuge does not currently have an officially recognized Friends Group but is working to establish a coalition of partners to include a variety of non-profit organizations. The formation of a Sheldon Friends Group would benefit Sheldon Refuge through advocacy, volunteerism, contributions to local economies, and direct links to surrounding communities as well as regional and national associations. Currently there are limited facilities available, but there may be additional opportunities to provide housing by improving existing and developing new facilities (e.g., trailer pads, hookups) for camp hosts and other volunteers. In addition, increased recruitment efforts at schools and universities, and among conservation groups, as well as general postings on the Sheldon Refuge web site and on www.volunteer.gov, may generate additional interest.			

Objective 8h: Developed Camping (see Figure 5.1)			
Provide developed camping opportunities at the Virgin Valley Campground to support wildlife-dependent public uses.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Allow open, unstructured camping at Virgin Valley Campground with limited facilities.	√		√
Define and post the Virgin Valley Campground boundary, and designate and physically define campsites.		√	
Raise quality standards at Virgin Valley Campground and convert to a fee campground.		√	
Develop interpretive signs for the public.		√	√
Rationale: While camping is not a priority wildlife-dependent public use on Sheldon Refuge, as defined in the Refuge Improvement Act, it does directly support priority wildlife-dependent uses such as hunting, fishing, wildlife observation, and photography. Recent increased use of the Virgin Valley Campground is attributed to visitation at neighboring private opal mines. During peak seasons, overcrowding and user conflicts are of concern, as well as overflow into areas immediately adjacent to the campground resulting in further environmental impacts. For example, the riffle beetle, a rare, endemic invertebrate, inhabits the outfall of the hot springs pool that terminates in McGee Pond several yards away. Additionally, exotic, non-native species have been introduced by the public into the springs including guppies, bullfrogs (both adults and tadpoles), and warm-water fish. Service policy provides guidance to protect habitat, cultural resources, and compatible wildlife related recreation. As popularity increases, it is essential to effectively manage this area to ensure that the appropriate			

information is relayed to visitors and that camping remains a high-quality experience (as defined by Service policy) for visitors participating in wildlife-dependent recreational uses. Campground improvements to define and designate campsites would eliminate visitor confusion, reduce impacts to vegetation and historic resources, and improve law enforcement consistency. Campsite registration and fees for overnight use would improve the level of maintenance for existing facilities, and enhance visitor education and outreach through volunteer campground hosts. A campsite fee structure based on length of stay is expected to eliminate site competition, but maintain opportunities for long-term use for visitors willing to pay the higher fees.

Objective 8i: Semi-primitive and Primitive Campgrounds (see Figure 5.1)

Provide semi-primitive and primitive-vehicle-accessible camping opportunities at designated sites in support of wildlife-dependent public uses.

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Continue to provide semi-primitive and primitive camping opportunities at 12 designated campgrounds.	√		
Delineate campground boundaries to eliminate sprawl.		√	
Develop additional amenities at Big Spring and Catnip Reservoir campgrounds and convert to fee campgrounds.		√	
Relocate up to nine campgrounds to minimize impacts to sensitive riparian habitats and cultural resources (see also strategy for Objectives 3a and 3b).		√	
Consolidate up to four campgrounds with other existing campgrounds to reduce impacts to sensitive riparian habitats and cultural resources (see also strategy for Objectives 3a and 3b).			√

Rationale: Currently, there are five semi-primitive and seven primitive campgrounds designated on Sheldon Refuge; however, these campgrounds have no clear boundaries and individual campsites have no formal delineation. Additionally, refuge camping areas lack natural barriers that limit vehicle traffic, posing disturbance threats to sensitive riparian areas and cultural sites. Vegetation and cultural resources are most vulnerable to the impacts of undefined camping. The physical impacts of camping can be unsightly and are inconsistent with the natural setting desired on Sheldon Refuge.

The majority of scoping comments received were in support of moving campgrounds out of sensitive areas and providing enhanced facilities at the developed Virgin Valley Campground.

Objective 8j: Primitive Camping

Provide opportunities for permit-only primitive backcountry camping in support of wildlife-dependent public uses and to maintain primitive character and outstanding opportunities for solitude.

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√

Strategies Applied to Achieve Objective	Alt 1	Alt 2	Alt 3
Require Special Use Permits for all overnight use outside designated campgrounds.	√	√	√
Increase public awareness of primitive backcountry camping opportunities and natural features to minimize pressure on current developed and semi-primitive campgrounds.	√	√	
Monitor number of backcountry permits issued and develop more comprehensive regulations if use exceeds appropriate thresholds for solitude (which would be established though monitoring of existing use and visitor surveys).		√	√
Rationale: At present, permit-only primitive backcountry camping is considered underutilized, and the program could be further developed to alleviate pressure on existing developed, semi-primitive, and primitive campgrounds. This would provide visitors with a sense of solitude and an enhanced appreciation for the vast landscape. Backcountry camping is consistent with wilderness policy and established WSAs on Sheldon Refuge, and provides a compatible camping alternative in support of wildlife-dependent public uses. Overnight backcountry use would be maintained at a low level that does not cause readily apparent environmental impact and preserves outstanding opportunities for solitude.			

Objective 8k: Horseback Riding			
Provide horseback riding opportunity in support of wildlife-dependent public uses.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Allow horseback riding throughout Sheldon Refuge under current regulations.	√	√	√
Allow horseback access to the backcountry for overnight use outside of established campgrounds.	√	√	√
Monitor use by horseback riders and develop more comprehensive regulations if use increases.		√	√
Rationale: Recreational horseback riding is not considered a wildlife-dependent public use; however, it does support priority wildlife-dependent uses such as hunting and wildlife observation. Other than travel on foot, horseback riding is the only form of non-mechanized transportation into Sheldon Refuge's wilderness backcountry. Horseback riding on Sheldon Refuge has historically occurred in small numbers, and estimates of current refuge use from incidental observation are less than 10 horseback groups per year. The current level of use is believed to have very little impact on refuge habitats. If monitoring as part of Alternative 2 (preferred) determines that there are impacts related to use of springs, introduction or spread of noxious weeds, or conflict with other public uses is occurring, Sheldon Refuge would establish thresholds for impacts from horseback riding and regulate as necessary to maintain a compatible level of use.			

Objective 8l: Rock Collecting
Provide opportunities for rock collecting which are compatible with refuge purposes, goals, and other public uses.

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Continue to allow the surface collection and removal of up to seven pounds of rock per person, per day.	√	√	√
Develop outreach materials to educate the public about appropriate rocks for collection, acceptable collection methods, and potential conflicts with other Federal regulations.		√	√
Increase law enforcement to maintain fewer than five violations related to rock collecting per year.		√	
Implement mandatory Special Use Permits if five or more violations associated with rock collecting are documented in two years of any five-year period.			√
Rationale: While not a priority, wildlife-dependent public use, collecting rocks and minerals on Sheldon Refuge is a pre-existing compatible use that has become popular with some visitors and that Sheldon Refuge has the authority to authorize. The public can surface-collect up to seven pounds of material per day, which includes petrified wood, opal, and agate. Refuge brochures currently promote this activity and a compatibility determination was prepared and last updated in 1999. However, rock collecting can cause conflict with the Archaeological Resources Protection Act and the National Historic Preservation Act (NHPA) enforcement because individuals engaged in rock collecting, either knowingly or unknowingly, may also illegally collect cultural or historic resources (e.g., arrowheads and fossils). While violations associated with rock collecting are suspected to occur on Sheldon Refuge, it is unknown how many violations occur or if a sufficient number of violations are inadvertent or unintentional that violations could effectively be reduced through additional regulation or permit. The preferred alternative proposes an adaptive management strategy to more accurately document where and why violations occur and adjust refuge outreach efforts accordingly.			

Objective 8m: Vehicle Access			
Allow off-highway vehicle (OHV) access in support of wildlife-dependent public uses on roads open to vehicle traffic.			
Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Allow OHVs refuge-wide on roads designated open to vehicle traffic.	√	√	√
Require OHV operators to register their vehicle(s) with Sheldon Refuge and limit use to only wildlife-dependent recreation on roads designated open to public use of vehicles.		√	
Rationale: OHV use is an accepted mode of transportation on roads only open to vehicle traffic in support of compatible wildlife-dependent public use; recreational use of these vehicles is not. However, current limitations and restrictions on the use of OHVs on Sheldon Refuge are neither well-communicated nor enforced. In addition, illegal OHV use within proposed wilderness areas and WSAs is a management			

concern as is damage caused to roads and adjacent habitats during wet conditions. Illegal off-road travel to retrieve game, and access remote areas for recreational use is also a growing concern because of increasing damage to fragile habitats in the High Desert. Reducing the number of OHV violations and damage to natural resources is necessary to ensure the use remains compatible with the purposes for Sheldon Refuge and the Wilderness Act. For three reasons—the remoteness and rugged terrain of Sheldon Refuge, the small number of law enforcement officers, and the inability to positively identify individual OHVs for law enforcement purposes—requiring OHV users obtain Special Use Permits is one of the only practical ways to both inform the public and effectively enforce existing regulations.

Objective 8n: Transportation Management

Within three to five years of the final decision for the CCP, develop and adopt a transportation management plan (see also Figures 2.1, 2.2, and 2.3 depicting maps of the three transportation management alternatives).

Public Access and Transportation: Manage a network of roads, routes, and trails to provide access for compatible wildlife-dependent public uses consistent with recognized Recreation Opportunity Spectrum Setting descriptions for Primitive, Semi-Primitive Nonmotorized, Semi-Primitive Motorized, Roaded Natural, and Rural categories (see Appendix L).

Other Access and Transportation: For roads and routes currently closed or not designated open to general public use, authorize access and transportation for administrative use necessary to implement management goals and objectives and for special uses such as mining claims, mill site claims, private lands, power line rights-of-way, and other non-public uses on a case-by-case basis by Special Use Permit. Special Use Permits would determine reasonable routes, modes, and frequency for transportation consistent with applicable laws, regulations, and policies.

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Develop a brochure with a detailed transportation map and road policy.	√	√	√
Implement seasonal road closures on routes open to public travel to reduce soil erosion and wildlife impacts.	√	√	
Continue to allow public use of all vehicle routes outside the proposed wilderness areas for wildlife-dependent public uses (approximately 365 miles; see Figure 2.1).	√		
Designate vehicle routes open to public use that are determined to have minimal or no impacts to wildlife and wildlife habitat or impacts that can be minimized through management actions such as re-routing, placement of culverts, and construction of waterbars, and that also provide access determined necessary to support wildlife-dependent public uses (approximately 300 miles, plus an additional 38 miles contingent upon wilderness proposal). Designate other routes necessary to support Sheldon Refuge operation and administrative needs (see Figure 2.2).		√	

Convert Kinney Camp access route to a pedestrian trail to support environmental interpretation and wildlife observation (see Figure 2.2).		√	
Designate vehicle routes open to public use that are determined to have minimal or no impacts to wildlife and wildlife habitat without additional management action to minimize or reduce impacts and that also provide access determined necessary to support wildlife-dependent public uses (approximately 289 miles, plus an additional 33 miles contingent upon wilderness proposal). Designate other routes necessary to support refuge operations and administrative needs (see Figure 2.3).			√
Identify and place signs indicating roads and routes closed to public use and the use of mechanized equipment and vehicles.	√		√
Identify and place signs indicating roads and routes open to public use and the use of mechanized equipment and vehicles. Inform Sheldon Refuge visitors that all unmarked roads and routes are closed to public entry and use.		√	
Increase signage and develop an auto tour route adjacent to Highway 140.		√	
Maintain all improved primary access routes (Highways 140, 8A, 34, 34A; Summit Lake/Badger, Bog Hot, and Virgin Valley roads).	√		
Increase the frequency of maintenance on improved roads.		√	
Maintain only state, county, and other improved roads where agreements are currently in place (Highways 140, 8A, 34, 34A; Summit Lake/Badger and Bog Hot roads).			√
Rehabilitate and naturalize closed, abandoned, or illegal roads and routes using methods that require minimal disturbances over the shortest distance necessary.		√	
Rationale: Vehicle access is important to support wildlife-dependent public uses on Sheldon Refuge, but a large number of routes have appeared over time as a result of mineral prospecting, ranching, fire suppression, and trespass. In addition, there is a need to allow access and transportation along other existing roads and routes for valid existing rights and uses. Sheldon Refuge is interested in providing for a variety of visitor experiences and access means, including vehicular, horseback, and pedestrian access. At present, there are several hundred miles of roads on Sheldon Refuge used by motorized vehicles, many of which are duplicative (i.e., they lead to the same destination), routed through sensitive ecological or cultural areas, or were not specifically opened for public uses and consequently have been closed. Within the Virgin Valley area alone, more than 120 miles of routes have been established through prospecting and mining. These routes are located in highly erodible soils, often cross seasonal drainages at unsuitable locations or without adequate construction, and provide little or no access necessary for wildlife-dependent public uses. Consequently, authorizing use of these routes on a case-by-case basis through a Special Use Permit may be appropriate, but there is no need to designate these routes open for general public use. Road status (open, closed, or administrative) should be based on a combination of administrative needs (including fire protection); habitat, wildlife, and wilderness concerns; cultural and historical resource protection; safety considerations; current public use program and anticipated changes; and maintenance capability. Roads open to vehicular traffic should be classified by vehicle capability, seasonal conditions, and long-term maintenance standards and needs.			

A comprehensive evaluation of the road network was completed for the entire network of roads and motorized routes throughout Sheldon Refuge. Each route was evaluated using three sets of criteria:

1) Public Use criteria included associated wildlife-dependent uses; access to specific destinations; the presence of alternate routes in close proximity or to the same destination; conflicts with other uses; law enforcement difficulties and issues associated with vehicle access; natural appearance and revegetation of the route; and hazards to public safety from current route condition.

2) Resource Impact criteria received more weight in the evaluation than did Public Use criteria and included erosion and other soil impacts; damage to riparian habitats and other rare, unique or sensitive habitats (see Goal 4); disruption, disturbance, or harassment of wildlife; and impacts or disturbance to known sites of cultural, historic, or religious importance. The evaluation included impacts from use of the route itself and from activities associated with use of the route.

3) Access and Transportation criteria included function of the route as a collector for other routes; as a route connecting to other existing roads outside the refuge; and as a route providing access to trailheads or key points of access to non-motorized portions of the refuge.

The final determination for vehicle routes proposed under Alternative 2 (preferred alternative) included only those routes that had no net adverse impact or only slightly net adverse impacts that could be acceptably reduced through intensive management actions such as route realignment; culverts, waterbars, or other water control structures; or seasonal closure. Routes included under Alternative 3 included only those routes that had no net adverse impact or only a slightly net adverse impact that could be acceptably reduced through minimal management action and activity (e.g., seasonal closure).

Photo 2.15 The majority of vehicle routes within Sheldon Refuge are primitive and not suitable for two-wheel drive (Photo Aaron Collins).

Objective 8o: Commercial Outfitting and Guiding

Within one year of the final decision for the CCP, develop and implement a Commercial Hunting Outfitter and Guide Operations Plan.

Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Review qualifications and issue five-year Special Use Permits for up to 10 commercial operators to guide and outfit hunters.	√	√	√
Rationale: Commercial hunting guides often provide opportunities for hunters who would not be able to participate otherwise, and these guides increase the probability that less experienced hunters can enjoy a safe and successful opportunity which might be available only once in their lifetime. Sheldon Refuge encourages family oriented sport hunting consistent with promoting positive hunting values and hunter ethics. The hunting program at Sheldon Refuge emphasizes quality hunting experiences, which includes less crowding, less competition, fewer conflicts between hunters, relatively undisturbed wildlife, greater hunter safety, and less interference from or dependence on mechanized aspects of the sport. Commercial guiding activities authorized on refuge lands would contribute to these principles under established Special Use Permit conditions. Through a wilderness MTA, Sheldon Refuge has determined no more than 10 commercial guide operations would be needed to provide necessary services to the public. Due to the large proportion of lands currently proposed for wilderness designation, the maximum number of 10 permits would apply to the entire Sheldon Refuge. Guides would compete for five-year Special Use Permits through a prospectus system based upon determination of which submitted proposals best meet criteria established by the Service and Sheldon Refuge, and which provide the best quality services to the public. Permits for guides in good standing could be renewed for one additional five-year period without competition.			

Objective 8p: Administrative Facilities			
Within five years of the final decision for the CCP, develop and implement a facilities plan to identify buildings and structures necessary to support refuge operations and enhance visitor services.			
Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Maintain current Sheldon Refuge Office and shop complex at Dufurrena.	√		√
Conduct energy audit implement recommendations to reduce energy costs.	√		√
Relocate Sheldon Refuge administrative offices to Highway 140.		√	
Construct additional quarters and facilities to support increased staffing and volunteers necessary to implement the CCP.		√	
Rationale: To fully implement the CCP, additional facilities would be necessary to accommodate more volunteers and increased staffing. The current administrative offices for the Sheldon Refuge are located in a small mobile home trailer and are barely adequate for year-round operations. Maintaining the existing facilities would require remodeling and is expected to become increasingly more expensive due to the type and age of the trailer. The most efficient and cost-effective option to meet all needs is to construct a new facility along Highway 140 to accommodate both administrative and public use needs.			

Photo 2.16 The Sheldon Refuge Office cannot accommodate the visiting public and the necessary office space.

2.2.9 Goal 9. Protect and manage Sheldon National Wildlife Refuge Wilderness Study Areas to maintain wilderness character and values.

Objective 9a: Wilderness Study Areas			
Manage WSAs to protect wilderness character.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Manage approximately 439,200 acres identified as WSAs and/or proposed wilderness area for naturalness, wildness, and opportunities for solitude or primitive and unconfined recreation.	√	√	√
Continue to use motorized equipment and vehicles on previously established routes to conduct prescribed fire and selective thinning of juniper consistent with the 2001 MTA.	√		
Determine the minimum administrative action necessary within the proposed wilderness areas and WSAs through the CCP/EIS alternatives and impact analysis.	√	√	√
Consistent with Refuge System policy for management of proposed wilderness areas, determine the minimum tool necessary to implement actions within each alternative, which could include activities otherwise prohibited by Section 4c of the Wilderness Act and Manual Section 610 FW 1.6. Actions to be analyzed include gathering of horses and burros; inventory, monitoring, and study of large mammals; removal of abandoned commercial livestock developments; restoration and rehabilitation of springs and playas; thinning and removal of expanding juniper; maintenance of guzzlers;		√	√

and weed control (see Appendix G).			
Rationale: As part of the wilderness review, the Service determined 388,742 acres on Sheldon Refuge satisfy the minimum criteria for wilderness designation and are now classified as WSAs. The remaining 50,462 acres were not found to meet the minimum criteria but were previously proposed for wilderness designation. Service policy (see 610 FW 4) also directs that WSAs are to be managed so as to not adversely affect wilderness character until completion of the wilderness review and, if appropriate, action by Congress. In addition, those areas proposed in 1974 for designation as wilderness will continue to be managed as wilderness until further action by the President and/or Congress. If and when the President proposes to Congress that the WSAs recommended by the Service be designated as wilderness, those proposed wilderness areas will be managed as wilderness in accordance with Service Policy 610 FW 1. Current Service policy for the management of proposed wilderness WSAs was completed after the 2001 MTA for juniper treatment within Sheldon Refuge. To ensure consistency with current policy, a minimum requirement decision and analysis including an MTA needs to be completed for management activities planned within these areas.			

Objective 9b: Wilderness Recommendations			
Identify and recommend areas suitable for wilderness designation.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Recommend 341,500 acres previously proposed for wilderness designation (see Figure 2.4).	√		
Recommend approximately 341,935 acres for wilderness designation which best coincide with habitat management objectives and existing public uses (includes approximately 267,745 acres currently proposed, see Figure 2.5).		√	
Recommend approximately 236,791 acres for wilderness designation which represent the most pristine areas within Sheldon Refuge (includes approximately 193,966 acres currently proposed, see Figure 2.6).			√
Rationale: Consistent with the Wilderness Stewardship Policy (610 FW 1), Sheldon Refuge conducted a wilderness inventory and study in association with development of this CCP. Based upon this inventory and study, Sheldon Refuge proposes 341,935 acres be recommended for wilderness designation. This recommendation is included as Appendix F and is the preferred alternative for this CCP.			

2.2.10 Goal 10. Protect and manage the prehistoric, historic, and paleontological resources of Sheldon Refuge to ensure present and future generations recognize the significance of the area's past.

Objective 10a: Historic Structures (see Figure 5.1)			
Within 10 to 15 years of the final decision for the CCP, complete an inventory of historic structures and determine appropriate level of protection and preservation.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**

Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Maintain necessary law enforcement measures.	√	√	√
Develop a Cultural Resources Management Plan.	√	√	√
Record all historic structures as Sheldon Refuge facilities for the purposes of asset and property management, evaluating historic priority, and maintaining Federal compliance.	√	√	
Continue minimal inventory, protection, and rehabilitation as current staff time and funding allow.	√		
Inventory and protect all sites through the use of partnerships, rehabilitate two to three of the most important structures, interpret one site (e.g., Kinney Camp or Virgin Valley Ranch), and collect an oral history.		√	
Collect new information on historic resources.		√	
Make some structures (i.e., Little Sheldon Civilian Conservation Corps Overlook Cabin or Badger Mountain Work Cabin) available for overnight rental, improve other structures for Sheldon Refuge use, and collect an oral history.		√	
Let sites deteriorate and revert to natural conditions.			√

Rationale: Most historic structures within Sheldon Refuge are associated with late nineteenth and early twentieth century homesteading and ranching, or the Civilian Conservation Corps (CCC) activities between 1935 and 1941 (see Table 5.1). Historic structures (with the exception of historic buildings at the Alkali Ranch) have had initial basic evaluations and surveys, but detailed inventories and collection of historic data have not been completed. These sites contain wood, stone, or concrete buildings and structures, as well as buried historic artifact deposits. The effects of weather and vandalism on them are increasingly evident with the passage of time. Visitors value these sites and often visit them. The highest priority structures would be rehabilitated.

An untapped and important resource, which needs to be utilized as soon as possible, is the oral history, which can record information from long-time residents of the area and descendants of original settlers. With the continued passage of time, this rich history is forgotten or lost.

Both the Kinney Camp and Virgin Valley Ranch sites provide the best opportunities for interpretation. Both are relatively accessible to the public and could easily be incorporated into the proposed auto tour route. The Virgin Valley Ranch is near wet meadow and riparian habitats and provides waterfowl and other wildlife viewing opportunities. Kinney Camp has several historic buildings and unique corral construction, with more opportunities for solitude and less evidence of modern developments, which help to recreate the historic setting for interpretation.

Photo 2.17 The historic Kinney Camp homestead is centrally located to other public uses within Sheldon Refuge.

Photo 2.18 The Overlook Cabin at the west entrance to Sheldon Refuge is representative of work done by the Civilian Conservation Corps.

Objective 10b: Interpretation of Prehistoric Cultural Resources			
Use partnerships to opportunistically inventory, evaluate, stabilize, and interpret prehistoric cultural resources.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Conduct inventory, evaluation, and protection for Federal compliance at active refuge management sites.	√	√	√
Develop and conduct a systematic inventory, evaluation, and protection plan for approximately 10% of Sheldon Refuge.		√	
Interpret and educate the public on prehistoric resources, emphasizing first peoples, prehistoric land, and resource use.		√	
Establish inventory and research program with universities and/or scientific organizations.		√	√

Exchange information and coordinate planning with Tribes, historical institutions, and other preservation partners for research, interpretation, and protection of cultural resources.		√	√
Rationale: Sheldon Refuge is rich with prehistoric cultural sites. They include rock art, lithic scatters, material quarries, resource utilization sites, and village sites. The two largest threats to archaeological sites at Sheldon Refuge are feral horses and disturbance associated with public use. Looting of archaeological and historic sites has been a serious problem for decades on Sheldon Refuge. To address these challenges the first need is to inventory and research a sample of the archaeological sites of Sheldon Refuge, particularly at places that sustain high use by the public or feral horses. Once the information potential and specific management needs of the resources have been identified, an implementation plan can be prepared to recover scientific data, stabilize erosion, protect cultural information, and interpret cultural resources for the public. Due to current staffing levels and higher priorities for any additional future staffing and programs, accomplishment of the strategies identified for this objective would be primarily through partnerships and agreements with other agencies and organizations.			

Photo 2.19 Petroglyphs scattered throughout Sheldon Refuge remind visitors of the region's earliest inhabitants.

Objective 10c: Paleontological Resources			
Use partnerships to opportunistically inventory, evaluate, protect, and research paleontological resources.			
Alternatives	**Alt 1** (no action)	**Alt 2** (preferred)	**Alt 3** (natural processes)
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Provide protection measures to ensure that important paleontological resources are not adversely impacted.	√	√	√
Establish inventory and research program with universities or scientific organizations to identify, map, and research paleontological resources.		√	

Inventory and assess paleontological collections.		√	
Rationale: Preliminary studies carried out in the 1980s identified rich and diverse paleontological resources on Sheldon Refuge, primarily in the lacustrine deposits of Virgin Valley and the Thousand Creek basin. Limited excavation and collection of specimens by several universities occurred during this time. There was also a large expedition in the early 1900s. Since then little information has been gathered to identify and research the extent and importance of these resources.			

Objective 10d: Partnerships			
Develop partnerships opportunistically to help document and record cultural resources.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Establish inventory and research program with university or scientific programs.	√	√	√
Work with local historical societies to research historic records and capture oral histories.	√	√	
Inventory and assess cultural resource collections.	√	√	
Initiate projects similar to Passport in Time projects conducted on National Forests.		√	
Rationale: Limited funding of the cultural resources program on Sheldon Refuge has, at present, mainly kept the program at a very basic level of site identification and compliance with Section 106 of the NHPA during active Refuge management projects. Only a small portion of Sheldon Refuge has been inventoried extensively and had sites recorded appropriately. Future increases in funding at Sheldon Refuge would be directed toward projects more directly related to the conservation of fish, wildlife, plants and their habitats. Therefore, accomplishment of objectives for the protection and management of historic, prehistoric, and paleontological resources could realistically be accomplished through continued development of partnerships.			

Objective 10e: Tribal Coordination and Consultation			
Coordinate and consult with Tribes on natural and cultural resource protection.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Annually coordinate with staffs of Tribes.	√	√	√
Share cultural resource information between Tribes and Sheldon Refuge.	√	√	√

Establish Native American Graves Protection and Repatriation Act protocol and develop Memorandum of Understanding for handling inadvertent discoveries.	√	√	√
Coordinate with tribal cultural resource programs to identify and plan for management of significant sites.		√	
Rationale: Although Sheldon Refuge has had direct consultation and meetings with the Northern Paiute Tribe in the past, it is important that communication and consultation become more regular and systematic on issues of shared interest. In partnership with local Tribes (e.g., Summit-Lake Paiute, Fort McDermott, Fort Bidwell, Burns-Paiute, and Cedarville Rancheria), Native American Graves Protection and Repatriation Act protocol and procedures for handling inadvertent discoveries of human remains, burial objects, and sacred objects need to be addressed.			

2.2.11 Goal 11. Reduce illegal and unauthorized activities on Sheldon Refuge.

Objective 11a: Law Enforcement			
Within five years of the final decision for the CCP, develop a Law Enforcement Plan.			
Alternatives	**Alt 1 (no action)**	**Alt 2 (preferred)**	**Alt 3 (natural processes)**
Objective as written above applies to alternatives indicated (√)	√	√	√
Strategies Applied to Achieve Objective	**Alt 1**	**Alt 2**	**Alt 3**
Work with partners to develop educations materials to avoid illegal activities.	√	√	√
Provide adequate patrolling, and enforcement of regulations to eliminate unauthorized use of areas closed to public use of vehicles.	√		
Increase both law enforcement patrols and regular staff presence to reduce unauthorized or illegal activities.		√	√
Provide training for staff to recognize and deal effectively with specialized violations.		√	
Rationale: Illegal and unauthorized uses that occur on Sheldon Refuge presently include illegal OHV use, camping outside of designated areas, poaching, archaeological theft, vandalism, and theft of refuge signs. Illegal uses persist partly because of the lack of public knowledge and support, as well as limited law enforcement capability. Currently the Sheldon Refuge Manager also serves as a law enforcement officer, and one full-time officer is assigned to both Sheldon and Hart Mountain refuges. Due to the vast area to patrol, additional law enforcement is necessary for adequate coverage.			

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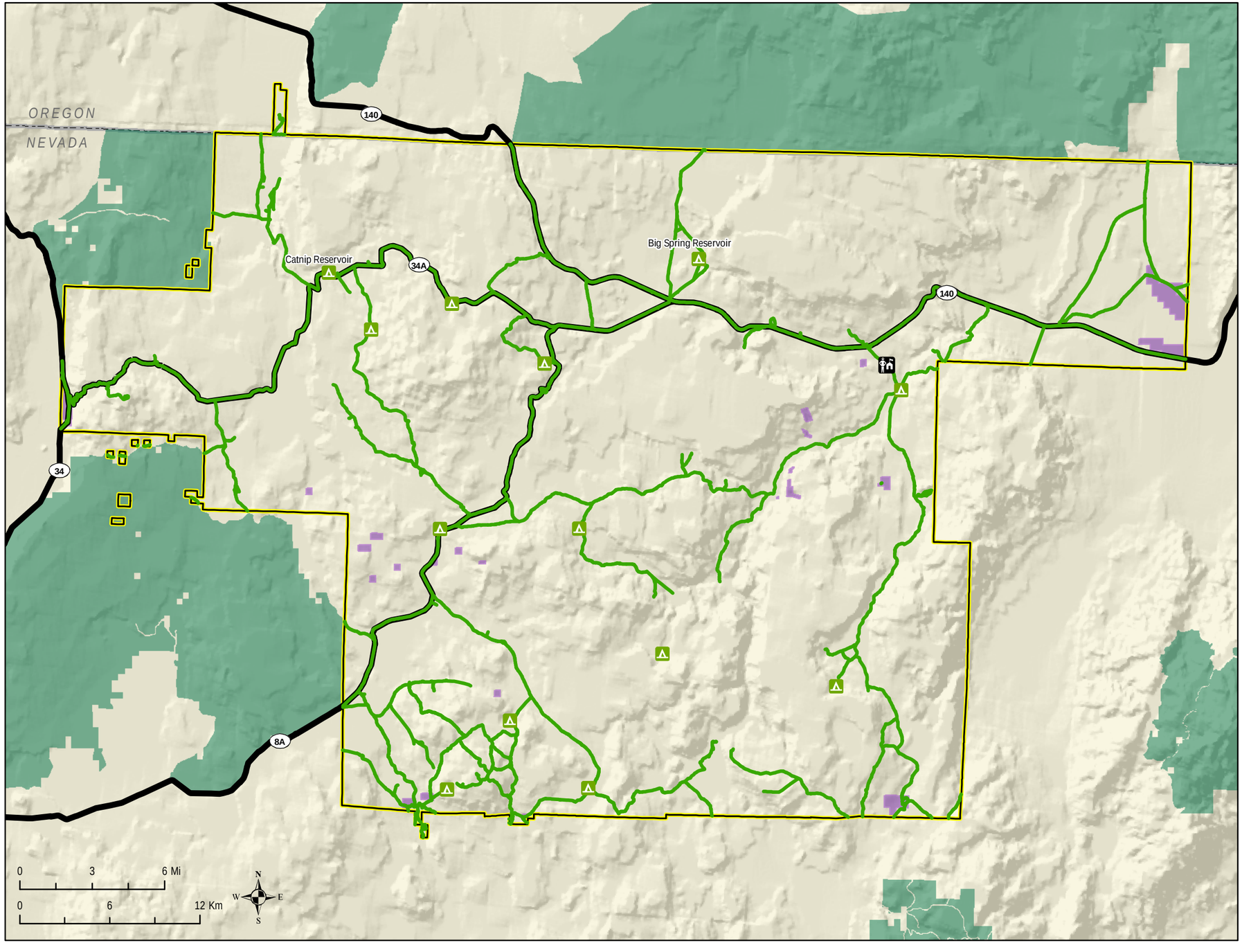
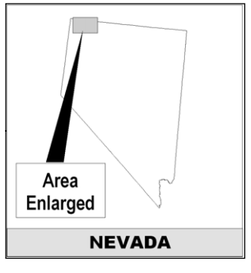


Figure 2.1
Public Vehicle Access for Sheldon National Wildlife Refuge Alternative 1

LEGEND

- Approved Refuge Boundary
- Private Lands (Inholdings)
- Refuge Headquarters
- Refuge Campgrounds
- BLM Wilderness Study Areas
- Highways
- Existing Vehicle Routes (clipped to Refuge)



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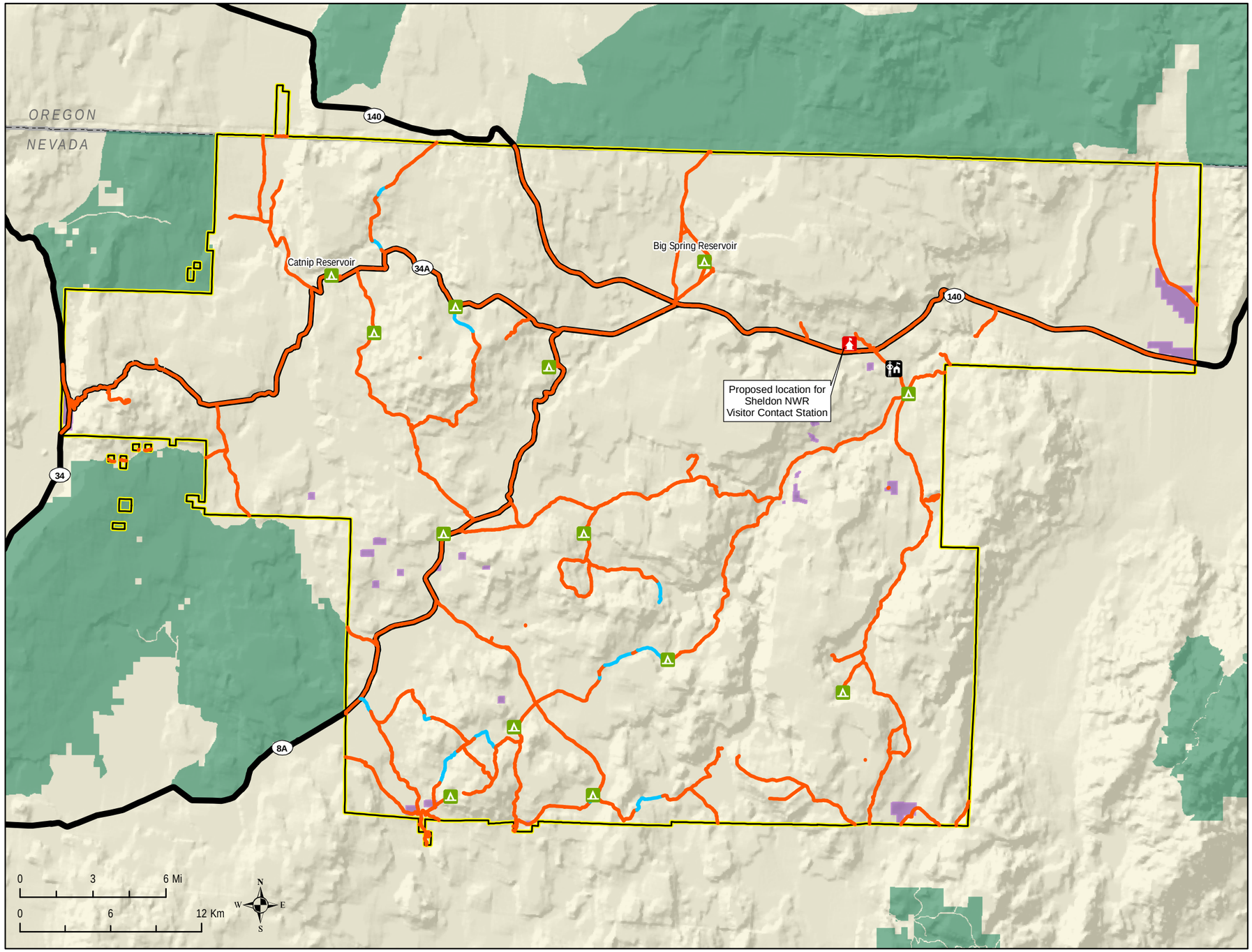
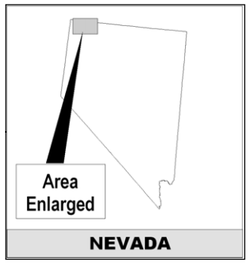


Figure 2.2
Public Vehicle Access for
Sheldon National Wildlife Refuge
Alternative 2

LEGEND

- Approved Refuge Boundary
- Private Lands (Inholdings)
- BLM Wilderness Study Areas
- Refuge Headquarters
- Proposed Visitor Contact Station
- Refuge Campgrounds
- Public Vehicle Routes (Alternative 2)
- Rehabilitate or Relocate
- Highways



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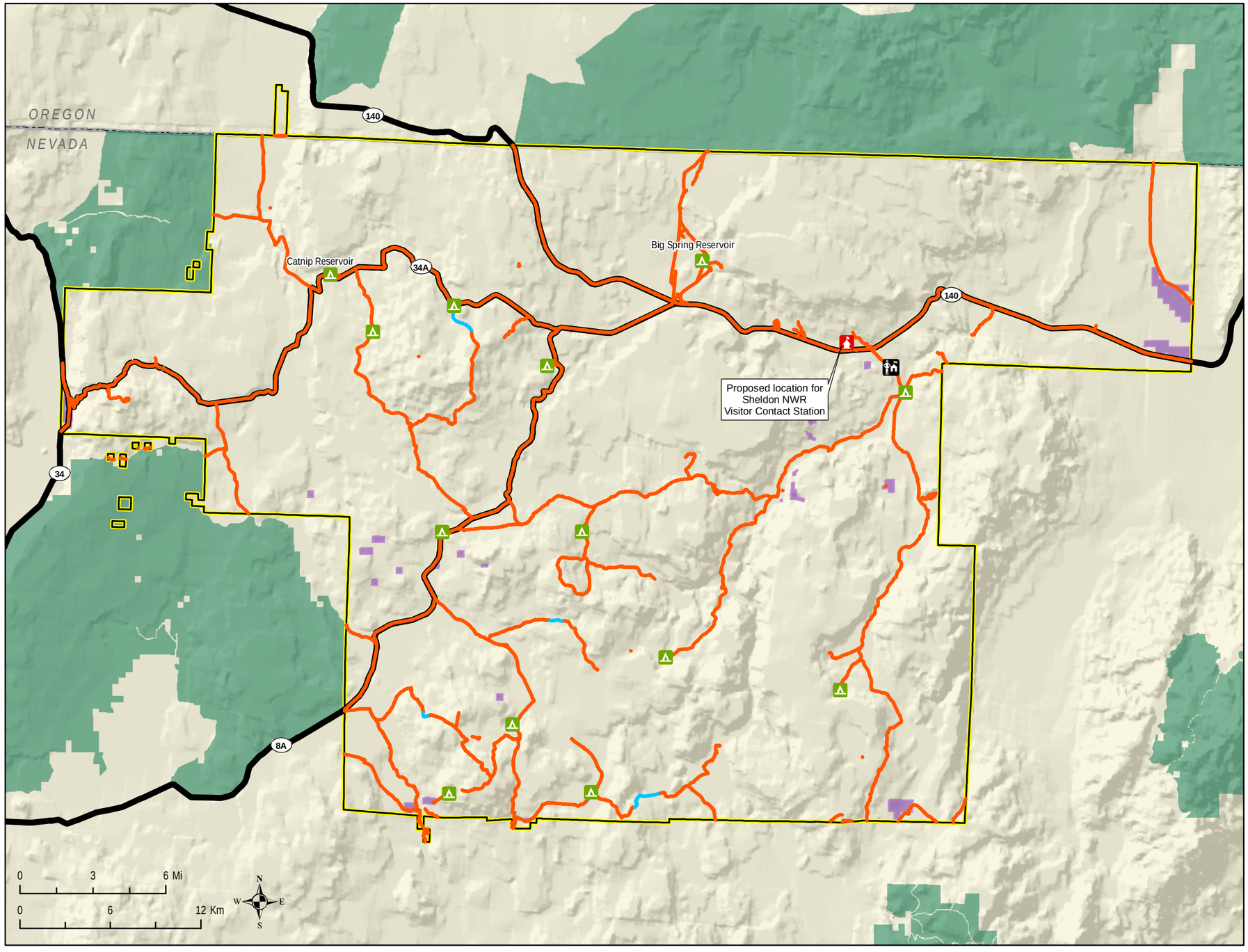
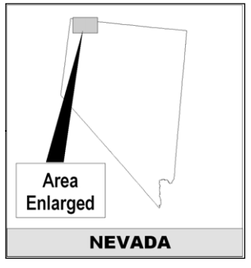


Figure 2.3
Public Vehicle Access for
Sheldon National Wildlife Refuge
Alternative 3

LEGEND

- Approved Refuge Boundary
- Private Lands (Inholdings)
- BLM Wilderness Study Areas
- Refuge Headquarters
- Proposed Visitor Contact Station
- Refuge Campgrounds
- Public Vehicle Routes (Alternative 3)
- Rehabilitate or Relocate
- Highways



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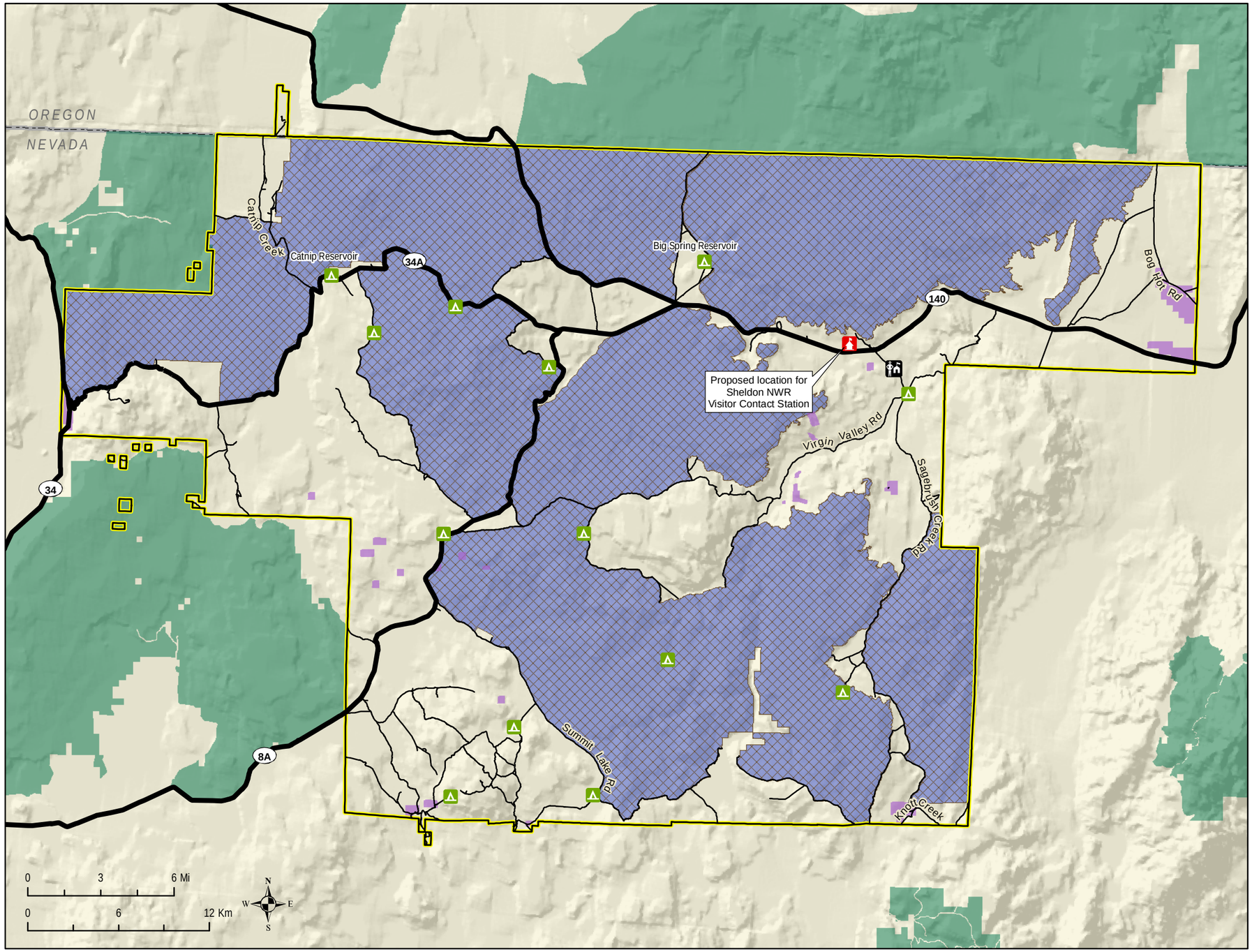
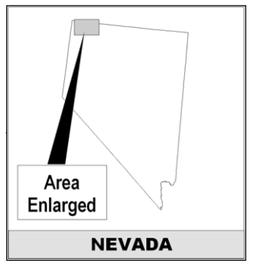


Figure 2.4
Wilderness Recommendations
Alternative 1

LEGEND

- Approved Refuge Boundary
- Private Lands (Inholdings)
- Refuge Headquarters
- Proposed Visitor Contact Station
- Refuge Campgrounds
- Current Proposed Wilderness Areas
- Recommended Wilderness Areas (Alternative 1)
- BLM Wilderness Study Areas
- Highways
- Existing Vehicle Routes



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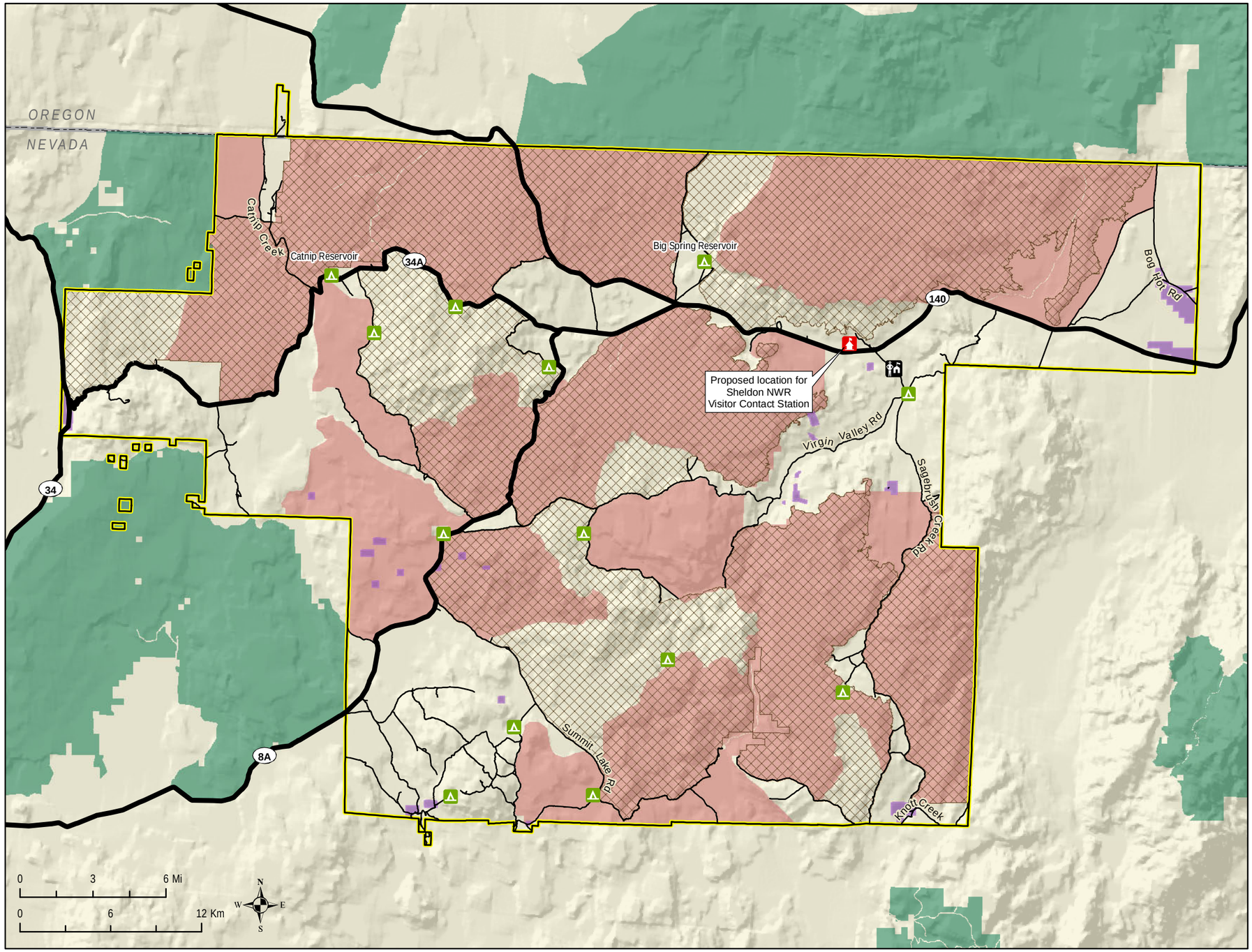
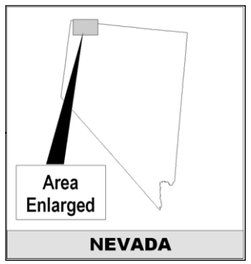


Figure 2.5
Wilderness Reccomendations
Alternative 2

LEGEND

- Approved Refuge Boundary
- Private Lands (Inholdings)
- Refuge Headquarters
- Proposed Visitor Contact Station
- Refuge Campgrounds
- Current Proposed Wilderness Areas
- Recommended Wilderness Areas (Alternative 2)
- BLM Wilderness Study Areas
- Highways
- Existing Vehicle Routes



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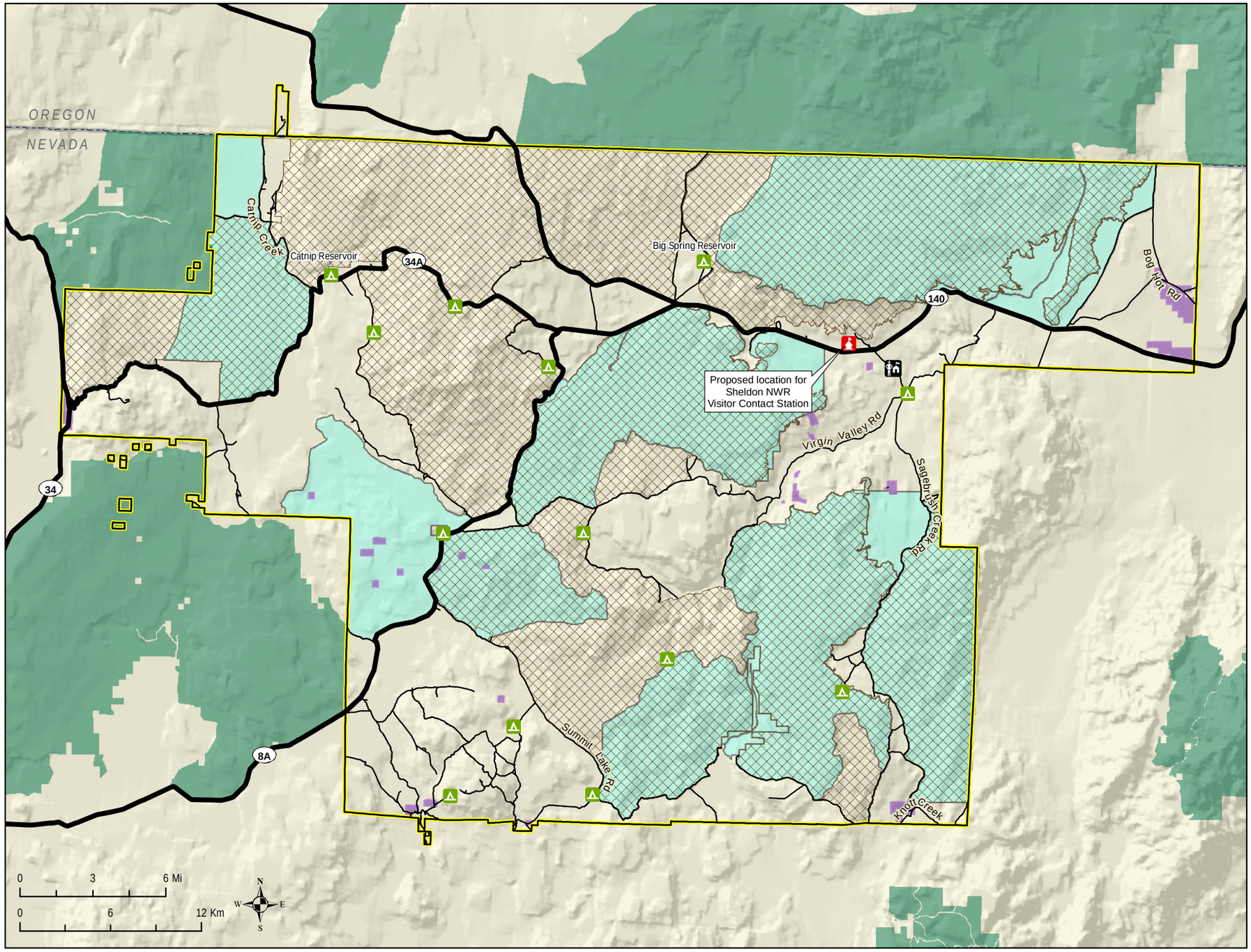
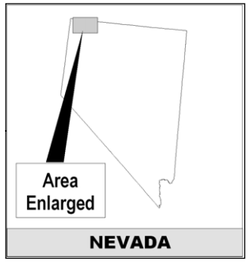


Figure 2.6
Wilderness Reccomendations
Alternative 3

LEGEND

- Approved Refuge Boundary
- Private Lands (Inholdings)
- Refuge Headquarters
- Proposed Visitor Contact Station
- Refuge Campgrounds
- Current Proposed Wilderness Areas
- Recommended Wilderness Areas (Alternative 3)
- BLM Wilderness Study Areas
- Highways
- Existing Vehicle Routes



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Chapter 3. Physical Environment

3.1 Geographic and Ecosystem Setting

3.1.1 Great Basin Ecosystem

The Great Basin Ecosystem is defined by sagebrush-steppe, salt desert shrub, and pinyon-juniper woodland habitats and the various other fish and wildlife species which live within those habitats. This ecosystem encompasses a portion of the Columbia Basin Plateau in eastern Oregon and southern Idaho as well as the Great Basin Region extending from the Sierra Nevada Mountains in eastern California, across most of Nevada north of the Mojave Desert, to the Rocky Mountains in western Utah. The Great Basin Ecosystem, comprising three ecoregions—the Columbia Plateau, Great Basin, and Wyoming Basins—supports the majority of sagebrush in North America (Suring et al. 2005a).

The majority of Sheldon Refuge falls within the Great Basin, and secondly, Columbia Plateau ecoregions. Sheldon Refuge is dominated by expansive communities of sagebrush steppe. Approximately 111 million acres of the northern intermountain region in the United States are classified as true sagebrush steppe, which predominantly consists of a sagebrush shrub component with an understory of native bunchgrasses and forbs (West 1999). The sagebrush-steppe ecosystem now constitutes one of North America's most imperiled and neglected ecosystems (Dobkin and Sauder 2004; Mac et al. 1998; Noss and Peters 1995).

3.2 Climate

Variability is a natural part of the climate system and has occurred throughout the earth's history driven by complex interactions among the earth's solar orbit, atmospheric CO_2 concentrations, continental ice sheets, ocean circulation, and other factors (see summary by Inkley et al. 2004). However, it is widely accepted by the scientific community that the earth is now undergoing a period of rapid climate change at a rate that has the potential to result in abrupt changes in ecosystems and mass species extinctions (Inkley et al. 2004; USFWS 2008b). Increasing surface and water temperatures; rising sea-level; melting sea ice and glaciers; changing precipitation patterns; growing frequency and severity of storms; and increasing ocean acidification are among the many climate-driving changes observed to date (USFWS 2008b). In addition, climate change may magnify the influences of other threats to ecosystem conservation on national wildlife refuges, including habitat loss and fragmentation, changes in water quality and quantity, and increased transportation corridors (Scott et al. In Review). As summarized by Scott et al. (In Review), the current threats to the National Wildlife Refuge System potentially exacerbated by climate change include invasive non-native species, plant and animal disease, urbanization and increased economic pressure, altered hydrological regimes, sea level rise, extreme weather events, and regime shift (entire ecological communities transformed from historical conditions, either latitudinal or altitudinal).

Specific to the Great Basin, documented climate changes have occurred during the past 100 years, including 1) region-wide warming; 2) increase in precipitation; 3) decline in snow pack; and 4) earlier spring arrival (Chambers 2008). Region-wide warming, while widespread, has varied across the region (Wagner 2003). Minimum temperatures have increased more than maximum temperatures, and the variability in inter-annual temperatures has declined. As a result, the

probability of very warm years has increased and very cold years declined (Chambers 2008). Since the 1950s, annual precipitation across the Great Basin has increased 6%-16%. Variability between years has also increased, with a heightened probability of extreme high-precipitation years (Chambers 2008). Trends in the April 1st snow pack have been declining at most monitoring sites in the Great Basin. Elevation and mean winter temperature have a strong effect on snow pack, with the warmest sites exhibiting the largest losses (Chambers 2008). Finally, the timing of spring snowmelt-driven streamflow is now approximately 10 to 15 days earlier than in the mid-1900s, including an increase in variability between years in spring flow (Baldwin et al. 2003; Stewart et al. 2004).

Although future climate is impossible to accurately predict, the comparison of various climate models and extensive analysis has led to some generally accepted predictions for the next 100 years (see discussion by Inkley et al. 2004). The degree of future climate change will depend on the increase of CO2 by 2100 and will vary in the Great Basin due to large differences in topography (Chambers 2008). Warming is projected to increase between 2 and 5˚C (3.6 to 9˚F) over the next century for Western ranges (Cubashi et al. 2001). There is greater variability among models for projected precipitation changes (Inkley et al. 2004), and average projected changes across the West are near zero (Cubashi et al. 2001). However, losses in snow pack are likely to continue and even accelerate (Mote et al. 2005). Most watersheds in the Great Basin exhibit high natural variability in unregulated streamflow (Hurd et al. 1999), and this variability may increase (Chambers 2008). Climate trends that lead to changes in hydrology will have a large effect on wetlands and other shallow water bodies (Scott et al. In Review). One scenario for western stream flows are changes in the current seasonal proportionality of flows: increased winter flow; reduced and earlier spring peaks; and reduced summer and fall flows (Chambers 2008). Water resources in these arid regions are already in high demand and changes or decreases in water availability will exacerbate competition for water between wildlife, urban centers, agriculture (Hurd et al. 1999), and livestock. Plant invaders, including annual grasses (e.g., cheatgrass), perennial forbs, and woody species may be advantaged by higher levels of CO2. In addition, grazing by cattle on refuges in arid regions may exacerbate the effects of drought stress and aid in the spread of exotic species (Scott et al. In Review); grazing by feral horses and burros is likely to have similar impacts. Some suggest that grazing may also interact with climate-driven vegetation changes to further alter plant communities and wildlife habitat in these areas (Donahue 1999).

Naturally occurring climate cycles impact the life cycles and demographics of both individual wildlife species and certain relationships among species (see Kim et al. 2008). Potentially more important for ecosystems and wildlife than projected climate change are changes in variability and extremes (Inkley et al. 2004). Models predict more hot extremes and fewer cold extremes; reduced day and night temperature differences as nighttime temperatures raise more than daytime temperatures; decreased relative humidity; and increased heat indices (Brown et al. 2004; Inkley et al. 2004). These factors will likely extend fire seasons, with more fires occurring earlier and later than is currently typical, thereby increasing the total area burned in some regions (McKenzie et al. 2004). If climate change increases the variability and length of time for extreme fire weather, larger and more severe fires could be expected (Chambers 2008). The effect of unusually wet years on fuel accumulation will be especially important in dry, sparsely vegetated areas such as desert grass and shrublands (Kipfmueller and Swetnam 2000). In more arid portions of the Great Basin, the frequency and extent of fire is likely to be higher in years with better growing conditions (high fall, winter, and spring precipitation) and as a result of fuel accumulation the previous growing season (Westerling et al. 2006). Progressive invasion by cheatgrass, expansion of pinyon-juniper species, and increases in tree density are likely to result in increases in fire frequency and severity (Link et al.

2006; Miller et al. In Press). Infectious diseases and insect outbreaks could also increase under several different warming scenarios (Logan 2006), placing other species at risk.

As temperature and rainfall patterns change, some species will likely benefit and others may not (Inkley et al. 2004). For example, inhabitants of high elevation zones may experience shrinking habitats and local extinctions may occur among mammalian, avian, and butterfly species (Murphy and Weiss 1992); amphibians and reptiles in these areas may be at particular risk (see Inkley et al. 2004). Localized species which are limited in their distribution and do not migrate will also likely be some of the most highly impacted. For a sampling of species-specific examples see Epps et al. (2004), Beever et al. (2008), Kim et al. (2008), and Zakharov and Hellmann (2008). Of particular interest for Sheldon Refuge, simulations indicate that the potential range of big sagebrush (*Artemisia tridentata*), a dominant and vital species in the area, may shift northward in response to increases in the mean temperature of the coldest month accompanied by a significant contraction of its current range (Shafer et al. 2001). Others predict that the most shrubland losses in the United States will occur in the Great Basin, where the potential for increased precipitation will lead to the replacement of shrubs by savannas; savannas have been simulated to increase by more than 50% under several warm scenarios (Bachelet et al. 2001).

Overall, range shifts in plants are likely to depend upon factors including soil types, migratory pathways, seed dispersal mechanisms, and pollinator availability. Shifts by wildlife are likely dependent upon availability of migration corridors, suitable habitats, and concurrent movement of forage and prey. Further complicating these potential shifts will be other landscape changes such as roads, urban development, and habitat fragmentation, all of which can present significant barriers to species range shifts (Inkley et al. 2004).

3.3 Hydrology

3.3.1 Water Resources

Water resources within Sheldon Refuge are typical of the closed watersheds in the Great Basin—with no outlet to an ocean. Streams, ponds, and playas within these watersheds are intermittent and typically dry during the summer months. There are also numerous wetlands and springs within Sheldon Refuge. These water resources support wetland communities that make up a small fraction of the land area of Sheldon Refuge. Despite the small size they are crucial oasis for the majority of wildlife on Sheldon Refuge. Numerous artificial water resources have been created throughout Sheldon Refuge in the form of reservoirs, stock ponds, guzzlers, and pit reservoirs

Sheldon Refuge water supply is dependent on the accumulation of snow during the winter months. The size of the winter snowpack, and its persistence into the early summer, determines how much water will accumulate in playas and reservoirs and how much will flow through the creeks.

3.3.1.1 Streams/Creeks

In general streams at Sheldon are small, often less than 5 feet wide. Year-round flow is not common except in reaches near springs or areas where the water table is close to the ground surface. Badger Creek is the only stream system within Sheldon Refuge for which hydrologic data have been collected (USGS 2010a). These data were collected by the U.S. Geological Survey (USGS) between 1963 and 1973 and are probably characteristic of most streams within Sheldon Refuge. As shown in

Figure 3.1.A, surface water has been relatively common during snowmelt runoff, between March and June, but typically dry for the remainder of the year. Nearly 75% of the days for which flows in Badger Creek were above 0 cubic feet per second (cfs) occurred between March and June (Figure 3.1.B). Stream gage data collected at Mahogany Creek (USGS 2010b; Figure 3.2A), located just south of Sheldon Refuge, show a similar pattern for the percentage of days where stream flow exceeded 0 cfs with about 65% of all runoff occurring between March and July during snowmelt runoff (Figure 3.2.B).

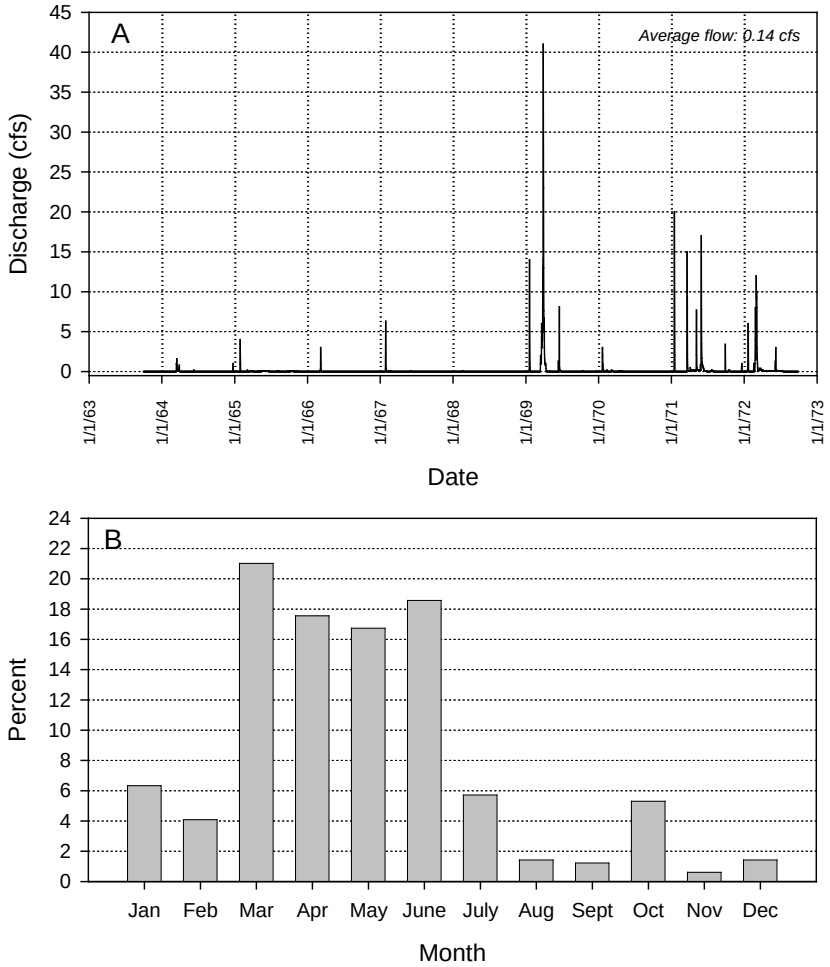

Figure 3.1 A) Mean daily discharge at USGS gaging station on Badger Creek 1963-1973. B) Percentage of days in the Badger Creek gage record where flow exceeded 0 cfs, organized by month.

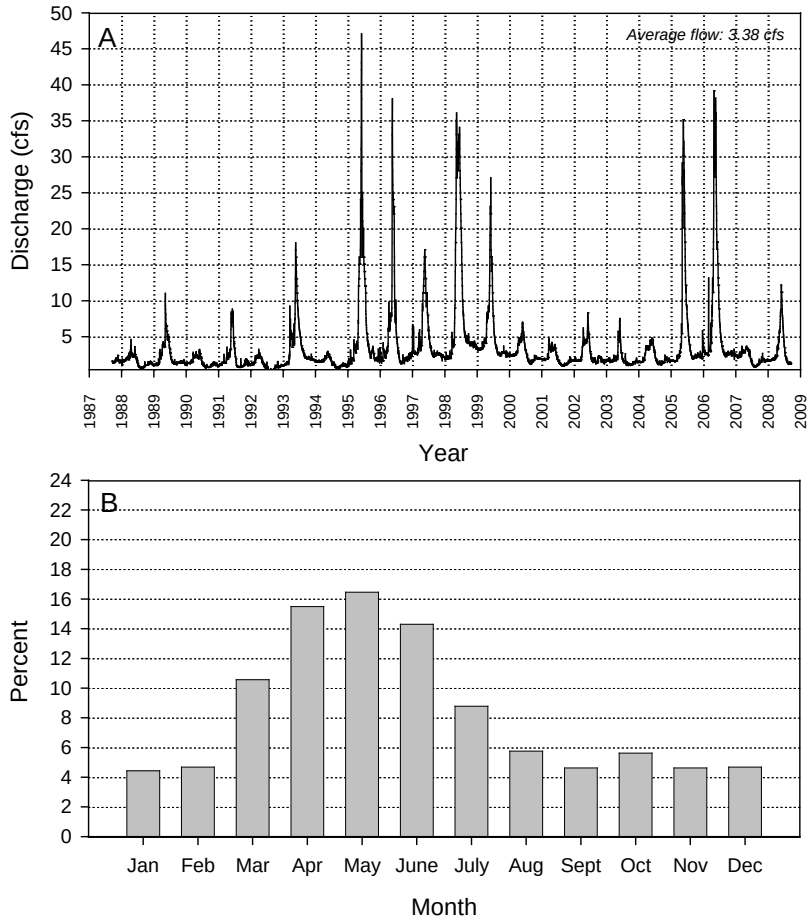

Figure 3.2 A) Mean daily discharge at Mahogany Creek USGS gaging station 1987 to present. B) Percentage of days in the Mahogany Creek gage record where flow exceeds 2 cfs, organized by month.

The Virgin Creek/Thousand Creek watershed is the largest stream system within Sheldon Refuge (Photo 3.1). Virgin Creek flows year-round along most of its length and supports extensive wet meadow and riparian habitat in the Virgin Valley. Although many other creeks on Sheldon may flow continuously during the snowmelt period, year-round flow is only found in the vicinity of springs or in areas where the water table is close to the ground surface.

3.3.1.2 Springs/Seeps

A spring "is a place where ground water flows from rock or soil onto the ground surface" (Wilson and Moore 1998). There have been 130 springs identified on Sheldon Refuge concentrated in the western and southern portions of Sheldon Refuge (Collins 2009). These springs are important because they are often the only year-round water source for streams and wetlands. A spring's aquifer is analogous to a stream's watershed. With Sheldon Refuge it is believed the aquifers for springs above 6,000 feet in elevation have different water sources than those at lower elevations.

More than 50% of springs within Sheldon Refuge are above 6,000 feet in elevation (Figure 3.3). The aquifers for these springs are very likely localized, relatively small, and receive most of their flow

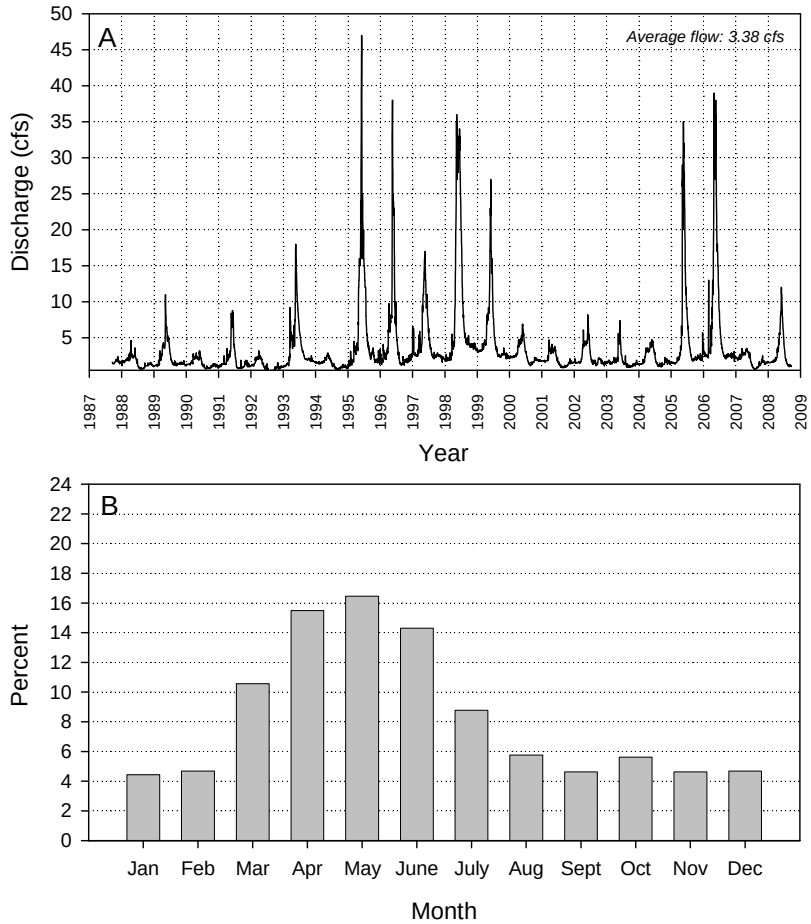

Figure 3.2 A) Mean daily discharge at Mahogany Creek USGS gaging station 1987 to present. B) Percentage of days in the Mahogany Creek gage record where flow exceeds 2 cfs, organized by month.

The Virgin Creek/Thousand Creek watershed is the largest stream system within Sheldon Refuge (Photo 3.1). Virgin Creek flows year-round along most of its length and supports extensive wet meadow and riparian habitat in the Virgin Valley. Although many other creeks on Sheldon may flow continuously during the snowmelt period, year-round flow is only found in the vicinity of springs or in areas where the water table is close to the ground surface.

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For springs at lower elevations, aquifers are generally much larger, collect larger amounts of water, and have much more consistent flow throughout the year as water gradually percolates through a permeable rock such as fractured basalt and travels longer distances before eventually being forced onto the ground surface by an impermeable rock such as the volcanic tuff layers commonly found within Sheldon Refuge (Photo 3.2). The distribution of springs on Sheldon Refuge suggests this scenario is plausible. Nearly 78% of the mapped springs are found between 5,700 and 6,700 feet, which is comparable to the elevation where most tuff deposits are exposed (USGS 1984).

Photo 3.2 Lower elevation springs like the one shown are commonly found at the bottom of draws and small canyons.

3.3.1.3 Water Improvements

Early pioneers in the Sheldon area quickly recognized that successful agriculture required irrigation during the summer months. These settlers built most of the region's large reservoirs to help ensure water was available through July, August, and September. By the time Sheldon Refuge was established the biggest reservoirs (Catnip, Big Spring, and Swan Mountain) were already built. Early management activities on Sheldon Refuge focused on additional development of water resources to increase year-round water for wildlife. Ponds were dug in seeps, spring flow diverted to watering troughs, and stock ponds built. Although these activities have been common since the 1930s there is debate about how effective these activities are for wildlife (Broyles 1995).

There have been 183 water improvements identified on Sheldon (Figure 3.4). These improvements include reservoirs, stock ponds, pit reservoirs, gabions, diversion canals, and water control structures. Figure 3.4 also includes digitized boundaries of lakes, ponds, and reservoirs.

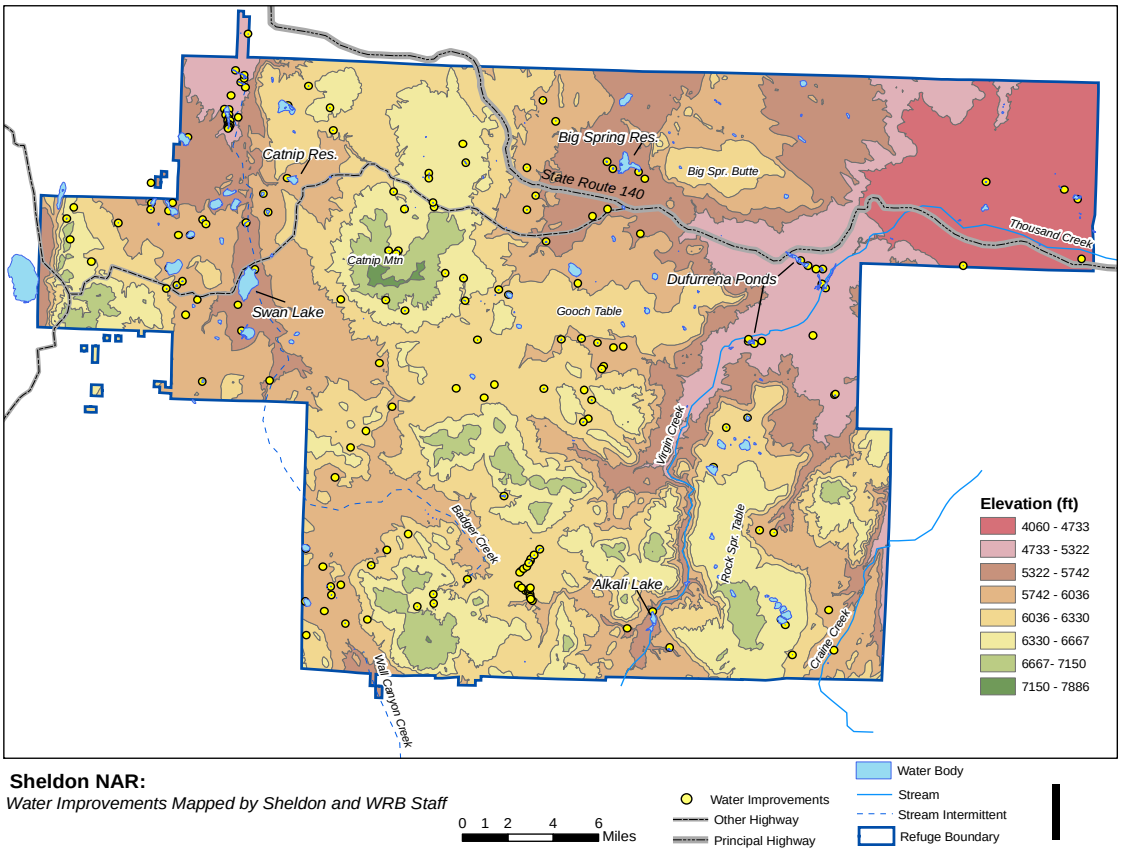


Figure 3.4 Mapped water improvements and USGS National Hydrography Dataset water bodies on Sheldon Refuge.

Note: Water improvement data should be considered draft until field verified.

Reservoirs

Reservoirs on Sheldon Refuge support fishery resources as well as habitat for waterfowl and wildlife. The largest are presented in Table 3.1.

Table 3.1 Twelve Largest Reservoirs on Sheldon Refuge

Name	Acres	Name	Acres
Swan Lake*	643	Big Spring*	249
Rye Patch*	109	Alkali	85
Catnip* 73		Racetrack*	31
Bog Hot	22	Dufurrena 21*	21
Dufurrena 20*	15	Dufurrena 13*	14
Dufurrena 19*		Rock Springs Table*	

Acreages were derived from data in the USGS National Hydrography Dataset. Bog Hot is located on a private inholding and Dufurrena 13 is being re-configured. Reservoirs marked with an asterisk are inventory dams according to USFWS Dam Safety.

Catnip Reservoir, Big Spring Reservoir, and the Dufurrena Ponds typically hold water year-round. The remaining reservoirs fill seasonally or may only have water in them during multi-year wet

periods. The USFWS Dam Safety program has identified 10 inventory dams on Sheldon Refuge. Inventory dams are higher than 6 feet and store more than 20 acre-feet of water (see Table 3.1).

Fifty-two of the water improvements in Figure 3.4 have been identified as dams impounding water. Most of these are in fact small check dams or dikes less than 10 feet high built using soil and rock from upslope to create what is commonly referred to as a stock pond.

Stock ponds

Stock ponds are typically earthen dams built across ephemeral drainages or depressions. These small reservoirs are intended to capture snowmelt runoff and create a watering place that will persist into summer. Ponds form behind these check dams in the spring and early summer but will usually be dry by mid-summer. Seventy water improvements in Figure 3.4 are identified as stock ponds.

Guzzlers

Guzzlers are water improvements built to provide an additional water source for wildlife where none existed before. These contraptions collect precipitation and divert it into a water storage tank. Water in the tank is fed into a small drinking trough that wildlife can access. There are 18 guzzlers identified on Sheldon Refuge. Of these, 12 are designed for chukar and six are designed for bighorn sheep. Most of these are built and maintained by NDOW.

Playas/pit reservoirs

Playas are natural depressions where water collects in the spring and early summer. Water is typically less than 6 inches deep and present during snowmelt runoff or after larger rain events. These features are usually dry each summer and may not have water in them for several years. Early settlers and refuge staff developed many playas by excavating large pits in them (Photo 3.3). These pits hold water longer in the summer and at greater depths than undisturbed playas. Twenty-two water improvements shown in Figure 3.4 are pit reservoirs in playas. Although there are other playas on Sheldon Refuge they have not been identified as having pit reservoirs in them.

Photo 3.3 Excavated catchments or dugouts like the one shown were constructed in the middle of playas to concentrate water for livestock use (Photo Aaron Collins).

3.3.1.4 Wetland Resources

Wetlands at Sheldon occur wherever there is permanent water.

Wet meadows

Wet meadows are found in the valleys adjacent to the larger streams on Sheldon Refuge. They are typically associated with streams and springs that flow year-round, such as Virgin and Thousand creeks. Small wet meadow communities (<3 acres in size) are found in the vicinity of high elevation springs and seeps.

Wet meadows are defined as areas that may flood with surface water for portions of the year and the water table is within 10 feet of the ground surface, year-round. The vegetation community is dominated by wetland plant species such as sedges and rushes. Ranchers historically grazed cattle in these areas and today overuse by feral horses and burros is damaging many of these meadows. Meadows with extensive grazing suffer from soil compaction, vegetation removal, and headcutting. Headcuts occur where surface water runoff initiates sudden downward soil erosion. Once this type of erosion becomes established an incised drainage channel forms, lowering the water table and drying the adjacent meadow habitat.

Riparian communities

Riparian habitat is an important resource for wildlife on Sheldon Refuge. These communities are associated with year-round water in creeks and some of the larger springs. Vegetation is dominated by willows and stands of aspen or cottonwood.

Like any habitat near a permanent water supply many of Sheldon Refuge's riparian communities were grazed when cattle were allowed on Sheldon Refuge. Today, feral horses and burros continue to impact these areas by removing vegetation and compacting soil (USFWS 2007a). Beaver introduced into the Virgin Creek watershed in the 1950s led to destruction of some of the aspen forests there. Today, beaver dams in the Virgin Creek drainage have helped create thick stands of willows.

Open water marsh

Marshes are usually associated with human-made impoundments. The Dufurrena Ponds and the IXL wetland impoundments are examples of this habitat type. Cattail and bulrush (tule) are the dominant wetland vegetation although willows can become established in these areas too. Virtually all of these communities are associated with human-made or beaver-built impoundments.

3.3.1.5 Groundwater Resources

Groundwater resources in the Sheldon area were investigated by Sinclair (1963a, 1963b) for the State of Nevada. It appears that there have not been any other significant investigations of groundwater resources on Sheldon since then.

Sinclair (1963b) concluded that most groundwater in the area is found in the unconsolidated sands and gravels (alluvium) that have accumulated in Sheldon Refuge's valleys. He speculated that a groundwater barrier exists at the head of Thousand Creek Gorge. Groundwater "backs up" upstream of this barrier, helping keep the water table near the ground surface in the Virgin Valley. The high

water table in the valley maintains wetland habitat and perennial flow in Virgin Creek. Similar hydrogeologic conditions may exist in other valleys with permanent water.

The Virgin Valley and other valleys like it have enough water in them to support some groundwater production. However, these basins are not large enough to support development beyond local domestic uses. Groundwater development for municipal or industrial uses would quickly deplete groundwater resources in the local valley-fill aquifers and lead to drying nearby wet meadow, riparian, and stream ecosystems.

At the present it appears that groundwater development on Sheldon is limited to domestic production primarily in the Virgin Valley Mining Area. Well log records from Nevada Department of Water Resources identify 12 wells that have been drilled within Sheldon Refuge, 10 of which are located in the Virgin Creek/Thousand Creek watershed.

The current scale of groundwater development does not appear to be affecting water resources in the Virgin Valley. However, if development increases, water resources could be impacted quickly. Groundwater development in the Virgin Valley Mining Area is a more direct threat to water resources than development outside Sheldon Refuge. Groundwater pumping from alluvial deposits in the Virgin Valley would lower the water table and reduce the extent of permanent, year-round Virgin Creek flow.

3.3.1.6 Water Supply and Climate Change

The water supply for all water resources on Sheldon Refuge is dependent on the accumulation of snow during the winter months. Runoff and precipitation patterns (see Figures 3.1 and 3.2) indicate snow accumulation and subsequent melting determines how much water will infiltrate into groundwater aquifers, accumulate in reservoirs, and the extent of year-round flow in refuge creeks.

3.3.2 Water Quality

A review of Environmental Protection Agency (EPA) online data (EPA 2010) indicates there are no Total Maximum Daily Load or National Pollutant Discharge Elimination System violations in the vicinity of Sheldon Refuge.

Most of Sheldon Refuge is uninhabited with very little development. The greatest concentration of infrastructure on Sheldon Refuge is in the Virgin Valley Mining Area in the form of roads, houses, and mining operations. There is a threat of sediment runoff into wetlands and ponds from adjacent mining operations and roads during storm events.

3.3.3 Water Rights

Water in Nevada is considered a resource of the State. The State grants individuals, corporations, municipalities, and government agencies the right to use the State's water.

Sheldon Refuge's size and remoteness protects most of the identified water resources inside Sheldon Refuge. Because, the headwaters of the largest streams are inside Sheldon Refuge there is little chance upstream users can divert water from stream resources. High elevation springs are fed by local aquifers inside Sheldon Refuge boundary and above potential groundwater development areas.

A review of water right files in the Service's Water Resources Branch office and State of Nevada's water right database identified 139 possible water rights or Federal reserve water right claims within the boundaries of Sheldon Refuge, the majority of which are either appropriative or reserved water rights belonging to the Service. Three water rights are not held by the Service and are located on private inholdings.

Water rights within Sheldon Refuge are associated with springs, streams, wetlands, wells, reservoirs, ditches and canals. Of particular interest in the CCP is the management of certain reservoirs and associated aquatic and riparian habitats. A more detailed discussion of other water rights within Sheldon Refuge is included in the Sheldon National Wildlife Refuge Water Resource Assessment Report (Wurster 2009).

3.3.3.1 Reservoirs and Water Rights

Forty-four of the water improvements identified in Figure 3.4 are identified as dams and 71 are identified as stock ponds. Of the 183 water improvements, 28 are associated with an existing appropriative water right Place of Use (Table 3.2).

Two (Alkali and Big Spring) of the 18 reservoirs have storage rights associated with them. The others do not have rights to store water but there are rights to use water from those reservoirs to irrigate fields and water stock. Fortunately, in Nevada the right to use water from a reservoir confers the right to store water in that reservoir (Palmer 1993).

Three reservoirs in Table 3.3 are found on inholdings or inside the Virgin Valley Mining Area. These include a small dam in the vicinity of Bog Hot Springs and a small check dam on Badger Creek at the Kennedy Property.

Table 3.2 Named Reservoirs and Stock Ponds within 750 Feet of an Appropriative Water Right Place of Use

Reservoir/Stock Pond Name	Reservoir/Stock Pond Name
Alkali Lake	Big Spring Reservoir
Catnip Reservoir	Campground Pond
Dufurrena Pond 19	Dufurrena Pond 20
Dufurrena Pond 21	Dufurrena Pond 22
IXL North Impoundment A	IXL North Impoundment B
North Lake	Rye Patch Reservoir
Sheep Pen Reservoir	Smith Lake
Swan Lake	South Lake
Stock Pond at Catnip Springs	Swan Mountain Reservoir

Table 3.3 Reservoirs, Stock Ponds, and Pit Reservoirs with Prepared Federal Reserve Water Right Claims

Reservoir Name	Reservoir Name	Reservoir Name	Reservoir Name
Andy's Reservoir	Balzedar	Beside 34A	Big Basin #3
Buzzard's Roost	Celia	Middle Center	Center
Chukar	Gunsight	Highway 140	Hobble Spring #2
Hobble Spring #3	Horse Lake	Jog	Little Lake
Lower Jacobs	Middle Jacobs	Mud Spring	North Onion Lake
North Sagehen	North Swan Creek	Nut Mountain	Perlite

Reservoir Name	Reservoir Name	Reservoir Name	Reservoir Name
Racetrack Springs	Rainbow	Rock Springs Table	Round Mtn. Lake
Section 18	Section 8	Sidehill Spring	South Onion Lake
South Swan Creek	Swan Lake Trench	The Knob	Unnamed #1
Unnamed #2	Unnamed #3	Upper Jacobs	Upper Wall Canyon
West Boundary			

3.4 Topography

The entire Sheldon Refuge is located between 4,230 and 7,300 feet in elevation, with more than 12 mountain tops over 6,500 feet. The topography of Sheldon Refuge is characterized by large expanses of high basalt plateaus or "tables" and broad mountains separated from one another by valleys and canyons. The most dramatic of these canyons is Thousand Creek Gorge with cliffs dropping more than 450 vertical feet from the basalt table rim (Photo 3.4). Located in the eastern portion of Sheldon Refuge, Thousand Creek itself flows into the dry Bog Hot Valley which is at the lowest elevation of Sheldon Refuge. Catnip Mountain with its broad ridges is deceptively the highest point within Sheldon Refuge at 7,292 feet. The western portion of Sheldon Refuge differs somewhat with more typical mountain and valley topography including Yellow Peak, which drops abruptly from its 7,191 foot summit to the bottom of Long Valley 1,600 feet below.

Photo 3.4 Both the mouth of Thousand Creek Gorge and the flat-topped finger of Railroad Point in the distance are characteristic of Sheldon Refuge topography (Photo Gail Collins).

3.5 Geology/Soils

Soils in Sheldon are semi-arid, very young, and poorly developed. The soils are largely a result of lake sedimentation, volcanic activity, and water erosion. 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 semi-arid, 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 2003).

The following soils map unit descriptions are excerpted from the Sheldon National Wildlife Refuge Renewable Natural Resources Management Plan (USFWS 1980).

The Rolling Hills map unit occurs in mountainous terrain and foot slopes of prominent hills from 6,000 to 6,500 feet in elevation. Soils are moderately deep to deep and stony or gravelly on the surface. Erosion hazard is moderate. About 71,598 acres or 12% of Sheldon is covered by this unit.

The Rockland map unit occurs around 6,000 feet elevation in small clumps or strips on rocky ridges and similar mountainous areas where bedrock outcrops occur. Soils on this unit are shallow to moderately deep over basalt bedrock and are stony and gravelly throughout. Erosion hazard is slight to moderate. This unit occupies about 4,200 acres or 0.7% of Sheldon Refuge.

The Stony Terrace and Claypan Terrace map units occur on gently sloping tablelands around 5,600 feet elevation. These units often occur in association; with the soils of stony terrace being very stony on the surface and the soils of claypan terrace having gravelly loamy surface layers. Stony terrace occupies 93,500 acres or 16% of Sheldon while claypan terrace occupies 100,000 acres or 17% of Sheldon Refuge.

The Arid Rolling Hills map unit occurs on nearly level to rolling areas from 4,300 to 5,400 feet elevation. Soils of this unit are shallow, very stony, and have a moderate erosion potential. This unit occupies 63,900 acres or 11% of Sheldon Refuge.

The Arid Loamy Terrace map unit occurs on nearly level to gently sloping basin terraces from 4.500 to 5,500 feet elevation. The soils are gravelly throughout with a hardpan or cemented gravel at 18 inches. Erosion hazard is slight. About 95,927 acres or 17% of Sheldon is covered by this unit.

The Snow Pockets map unit occurs on north facing slopes where snowdrifts form and persist after snow is gone from the general terrain. Slope gradient is from 15% to 60% and elevation is above 6,000 feet.

The Mountain Swale map unit occurs in mountainous terrain as narrow alluvial fans in the bottom of drainages and as small basin-like depressions in the uplands. Elevation is about 6,000 to 7,000 feet. Soils are loamy, deep and very gravelly, and erosion hazard is slight. Only 201 acres of this unit occur on Sheldon in isolated patches.

The Poorly Drained Bottom map unit occurs as nearly level bottoms in basins having large or mountainous watersheds and is usually associated with perennial springs. Elevation is 4,500 to 6,500 feet. Surface soil layers are black; subsoils are very gray and mottled due to poor drainage. A restrictive layer usually occurs at three to four feet which retains the water table. Hazard for gully erosion is high. There are only 444 acres of meadow on Sheldon Refuge.

The Rolling Hills and Juniper South Exposure map units occur on prominent hills, ridges, plateaus, and south facing slopes with a 2% to 50% gradient. Elevation is about 4,300 to 6,000 feet. Soils are stony to very stony throughout the profile and are usually shallow over basalt bedrock. Erosion is slight. These two map units cover 820 acres on Sheldon Refuge.

The Aspen Grove map unit occurs near some springs on Sheldon but the areas are very small. Soils of this unit have thick, dark colored surface layers with loamy and gravelly subsoils. Erosion hazard is slight.

Riparian areas occur along Hell, Virgin, Catnip, and Fish creeks and some spring sites. The soil is easily eroded.

The Virgin Valley Hills are a unique geological and physiographic area. It is typified by lacustrine deposits, steep truncated slopes and butte caps of igneous rock. The soil is extremely fragile and erodible. About 34,208 acres or 6% of Sheldon is in this area.

3.6 Environmental Contaminants

A number of sites within Sheldon Refuge have been evaluated for environmental contaminants, including lead-based paint, volatile organic compounds (VOCs), and soil contaminants from past mining activities.

In 2001 lead paint screening was conducted for 16 sites, which included a number of structures and buildings. Samples indicated elevated levels of lead from one small building at the Little Sheldon Headquarters/Work Station. Also in 2001, 17 measurements were taken to detect VOCs, with no positive results.

Soil samples collected in 2001 indicated a moderate threat from lead contamination associated with buildings at the IXL Ranch, the Little Sheldon Headquarters/Work Station, and the Virgin Valley Ranch. Mercury contamination at an abandoned mining site along Hell Creek was determined to pose a relatively low threat (USFWS 2001a).

3.7 Land Use

Within Sheldon Refuge are a relatively small amount of private lands, including inholdings and patented mining claims. These inholdings and patented claims are entirely surrounded by public lands and as a result, some have permits for vehicle access, electric transmission lines, and other uses which affect Sheldon Refuge.

The vast majority of lands surrounding Sheldon Refuge are public lands managed by the BLM. As multiple-use public lands, a wide variety of land uses occur on surrounding BLM lands. Uses include mining, grazing, high-voltage electrical transmission lines, natural gas transmission

pipelines, geothermal energy development, wind energy development, OHV recreation, conservation of historic landmarks and trails, and wilderness preservation. Other surrounding lands include the Paiute-Summit Lake Reservation, and various private ranches.

3.7.1 Valid Existing Rights, Rights-of-Way, and Easements

3.7.1.1 Rights-of-Way

Both permanent and temporary rights-of-way exist for State of Nevada Highway 140, for a private overhead electrical line extending from the eastern boundary of Sheldon Refuge to various properties and mining claims in the Dufurrena area, and for access to a private inholding in the western portion of Sheldon Refuge.

3.7.1.2 Access to Private Inholdings

There are seven separate parcels of privately owned land which are within and completely surrounded by lands managed by Sheldon Refuge. As a result, access to these parcels must be granted by Sheldon Refuge in the form of a Special Use Permit to allow reasonable access for use of those lands. As part of the initial wilderness review and study completed for Sheldon Refuge in 1974, an inventory of motorized routes throughout the entire Refuge was completed. At that time no motorized route existed to any of the seven inholdings.

Since 1974, motorized access along a designated unmaintained route has been authorized by the Service to only one parcel, and continues to be allowed under a valid Special Use Permit. Motorized access has not been authorized to the two inholdings located within the Alkali Peak Proposed Wilderness Area or the four remaining inholding parcels south of Fish Creek Table.

3.7.1.3 Easements

There are no existing easements within Sheldon Refuge.

Chapter 4. Biological Environment

This chapter addresses the biological resources and habitats found on Sheldon Refuge. However, it is not an exhaustive review of all species and habitats. The chapter begins with a discussion of biological integrity, as required under the Refuge Improvement Act. The bulk of the chapter is then focused on the presentation of background information used in development of the draft management goals, objectives, and strategies of this CCP. Background information includes a description, location, condition, and trends of associated wildlife or habitats, and stresses and sources of ecological stress (collectively, "threats").

4.1 Biological Integrity, Diversity, and Environmental Health Analysis

The landscapes that make up Sheldon Refuge extend across large portions of 11 states in the Intermountain West, but very little of the sagebrush biome remains undisturbed or unaltered from its condition prior to European settlement (West 1996). These cold-desert rangelands, the so-called western rangelands, were considered more complex and biologically rich less than 150 years ago than at present (Dobkin and Sauder 2004). The sagebrush-steppe ecosystem as a whole now constitutes one of North America's most imperiled and neglected ecosystems (Dobkin and Sauder 2004; Mac et al. 1998; Noss and Peters 1995) due to profound influences of livestock grazing. Agriculture and herbicide use, mining, energy development, power line and natural gas corridors, and the expansion of road networks have also fragmented landscapes or completely eliminated sagebrush from extensive areas; these changes may have pushed these sagebrush systems in some areas beyond ecological thresholds for recovery (see Dobkin and Sauder 2004). Across the Great Basin, this has resulted in alteration of plant community composition and soils, changes to the natural fire regime, and spread of exotic plant species (Bock et al. 1993b; Fleischner 1994; Miller and Rose 1999; Rotenberry 1998; Saab et al. 1995; Yensen 1981; Young 1994; Young and Sparks 2002). More than 60% of the remaining sagebrush steppe now has either exotic annual grass in the understory or has been completely converted to non-native annual grasslands (West 2000). In addition, more than 90% of the region's flowing waters and their associated riparian habitats have been compromised by livestock and agricultural development (Chaney et al. 1990; Ohmart 1994).

As detailed by Vale (1975), early writings by the first Europeans exploring the northern Intermountain West described pristine vegetation visually dominated by vast stands of sagebrush; grass was generally confined to wet valley bottoms, moist canyons, and mountain slopes (also see Welch 2005). However, sagebrush was long considered by land managers to be an undesirable shrub and subsequently reduced throughout its range in western North America (see summary by Welch 2005). Prior to the end of World War II, most treatment of sagebrush was by mechanical methods such as plowing, chaining, and disking, although fire and heavy grazing pressure had been used in some areas prior to mechanical control. After the mid-1940s, use of herbicides, primarily 2,4-D, became a widespread tool in reducing the abundance of sagebrush (and inadvertently many other shrubs and forbs) (see Baker et al. 1976; Svejcar 1997), with the basic premise that sagebrush was competing for nutrients, water, and space with more desirable grasses preferred by livestock (Baker et al. 1976; Dobkin and Sauder 2004). There is anecdotal evidence that small areas on Sheldon Refuge were treated (Deming 1959). But as early as the 1950s, individuals began to question sagebrush control efforts as a serious threat to the maintenance of populations of sage-grouse, pronghorn, and mule deer, and to identify species of birds (i.e., sage-grouse, sage thrasher, sage

sparrow [*Amphispiza belli*], and Brewer's sparrow [*Spezella breweri*]) that would be adversely affected if sagebrush were eradicated (Baker et al. 1976).

Among land uses, the introduction of livestock and associated habitat alteration have had the most widespread impact on western ecosystems (Bock et al. 1993a; Fleischner 1994; Ohmart 1996). Livestock (i.e., cattle, sheep, and horses) were introduced to the Great Basin rangelands in the mid-1800s and were afforded abundant forage due to centuries of fire disturbance (Gruell 1995). Competition among settlers, plentiful forage, and limited knowledge of range-animal relationships encouraged excessive numbers of livestock when compared to contemporary standards (Gruell 1995; Rouse 1942). Wire fencing, a fundamental livestock management tool, also exacerbated problems attributed to habitat degradation and fragmentation by creating obstacles that inhibited daily and migratory movements of native wildlife species (Fleischner 1994; Harrington and Conover 2006). Across the Great Basin, overgrazing, in combination with alteration of natural fire regimes and climate change, has also resulted in encroachment and habitat conversion of native communities (Miller et al. 2000; Suring et al. 2005b).

These historical land use practices included the area now known as Sheldon Refuge, and overgrazing in this area can be attributed to two separate periods: approximately 1880 to 1940 and 1940 to 1976 (USFWS 1980). The first homesteaders arrived in the area now known as Sheldon Refuge around 1880 and were associated with the cattle and sheep livestock industry (USFWS 1985). Also beginning in the late 1890s and well into the twentieth century, there was a market demand for horses, and there is evidence of campsites on Sheldon Refuge that were selected because of geographical advantages for horse trapping (USFWS 1985). In addition to homesteader activity, Sheldon Refuge was also part of an enormous cattle and land domain of the Miller and Lux Land and Livestock Company, which controlled most of the deeded land within the area. During this period, cattle and horses were the principal livestock grazed (Fallon 1941). The horses occupied the range year-round, while most of the cattle were wintered in nearby Surprise Valley on supplemental hay. In 1926, large numbers of domestic sheep (approximately 20,000) were documented ranging across Sheldon Refuge from April to October each year (Fallon 1941). By the mid-1930s, local managers began to discuss a lack of effective range management and document signs of overuse, including evidence of sheet erosion and degraded range conditions (Fallon 1941; Rouse 1942; Rouse and Fallon 1940; Rush 1936; USFWS 1942). It was believed that range productivity may have been permanently impaired by the loss of topsoil (Rouse and Fallon 1940).

The second period of overgrazing, 1940 to 1976, was defined by uncontrolled cattle and horse grazing with approximately 20,000 Animal Unit Months (AUMs) average use under BLM administration. Unknown numbers of domestic sheep grazed on Sheldon Refuge until at least 1948 (USFWS 1948). It is suspected that domestic sheep were then restricted from Sheldon Refuge sometime after the mid-1950s (USFWS 1952); while the exact date is unknown, it likely preceded the reintroduction of California bighorn sheep in 1968. Uncontrolled grazing is range use with few restrictions as to where, when, or extent of use. As a result, cattle, horses, and sheep could selectively concentrate their utilization in prime forage areas around water sources (USFWS 1980). Anderson and Franzen (1978) found during the mid-1970s that excessive annual utilization during the growing season had resulted in uniformly low vigor of key forage species over much of Sheldon Refuge, and that it was indicative of an unacceptably slow rate of ecological improvement.

The Service assumed grazing responsibility on Sheldon Refuge under the Refuge Administration Act in 1976. Any grazing permits issued subsequent to 1976 were managed in accordance with the Refuge Administration Act, as amended, and associated regulations and policies. As of 1980,

approximately 18,700 cows were grazed on Sheldon Refuge between April and late October by 10 permitees; the season of use paralleled that implemented on adjacent BLM lands (USFWS 1980). Following recommendations in the 1980 Refuge Management Plan (USFWS 1980), livestock grazing was reduced to an approved use of up to 17,721 AUMs and areas for grazing use were restricted. Ecological conditions appeared to be improving by the mid-1980s toward potential natural communities and increased soil stability (Anderson 1984), although issues associated with overuse, both by cattle and feral horses, were still noted into the mid-1990s (St. George et al. 1993). Beginning in the early 1990s, the Conservation Fund, with a grant from the Mellon Foundation, purchased all remaining grazing permits on Sheldon Refuge from willing sellers at fair market value and retired them from use. The last permits were purchased and retired in 1994. As a result, there are no valid claims of grazing rights or privileges on Sheldon Refuge.

Since 1994, Sheldon Refuge has been one of the largest contiguous blocks of land in the Great Basin that is free from domestic cattle and sheep grazing, and apparent ecological conditions have continued to improve. However, feral horses and burros continue to graze uncontrolled on Sheldon Refuge as their population numbers have increased (Collins 2008a), impeding further potential for ecological recovery. Although their numbers have never approached those documented for cattle and sheep, feral horses and burros can affect the landscape in ways different than other livestock; for example, wintering horses and burros remain on the Sheldon Refuge year-round, exerting grazing pressure on native plant communities during times of the year when other livestock would normally receive supplemental feeding (Fallon 1941; Young et al. 1972). Year-round and long-term overuse can result in a systematic weakening and reduction of grasses and forbs, resulting in a loss of species and structural diversity and monotypic stands of less palatable species. For more information on the specific effects of feral horses and burros on habitats within Sheldon Refuge and in the sagebrush ecosystem see USFWS (2008a).

In addition to livestock utilization, associated predator control efforts across the West also altered western rangeland ecosystems. Across the West, wolves, coyotes, mountain lions, other large predators, and many small predators were poisoned, shot, and trapped unremittingly during most of the 1900s (Carrier and Czech 1996). High desert species regarded as competitors with livestock have also been periodically targeted, including wild ungulates (e.g., pronghorn) and small mammals (e.g., ground squirrels [*Spermophilus* spp.], mice) (see Carrier and Czech 1996). On Sheldon Refuge, formal predator control was largely initiated between 1955 and 1967, primarily for coyote and bobcat (McNay 1980), but control efforts also targeted rodents, raccoons (*Procyon lotor*), American badgers (*Taxidea taxus*), porcupines (*Erethizon dorsatum*), and raptors (Deming 1959; Sheldon Refuge files); Sheldon Refuge staff conducted informal predator control efforts at least between 1941 and 1968 (USFWS 1941, 1968). The reduction or elimination of predators over vast areas may have had profound effects on natural rangeland ecosystems. Coyotes, for example, have been suggested to play a keystone role in a multitude of habitats including chaparral, grassland, and wetland ecosystems. Keystone predators have a regulatory effect on medium-sized predators (e.g., badgers, skunks (*Mephitis* spp.), bobcats, foxes (*Vulpes* spp.), ravens (*Corvus* spp.), eagles). Removal of coyotes can therefore result in increased abundance of medium-sized predators, which in turn reduces the abundance and diversity of prey species; alteration of the prey base could have cascading effects throughout the ecosystem (see summary by Henke and Bryant 1999). In addition, coyotes can indirectly impact interactions for species such as sage-grouse. For example, the presence of coyotes reduces the number of mammalian nest predators that prey on sage-grouse eggs (e.g., fox, badger, raven). By also limiting the number of prey species (e.g., jackrabbits [*Lepus* spp.], ground squirrels), coyotes also reduce the number of golden eagles (*Aquila chrysaetos*, a significant predator of adult sage-grouse) and reduce competitors for forage. Indeed, it has been suggested that coyote control

may inadvertently contribute to sage-grouse declines and that a healthy coyote population has the potential to enhance the long-term prospect for many sage-grouse populations (Mezquida et al. 2006). There is currently no open harvest seasons for predator species on Sheldon Refuge, and there is little direct knowledge regarding trends in their populations; however, we can expect that both prey and predator populations have been restored to a more natural equilibrium than previously observed.

As a result of these factors, the ecosystem within and surrounding Sheldon Refuge has undergone dramatic alteration since pre-European settlement times. However, despite these alterations, Sheldon Refuge does remain one of the last, relatively intact representations of the sagebrush-steppe ecosystem in the Great Basin. The five most discernible changes within Sheldon Refuge include 1) continuing disturbance from feral horse and burro activity; 2) influx of invasive and encroaching species, particularly non-native; 3) changes in the natural fire regime; 4) changes in hydrology associated with water developments; and 5) habitat alteration associated with roads and off-highway vehicles, and mining.

4.1.1 Feral Horses and Burros

The release of domesticated animals from captivity into the wild, whether intentional or accidental, has created serious problems for native species on a global scale (Douglas and Leslie 1996). Feral horses and burros are defined as non-indigenous, unbranded, unclaimed descendants of domestic horses and burros which roam free on certain refuge lands in the western United States (7 RM 6.5). Burros and horses, the most common feral species on western rangelands (Douglas and Leslie 1996), occur in substantial numbers on Sheldon Refuge. Burros became feral when domestic animals were released into the wild following the decline of mining, the advent of the railroad, and availability of motorized vehicles (Douglas and Leslie 1996; McKnight 1958). Similarly, horses became feral prior to establishment of Sheldon Refuge as animals escaped or were released from ranches and grazing allotments. The fact that feral horses within Sheldon Refuge descended from domestic animals is well documented. During a horse gather conducted in 1948, at least 74% of the over 2,500 horses removed from Sheldon Refuge were branded. The majority of the remaining horses were attributed to a single grazing operator (USFWS 1948). Further, at least one grazing operator appeared “to have more horses than their license cover[ed]” (Fallon 1941:32), and another was documented to be singularly responsible for 400 horses on the range (four times the number of cattle for that operator; Fallon 1941).

The feral horse population on Sheldon Refuge during the early 1990s averaged 200 to 300 animals as a result of a proactive population control program; without control efforts, the population has substantially increased during recent years to an estimated 1,341 individuals in 2008 (Lubow 2009). In addition, Sheldon Refuge is surrounded by BLM HMAs, and horses may have moved onto Sheldon Refuge from these areas. A more detailed accounting of feral horse and burro population dynamics and impacts to the landscape can be found in Douglas and Leslie (1996) and USFWS (2008a). Recent efforts to control the feral horse and burro populations have been focused on conducting periodic gathers for adoption. Methods used to gather and adopt feral horses from Sheldon Refuge have been thoroughly investigated (USFWS 2008a) and will not be discussed here.

Feral horse and burro herds continue to exert continual grazing pressure on Sheldon Refuge. This grazing pressure has likely resulted in reduced shrub and perennial grass cover, lower species diversity, increased competition with pronghorn and other native grazers, and other documented impacts (Autenrieth 1982; Beever et al. 2003b; Fagerstone and Ramey 1996; Meeker 1979; Salwasser 1980).

Grazing within Sheldon Refuge has played a factor in deciduous woodland decline. The reduction in deciduous woodlands, including aspen, has undoubtedly reduced suitable nesting habitat and availability of nest sites for cavity-nesting species dependent upon large trees; studies have emphasized the importance of snags and live trees with heartwood decay to cavity-nesting birds (Dobkin et al. 1995).

4.1.2 Invasive, Non-Native, Encroaching, and Expanding Species

4.1.2.1 Upland Habitats

Non-native species

It has been long recognized that native plant communities within the big sagebrush–bunchgrass vegetation type are extraordinarily subject to invasion by non-native annual species (Jardine and Anderson 1919 as cited in Young et al. 1972). Approximately 30 species of plants that are introduced, non-native, and often noxious now occur within native vegetation types on Sheldon Refuge (Sheldon Refuge files). Invasive plant species displace native vegetation, altering the composition and structure on vegetation communities, affecting food webs, and modifying ecosystem processes (Olson 1999). The spread of invasive plant species across the Great Basin was likely facilitated by the rapid increase in grazing that resulted from European exploration and settlement in the American West. Invasive plants are most likely to become established where native vegetation has been disturbed (e.g., intensively grazed sites, cabin sites, campgrounds, hiking trails, off-road tracks, roads, and fire suppression lines; see Masters and Sheley 2001). Most invasive plants also need some form of transportation to reach new areas (Trombulak and Frissell 2000). Several potential modes of transportation, or "vectors", continually travel throughout Sheldon Refuge in the form of highway traffic, off-highway vehicles, people, pets, domestic stock, feral horses and burros, wildlife, and firefighting equipment. Changing climates and associated habitat alteration will likely increase opportunities for invasive species to spread because of their adaptability to disturbance (Inkley et al. 2004).

Belsky and Gelbard (2000) identified the following disturbance factors that contribute to plant community vulnerability to invasion: selective grazing of native plants over weed species; trampling vegetation and compacting soils; impacts to biological (microbiotic) soil crusts and mycorrhizal fungi; impacts to soil nitrogen levels; and changes in fire regimes. Feral horses and burros have been found to contribute to many of these factors (USFWS 2008a). Knapp (1996) found that cattle, sheep, and feral horses facilitated cheatgrass spread in the Great Basin. Further, Beever et al. (2007) found that sites with horses tended to have more grazing resistant forbs and exotic plants (particularly cheatgrass) than those areas where horses had been removed 10 to 14 years previously.

Primary non-native, invasive, or noxious upland plants on Sheldon Refuge include cheatgrass, knapweed (*Centaurea diffusa*, *C. maculosa*), kochia (*Bassia scoparia*), hoary cress (*Cardaria draba*), yellow sweetclover (*Melilotus officinalis*), common cocklebur (*Xanthium strumarium*), bull thistle (*Cirsium vulgare*), scotch thistle (*Onopordum acanthium*), and Russian thistle (*Salsola* spp.) Other invasive plants found within Sheldon Refuge that are rapidly invading upland wildlife habitats across the West include medusahead wildrye (*Taeniatherum caput-medusea*), and rush skeleton-weed (*Chondrilla juncea*) (Knick et al. 2003). Currently, the combined invasive species cover is estimated to be less than 1% of the total refuge area (less than 5,750 acres), and substantial occurrences are generally confined to road corridors and other sites of disturbance.

The introduction of cheatgrass to the arid potions of the sagebrush ecosystem has fundamentally and perhaps irreversibly altered the natural fire regime by increasing the frequency and severity of fires (West 1979 as cited in Knick et al. 2005). Cheatgrass alters successional patterns in post-fire plant communities by interfering with native seedling establishment, competing with established perennials for resources, and shortening the interval between fires. Cheatgrass dominance and associated fires reduce populations, diversity, and recovery of biological soil crusts, which affect nutrient cycling, water infiltration, and potential soil erosion (Zouhar 2003). Cheatgrass has also been associated with soil organic matter loss, and changes in its composition and distribution (Norton et al. 2004). Cheatgrass was well established throughout much of its current distribution in the Intermountain West by 1930. However, cheatgrass has rapidly increased its dominance in native plant communities during the past 30 years. Although cheatgrass can colonize regions in the absence of fire, the combination of fire, livestock grazing, habitat management practices, other disturbances, and climate conditions have most rapidly facilitated the heavy dominance by cheatgrass in some sagebrush systems (see summary by Knick et al. 2005). The expansion of cheatgrass is of particular concern to Sheldon Refuge. However, compared with much of the rest of the Great Basin, current cheatgrass infestation on Sheldon Refuge is considered relatively low and primarily confined within travel corridors and other disturbed sites (e.g., mining areas, campgrounds, historic homesteads, burned areas).

Other non-native species that have been introduced to uplands on Sheldon Refuge include California (valley) quail, chukar, and Hungarian (gray) partridge. The impacts of these species to the environment are considered low. California quail have been released throughout northern Nevada and eastern Oregon; 130 quail were first noted on Sheldon Refuge in 1941 and hunting for these birds was first allowed within Sheldon Refuge in 1961, although populations are not considered large (Sheldon Refuge files). Chukar were first introduced to Sheldon Refuge in 1941, and harvest has been allowed since 1961 (USFWS 1971). Little information is available regarding Hungarian partridge; they were first noted on Sheldon Refuge in 1940 but are only occasionally sighted and thought to occur in limited numbers (Sheldon Refuge files; USFWS 1971).

Native and indigenous species

One of the other, most evident changes in vegetation of the Great Basin during the past 120 years has been the expansion of pinyon-juniper woodlands into the sagebrush ecosystem (Miller et al. 2000; Suring et al. 2005a). Over 90% of the existing western juniper woodlands have developed in the last 100 years; only 3%-5% is considered old-growth (Miller et al. 2008; USDI 1990); see Section 4.2.7 for information specific to Sheldon Refuge. Prior to European settlement, juniper was primarily confined to rocky ridges or surfaces with sparse vegetation; however, newly formed juniper woodlands now occupy more productive sites with deep well drained soils (see Miller et al. 2000). Expansion of western juniper coincides with European settlement in this portion of the Great Basin and it has been hypothesized that climate, altered fire frequencies, and grazing in the late 1800s were the primary factors (Miller and Rose 1995). On Sheldon Refuge, western juniper is successionally aggressive and can drastically alter or eliminate the understory component after encroachment. Conversion of sagebrush communities to juniper woodlands places additional stress on the sagebrush-steppe ecosystem that has been severely reduced in area and degraded in quality (Suring et al. 2005a). Juniper expansion is of particular concern because the presence of trees in deeper well-drained soils, where they historically were not abundant, causes increased soil erosion; reduced stream flows; reduced forage production; altered wildlife habitat; changes in plant community composition, structure, and biodiversity; and the replacement of mesic and semi-arid plant communities with woodlands (Miller et al. 2005). The replacement of aspen, riparian, and mountain

big sagebrush communities by western juniper may have detrimental effects on wildlife populations dependent upon these habitats. In summary, low levels of western juniper can be beneficial for many wildlife species but increasing dominance at both the community and landscape levels will result in a general decline in landscape and plant community diversity, resulting in a decline of wildlife abundance and diversity (Miller et al. 2005). Sagebrush encroachment is occurring on some meadow habitats on Sheldon Refuge, most likely as a result of lowered water tables and other factors (see Section 4.2.1).

Deciduous woodland and snowpocket aspen stands are declining in abundance across much of the West (see Dobkin et al. 1995; Heltzel and Earnst 2006), and on Sheldon Refuge as well. Ongoing risk factors for western aspen stands include low aspen densities, little regeneration, and encroaching sagebrush and juniper species (Bartos and Campbell 1998).

There is considerable controversy about whether elk (*Cervus canadensis*) once occupied rangelands of the Great Basin and Desert Southwest, and debate centers on recent transplants of elk and/or colonization by elk into these areas (Wisdom and Thomas 1996). There is evidence that elk originally occupied most grassland biomes throughout western North America, including major portions of the Great Basin and Desert Southwest. However, it has been suggested that a lack of permanent water likely restricted historical elk occurrence in large numbers in the driest portions of these regions; these dry areas, including Sheldon Refuge, presumably are outside the historical range of this species (see Wisdom and Thomas 1996). Elk were considered extinct from Nevada by the end of the nineteenth century (NDOW 1997). Between the 1930s and 1990s, elk were released at sites in eastern and central Nevada; their populations are currently expanding (NDOW 1997). To date, individual elk have been only occasionally spotted on Sheldon Refuge.

4.1.2.2 Riparian and Wetland Systems

Non-native, invasive, or noxious plants that occur in riparian areas on Sheldon Refuge include pepperweed (*Lepidium latifolium*, *L. perfoliatum*), saltlover (*Halogeton glomeratus*), Russian olive, Canada thistle, common reed (*Phragmites australis*), and water hemlock (*Cicuta maculate*).

Throughout the semi-arid rangeland, woody species (e.g., *Artemesia* spp.) have expanded into wet meadow systems at the expense of grasses and forbs (see Berlow et al. 2002). Factors influencing this expansion include 1) reduced natural fire frequency due to livestock (including feral horses and burros) grazing of herbaceous species; 2) decreased soil moisture from widespread soil compaction and disturbance from livestock trampling; 3) increased aridity (i.e., lowered water table) from grazing-induced changes in hydrology; 4) changes in the abundance of native wildlife; 5) increased shrub seed dispersal by livestock; and 6) interactions among the above factors (see Berlow et al. 2002).

In addition to invasive or expanding plants, there are species of non-native amphibians and fish which have been introduced to waterways on Sheldon Refuge. Guppies have been released by visitors at several locations on Sheldon Refuge; this species is very adaptable and can occupy a wide range of habitats, particularly warm springs (Williams et al. 1980). Exotic fish establishment is known to have a detrimental effect on native fisheries. For example, the absence of native chubs in Thousand Creek Spring is most likely a result of the introduction and subsequent establishment of guppies (Williams et al. 1980). Rainbow trout were first introduced into Virgin Creek in 1934 (Williams et al. 1980) and subsequently into other areas of Sheldon Refuge, which has resulted in the loss of the native species of Alvord cutthroat trout due to hybridization (Bartley and Gall 1991).

Bullfrogs have also been introduced to areas in Virgin Valley, and the population in the late 1970s was described as large (Storm 1980). Bullfrogs are voracious predators and eliminate native frogs in areas where they are introduced (Storm 1980). The full impact to the native frog populations on Sheldon Refuge both from predation by bullfrogs is unknown. In 2009, chytrid fungus (*Batrachochytrium dendrobatidis*) was documented on Sheldon Refuge (see Section 4.1.3). Chytridiomycosis, a disease caused by the chytrid fungus, is thought to be one of the biggest threats facing amphibian species worldwide; bullfrogs have been proposed as an important vector of the chytrid fungus (Weldon et al. 2004). Section 4.1.3 discusses this disease in more detail.

4.1.2.3 Control Efforts

Already a very significant problem in some areas for native plants and wildlife, invasive species control efforts will be essential, including extensive monitoring and spot control to preclude larger impacts (Inkley et al. 2004). Mechanical and physical methods have been used to combat invasive and encroaching plants in a variety of habitats, specifically in areas with encroaching western juniper. Chemical control methods are also being investigated for herbaceous species, and refuge staff are working with cooperators to develop an Integrated Pest Management Plan and associated pesticide use proposals, where appropriate. Despite recommendations to remove or control invasive animals (e.g., guppies, Storm 1980; bullfrogs, Williams et al. 1980) no attempts have been made to date.

4.1.3 Disease

Emerging infectious diseases pose a serious potential threat to wildlife conservation (Daszak et al. 2000). Greater sage-grouse are highly susceptible to West Nile virus (WNv) infection and once infected, there is little to no chance of survival (Clark et al. 2006). WNv was first confirmed in Greater sage-grouse in 2003 in northeast Wyoming. That year, WNv mortality contributed to a 25% decline in survival of marked birds in Wyoming and Montana (Naugle et al. 2004). Between 2004 and 2008, Greater sage-grouse, passerines, and feral horses were sampled for WNv antibodies on Sheldon and Hart Mountain refuges. To date, all sage-grouse and passerines have tested negative. However, of the feral horse samples tested in 2008 and 2009, 19% and 7%, respectively, tested positive for specific WNv neutralizing antibody (Franson et al. In Review). Specific WNv neutralizing antibodies were first detected in feral horses samples collected at Sheldon Refuge in 2005 when a single horse was found positive. Antibody positive status indicates an exposure to the virus, not necessarily that the animal is capable of transmitting the virus at the time of sampling. To transmit the virus the animal would have to have a virus positive result. To date, it is still widely believed that infected horses cannot infect a mosquito (Dusek 2008). However, a full understanding of the implications of WNv for sage-grouse conservation requires a long-term, coordinated monitoring strategy (Naugle et al. 2005).

In 2009, chytrid fungus was detected in introduced non-native bullfrogs in the Virgin Valley on Sheldon Refuge (Sheldon Refuge files). Bullfrogs have been proposed as an important vector for transmission of the chytrid fungus to native frogs and other amphibians (Weldon et al. 2004). Chytridiomycosis, a disease caused by the chytrid fungus, is thought to be one of the biggest threats facing native amphibian species worldwide (Weldon et al. 2004). Chytridiomycosis has been proposed as the cause of death in frog populations in the rain forests of Australia and Panama and associated with the decline of frog populations in Ecuador, Venezuela, New Zealand, and Spain (Weldon et al. 2004). The full impact to the native frog populations on Sheldon Refuge, outside of Virgin Valley, from this introduced disease is unknown.

Recently, large die-offs of wintering populations of bats have been documented in the eastern U.S. as a result of white-nose syndrome (WNS). WNS is such named because of a white fungus observed growing on the noses of some infected bats. The disease is not well understood, but one hypothesis is that infected bats arouse from hibernation to attempt to deal with the fungal infection and in doing so prematurely use up all of their fat reserves. The earliest evidence of WNS was documented at a cave in New York in 2006; since then, hundreds of thousands of bats have died. WNS is spread by bat-to-bat contact as well as by humans exploring caves and mines. To date, WNS has not been reported in the western United States; however, it generally accepted that it will eventually spread across many regions of North America (Western Bat Working Group 2009).

Many studies have identified disease as one of the most common factors limiting native and reintroduced bighorn sheep populations in the latter half of the twentieth century (see summary by Cassirer and Sinclair 2007). Disease, primarily bacterial pneumonia, has played an important role in the dynamics of bighorn sheep populations and has been responsible for numerous declines throughout North America; catastrophic all-age disease events are commonly reported in bighorn sheep populations. However, in some cases and even in the absence of a large-scale die-off, chronic or sporadic pneumonia-caused mortality could also be a primary factor limiting population growth (Cassirer and Sinclair 2007).

4.1.4 Changes in the Fire Regime

Fire regimes are the pattern of fire across the landscape and are defined by the combination of the frequency, intensity, severity, and time of year in which natural fire occurs within any particular area over a period of time. Areas within Sheldon Refuge are classified for fire management purposes based upon the frequency in which fires occur and the current condition of vegetation and fuels relative to historical conditions.

Fire is one of the dominant and most visible disturbances in the Great Basin and has played a significant role in shaping the sagebrush-steppe ecosystem of the western United States (Knick et al. 2005; Miller et al. 1994; Pyne 1982; Wright and Bailey 1982; Young et al. 1972); the plants and animals native to the sagebrush steppe evolved under the influence of periodic natural fire. After investigating fire episodes in the Interior Columbia Basin Ecosystem from 1540 to 1940, Barnett et al. (1997) concluded that 4% (4 million acres) of the Columbia Basin sagebrush types burned annually. Historically, fires in the Great Basin shrublands typically produced a mosaic of burned and unburned areas.

The distribution of soils, topography, moisture conditions, and fuels resulted in a mosaic of openings and uneven-aged stands of sagebrush (Connelly et al. 2004; Suring et al. 2005b). However, fire may not be beneficial in all situations to all species or detrimental to all species in all situations (Rose and Miller 1998; Wright and Bailey 1982). Additionally, there is some disagreement on the frequency and spatial scale of fires prior to European settlement (Dobkin and Sauder 2004). Fire is important in the maintenance of forb and grass components, facilitates nutrient cycling, and regulates other ecosystem processes within the sagebrush community (Knick et al. 2005). In the short term, fire generally increases the availability and palatability of herbaceous plants and crown-sprouting shrubs (e.g., rabbitbrush [*Ericameria nauseosa*], chokecherry, snowberry), while materially reducing other shrub and juniper cover. In the long term, the development of shrubs results in the re-establishment of critical cover (Gruell 1995). Then as sagebrush cover and density increase during succession, cover and density of associated herbaceous plants often decline (Britton and Clark 1985; Gruell 1995; Harniss and Murray 1973; Wright and Bailey 1982).

Prior to European settlement, fires in the Great Basin were believed to have occurred on average every 20 to 200 years (Burkhardt and Tisdale 1976; Houston 1973; Miller et al. 1994), depending on the existing plant community. Use of fire by Native Americans prior to European settlement in southeastern Oregon and northern Nevada has also been suggested, and it has been argued that the nomadic Paiute of eastern Oregon may have used fire on a widespread basis (see Gruell 1995). However, documentation of Native American use of fire is fragmented at best, and there are those that disagree with the overall extent of fire use (see Williams 2002). It is thought that European settlement during the 1850-1870s altered fire occurrence, and the resulting fire exclusion profoundly changed the vegetation composition in the Great Basin. In some areas characteristic fire-return intervals are now much longer as a result of fire suppression and the loss of fire fuels to livestock grazing; in other places, fire-return intervals are dramatically shorter due to the spread and dominance of fire-promoting exotic species, such as cheatgrass (Dobkin and Sauder 2004). The introduction of livestock and exclusion of fire have increased the distribution and density of juniper and big sagebrush across the Great Basin (Miller et al. 1994; Young and Evans 1981) and have resulted in declines in aspen density and regeneration. Prior to European settlement, fires probably created aspen communities with a mosaic of differing age classes, characterized by age classes of less than 60 to 100 years old, with stands over 100 years old being rare (Miller et al. 2001). Mosaics of different seral stages have changed to rather homogenous stands of dense sagebrush with corresponding reductions in herbaceous understory species as a result of fire suppression and livestock influence (Champlin and Winward 1982; Crane and Fisher 1986; Crawford et al. 1992; Goodrich 1999; Hironaka et al. 1983; Kauffman 1990; Tart 1996; Winward 1985; Wright and Bailey 1982; Young 1990).

4.1.4.1 Frequency of Fire within Sheldon Refuge

Following the area's settlement by ranchers and miners, the number of human-caused fires increased, but both these and other lightning-caused fires were aggressively suppressed and extinguished. Between 1935 and the early 1980s all natural fires were aggressively suppressed throughout Sheldon Refuge (USFWS 2009). Beginning in the 1960s and continuing through the 1980s, a limited amount of prescribed burning was conducted within Sheldon Refuge. The use of prescribed burning increased in the late 1980s and continues to be used to achieve a variety of management objectives.

From 1993 through 2004 an average of four natural fires occurred within Sheldon Refuge each year. The number of natural fires within any particular year during the same time period varied from zero to 10. On average, an additional six fires per year were ignited as prescribed fire to achieve habitat management objectives. The number of prescribed fires within any particular year during the same time period ranged from zero to 12 (Figure 4.1).

Documented lightning-caused fires after 1890 have remained relatively small. Excluding the Badger Fire which burned approximately 38,000 acres in 1994 (approximately 6% of Sheldon Refuge), an annual average of 1,659 acres burned by natural fires from 1993 through 2004 on Sheldon Refuge (USFWS 2008a). Prescribed fires have also remained small in size. From 1993 through 2004 the 74 prescribed fires burned an annual average of 327 acres. This average increased from 2005 through 2008 to an average of 1,365 acres; a total of 1,014 acres were burned via prescribed fire in 2009 (NFPORS 2009).

Under current fire management, the frequency of fires has been increasing, particularly prescribed fire, but the average size of an individual fire remains relatively small when compared to presumed natural conditions.

4.1.4.2 Fire Intensity within Sheldon Refuge

Lightning-caused fires within Sheldon Refuge are generally intense, fast-moving fires driven primarily by localized winds. Flame lengths range from 8 to 12 feet, and up to 20 feet in length in steep terrain (USFWS 2008a). In contrast, prescribed fires are usually conducted during the phase of dormancy of perennial grasses, generally after summer cure and prior to green-up, and as a result are less intense.

4.1.4.3 Fire Severity within Sheldon Refuge

Despite the intense nature of fires within Sheldon Refuge, natural fuel conditions throughout much of Sheldon Refuge are discontinuous and light—generally resulting in the potential for rapid fires but with low to moderate severity. Shrubs and other woody plants can be killed or completely consumed by flames of varying intensity, but basal stems of perennial bunchgrasses, and underground plant rhizomes, suckers, and runners are left intact to regrow and sprout the following season. When fuel conditions are above normal, fire intensity and duration can increase to the point all plants are killed or consumed (USFWS 2009).

In the western portion of Sheldon Refuge of mid and higher elevations, natural fuel conditions are generally more continuous and heavy, resulting in the potential for higher severity fires which can completely remove the dominant overstory canopies of western juniper, mountain mahogany, bitterbrush, and sagebrush—resulting in replacement by early successional plant communities.

4.1.4.4 Timing of Fires within Sheldon Refuge

The majority of lightning-caused fires occur from June through September, with some fires occasionally starting as early as mid-May or as late as mid-October. Prescribed fires are typically conducted from September through April, but prescribed fires have been ignited during every month of the year when management prescriptions for ignition have been met.

4.1.4.5 Current Fire Regime within Sheldon Refuge

Clearly existing conditions and management actions do not correspond to a natural fire regime. Past land management practices, including fire suppression, which occurred even before Sheldon Refuge was established, have potentially altered the patterns and types of vegetation and fuel across the landscape. In addition, the paramount importance of safety dictates that prescribed burns are conducted only when strict environmental conditions are met, which are not typical of the hotter, dry, and windy summer conditions of natural fires. Prescribed burning does not mimic natural fire because it generally occurs when conditions are cooler and wetter than during the summer months when lightning-caused fires would typically occur.

Presently, the condition of the fire regime within Sheldon Refuge is characterized as having a high (>66%) departure from historical conditions (USFWS 2009).

4.1.5 Human Disturbance and Habitat Fragmentation

4.1.5.1 Water Developments

Nearly every riparian and aquatic habitat system in Nevada has been altered or modified to some degree from pre-European settlement, through actions such as channelization, construction of dams and diversions, regulation of flows or diversion of flows for agriculture, groundwater depletion, recreational and urban development, de-watering activities (e.g., mining), and the introduction of non-native aquatic species (Wildlife Action Plan Team 2006), and the situation is no different within Sheldon Refuge. Hydrologic processes have been materially altered by previous water development efforts for livestock, including spring boxes, diversions, troughs, canals, dug-outs, and artificial ponds and reservoirs. Water diversions, pumping, and associated groundwater depletion can eliminate riparian habitats entirely because springs and ephemeral streams can easily be pulled underground by removal of a water source (Herbst 1996).

In efforts to enhance the distribution and productivity of livestock and game species, water sources have been built across Sheldon Refuge (see Figure 3.4). Although use of water catchments continues to be a popular management tool in the western United States, the efficacy of such efforts has been questioned and their use is controversial, particularly within wilderness areas (see summary by Cain et al. 2008). On Sheldon Refuge, water catchments or guzzlers have been constructed primarily for the benefit of chukar (a non-native species, see Section 4.1.2) and California bighorn sheep (Wurster 2009). Other modifications and alterations of riparian and aquatic habitats within Sheldon Refuge are the result of hundreds of spring diversions, small and large dams, dug-outs, troughs, and diversion canals. Almost 60% of surveyed sites on Sheldon Refuge were noted as being developed (Collins 2009). Of those developed sites, it was estimated that at least 48% of the structures were either only partially functioning or had already failed (Collins 2009). Repair of these structures must be weighed between the costs of restoration and ecological values. However, it is possible that some riparian systems have been lost entirely or altered so dramatically that they no longer provide the range of habitat opportunities that they would offer if they were not manipulated or otherwise managed (Wildlife Action Plan Team 2006). For example, constructed reservoirs such as Big Spring, Catnip, and Swan Lake are incontrovertible features of the landscape of Sheldon Refuge. Although the creation of these reservoirs necessitated loss of native habitat by inundating riparian habitats, affecting wetlands by altering water availability downstream, and creating habitats which support non-native aquatic and invasive plant species, many now provide significant summering, wintering, and migratory staging sites for waterbirds (Wildlife Action Plan Team 2006).

4.1.5.2 Fences

Currently, Sheldon Refuge has approximately 200 miles of residual allotment fences remaining from historical livestock grazing management. Much of this interior fencing is in extreme disrepair and has become an entanglement hazard for wildlife; efforts are ongoing to remove these hazards. However, one consequence of Sheldon Refuge being surrounded by BLM HMAs is that feral horses and burros may be moving onto Sheldon Refuge from these adjacent lands. This has necessitated additional fencing construction and maintenance along the exterior Sheldon Refuge boundary. Negative impacts of fences can be mitigated by proper design, and current fence construction standards on Sheldon Refuge use BLM wildlife fencing standards for all new fence construction.

4.1.5.3 Habitat Alteration Associated with Roads and Off-highway Vehicle Use

Among the most widespread forms of natural landscape modification landscape during the past century has been the construction and maintenance of roads. To date, more than 550,000 miles of roads have been built on Federal lands to facilitate resource extraction, recreation, and transportation (Havlick 2002). Over 22% of the contiguous United States is estimated to have been ecologically altered by the nation's road network, and that roads in rural areas have the greatest total ecological effect (Forman 2000; Riitters and Wickham 2003). Further, the typical western watershed has more than 20% of its total land area within 0.2 mile of a road, and many have more than 40% (Riitters and Wickham 2003).

Within Sheldon Refuge, vehicle use occurs on approximately 850 miles of road, routes, and trails. This includes unauthorized and illegal use within proposed wilderness areas and other areas closed to vehicle use. Since 1974, route density within Sheldon Refuge has more than doubled from approximately 0.37 mile of route per square mile to roughly 0.84 mile of route per square mile. Improper placement of roads in riparian areas has increased erosion, siltation, disturbance to wildlife, and habitat fragmentation (see Section 6.1.2.1; Ohmart 1996; Wildlife Action Plan Team 2006). Many remote campgrounds and roads are also situated in or near riparian areas, creating additional disturbance.

4.1.5.4 Recreation Uses and Activities

Specific recreational use impacts to riparian and aquatic systems within Sheldon Refuge include bleach and soap added to springs, soil compaction, removal of vegetation and resulting erosion from camping along edges, and manipulation of water flow from installing tubs and water diversions (e.g., Virgin Valley bathhouse). Disturbance, displacement, and habituation of wildlife due to recreation activity have been well documented and studied in other areas (Hammitt and Cole 1987). Other than impacts associated with hunting and vehicle use we presume impacts to wildlife and their habitats from wildlife observation, photography, sport fishing, and interpretation occurring on Sheldon Refuge occur seasonally and are short-term in nature due to the relatively few number of refuge visitors. As noted in other sections of this document, we estimate most impacts occur within Virgin Valley where uses and facilities are congregated and at other public use facilities such as semi-primitive and primitive campgrounds.

4.2 Refuge Habitats and Vegetation Types

The Great Basin and Columbia Plateau ecoregions include a variety of distinct habitats and vegetation types. Each habitat type is defined by the relative abundance of associated plant species. The health and function of these habitat types are the foundation upon which management of Sheldon Refuge is based and are therefore very important for developing and implementing future management decisions (Table 4.1).

Table 4.1 Estimated Acres by Landcover Type, Sheldon National Wildlife Refuge, Nevada
(See also Figure 4.2, which displays the location and distribution of these various habitat types.)

Vegetation Types[1]	Habitat Types	Estimated Acres	Percentage of Total Area
Intermountain Basins Big Sagebrush	Big sagebrush steppes and shrublands	133,617	23.898%
Columbia Plateau Low Sagebrush	Low sagebrush shrublands and steppes	133,500	23.877%
Intermountain Basins Greasewood	Salt desert scrubs and greasewood flats	23,669	4.233%
Intermountain Basins Mixed Salt Desert		10,716	1.917%
Intermountain Basins Montane Sagebrush	Montane sagebrush steppes	180,343	32.255%
Northern Rocky Mountain Deciduous Shrub		2,445	0.437%
Intermountain Basins Semi-desert Grassland	Semi-desert grasslands and steppes (including Great Basin wildrye stands)	37,327	6.676%
North American Arid West Emergent Marsh	Emergent marshes and wet meadows	3,511	0.628%
Cattails		172	0.031%
Open Water	Streams and reservoirs (including springs and springbrooks)	455	0.081%
Intermountain Basins Playa	Ephemeral wetlands (includes playas, salt flats, and mudflats)	7,131	1.275%
Barren	Cliffs, canyons, talus slopes, and barren lands		
Intermountain Basins Cliff and Canyon		10,164	1.818%
Rocky Mountain Aspen Forest and Woodland	Deciduous woodlands and shrublands	275	0.049%
Intermountain Basins Mountain Mahogany	Mountain mahogany woodlands	9,009	1.611%
Intermountain Basins Juniper	Western juniper woodlands	4,863	0.870%
Invasive Annual Forbland		857	0.153%
Invasive Annual Grassland		1,054	0.189%
Total area classified (excludes outlier properties)		559,109.18	

[1] Does not include spring and springbrooks habitats, which are too small to be mapped by landcover type.

4.2.1 Sagebrush-steppe and Other Shrubland Habitats

4.2.1.1 Description and Location

Sagebrush is often the dominant shrub on salt-free soils at elevations between 492 and 10,826 feet (Miller and Eddleman 2001). There are five main types of sagebrush or shrubland habitat on Sheldon Refuge: 1) montane sagebrush steppe; 2) big sagebrush steppe (Photo 4.1); 3) big sagebrush shrubland; 4) low sagebrush shrubland and steppe; and 5) salt desert scrub and greasewood flat. This nomenclature generally follows that described in LANDFIRE (2007) and the Southwest Regional Gap Analysis Project (NatureServe 2004). Further detail may also be found in Rogers and Tiehm (1979).

Photo 4.1 Typical sagebrush-steppe habitat within Sheldon Refuge.

Big sagebrush steppe

These stands are dominated by basin big sagebrush (*A. t.* spp. *tridentata*) occurring in deep, friable soils. Other shrubs include rabbitbrush and Wyoming big sagebrush (*A.t.* ssp. *wyomingensis*). Native perennial bunchgrasses and forbs predominate the understory and include bluebunch wheatgrass (*Pseudoroegneria spicata*), Thurber's needlegrass (*Achnatherum thurberianum*), Great Basin wildrye, and Sandberg's bluegrass (*Poa secunda*). The forb component can be diverse with more than 200 species identified over the range of this habitat type in the Great Basin. Native annual forbs may dominate following disturbance.

Big sagebrush shrubland

These stands are dominated by Wyoming big sagebrush. Other shrubs include spiny hopsage (*Grayia spinosa*), basin big sagebrush, and rabbitbrush. Sandberg's bluegrass is the primary herbaceous species; other native species include needle-and-thread (*Hesperostipa comata*), bluebunch wheatgrass, and Great Basin wildrye. Forbs are relatively sparse except following disturbance and include lupine (*Lupinus* spp.).

Low sagebrush shrubland and steppe

These stands are dominated by low sagebrush. Rabbitbrush and bitterbrush also occur. Associated species include Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass, Thurber's needlegrass, squirreltail (*Elymus* spp.), Sandberg's bluegrass, and prairie junegrass (*Koeleria macrantha*). A variety of forbs are usually present including *Phlox* spp., *Lomatium* spp., *Crepis* spp., buckwheat (*Polygonaceae* spp.), and *Lupinus* spp.

Two rare plants are known to occur in this habitat type on Sheldon Refuge: rose biscuitroot and grimy ivesia. The first species, rose biscuitroot, is found in scree and rock fissures overlying clay soils in low sagebrush shrublands. The second species, grimy ivesia has been documented occurring

as a dominant plant in sparsely vegetated gravelly and rocky areas within a matrix of shrublands dominated by low sagebrush and mountain sagebrush (Nachlinger and Tiehm 1996). The Sheldon Refuge population of grimy ivesia represents 86% of the known individuals within Nevada and 85% of all globally known plants (Nachlinger and Tiehm 1996).

Salt desert scrub and greasewood flat

These habitats occur as a mosaic of low shrub communities interspersed with native bunchgrasses on alkaline or moderately saline soils where a relatively high water table is present. Precipitation is also a major factor, and winter moisture accumulation amounts will affect spring plant growth. Some communities are further maintained by intra- or inter-annual flooding cycles followed by extended drought. Common shrubs include greasewood, shadscale saltbrush, fourwing saltbrush (*Atriplex canescens*), silver sagebrush (*Artemesia cana*), winterfat (or whitesage), and spiny hopsage. Common herbaceous species include Indian ricegrass (*Achnatherum hymenoides*), needle-and-thread, saltgrass, squirreltail, sea-blight (*Suaeda torreyana*), and globemallows (*Sphaeralcea* spp.).

Montane sagebrush steppe

These stands are dominated by mountain big sagebrush. Mountain big sagebrush generally occupies moist, productive rolling upland sites. Bitterbrush is a common component of these sites. Other common shrubs include threetip sagebrush (*Artemisia tripartite*) and mountain shrub species (e.g., currant, wild rose [*Rosa* spp.], and snowberry). Herbaceous species include Thurber's needlegrass, Idaho fescue, bluebunch wheatgrass, and Sandberg's bluegrass.

Other associated sagebrush-steppe communities

Biological soil crusts are an integral component of rangeland soils and occur across Sheldon Refuge. These complex assemblages of lichens, liverworts, mosses, cyanobacteria, and algae dominate the uppermost part of the soil surface (Rosentreter and Eldridge 2004). Biological soil crusts provide living cover in environments where soil conditions and high evapotranspiration rates do not support dense vascular plant cover. They reduce soil erosion and enhance nutrient cycling in semi-arid and arid plant communities (see Kaltenecker et al. 1999; Rostentreter and Eldridge 2004).

4.2.1.2 Condition and Trends

Big sagebrush steppe

Basin big sagebrush has a variable mean fire-return interval (<50-150 years). Ecologically significant fires are generally mixed lower severity fires with high severity fires that occur on longer intervals. Periodic drought and insect outbreaks are also factors. Shrub canopy closure of 30%-40% may occur, but it is considered rare. Recently, invasive annual grasses have encroached on patches of varying size. Across the Great Basin, a lack of fire has resulted in a greater proportion of the late-seral closed canopy class than is thought to have occurred historically. Livestock grazing has further increased the proportion of rabbitbrush and decreased native bunchgrass vigor and abundance in all seral stages. On Sheldon Refuge, these habitats are confined to areas of deep soils with adequate moisture and are generally in overall fair condition.

Big sagebrush shrubland

Wyoming big sagebrush habitats historically experienced relatively infrequent fire due to highly variable fire fuels; average fire-return intervals were estimated to be 25 to 100 years (Rose and Miller 1998). Shrub die-offs have occurred, but the causes are largely unknown. Typical canopy cover in this habitat ranges from 8% to 23%; at 12% to 15% cover understory production can begin to decline (Winward 1991). Return of a site following disturbance with a previously high canopy cover (~20%) to a shrub-dominated canopy can take upward of 40 years in drier sites (Winward 1991). In the Great Basin, past overgrazing has allowed invasive annual grasses, mostly cheatgrass, to establish within many of these habitats. In some areas, cheatgrass has contributed to larger and more frequent fires than occurred historically and is resulting in habitat conversion. In addition, grazing has also contributed to an increased density of large shrubs and a reduction in perennial grasses. On Sheldon Refuge, grazing by feral horses continues to be a main concern in these habitats. While encroachment by cheatgrass in disturbed areas is also a concern, these habitats appear to be in overall fair condition.

Low sagebrush shrubland and steppe

Fire in low sagebrush habitats does not carry well and is infrequent under all but extreme conditions. Prior to European settlement, the estimated mean fire-return interval in low sagebrush habitats was 100 to 200 years (Rose and Miller 1998); it is likely that the period of fire suppression has not yet pushed this habitat beyond its historical fire-free interval (Ballard 2002). These habitats regenerate slowly following fire, and prescribed fire treatments in these types of less productive habitats have had mixed results (Rose and Miller 1998). Disturbed low sagebrush habitats are also commonly threatened by invasion from exotic annual grasses, including cheatgrass; invasive plants are less likely to invade undisturbed sites in good condition. Some stands across the Great Basin have seen reductions in large perennial bunchgrasses as a result of past grazing history. On Sheldon Refuge, while grazing by feral horses and burros continues to be a main concern, these habitats appear to be in overall fair to good condition.

Salt desert scrub and greasewood flat

Moisture supporting these intermittently flooded wetlands is usually derived off-site, and they are dependent upon natural watershed function for persistence (Reid et al. 1999). However, the length and severity of drought in the Great Basin has increased since the beginning of the twentieth century. Disturbance events are generally unpredictable and include drought (mean 70 years), flooding (mean 100 years), and fire (mean 150-1,000 years) although stand-replacing fire is rare. Historical overgrazing by livestock on Sheldon Refuge contributed to an increase of shrubs on these sites, and a significant proportion of Great Basin wildrye stands have been converted to greasewood dominated habitats (Photo 4.2). Upland salt desert shrub and greasewood communities are also easily invaded and, in the short term, replaced by cheatgrass and other invasive plant species (e.g., *Halogeton* spp.). In some areas of the Great Basin, the invasion of cheatgrass has altered fire behavior and frequency in these community types. On Sheldon Refuge, ongoing grazing by feral horses and burros precludes restoration.

Photo 4.2 Typical salt desert scrub and greasewood habitat within Sheldon Refuge (Photo Gail Collins).

Montane sagebrush steppe

Mountain sagebrush habitats incur stand-replacing fire every 12 to 15 years on average, ranging from three to 38 years (Miller and Rose 1998). The disturbance pattern largely creates a variety of age classes across the larger landscape ranging from 100 to 5,000 acres in size. Under pre-European settlement conditions, mosaic burns generally killed the above-ground portion of at least 75% of plants (also called topkill) due to the relatively continuous herbaceous layer. These stands also incur periodic mortality due to insects, disease, winter kill, rodent outbreaks, and drought. These disturbances in combination may have significantly reduced the cover of dense stands every 50 to 100 years.

Bitterbrush is a major component of some mountain big sagebrush habitats on Sheldon Refuge and is considered a valuable forage shrub on many ranges occupied by wintering ungulates. Initially, fire exclusion coupled with intensive spring perennial grazing by livestock appeared to favor bitterbrush stand establishment, growth, survival, and increased density (Bunting et al. 1985; Rice 1983; Salwasser 1979). However, livestock overgrazing, senescence, extreme natural fire, and encroachment by big sagebrush has severely reduced bitterbrush abundance across much of its range (Murray 1983; see Ganskopp et al. 2004). Currently, diminished bitterbrush recruitment and reduced vigor are attributed mainly to the absence of disturbance, including fire (Adams 1975; Bedunah et al. 2004; Rice 1983; Roberts et al. 1989; Salwasser 1979). Plant age and vigor in particular can contribute to sprouting responses; shrubs less than five or greater than 60 years old do not sprout well (Martin and Driver 1983; USDA 1999). Other sources of disturbance include periodic defoliation by insects (e.g., tent caterpillar, grasshopper, tussock moth) and disease (e.g., root rot, fungus) (Dryer et al. 2007). However, many species of insects and mites inhabit bitterbrush, several of which are beneficial; bitterbrush is insect pollinated (Dryer et al. 2007).

Fire exclusion in many bitterbrush stands has resulted in increased competition from western juniper and big sagebrush encroachment. Indeed, protection of stands from fire to the point of advanced age,

where excessive fuel has accumulated, plant competition has developed, or the plants have not developed sprouting capability, has led to bitterbrush stands that are increasingly susceptible to fire across the Great Basin (Martin and Driver 1983). In the Badger Mountain area of Sheldon Refuge, natural fire re-occurred in 1994, 1997, and 2000. After the 1994 fire, there was marked recruitment of bitterbrush seedlings on the margins of the burned area (Clements and Young 2006). But the 1997 and 2000 fires in the same area may have eliminated some of the seed source necessary for further shrub recruitment (Clements and Young 2006). On Sheldon Refuge, while grazing by feral horses continues to be a main concern, these habitats appear to be in overall fair condition.

4.2.2 Other Associated Sagebrush-steppe Communities

4.2.2.1 Associated Wildlife

Birds

Bird species whose distribution is closely tied to sagebrush habitats during at least part of the year are considered sagebrush obligates (Braun et al. 1976; Paige and Ritter 1999). Shrubland and grassland birds are declining faster than any other group of species in North America (Dobkin 1994; Paige and Ritter 1999; Saab and Rich 1997). In fact, sagebrush habitats have been identified as one of the top most threatened bird habitats in the United States (American Bird Conservatory 2007). Dobkin and Sauder (2004) documented significantly declining population trends for 16 of the 25 upland bird species considered. In addition, Paige and Ritter (1999) identified 18 bird species associated with sagebrush ecosystems that were of conservation concern. These species represent an important component of the biodiversity of the western United States but have seen little conservation action (Knick et al. 2003). Recently, the three primary passerine species of sagebrush habitats, Brewer's sparrow, sage sparrow, and sage thrasher, have received special conservation status in one or more western states (Knick and Rotenberry 2002; Wildlife Action Plan Team 2006). The status of populations on Sheldon Refuge is unknown.

Greater sage-grouse

Widespread concern for sagebrush-obligate wildlife due to loss of sagebrush habitats has been primarily focused on Greater sage-grouse (habitat distribution shown in Figure 4.3), the flagship game bird of these landscapes (see Dobkin and Sauder 2004). Sage-grouse on Sheldon Refuge have been documented to nest in shrub habitats, including low sagebrush, big sagebrush, and bitterbrush sites (Klebenow and Burkhardt 1982). While shrubs also provide important forage, the importance of forbs and insects in the sage-grouse diet has been well documented (Drut et al. 1994; Evans 1986; Gregg 2006). For example, Huwer et al. (2008) found that increasing forb cover in areas with <20% forb cover may lead to increased chick survival and grouse productivity. For more information on sage-grouse ecology, see Connelly et al. (2004) and CalPIF (2005).

Within the core area of their range, sage-grouse populations have dramatically declined (Braun 1998; Wisdom et al. 1998). Sage-grouse have been extirpated in British Columbia, Nebraska, New Mexico, Arizona, and Oklahoma (Braun 1991, 1993). In 2008, the Western Association of Fish and Wildlife Agencies (WAFWA) conducted new population trend analyses that incorporated an additional four years of data beyond the Connelly et al. 2004 analysis (WAFWA 2008). Although the WAFWA analyses used different statistical techniques, lek counts also were used. WAFWA results were similar to Connelly et al. (2004) in that a long-term population decline was detected from 1965 to 2007 (average 3.1% annually; WAFWA 2008). WAFWA attributed the decline to the

reduction in number of active leks (WAFWA 2008). Across Nevada, annual rates of change suggest a long-term decline for sage-grouse. The statewide population reached a low in the mid-1990s and according to Connelly et al. (2004) did not appear to have changed substantially since that time. In the mid-1980s, a study in an area adjacent to Sheldon Refuge suggested that high harvest rates combined with low annual recruitment were affecting the low density sage-grouse population (Zunino 1987).

Recorded estimates of sage-grouse numbers and population trends have been maintained since 1942 on Sheldon Refuge (USFWS 1971); however, methods were not standardized until the mid-1990s (Collins 2008b). The primary method used to monitor trends in sage-grouse populations is by conducting helicopter surveys to count the number of male birds annually at designated lek areas during the breeding season. Average numbers of male sage-grouse per lek surveyed on Sheldon Refuge[1] from 1998-2010 are displayed in 4.3. In 2004 the population of sage-grouse within Sheldon Refuge was estimated at 2,896 to 3,475 birds (Sage-grouse Conservation Team 2004). In 2007, 2008, and 2009, a population decrease was noted for Sheldon Refuge, which had shown population increases each year since calculations were first established in 2003 (Collins 2010; Sage-grouse Conservation Team 2007; Sheldon Refuge files).

Hunting for sage-grouse within Sheldon Refuge has been conducted intermittently and for various purposes over the past 50 years. There was no hunting for sage-grouse on Sheldon Refuge between the refuge's establishment in 1931 and 1960. A limited annual sport hunting season was initiated in 1961 (USFWS 1971) but was subsequently closed. In 1995, the Service, in cooperation with the State of Nevada, initiated a limited permit-only hunting season for Greater sage-grouse on the majority of Sheldon Refuge (Collins 2008b; Day 2009) specifically to collect bird wings for use in estimating population productivity and reproduction. Although population trend can be estimated from lek counts alone, production data help determine whether recruitment rates are high enough to sustain a population. Nest success and recruitment of juveniles into the population are usually cited as the most significant parameter influencing sage-grouse population trend (Armentrout et al. 2004). The nest success for 2008 was estimated to be 61%. This was higher than all other areas in the western region of Nevada, which includes Washoe, Humboldt, and Churchill counties. However, the accuracy of this estimate is questionable due to greater susceptibility of immature birds to hunter harvest and concerns related to inadequate sample size. Wing data from birds harvested on Sheldon Refuge are also used to estimate sage-grouse sex and age ratios. Monitoring upland game population trends with sex and age ratios from hunter harvests is a common practice, although recent analyses indicate that the number of samples required to generate precise population estimates currently exceeds the harvest levels of most states (Hagen and Loughin 2008). Questions regarding the ability to conduct meaningful population analysis from hunter-harvested wings have previously been noted for Sheldon Refuge (Klebenow and Burkhardt 1982). Despite the limitations of wing data, they probably provide the only viable means for assessing the effects of management actions on production at the state or local population management unit scale (Sage-grouse Conservation Team 2004).

[1] The Sheldon Refuge boundary corresponds closely with the Sheldon Population Management Unit (PMU) boundary, except that desert habitats in the eastern portion of Sheldon Refuge are not included in the PMU. PMUs are the management units identified by the State of Nevada and used for statewide sage-grouse management and planning purposes.

The hunt on Sheldon Refuge is considered the most conservative in Nevada and is conducted by permit during two separate two-day seasons during September each year. In total, 75 permits are issued, each of which allow a maximum daily harvest of two birds and a maximum possession limit of four birds for a maximum allowable harvest of 300 birds. The average annual harvest reported is 144 birds. NDOW and Sheldon Refuge coordinate the timing and harvest limit of the hunting season(s). All permit holders are required to deposit one wing from each sage-grouse harvested in collection barrels on Sheldon Refuge. In addition, hunters must return a questionnaire to USFWS stating if they actually hunted, where they hunted, and how many birds they harvested. The compliance rate for returning the questionnaire was 90% in 2001 (Armentrout et al. 2004).

In 2010 the USFWS listed Greater sage-grouse as a candidate species under the Endangered Species Act, meaning that the Service finds that listing the Greater sage-grouse (rangewide) (as a threatened or endangered species) is warranted but precluded by higher priority listing actions. The Service recognizes the need to recover sage-grouse populations throughout the United States to ensure the continued existence and survival of the species. In support of sage-grouse population recovery efforts, 25 birds were translocated from Sheldon Refuge to Washington in 2004, and 22 birds were translocated to California in 2007.

Other birds

Sagebrush-steppe and shrubland habitats on Sheldon Refuge provide important habitat to a range of other bird species. As discussed above, the major sagebrush-steppe obligate passerine species are Brewer's sparrow, sage sparrow, and sage thrasher. In addition, many other birds seasonally occupy shrub-steppe habitats on Sheldon Refuge including vesper sparrow (*Pooecetes gramineus*), horned lark (*Eremophila alpestris*), lark sparrow (*Chondestes grammacus*), loggerhead shrike (*Lanius ludovicianus*), green-tailed towhee (*Chlorura chlorura*), gray flycatcher (*Empidonax wrightii*), Say's phoebe (*Sayornis saya*), western meadowlark (*Sturnella neglecta*), western kingbird (*Tyrannus verticalis*), and white-throated swift (*Aeronautes saxatalis*). Shrub-steppe uplands also provide foraging habitat for raptors, including bald eagle (*Haliaeetus leucocephalus*), long-eared owl (*Asio otus*), ferruginous hawk (*Buteo regalis*), red-tailed hawk (*B. jamaicensis*), and prairie falcon. Of the listed species above, Greater sage-grouse, Brewer's sparrow, sage sparrow, bald eagle, ferruginous hawk, white-throated swift, and loggerhead shrike have been identified as Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006).

Mammals

Pronghorn

Pronghorn (habitat distribution shown in Figure 4.4), a sagebrush-obligate species within the Sheldon and Hart Mountain refuges are migratory, and the populations of these two refuges are thought to intermingle (Pyle and Smith 1990). There have been few accurate total population counts of pronghorn on Sheldon Refuge or adjacent lands; generally efforts have been directed toward herd composition rather than population census. For all survey efforts (composition and census), discrepancies in location and distribution of the population during surveys, differences in the timing and intensity of effort, poor and varied techniques, and lack of available resources have contributed to the complexity of this issue (USFWS 2001b).

Pronghorn were nearly extirpated from North America in the late 1800s by sport and commercial hunting. Following the enactment of protective laws, pronghorn subsequently increased by >3,200%

during the twentieth century; they have been second only to deer species in abundance and harvest in the United States (Yoakum et al. 1996). Pronghorn populations have undergone large fluctuations since Sheldon Refuge was established. Three population trends are evident on the Sheldon and Hart Mountain refuges since the 1930s. First, summer numbers gradually declined from a peak in the late 1930s to a low in the mid-1950s. The population then increased in the late 1950s, and was apparently stable between the 1950s and 1970s. Pronghorn increased again in the 1980s (Pyle and Smith 1990). There were recent concerns in the mid- to late 1990s that the population on Hart Mountain Refuge was at risk of decline (USFWS 2001b). Early data from studies initiated during that period suggested that predators were responsible for the majority of pronghorn fawn mortality and that predator control was necessary for the recovery of the declining population (USFWS 2001b). Ultimately, predator control efforts were postponed indefinitely in part due to an unexpected improvement in fawn survival, and both the Hart Mountain and Sheldon pronghorn populations have since substantially increased (Collins 2008a). This indicates that predation was not the primary limiting factor. Indeed, additional data has since demonstrated that both the fawn's date of birth and previous summer's precipitation are highly important factors in fawn survival (Whittaker 2008). There was no harvest season for pronghorn within Sheldon Refuge between 1936 and 1967. Conservative harvest regulations were implemented in 1968, with an emphasis on quality hunting experiences (Pyle and Smith 1990).

For studies of pronghorn habitat requirements, diet, intra-species interactions, and population dynamics within Sheldon Refuge see Deming (1954), Meeker (1979), McNay (1980), and Maher (1991). Low sagebrush habitats on Sheldon Refuge in particular are important for pronghorn, especially for wintering and fawning. Sagebrush is also an important forage source year-round, with forbs contributing heavily to the diet during the summer. Winter weather severity and spring/summer precipitation strongly influence pronghorn population numbers, trends, production, recruitment, distribution, and seasonal movements (USFWS 2001b).

Mule deer

Mule deer populations (habitat distribution shown in Figure 4.4) have experienced wide fluctuations over the past 60 years due to past land management practices. The current decline of populations throughout the western United States most likely is the result of habitats that have reached optimum levels during and following a period of extreme disturbance. It is unlikely these lands will again support such high historically observed numbers of mule deer (Gruell 1986).

Studies have confirmed that mule deer diets on Sheldon Refuge are dominated by bitterbrush and mountain mahogany (Woodis 1989). Important mule deer fawning habitats on Sheldon Refuge also include mountain big sagebrush and mountain mahogany sites, and the Virgin Valley is important for spring foraging (Burkhardt et al. 1982). Data also indicate that some mule deer summering on Sheldon Refuge migrate off-refuge during the winter (Burkhardt et al. 1982; Sheldon Refuge files). There were no open seasons for deer harvest between 1936 and 1951. By the mid-1950s, mule deer ranges on Sheldon Refuge were noted as being severely overgrazed and attempts were made to reduce the wintering mule deer population by as much as 30% (USFWS 1956). However, in the early 1960s, it was noted that liberal harvest regulations, including either-sex and extended seasons, were potentially impacting Sheldon Refuge's mule deer population outside of the closed areas (USFWS 1962). Currently mule deer hunting is managed to limit take and maximize quality hunting experiences.

Pygmy rabbit

Pygmy rabbits (habitat distribution shown in Figure 4.3) are a sagebrush habitat specialist of heightened conservation concern for which data on distribution, movement, and space use are limited (USFWS 2003). Following declines in Oregon and Washington and a lack of solid information about its status elsewhere, the species was designated as a Federal species of special concern. In 2010, the Service determined that there has been some loss and degradation of pygmy rabbit habitat range-wide, but not to the magnitude that constitutes a significant threat to the species and that protection under the Endangered Species Act is not warranted.

While the population status of pygmy rabbits on Sheldon Refuge is largely unknown, recent investigations found that pygmy rabbits were still present throughout all of their historical range in Nevada (Larrucea and Brussard 2008). Pygmy rabbits are uniquely dependent on big sagebrush for cover and food, occupying some of the remaining sagebrush steppe in the Great Basin where sagebrush is relatively tall and dense and soils are deep. Dense sagebrush provides thermal cover and protection from predators (see Siegel-Thines et al. 2004). In addition to providing cover, sagebrush dominates the diet of pygmy rabbits throughout the year, with substantial use of grasses and forbs when seasonally available (see summary by Sanchez and Rachlow 2008). There are indications that pygmy rabbits use larger home ranges than expected for their body size, and that their range is influenced by gender, season, and dispersion of resources.

Other mammals

Additional sagebrush-obligate mammal species on Sheldon Refuge include kit fox (*Vulpes macrotis*), sagebrush vole (*Lagurus curtatus*), and Great Basin pocket mouse (*Perognathus parvus*). Other mammal species that utilize shrubland habitats on Sheldon Refuge include bobcat, coyote, mountain lion, desert wood rat (*Neotoma lepida*), black-tailed jack rabbit (*Lepus californicus*), Nuttall's (mountain) cottontail (*Sylvilagus nuttallii*), dark kangaroo mouse (*Microdipodops megacephalus*), northern grasshopper mouse (*Onychomys leucogaster*), and Preble's shrew (*Sorex preblei*). Many of the inhabitants of salt-desert scrub, in particular, require burrows for nesting, hunting, predator avoidance, and thermoregulation. Of the listed species, Preble's shrew, sagebrush vole, kit fox, pygmy rabbit, and mule deer are listed as Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006).

Reptiles and amphibians

The main sagebrush-obligate reptile species that occurs on Sheldon Refuge is the sagebrush lizard. Other species found in shrub uplands include collared lizard (*Crotaphytus collaris*), desert horned lizard (*Phrynosoma platyrhinos*), pygmy short-horned lizard (*Phrynosoma douglasii*), western whiptail (*Cnemidophorus tigris*), and striped whipsnake (*Masticophis taeniatus*). The desert horned lizard and pygmy short-horned lizard are listed as Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006).

Amphibians include the Great Basin spadefoot toad (*Scaphiopus intermontanus*). This species is unique in that it occupies arid regions of sagebrush flats and shrublands, breeding in temporary or permanent water bodies. While little is known of their movement capabilities, it is suspected they may move several hundred feet between breeding sites and terrestrial habitats (Hammerson 2005).

4.2.2.2 Threats

Across the Great Basin, human-caused disturbance and habitat fragmentation associated with livestock grazing, fencing, agriculture, mining, urban development, and recreational access are all considered threats. In addition, encroachment of western juniper, expanding invasive plant species, changes in the natural fire regime, disease, and grazing from feral horses and burros are also threats to these habitat types and associated fish and wildlife within Sheldon Refuge.

Shrubs and trees increased with the increasing length of fire-return intervals after the 1870s, and currently a dense shrub or tree layer dominates much of the mountain big sagebrush–bunchgrass communities in much of the Great Basin. Burkhardt and Tisdale (1976) concluded that fire-frequency intervals of 30 to 40 years would be adequate to keep western juniper from invading many sagebrush-grassland communities. As communities cross the threshold and juniper begins to dominate a site, the rapid decline of understory fine and woody fuels greatly reduces the potential for fire to occur (Miller et al. 2001). However, the decline of intact Wyoming big sagebrush–bunchgrass communities in the larger region has generated debate regarding the value and risks associated with using prescribed fire in an attempt to mimic historical fire regimes; in particular, the potential for prescribed fire to promote exotic annual grass invasion. Sites that have transitioned from shrub-steppe to woodland due to encroachment of western juniper may now only burn under severe weather conditions that create crown fires in tree-dominated communities (Knick et al. 2005).

Human disturbance and habitat fragmentation

Anthropogenic influences in shrub-steppe ecosystems have changed the landscape of the Intermountain West (see Section 4.2.1). This includes habitat fragmentation associated with livestock grazing, fencing, agriculture, mining, urban development, and recreational access.

4.2.3 Semi-desert Grasslands and Steppes

4.2.3.1 Description and Location

These habitat types include semi-desert steppes and grasslands characterized by sparse to moderately vegetated mosaic of shrubs and perennial grasses (Photo 4.3). The herbaceous layer is dominated by drought-resistant perennial bunchgrasses including bluebunch wheatgrass, Thurber's needlegrass, Sandberg's bluegrass, Great Basin wildrye, needle-and-thread, and Indian ricegrass. Shrubs include greasewood, spiny hopsage, saltbrush (*Atriplex* spp.), sagebrush, bitterbrush, and rabbitbrush. Nomenclature follows that described in LANDFIRE (2007) and the Southwest Regional Gap Analysis Project (NatureServe 2004).

Photo 4.3 Typical semi-desert grassland habitat within Sheldon Refuge.

4.2.3.2 Condition and Trend

The composition and structure of the semi-arid or desert grasslands of western North America have changed dramatically over the past 150 years. Native brushy or woody species in these communities have increased in density and cover due to changes in local conditions (Van Auken 2000). Causes for shrub or woody plant encroachment in semi-arid grasslands have been much debated. Most often cited as reasons are climate change, chronic high levels of grazing, changes in fire frequency, changes in grass competitive ability, spread of seed by livestock, small mammal populations, elevated levels of carbon dioxide, and combinations of these factors (see Van Auken 2000). Chronic high levels of grazing associated with the introduction of cattle (and likely feral horses and burros) appear to be a primary factor in the conversion of semi-arid grasslands into shrublands or woodlands. However, the mechanisms are still not well understood (Van Auken 2000). At the same time, fire frequency and fire size in these semi-arid grasslands have decreased, resulting in larger and denser stands of woody plants and less grass. There is historical evidence of fires in these systems from the earliest travelers and European settlers, although some argue that there was not enough fuel in these grasslands to carry an extensive fire; today natural fires are rare (see Van Auken 2000).

4.2.3.3 Associated Wildlife

Birds

Semi-desert steppes and grasslands support several breeding bird species including Greater sage-grouse, horned lark, mountain bluebird (*Sailia currucoides*), savannah sparrow (*Paserculus sandwichensis*), vesper sparrow, and western meadowlark. Grasslands also provide foraging habitat for raptors including American kestrel (*Falco sparverius*), ferruginous hawk, golden eagle, long-eared owl, short-eared owl (*Asio flammeus*), northern harrier (*Circus cyaneus*), northern shrike (*Lanius excubitor*), red-tailed hawk, and rough-legged hawk (*Buteo lagopus*). The Greater sage-grouse, ferruginous hawk, short-eared owl, and western burrowing owl (*Speotyto cunicalaria*) are listed as Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006).

Western burrowing owl

Populations of burrowing owls have declined in many portions of their range. The owls are listed as endangered in Canada, a species of National Conservation Concern in the United States, and are listed, or being considered for listing, in many western states (Conway et al. 2008; Klute et al. 2003). The status of the population on Sheldon Refuge is largely unknown. For details of burrowing owl ecology, see Klute et al. (2003).

Mammals

Semi-desert steppes and grasslands on Sheldon Refuge provide habitat for pronghorn, mule deer, kit fox, coyote, bobcat, mountain lion, yellow-bellied marmot (*Marmota flaviventris*), American badger (*Taxidea taxus*), black-tailed jackrabbit, white-tailed jackrabbit (*Lepus townsendii*), Belding's ground squirrel (*Spermophilus beldingi*), Ord's kangaroo rat (*Dipodomys ordii*), and northern grasshopper mouse. Species included as Nevada Species of Conservation Priority are mule deer and kit fox (Wildlife Action Plan Team 2006).

Reptiles and amphibians

Reptiles documented in these habitats on Sheldon Refuge include desert horned lizard, long-nosed leopard lizard (*Gambelia wislizenii*), pygmy short-horned lizard, rubber boa (*Charina bottae*), western whiptail, striped whipsnake, and western rattlesnake (*Crotalus viridis*). The desert horned lizard, pygmy short-horned lizard, and long-nosed leopard lizard are listed as Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006). Amphibians include the Great Basin spadefoot toad, although the distribution of this species is limited by available ponds for breeding.

4.2.3.4 Threats

In addition to feral horses and burros (see Section 4.1.1), human disturbances associated with recreation use and habitat fragmentation from vehicle routes and utility rights-of-way (see Section 4.1.5) are considered threats to these habitat types and associated wildlife within Sheldon Refuge.

4.2.4 Emergent Marshes, Wet Meadows, Streams, Reservoirs, Springs, Springbrooks, and Ephemeral Wetlands

4.2.4.1 Description and Location

Riparian habitats in western rangelands have exceedingly high values for human society, fish, and wildlife. Their resource values far exceed the approximate 0.1% of the land area they cover (Ohmart 1996). These areas serve to trap and stabilize eroded sediments, detoxify compounds, act as phosphorus sinks for soil enrichment, and serve as denitrification areas to provide high water quality (Ohmart 1996). Riparian areas are also the most ecologically productive and diverse of all terrestrial habitats. This results from a variety of physical environments arising from moisture gradients, margins of often highly contrasting vegetation components, and a general mosaic of habitats created by dynamic stream changes (Clary and Medin 1999). Riparian habitats are also particularly important in the arid refuge environment where the presence of water and relatively cool, often shaded conditions provide an ecological importance and diversity far beyond their extent; a large portion of both the flora and fauna in riparian zones exists nowhere else (Clary and Medin 1999; Ohmart 1996). Although many desert aquatic species are adapted to life in ephemeral, saline, or

geothermal habitats, prolonged disruption of aquatic environments has resulted in the loss of biodiversity in the Great Basin (Herbst 1996).

On Sheldon Refuge, water is scarce during the summer months, and the most consistent water sources are natural springs and associated springbrooks, the majority of which are located between 5,700 and 6,700 feet in elevation. See Section 3.3 for a more detailed description water sources and hydrology within Sheldon Refuge.

There are four major types of aquatic and riparian habitats on Sheldon Refuge: 1) ephemeral wetlands; 2) emergent marshes and wet meadows; 3) springs and springbrooks; and 4) streams and reservoirs. Nomenclature used generally follows that described in LANDFIRE (2007) and the Southwest Regional Gap Analysis Project (NatureServe 2004). Further detail may also be found in Rogers and Tiehm (1979).

Emergent marshes and wet meadows

These areas are generally broad flat areas that include wet meadows, ponds, fringes around lakes and along slow-flowing streams, and springbrooks (Photo 4.4). Water levels may be stable or fluctuate over a season, and these areas include seasonally flooded meadows or shallow freshwater floodplains. There is generally a diverse array of native wetland plants including emergent plants, sedges, and moist-soil plants. Common vegetation include bulrush (*Scirpus* sp., *Schoenoplectus* spp.), cattail, rushes, sedges, pondweed, pond lily (*Nuphar* spp.), and canarygrass (*Phalaris* spp.). Shrub species, where present, include willow, aspen, and chokecherry (*Prunus* spp.).

Photo 4.4 Typical wet meadow habitat within Sheldon Refuge.

Streams and reservoirs

Stream habitats have water temperatures generally <75˚F, and include flowing water with well-vegetated cover, stable banks free from barriers and diversions, stream velocity breaks, and in relatively silt free, rocky riffle-run areas (Photo 4.5). Substrates range from soft bottom sediments to

rocky riffle-run areas. Vegetation found along the reservoirs is generally characterized by species that are tolerant to fluctuations in water levels. Common species found on or near the shores include wedgeleaf dock (*Rumex triangulivalvis*), povertyweed (*Iva axillaries*), spikesedge (*Eleocharis* spp.), and cattail (*Typha latifolia*).

Springs and springbrooks

Ephemeral or perennial freshwater springs and associated springbrooks have a range of water temperatures (<78˚F to >86˚F). Substrates range from boulders and gravel to fines and vegetation and there is generally low to no turbidity. The vegetation found at these sites is very similar to that of riparian communities described earlier. However, unique and rare vegetation communities can be found at some of the thermal springs and may include desert centaury (*Centaurium exaltatum*), alkali pepperweed (*Lepidium dictyotum*), and boraxweed (*Nitrophila occidentalis*).

Ephemeral wetlands

Ephemeral wetlands include shallow swales with basin topography; these barren and sparsely vegetated areas include playas, salt flats, and mudflats (Photo 4.6). These systems hydrate via overland flow or groundwater discharge. The soils are lacustrine or palustrine and alkaline to hypersaline. Herbaceous species include fourwing saltbrush, spiny hopsage, and Great Basin wildrye.

Ephemeral wetlands within Sheldon Refuge consist almost entirely of small, closed basins called *playas*, which collect precipitation and runoff from the surrounding areas. Playas are formed and maintained through a combination of dissolution of subsurface basin material and wind deflation (Gustavson et al. 1995; Osterkamp and Wood 1987; Reeves and Reeves 1996). These processes concentrate salts and clay minerals in playa soils, making them more alkaline, and reduce water infiltration. As a result, playa habitats may become flooded after even a small amount of precipitation. Playas range in size from less than an acre tens of thousands of acres. Most playas within Sheldon Refuge are less than 50 acres in size. Because playa hydrology is determined by localized weather conditions, playas may be flooded seasonally or annually for several consecutive years, or may be dry for a number of years and flooded only rarely. Playa flooding is highly variable and may range from of only a thin film of water to several inches of water. Because playas are closed basins, water remains until it evaporates or infiltrates into the soil. During flooded conditions, typically during spring, playas teem with aquatic invertebrates. These invertebrates provide important forage for migrating birds. As playas begin to dry later in the season, the moist soils support grasses, sedges, and forbs, which provide forage for pronghorn, deer, sage-grouse, and other wildlife. Little research or literature is available related to playa formation and ecology, but for the Southern High Plains region of Texas and New Mexico, Haukos and Smith (2003) stated that because scattered individual playas collectively form the basis for diversity of the region, impairment of the function of an individual playa contributes to the decline of biodiversity across a much larger area than only the impacted wetland. Therefore, successful conservation of playas and associated flora and fauna is dependent upon protection of as many playas as possible in the landscape rather than attempting to identify the best playas and concentrating efforts on a select few wetlands.

Photo 4.5 Typical stream habitat within Sheldon Refuge.

Photo 4.6 Typical playa habitat within Sheldon Refuge (Photo Gail Collins).

Playa habitats support a broad array of bird, amphibian, invertebrate, and plant species. Invertebrates and other aqatic taxa which live in playa wetlands are specially adapted to withstand prolonged dry periods and to then quickly mature and reproduce during brief periods when playas flood. and Smith (2003). Historically, plants in playas were grazed seasonally by many wildlife species, including pronghorn (*Antilocapra americana* Ord), elk (*Cervus elaphus* Linnaeus), and bison (*Bison bison* Hamilton-Smith). Any grazing by wildlife today is generally by small mammals, although pronghorn and deer (*Odocoileus* spp.) continue to forage in grassland playas.

At any point-in-time, species occurrence in playas is dependent on three factors: 1) the composition of the available seed bank (i.e., viable seed in a position within the soil capable of germinating), 2) the environmental conditions of previous years that dictated species presence and replenishment of the seed bank, and 3) the environmental conditions of the current growing season that regulates germination and seedling growth from the seed bank (Haukos and Smith 1993).

4.2.4.2 Condition and Trends

Despite removal of domestic cattle and sheep from riparian areas, grazing by feral horse and burro populations continues to impact the condition of riparian habitats on Sheldon Refuge (USFWS 2008a). Impacts include indirect effects such as reducing plant vigor or eliminating vegetation by grazing and trampling.

Erosion and high levels of turbidity are common water-related issues on Sheldon Refuge (Barnett 2002; Steblein 2007). Most springs and adjacent meadows have been trampled by previous livestock and current feral horse use, resulting in weakened vegetation, erosion, and headcutting. In particular, grazing on Sheldon Refuge has resulted in deterioration of spring-associated meadows and destruction of riparian vegetation (including willows and aspen). Recent surveys of springs on Sheldon Refuge rated approximately 43% of perennial springs as displaying moderate to severe grazing disturbance; feral horses were the most commonly documented ungulate, occurring at 71% of sites surveyed (Collins 2009). In addition, 31 springs surveyed did not meet guidelines for riparian protection detailed by Chaney et al. (1990): undergoing moderate to severe utilization, affected by uncontrolled season-long grazing by feral horses, and stubble heights <3.19 inches.

Earlier accounts suggested that heavy grazing of Sheldon Refuge meadow habitats was the most serious management problem for Greater sage-grouse (USFWS 1971). While moderate levels of managed, seasonal grazing on Sheldon Refuge appeared to be effective in stimulating forb regrowth on meadows, weedy species were generally more prevalent at sites exposed to moderate to heavy long-term grazing (Evans 1986). Without plants to slow water movement and associated headcutting, the water table has dropped at some sites, and sagebrush, primarily on the periphery, has invaded associated riparian meadows.

Global declines in amphibian populations are perhaps one of the most enigmatic environmental problems of the late twentieth century (Daszak et al. 1999). While some declines are likely due to habitat destruction, others are not associated with obvious environmental factors. Other potential causes include the introduction of predators or competitors, increased ultraviolet irradiation, acidic precipitation, adverse weather patterns, environmental pollution, infectious disease, or a combination of factors (Daszak et al. 1999).

4.2.4.3 Associated Wildlife

Birds

Greater sage-grouse

Summer and fall habitat types utilized by sage-grouse on Sheldon Refuge include both uplands and meadow sites, including ecotones between these types (Klebenow and Burkhardt 1982). After hatching, sage-grouse broods seek out riparian meadows and other moist areas where native broadleaved flowering plants and insects are abundant. See Section 4.2.1 for more information

regarding Greater sage-grouse on Sheldon Refuge. On Sheldon Refuge, it has been shown that Greater sage-grouse generally avoid meadow areas where sagebrush encroachment has occurred. (Klebenow and Burkhardt 1982).

Other birds

Aquatic and riparian habitats on Sheldon Refuge provide important habitat for a wide variety of resident and migratory birds. Nevada lies within the Pacific Flyway, the primary seasonal movement corridor for waterbirds migrating west of the Rocky Mountains (Wildlife Action Plan Team 2006). The number of waterfowl that use Sheldon Refuge is not large compared to other areas, although a substantial number use Sheldon Refuge's wetlands during fall migration. While most shorebirds using refuge wetlands are spring and fall migrants, species including American avocet, American bittern (*Botaurus lentiginosus*), killdeer (*Charadrius vociferous*), Virginia rail (*Rallus limicola*), sora rail (*Porzana carolina*), black-necked stilt, long-billed curlew, spotted sandpiper (*Actitis macularia*), willet (*Catoptrophorus semipalmatus*), Wilson's phalarope, and common snipe (*Capella galliango*) are known to nest around permanent water sources. Other common waterbird species that occur seasonally in Refuge aquatic habitats are greater sandhill crane, black-crowned night heron (*Nycticorax nycticorax*), double-crested cormorant (*Phalacrocorax auritus*), Forster's tern (*Sterna forsteri*), black tern (*Chlidonias niger*), western snowy plover, greater and lesser yellowlegs (*Tringa melanoleucus* and *T. flavipes*), sandpipers (least [*Calidris minutilla*], solitary [*T. solitaria*], and western [*C. mauri*]), and grebes (Clark's [*Aechmophorus clarkii*], eared [*Podiceps caspicus*], horned [*P. auritus*], pied-billed [*Podilymbus podiceps*], and western [*A. occidentalis*]). These habitats also provide foraging areas for a range of seasonally resident and migrating raptors, including American kestrel, bald and golden eagles, ferruginous hawk, northern harrier, rough-legged hawk, Swainson's hawk (*Buteo swainsoni*), short-eared owl, long-eared owl, and western screech owl (*Otus asio*). Passerines also occupy these habitats and include bobolink (*Dolichonyx oryzivorus*), Brewer's blackbird (*Euphagus cyanocephalus*), red-winged blackbird (*Agelaius phoeniceus*), calliope hummingbird (*Stellula calliope*), rufous hummingbird (*Selasphorus rufus*), savannah sparrow, fox sparrow (*Passerella iliaca*), vesper sparrow, and western bluebird (*Sialia mexicana*). Mountain quail (*Oreortyx pictus*) are native to Sheldon Refuge, and although this species has been reported only rarely since the 1960s, it may be occasionally observed within riparian habitats.

Several species of waterfowl also nest on Sheldon Refuge including Canada goose (*Branta canadensis*), canvasback (*Aythya valisineria*), gadwall (*Anas strepera*), mallard (*Anas platyrynchos*), northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), redhead (*Aythya americana*), ruddy duck (*Oxyura jamaicensis*), blue-winged teal (*Anas discors*), green-winged teal (*Anas carolinensis*), and cinnamon teal (*Anas cyanoptera*). Limited waterfowl hunting opportunities became available on Sheldon Refuge beginning in 1999, the majority of which occur at the IXL Ranch wetlands, Alkali Reservoir, and Perry Springs (USFWS 1998a). Of the above species, those that are listed as Nevada Species of Conservation Priority include northern pintail, canvasback, cinnamon teal, American avocet, black-necked stilt, long-billed curlew, willet, greater sandhill crane, Forster's tern, black tern, western snowy plover, least sandpiper, grebes, bald eagle, ferruginous hawk, Swainson's hawk, short-eared owl, bobolink, rufous hummingbird, and mountain quail (Wildlife Action Plan Team 2006).

Mammals

Riparian habitats provide critical habitat for a variety of small mammals, including Preble's shrew, Merriam's shrew (*Sorex merriami*), vagrant shrew (*S. vagrans*), water shrew (*S. palustris*), montane

vole (*Microtus montanus*), Belding's ground squirrel, and white-tailed antelope ground squirrel (*Ammospermophilus leucurus*). In addition, these habitats provide important foraging areas for California bighorn sheep, mule deer, porcupine, striped skunk (*Mephitis mephitis*), hoary bat (*Lasiurus cinereus*), spotted bat (*Euderma maculatum*), and little brown myotis (*Myotis lucifugus*). Reported occurrences of river otter (*Lontra canadensis*) and muskrat (*Ondatra zibethicus*) have been rare. Seasonally wet areas, particularly associated with playa lakes, are a very important component in pronghorn summer and fall range. Of the above species, those that have been listed as Nevada Species of Conservation Priority include Preble's shrew, Merriam's shrew, vagrant shrew, water shrew, river otter, mule deer, California bighorn sheep, hoary bat, spotted bat, and little brown myotis (Wildlife Action Plan Team 2006).

Beavers

Beaver were released into Virgin Valley in the late 1960s by a local rancher (USFWS 1971); it is unknown if they historically occurred on Sheldon Refuge. By the end of the nineteenth century, beaver populations in North America had been rapidly depleted by overharvesting and removed from many riparian systems (see Svejcar 1997). If they were present on Sheldon Refuge prior to the decline throughout their range, the influence of beavers on the structure and functioning of riparian zones may have been substantial, at both the local and landscape scale.

Fish

Beginning in the early twentieth century, aggressive introduction programs established non-native trout species, including brook (*Salvelinus fontinalis*), brown (*Salmo trutta*), and rainbow trout, in many streams and reservoirs throughout Sheldon Refuge; the majority of those waters still maintain recreational fisheries to this day. Most recent sport-fish management efforts have focused on the conservation and expansion of remaining populations of endemic salmonids such as Lahontan cutthroat trout, while maintaining sport-fishing opportunities through the stocking of non-native trout species in appropriate locations including Big Spring Reservoir.

Lahontan cutthroat trout

Lahontan cutthroat trout were historically native to the major lakes and rivers of the Lahontan Basin of Nevada and California; habitat alteration preceded the listing of this subspecies first in 1973. Because of reduced numbers of this subspecies, individuals have been stocked in Sheldon Refuge reservoirs since 1947 to provide a source for propagation and stocking into other waters (Williams et al. 1980). Catnip Reservoir continues to provide habitat for the federally listed Lahontan cutthroat trout, but this habitat is outside of the recovery area. NDOW conducted spawning operation and egg takes at Catnip Reservoir until 2002, when the water level at Big Spring Reservoir declined and rainbow trout eggs were no longer available at Big Spring Reservoir. The progeny from these spawning efforts produced either pure Lahontan cutthroat trout or bowcutt trout (rainbow x cutthroat hybrids) and were used in sport-fish management throughout Nevada. Since 1959, 6.6 million cutthroat eggs have been taken at Catnip Reservoir (>1.0 million eggs between 1990 and 2001).

Prior to the allowance of sport fishing at Catnip Reservoir in 1998, the Lahontan cutthroat trout population was managed solely as a brood stock source for egg production. The spawning process is usually stressful for the fish and mortality can be high. Therefore, stocking rates were adjusted high to ensure the annual spawning run was robust. Additionally, stocking rates varied because it was uncertain how many Lahontan cutthroat trout Catnip Reservoir could support. Over the years, by

comparing relative body condition, biologists were able to determine that ±3,000 fish stocked per year produced the best results.

Currently, it is unknown if Catnip Creek has enough spawning habitat to support a viable population of Lahontan cutthroat trout, regardless of sport-harvest levels. NDOW has documented Lahontan cutthroat trout successfully spawning in the Catnip Creek, but survival rates of the juvenile trout and their contribution the lake's fishery is unknown. In 2011, NDOW plans to initiate a more comprehensive research project to determine the amount of contribution these naturally produced fish have on the fishery and if the fishery could sustain itself without hatchery augmentation. This project will likely take several years to accumulate enough data to make a determination.

Big Spring Reservoir has been periodically stocked with non-native rainbow trout, but due to dry weather conditions and a lack of water, this reservoir has not supported a fishery for several years. Because Big Spring Reservoir is an artificial impoundment, there is no potential spawning habitat, and the fishery, even with water and under optimal conditions, does not provide any spawning habitat. Therefore, it is impossible for this fishery to sustain itself in the absence of hatchery augmentation.

Alvord cutthroat trout

This undescribed subspecies of cutthroat trout is presumed extinct in Oregon and Nevada as a consequence of hybridization with introduced rainbow trout. Rainbow trout were first introduced into Virgin Creek in 1934 (Williams et al. 1980), and any remaining cutthroat trout descendants are likely rainbow trout/Alvord cutthroat trout (*Salmo gairdneri* x *Oncorhynchus clarki*) hybrids (Bartley and Gall 1991).

Chubs

Springs, springbrooks, and streams provide habitat for Alvord and Sheldon tui chubs. The Alvord chub is indigenous to the Alvord Basin of southeastern Oregon and northwestern Nevada. However, this species is limited in its distribution by interspecies competition, and the introduction of guppies has eliminated Alvord chubs from parts of Sheldon Refuge including the Dufurrena and Virgin Valley areas. The Sheldon tui chub is indigenous to Guano Basin of southern Oregon and northern Nevada (Williams and Bond 1981; Williams et al. 1980). The restricted range of this species resulted in its listing at one time as a species of special concern by the American Fisheries Society (Deacon et al. 1979).

Reptiles and amphibians

Species known to occur in suitable riparian and aquatic habitats include Western terrestrial garter snake (*Thamnophis elegans*), Great Basin spadefoot toad, and Pacific treefrog (*Hyla regilla*). The distribution of desert amphibians in the arid environment of Sheldon Refuge is sporadic in association with the distribution of water resources. Isolation of species and subpopulations has resulted in a high level of endemism which makes Nevada's (and the Sheldon Refuge's) populations particularly susceptible to localized habitat alterations, short-term climatic conditions (e.g., drought), and ecological changes (Wildlife Action Plan Team 2006).

Invertebrates

Sheldon Refuge contains a rich diversity of aquatic habitat types and inhabitant invertebrate fauna. Isolated desert springs and stream drainages, geothermal spring systems, and ephemeral playa lakes on Sheldon Refuge have been documented to contain over 200 aquatic invertebrate species, including several undescribed new species, rare and separate populations, and organisms specifically adapted to life in severe and transient desert environments (Herbst 1996).

There are 74 gastropods listed as Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006), the vast majority of which are springsnails (*Pyrgulopsis* spp.). This genus has been documented on Sheldon Refuge although species have not been identified (Herbst 1996). Most springsnail populations are highly isolated because springs and seeps are widely dispersed and disconnected. Their aquatic habitats are rare and sensitive to both drought and water development, and populations are likely declining almost faster than we can learn about them (Wildlife Action Plan Team 2006).

4.2.4.4 Threats

Feral horses and burros, sagebrush encroachment, non-native fish and wildlife, disease, and human disturbances from water developments and recreation uses have been identified as threats to these habitat types and associated fish and wildlife within Sheldon Refuge.

4.2.5 Cliffs, Canyons, Talus Slopes, and Barren Lands

4.2.5.1 Description and Location

These habitats generally include steep cliff faces, bluffs, high walls, narrow canyons, rocky ledges, crevices, and rock outcrops of various igneous, sedimentary, and metamorphic bedrock types (Photo 4.7). They also include areas of unstable scree, desert pavement, scarps, talus slopes, slides, dunes, mines, and gravel pits. These habitats are generally unvegetated to sparsely vegetated with widely scattered trees and shrubs (e.g., *Juniperus* spp., *Artemesia* spp.)

One rare plant, rattlesnake stickweed, has been documented occurring at the base of steep gorge walls, in rocky areas below the walls, and occasionally along ledges in the rock walls on Sheldon Refuge. This species is considered limited in its distribution and a potential species of concern (Nachlinger and Tiehm 1996). The rattlesnake stickweed population on Sheldon Refuge was the largest documented to date and at that time represented 96% of the total known individuals (Nachlinger and Tiehm 1996).

Photo 4.7 Typical talus slope habitat within Sheldon Refuge (Photo Gail Collins).

4.2.5.2 Condition and Trends

Cliffs are unique habitats that lend topographic diversity to homogenous areas. Cliff and canyon habitats are important to wildlife and provide structure for nesting, roosting, denning, shelter from weather, protection from predators, and areas for foraging (Wildlife Action Plan Team 2006). Cliffs benefit wildlife directly by providing shelter and cover, and indirectly by providing food from adjacent diverse plant communities (Ward and Anderson 1988). Currently, these habitats on Sheldon Refuge, outside of Virgin Valley, appear to be stable and in good condition.

4.2.5.3 Associated Wildlife

Birds

Several species of birds are dependent upon ledges, crevices, or talus slopes for nesting on Sheldon Refuge. Breeding birds include canyon wren (*Catherpes mexicanus*), rock wren (*Salpinctes obsoletus*), cliff swallow (*Petrocelidon pyrrhonota*), rough-winged swallow (*Stelgidopteryx ruficollis*), violet-green swallow (*Tachycineta thalassina*), Say's phoebe, white-throated swift, common raven (*Corvus corax*), golden eagle, and prairie falcon. Other species include black rosy finch (*Leucosticte atrata*), ferruginous hawk, and peregrine falcon (*Falco peregrinus*). Species listed as Nevada Species of Conservation Priority include peregrine falcon, ferruginous hawk, and white-throated swift (Wildlife Action Plan Team 2006).

Mammals

California bighorn sheep

California bighorn sheep (habitat distribution shown in Figure 4.5)are highly dependent upon open habitats in variable, steep, and dissected terrain for escape cover (Hansen 1982). Following their extirpation from Sheldon Refuge in the late 1920s, eight California bighorn sheep were re-introduced

from Hart Mountain Refuge in 1968 and were placed into an enclosure at Hell Creek (Thomas 1978; USFWS 1971). By 1975, it was suspected that sheep were escaping the enclosure. The population was estimated to be over 40 individuals in 1981 (Hansen 1982). California bighorn are listed as a Nevada Species of Conservation Priority.

American pika

Although long rumored to be present on Sheldon Refuge, this species was first officially documented in 2009 (habitat distribution shown in Figure 4.5). As summarized by Beever et al. (2008), pikas occur in talus and talus-like habitats across western North America and feed on grasses found near talus slopes and also store vegetation in hay piles among the rocks for overwinter use. Pika may be the most montane-obligate species in the Great Basin. Studies have found a rise in the minimum elevation of pika populations since historic times related to temperature driven distribution; pikas exhibit extreme vulnerability to elevated temperatures suggesting that climate change may be factor in their ecology. Pikas in the Great Basin appear to have undergone significant losses (25% of historical sites) during the last half century (Beever et al. 2003b) and are listed a Nevada Species of Conservation Priority.

Other mammals

Other mammal species occupying these habitats include mountain lion, bobcat, porcupine, yellow-bellied marmot, bushy-tailed woodrat (*Neotoma cinerea*), desert woodrat, least chipmunk (*Tamias minimus*), little brown myotis, fringed myotis (*Myotis thysanodes*), pallid bat (*Antrozous pallidus*), spotted bat, and Townsend's big-eared bat (*Corynorhinus* spp.) Mule deer and pronghorn have also been observed utilizing these types of habitats for protection from wind and sun, and for food on south slopes free from snow (Ward and Anderson 1988). Other species listed as Nevada Species of Conservation Priority include mule deer, little brown myotis, fringed myotis, spotted bat, and Townsend's big-eared bat.

Reptiles and amphibians

Several species of reptiles require talus slopes and rocky outcroppings, including collared lizard, side-blotched lizard (*Uta stansburiana*), western fence lizard (*Sceloporus occidentalis*), and night snake (*Hypsiglena torquata*).

4.2.5.4 Threats

In addition to threats from disease (see Section 4.1.3), and general threats from feral horses and burros, there are specific threats to American pika and California bighorn sheep, which are almost exclusively associated with cliffs, canyons, talus slopes, and barren land habitat types within Sheldon Refuge. In an evaluation of pika population extirpations (Beever et al. 2003a), it was found that many had occurred in areas open to livestock grazing, although further research was warranted. Feral horses may negatively influence pikas by competing for forage if grazing occurs in areas within 66 to 164 feet of talus. Indirect influences could also include trampling of soils or vegetation, which also occurs with horse grazing (Beever et al. 2003a). In addition, feral burros have been implicated as contributing to declines in bighorn sheep numbers; it has been recommended that burros be removed from areas where they are sympatric with bighorn sheep (Seegmiller and Ohmart 1981).

4.2.6 Deciduous Woodlands and Shrublands

4.2.6.1 Description and Location

These habitats include woodlands along riparian habitats or within snowpockets dominated by shrubs or trees including willow, aspen, currant, wild rose, snowberry, and chokecherry (Photo 4.8). Aspen stands on Sheldon Refuge are mostly associated with snowpockets. They also generally dominant along stream banks in the higher elevations of the western portion of Sheldon Refuge and can also be found in the eastern portion along perennially flowing, protected streams (aspen distribution shown in Figure 4.6). Further detail may be found in Rogers and Tiehm (1979).

Photo 4.8 Pockets of aspen and other deciduous trees and shrubs in Sheldon Refuge are most often found in areas where snow drifts during winter, along streams, and at springs as shown here (Photo Aaron Collins).

4.2.6.2 Condition and Trends

Decades of livestock overuse and exclusion of fire have resulted in extensive loss of woody riparian habitats (particularly aspen stands) and ecologically degraded conditions for much of what remains in the Intermountain West (Dobkin 1994; Fleischner 1994; Heltzel and Earnst 2006; Schier 1975) and likely Sheldon Refuge as well. For example, Wall et al. (2001) reported that three-fourths of aspen communities below elevations of 7,000 feet in the Great Basin have either been replaced, are being replaced, or have establishing populations of western juniper. Fire has been reported to be an important factor in facilitating the long-term presence and health of aspen across the landscape; disease, insects, and native browsing also influence the age structure (see Wall et al. 2001). Historically, total stand replacement in aspen habitats was estimated to occur every 100 years, on

average, with smaller disturbances every 16 years (Wall et al. 2001). On Sheldon Refuge, these habitats are considered in overall poor to fair condition.

4.2.6.3 Associated Wildlife

Birds

Deciduous woodlands provide critical habitat for several species occurring on Sheldon Refuge. Known or suspected breeding birds include ash-throated flycatcher (*Myiarchus cinerascens*), dusky flycatcher (*Empidonax oberholseri*), blue-gray gnatcatcher (*Polioptile caerulea*), broad-tailed hummingbird (*Selasphorus platycercus*), calliope hummingbird, rufous hummingbird, Cassin's finch (*Carpodacus cassinii*), lazuli bunting (*Passerina amoena*), Lewis' woodpecker (*Asyndesmus lewis*), northern flicker (*Colaptes auratus*), northern oriole (*Icterus galbula*), Swainson's thrush (*Catharus ustulatus*), warbling vireo (*Vireo gilvus*), MacGillivray's warbler (*Oporornis tolmiei*), orange-crowned warbler (*Vermivora celata*), yellow warbler (*Dendroica petechia*), and tree swallow (*Iridoprocne bicolor*). Other species include willow flycatcher (*Empidonax traillii*), American goldfinch (*Carduelis tristis*), western bluebird, black-headed grosbeak (*Pheucticus melanocephalus*), cedar waxwing (*Bombycilla cedrorum*), yellow-breasted chat, downy woodpecker (*Dendrocopos pubescens*), hairy woodpecker (*D. villosus*), red-naped sapsucker (*Sphyrapicus nuchalis*), and varied thrush (*Ixoreus naevius*). Dobkin and Sauder (2004) documented for the Great Basin significantly declining population trends for five of the 12 riparian bird species considered, which includes many of those listed above. In addition, this habitat also supports populations of raptors including bald eagle, Cooper's hawk (*Accipiter cooperii*), great horned owl (*Bubo virginianus*), long-eared owl, northern saw-whet owl (*Aegolius acadicus*), northern goshawk (*Accipiter gentilis*), northern shrike, osprey (*Pandion haliaetus*), red-tailed hawk, sharp-shinned hawk (*Accipiter striatus*), Swainson's hawk, and western screech owl. Of these species, bald eagle, northern goshawk, Swainson's hawk, rufous hummingbird, Lewis' woodpecker, willow flycatcher, and Cassin's finch are listed as Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006).

Mammals

Several species of mammal occur in this habitat type, including mountain lion, bobcat, coyote, beaver, porcupine, long-tailed weasel (*Mustela frenata*), ermine (*M. ermine*), Nuttall's cottontail, yellow pine chipmunk (*Tamias amoenus*), fringed myotis, little brown myotis, western small-footed myotis (*Myotis ciliolabrum*), Preble's shrew, and vagrant shrew. In addition, mule deer utilize these habitats for resting and foraging. Of these species, mule deer, fringed myotis, little brown myotis, western small-footed myotis, Preble's shrew, and vagrant shrew are listed as Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006).

Reptiles and amphibians

Deciduous woodlands provide habitat for reptile species including northern alligator lizard (*Elgaria coerulea*) and racer (*Coluber constrictor*). Amphibian species include the pacific treefrog.

4.2.6.4 Threats

In addition to feral horses and burros (see Section 4.1.1), threats to these habitat types and associated wildlife within Sheldon Refuge include changes in the natural fire regime (see Section 4.1.4), and resulting encroachment by sagebrush and western juniper (see Section 4.1.2).

4.2.7 Mountain Mahogany and Western Juniper Woodlands

4.2.7.1 Description and Location

Nomenclature follows that described in LANDFIRE (2007) and the Southwest Regional Gap Analysis Project (NatureServe 2004). Further detail may be found in Rogers and Tiehm (1979).

Western juniper woodlands

The vegetation in western juniper woodlands (habitat distribution shown in Figure 4.5) is characterized by a mature stand of western juniper. Mature stands of western juniper exhibit considerable diversity in structure and composition, varying from open-shrub tree savannas to nearly closed-canopy woodlands. However, tree canopy cover in the majority of stands is usually less than 20%. Ages are usually mixed with little to no recruitment in closed stands. Very old stands usually contain standing and downed dead trees that can persist for several hundred years, especially on dry sites and where downed trees do not come into contact with soil. A key indicator of mature western juniper woodland is the presence of old-growth trees (>130 years in age), dead snags, and recruitment of younger aged trees (Miller et al. 2005). Common understory shrubs include mountain big sagebrush, bitterbrush, and rabbitbrush (Photo 4.9). Other understory associates include Thurber's needlegrass, bluebunch wheatgrass, Sandberg's bluegrass, and prairie junegrass.

Photo 4.9 Typical western juniper habitat within Sheldon Refuge.

Mountain mahogany woodlands

Mountain mahogany woodlands (habitat distribution shown in Figure 4.7) are dominated by curl-leaf mountain mahogany (*Cercocarpus ledifolius* var. *ledifolius*) (Photo 4.10). These stands occupy areas often associated with late-enduring snowbanks and higher elevations to 8,000 feet. Mountain big sagebrush and scattered juniper may also occur. Common associates include Thurber's needlegrass, prairie junegrass, Sandberg's bluegrass, Idaho fescue, and *Lupinus* spp.

Photo 4.10 Typical mountain mahogany habitat within Sheldon Refuge.

4.2.7.2 Condition and Trends

The expansion of western juniper following European settlement is unprecedented. Numerous inventories and studies have demonstrated a rapid expansion of western juniper into adjacent sagebrush habitats since the late 1800s (Miller et al. 2008). This expansion is primarily the result of changes in the natural fire regime, which have allowed juniper to persist, and the removal of fire fuels through grazing by livestock. The distribution of old trees (>130 years old) is generally limited to rocky ridges and low sagebrush communities. Old trees are found only occasionally growing in deeper, well-drained soils such as mountain big sagebrush–grassland communities and are most often absent from aspen communities (Miller and Rose 1995). During the period of juniper expansion, younger trees have filled in between larger old trees creating much higher tree densities than historically occurred (Miller et al. 2008). On Sheldon Refuge, these habitats are overall considered in good condition.

In addition to the estimated 4,863 acres of western juniper habitat, it is estimated between 8,000 and 10,000 acres of habitat within Sheldon Refuge have been, or are in the process of being, encroached upon by western juniper. Currently Sheldon Refuge actively removes western juniper which has expanded into adjacent habitats through the use of prescribed burning and chainsaw thinning. Since 2003, Sheldon Refuge has treated an annual average of 373 acres, primarily to remove encroaching juniper. The number of acres has gradually increased over the same time period, with approximately 1,014 acres treated in 2009 (NFPORS 2009).

Mountain mahogany stands have also exhibited dramatic increases in density and distribution, which has been attributed to fire exclusion (Gruell 1995). Mountain mahogany was further proliferated by livestock grazing which diminished competing grasses. On Hart Mountain and Sheldon refuges, approximately 88% and 83% of the stands sampled, respectively, have been estimated to have been established after 1900 (Gruell 1995). Current concerns with mountain mahogany are that many stands are dominated by older trees with crowns that are practically unreachable to wildlife for browse and little recruitment of new plants. If natural fire were to re-enter these stands in their

current overgrown conditions, it is likely most or all mountain mahogany would be killed by the intense heat and these areas would be lost as valuable wildlife cover, forage, and nesting habitat. Mountain mahogany does not easily resprout after burning, and it is difficult to establish from seed. Factors that may limit natural seedling establishment include the presence of mountain mahogany litter that inhibits seed germination, competition for water and soil resources, and browsing of seedlings (see summary by Ibáñez et al. 1999). On Sheldon Refuge, these habitats are considered in overall fair to good condition.

4.2.7.3 Associated Wildlife

Birds

Mature western juniper and mountain mahogany stands provide habitat for a range of breeding bird species including juniper titmouse (*Baeolophus ridgwayi*), black-throated gray warbler (*Dendroica nigrescens*), yellow-rumped warbler (*Dendrocia coronata*), dusky flycatcher, gray flycatcher, fox sparrow, mountain chickadee (*Parus gambeli*), ruby-crowned kinglet (*Regulus calendula*), Townsend's solitaire (*Myaestes townsendi*), and western scrub jay (*Aphelocoma californica*). Western juniper berries (female cones) provide an important source of food for Townsend's solitaires, American robins, mountain bluebirds, cedar waxwings, Steller's jays, and scrub jays (Lederer 1977; Poddar and Lederer 1982; Solomonson and Balda 1977). Western juniper berries are the sole winter food used by Townsend's solitaires and make most of the American robin's diet throughout the winter (Lederer 1977; Poddar and Lederer 1982).Other species include black-headed grosbeak, chipping sparrow (*Spizella passerina*), golden-crowned kinglet (*Regulus satrapa*), Hammond's flycatcher (*Empidonax hammondii*), MacGillivray's warbler, Nashville warbler (*Vermivora ruficapilla*), northern shrike, olive-sided flycatcher (*Nuttallornis borealis*), pine siskin (*Spinus spinus*), red-breasted nuthatch (*Sitta canadensis*), Townsend's warbler (*Dendroica townsendi*), western bluebird, and western tanager (*Piranga ludoviciana*). These habitats are also important as nesting and resting habitat for migrating raptors, including Cooper's hawk, ferruginous hawk, golden eagle, northern goshawk, great horned owl, northern saw-whet owl, red-tailed hawk, rough-legged hawk, and sharp-shinned hawk. Of these species, northern goshawk, ferruginous hawk, and olive-sided flycatcher are listed as Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006). Old-growth stands differ structurally from post-settlement woodland, including having a greater density of cavities, which significantly influences cavity nesting species.

Mammals

These habitats on Sheldon Refuge provide important thermal cover for mule deer and pronghorn. Mountain mahogany also provides winter forage for big game (Scheldt and Tisdale 1970). Leckenby et al. (1982) concluded that dense stands of trees or shrubs over 5 feet tall provided optimal thermal cover. However, these stands provide minimal food resources. Trainer et al. (1983) reported that pronghorn rarely used western juniper woodlands during the winter or spring in eastern Oregon, preferring more open shrub-steppe communities or stands with only scattered trees. Other species occurring in these habitats include mountain lion, bobcat, porcupine, bushy-tailed woodrat, golden-mantled ground squirrel (*Spermophilus lateralis*), Great Basin pocket mouse, hoary bat, and least chipmunk. Of these species, mule deer and hoary bat are listed as Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006).

Reptiles and amphibians

These stands provide habitat for reptiles including pygmy short-horned lizard and racer on Sheldon Refuge. Pygmy short-horned lizards are listed as a Nevada Species of Conservation Priority (Wildlife Action Plan Team 2006).

4.2.7.4 Threats

Feral horses and burros (see Section 4.1.1) and changes in the natural fire regime (see Section 4.1.4) are considered threats to these habitat types and associated wildlife within Sheldon Refuge.

Old-growth western juniper and mountain mahogany trees provide unique, and often irreplaceable biological and ecological values, such as plant and animal habitat, biodiversity and genetic pools, and long-term climatic records (see Waichler et al. 2001). However, juniper establishment declines with woodland maturity because of a decrease in seedling establishment as shrubs die out and an increase in intra-specific competition (Miller et al. 2000). On some more arid sites, juniper woodland development has also led to desertification and reduction in site productivity and understory (Miller et al. 2000).

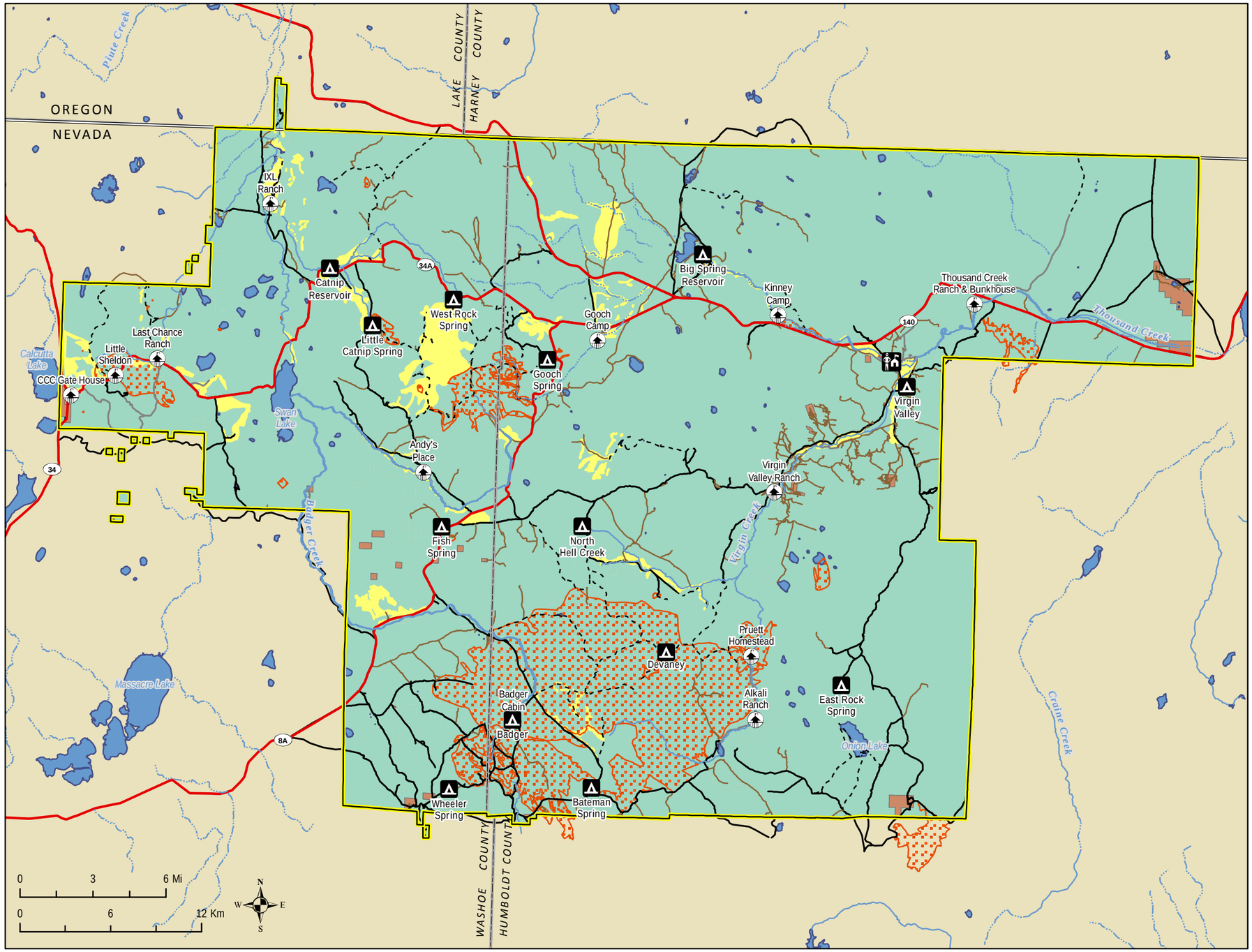
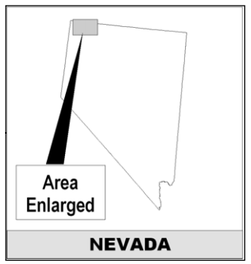


Figure 4.1
Fire History and Fire Protection

LEGEND

- Refuge Headquarters
- Approved Refuge Boundary
- Refuge Ownership
- Private Lands (inholdings)
- Campgrounds
- Sheldon Historic Structures
- Prescribed Fires 1991-2003
- Natural Fires 1985-2003
- County Boundary
- Service Routes
- Closed Routes
- No Vehicles
- Public Vehicle Routes
- State Line
- Highway
- Intermittent Stream
- Perennial Stream
- Lakes and Reservoirs



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Refuge Information Branch
Portland, Oregon
Map Date: 3/14/2011
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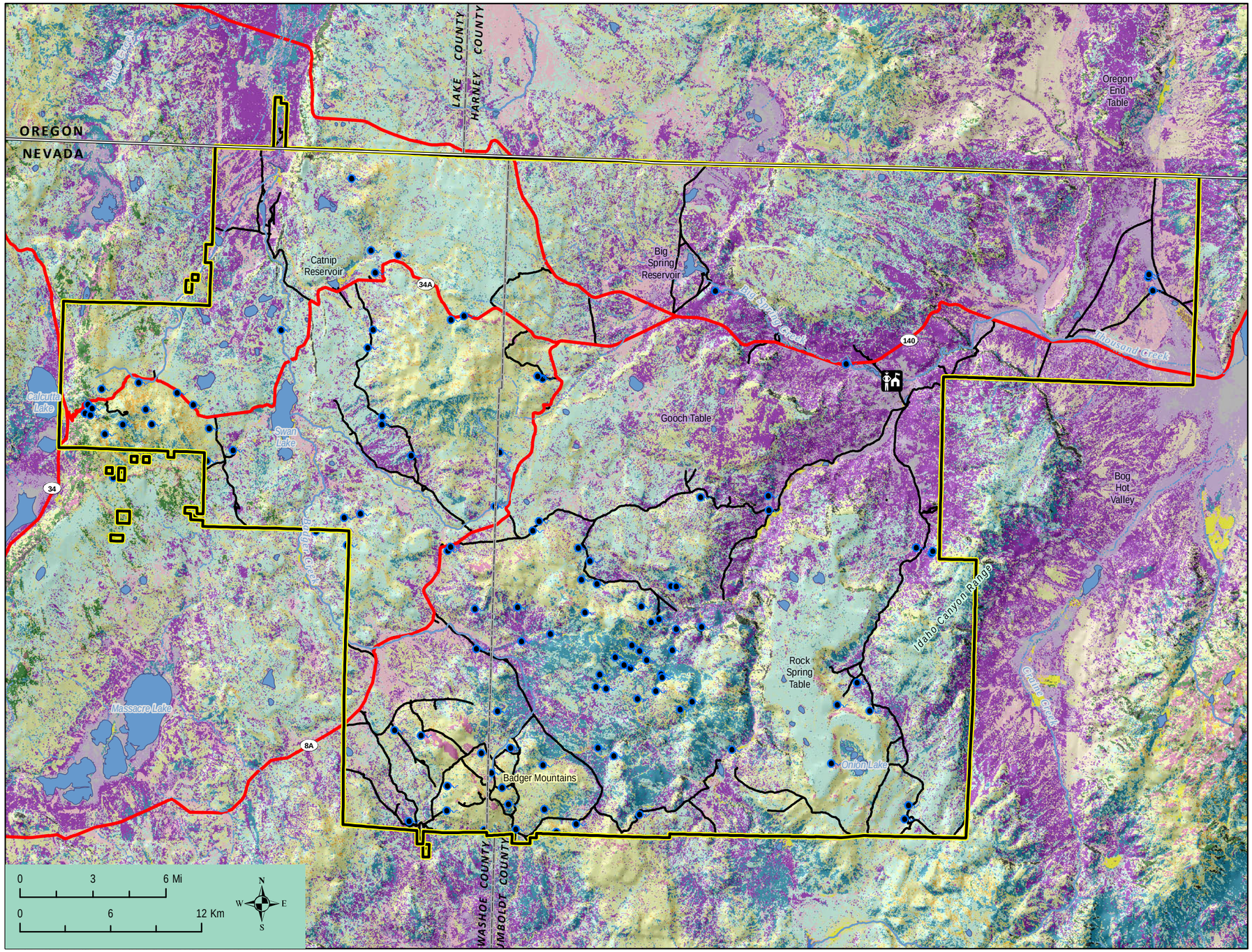

Figure 4.2
Habitat Distribution

LEGEND

- Refuge Headquarters
- Approved Refuge Boundary

Habitat Type

- Aspen
- Basin Big Sagebrush
- Canyon Vegetation
- Emergent Vegetation
- Greasewood
- Juniper
- Low Sagebrush
- Mountain Big Sagebrush
- Mountain Mahogany
- Mountain Shrub
- Perennial Grassland
- Salt Desert
- Sparse Vegetation
- Unclassified
- Water
- Wet Meadow
- Wyoming Big Sagebrush
- Seeps and Springs
- County Boundary
- State Line
- Intermittent Stream
- Perennial Stream
- Highway
- Public Vehicle Routes (clipped to Refuge)

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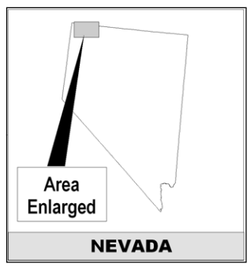

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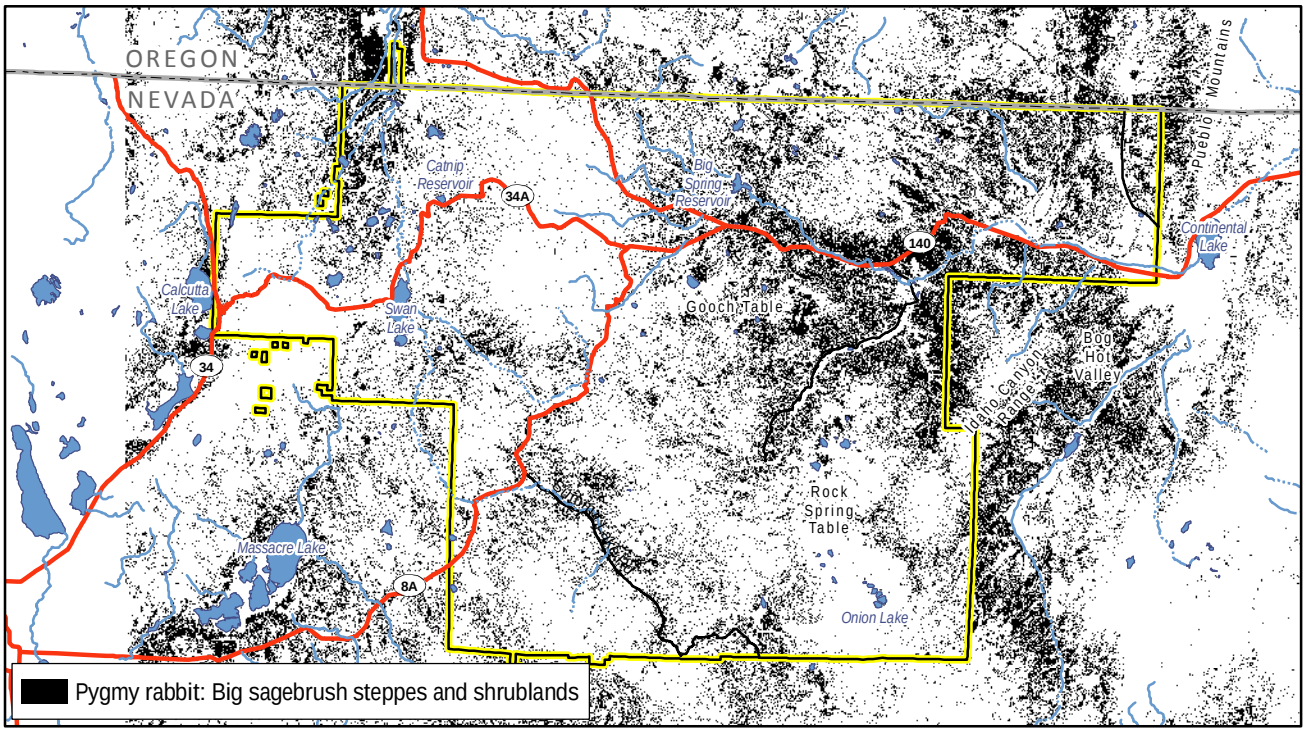
Figure 4.3 Pygmy rabbit and Greater sage-grouse distribution based on habitat



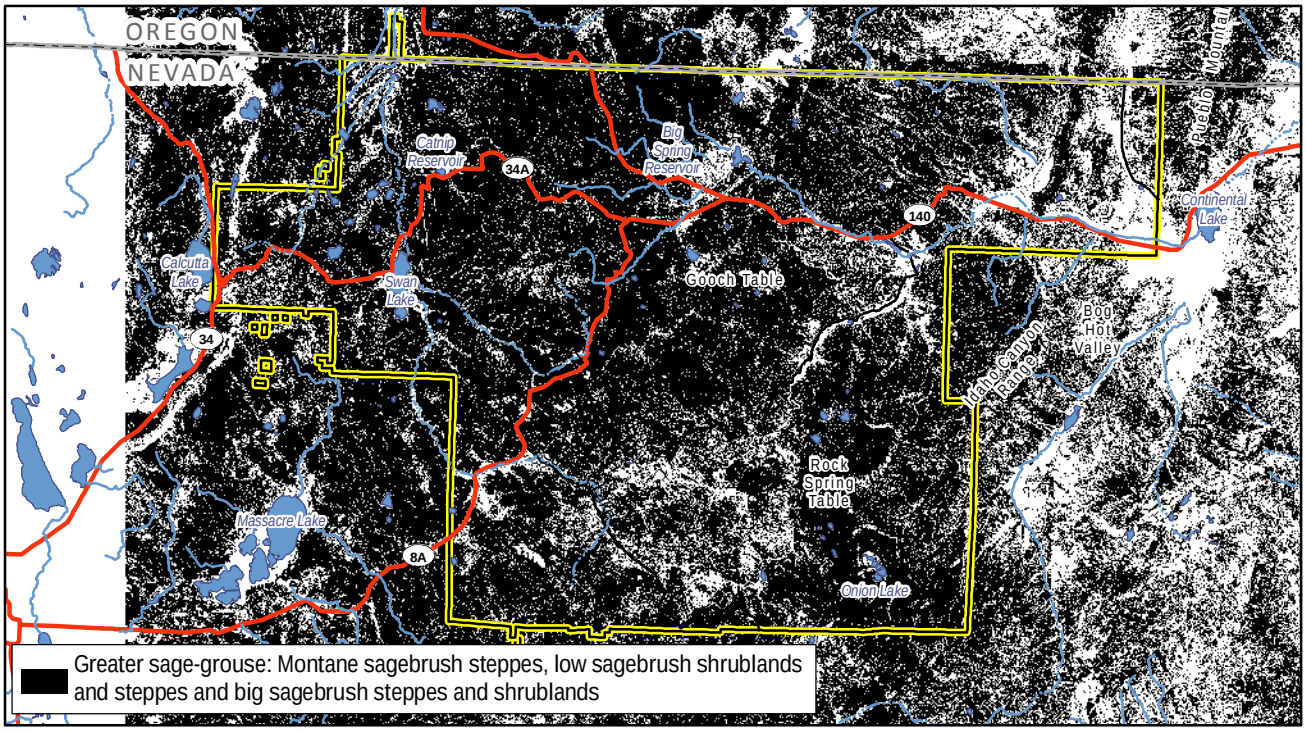


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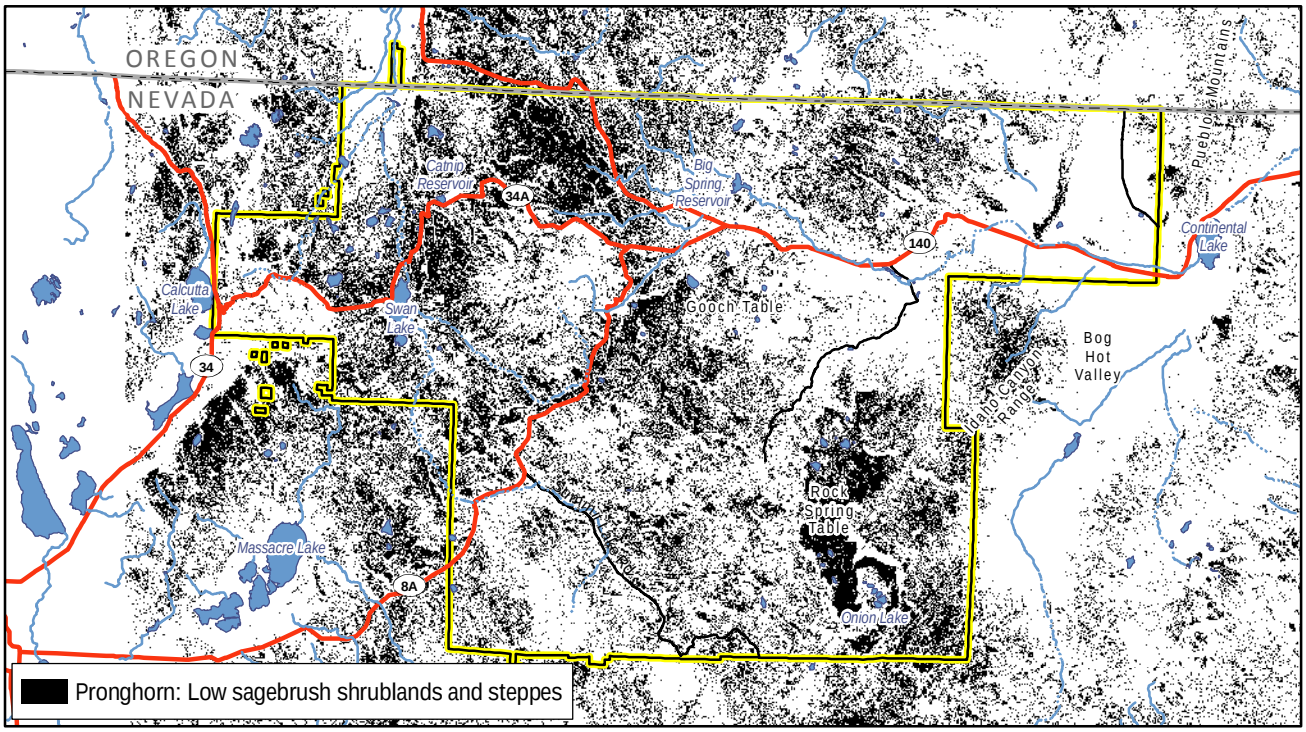
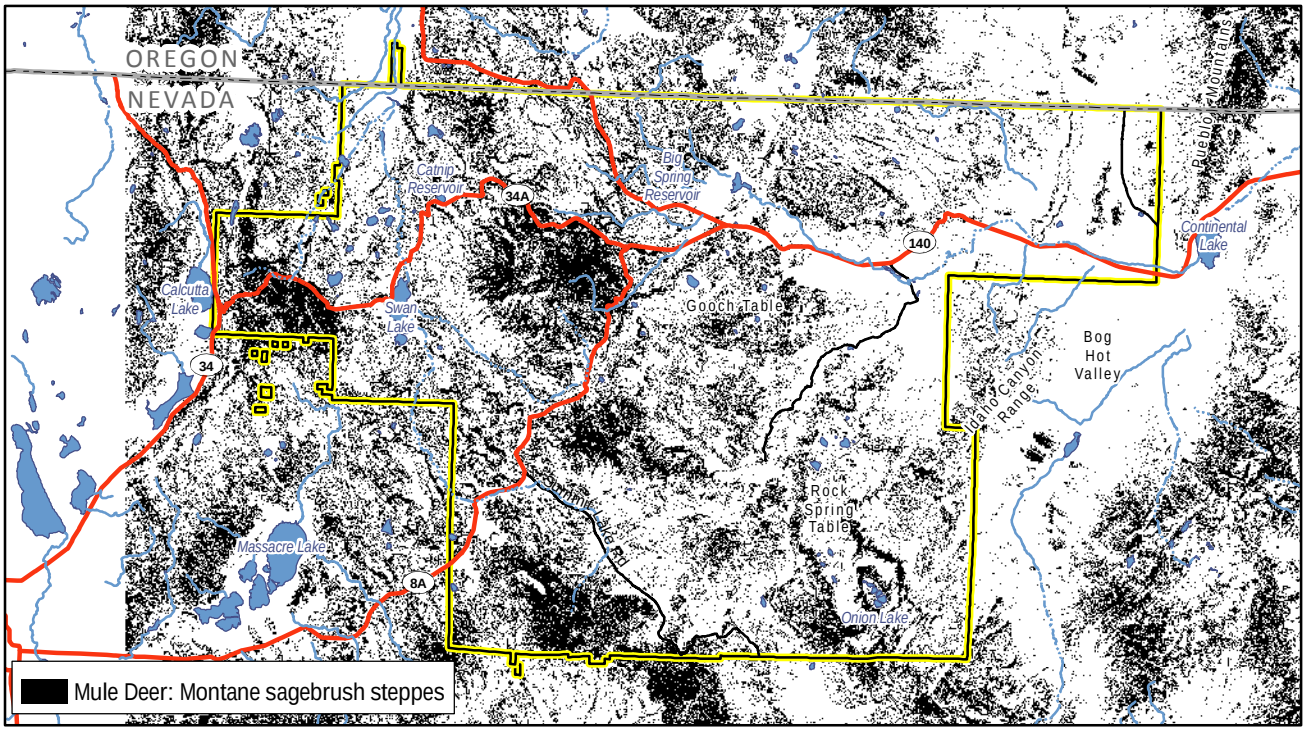
Figure 4.4 Pronghorn and mule deer distribution based on habitat





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Refuge Information Branch
Portland, Oregon
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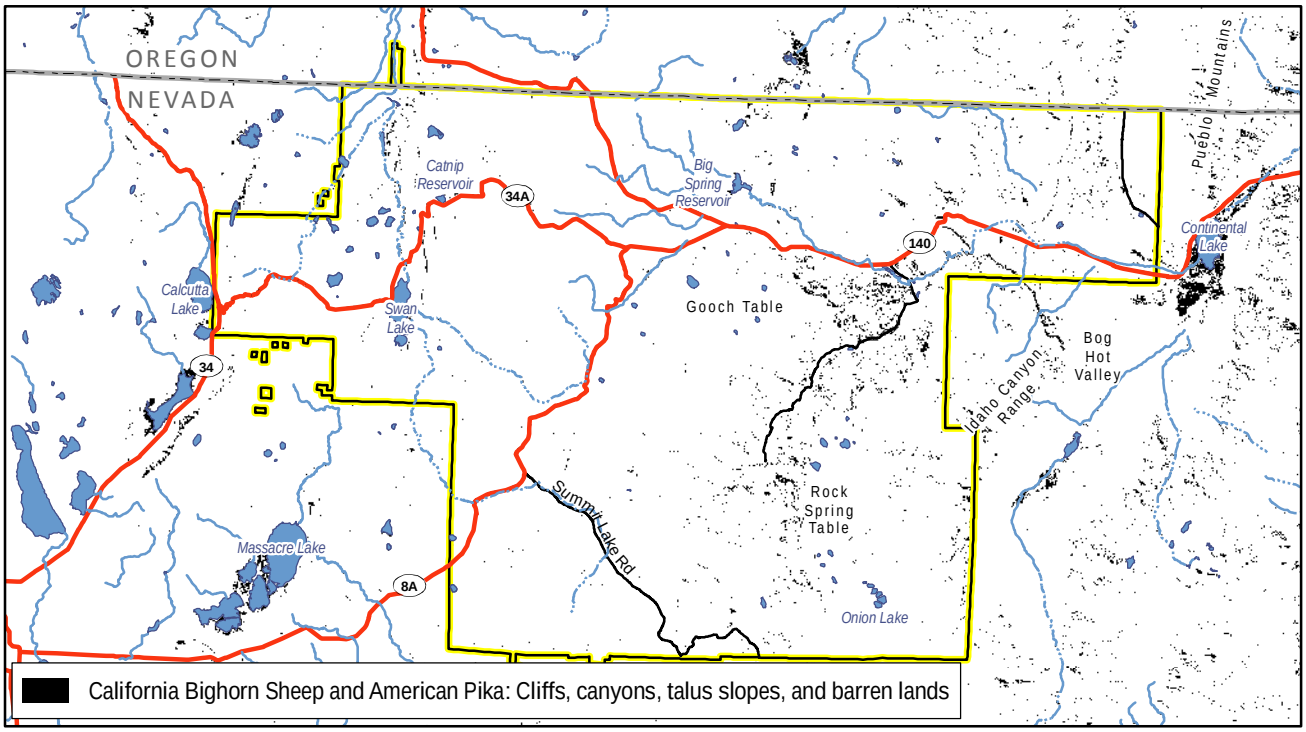
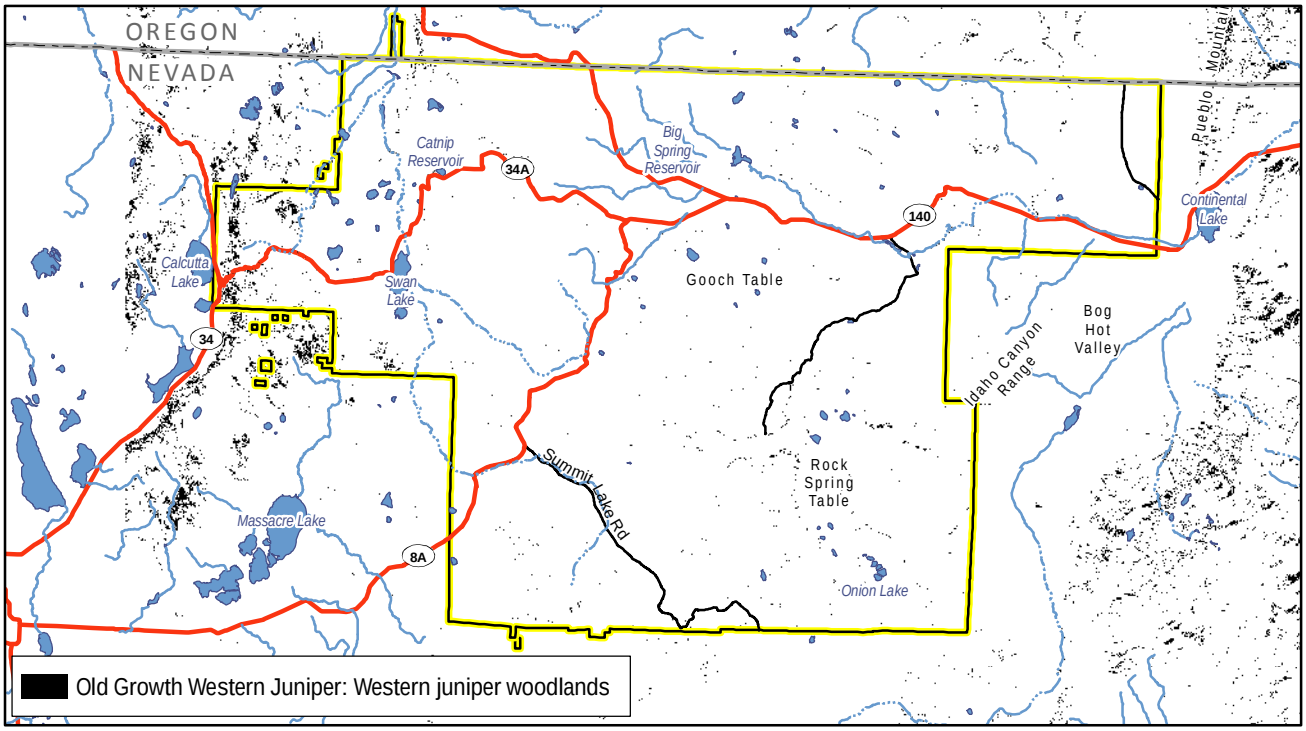
Figure 4.5 California bighorn sheep, American pika, and old-growth western juniper distribution based on habitat





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Refuge Information Branch
Portland, Oregon
Map Date: 3/14/2011
File: 10-091-3.mxd

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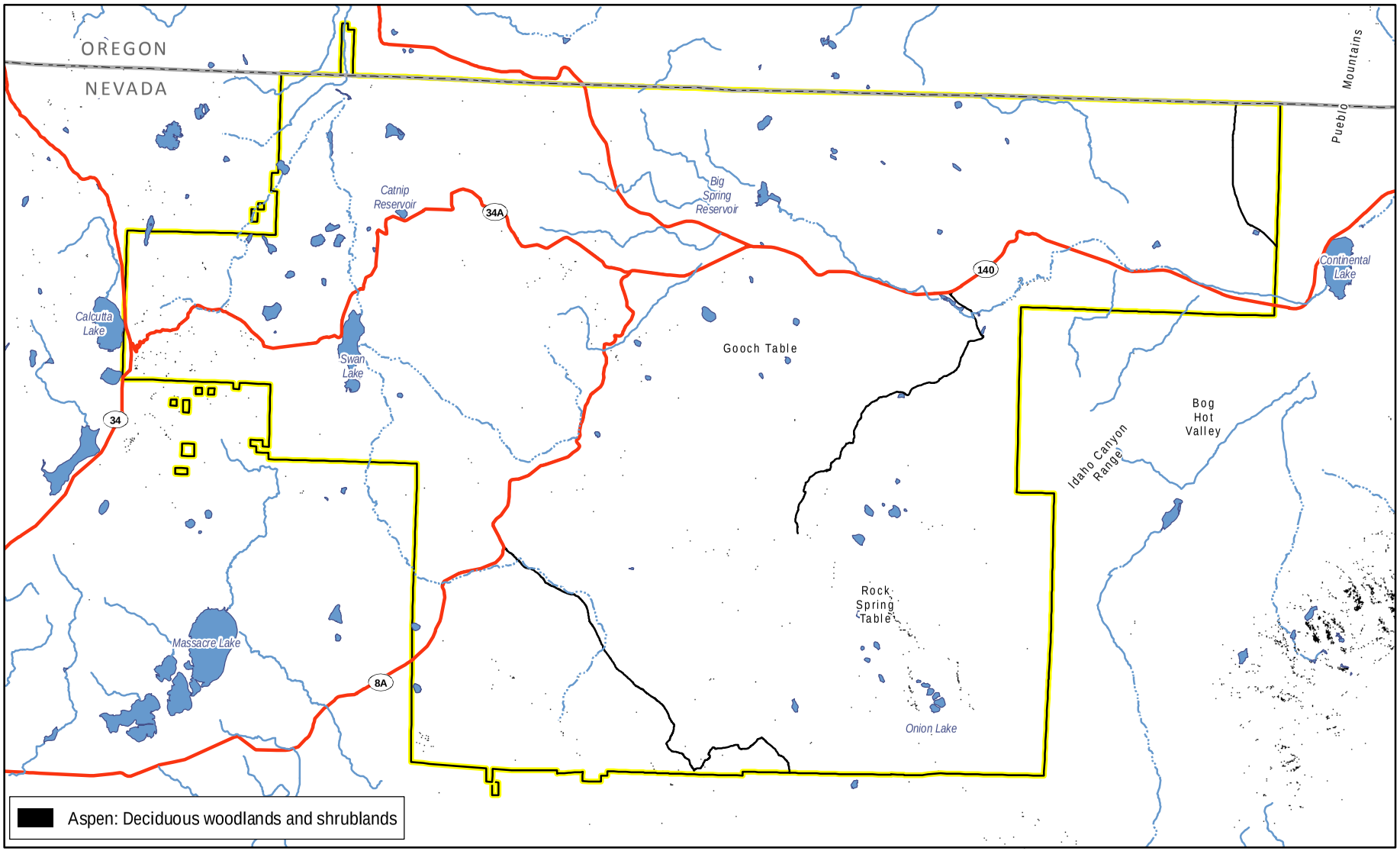
Figure 4.6 Aspen distribution based on habitat



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Produced by USFWS Region 1
Refuge Information Branch
Portland, Oregon
Map Date: 3/14/2011
File: 10-091-4.mxd

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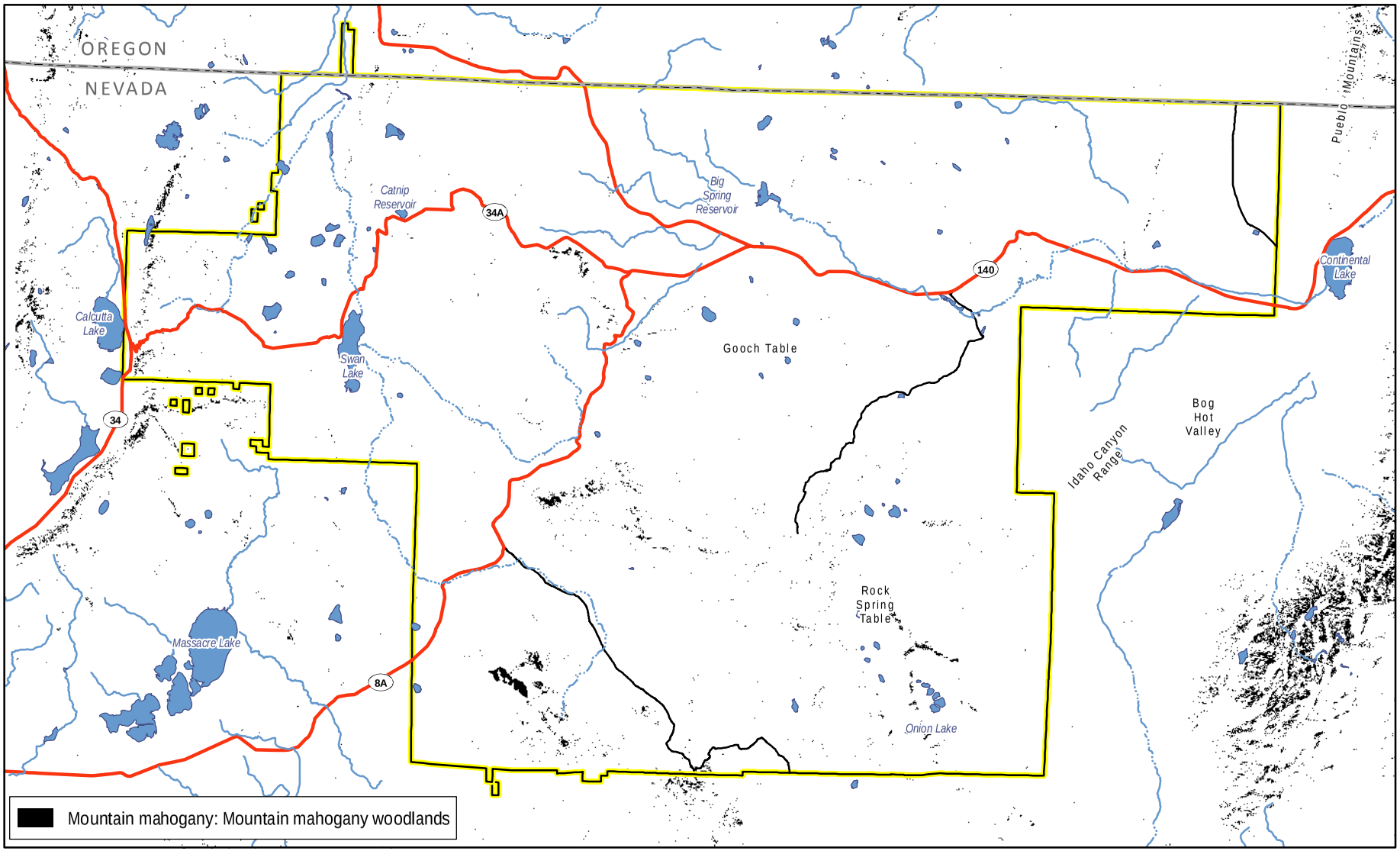
Figure 4.7 Mountain mahogany distribution based on habitat



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Refuge Information Branch
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Chapter 5. Social and Economic Environment

5.1 Infrastructure and Administrative Facilities

The infrastructure and facilities required to administer Sheldon Refuge are extensive. In addition to a number of buildings, structures, fences, and signs, Sheldon Refuge maintains a system of roads that provides access to administrative facilities and to fish, wildlife, plant, and habitat management and research project sites throughout Sheldon Refuge, and secondarily serves as public use and access.

5.1.1 Administrative Buildings and Structures

There are five primary administrative sites for Sheldon Refuge (Figure 5.1). These include the Sheldon Refuge Office (Dufurrena), the Sheldon-Hart Mountain Refuge Complex Headquarters in Lakeview, Oregon, the Thousand Creek Bunkhouse, the Little Sheldon Headquarters/Work Station, and the Badger Mountain Work Cabin. With the exception of the Complex Headquarters, all of these administrative sites are located on refuge lands.

The Sheldon Refuge Office, in Virgin Valley, consists of an office/visitor contact trailer, a barn and tack shed, two maintenance shops, a horse processing facility which includes a hay shed and corrals, and housing for two full-time employees (Photo 5.1). Currently the Sheldon Refuge Manager and two maintenance staff members are stationed at the Sheldon Refuge Office.

Photo 5.1 The Sheldon Refuge Office at Dufurrena includes residences, maintenance buildings, and a small office (Photo Gail Collins).

The Sheldon-Hart Mountain Refuge Complex Headquarters consist of an office and visitor contact building, a storage shed, a vehicle storage lot, and office space at the Lakeview Interagency Fire Center. Currently the Complex Manager, Deputy Complex Manager, Supervisory Wildlife Biologist, Fire Management Officer, Assistant Fire Management Officer, Prescribed Fire Specialist, Natural Resource Planner and three administrative staff members are stationed at the Complex Headquarters.

The Thousand Creek Bunkhouse is located near Highway 140 and east of the Dufurrena Headquarters. This facility consists of two buildings, which provide seasonal quarters and office space for one Fire Station Supervisor, one Engine Crew member, Biological Technicians, and other various staff members associated with seasonal and short-term refuge research and management projects and programs.

The Little Sheldon Headquarters/Work Station located on Highway 34A near the western boundary of Sheldon Refuge consists of a bunkhouse/office building and a storage shed. These facilities provide seasonal and short-term quarters and office space in support of refuge research and management projects and programs.

The Badger Mountain Work Cabin consists of a small dual-purpose building, which serves as bunkhouse and office space. This building is used as a field camp to support refuge research and management projects on a seasonal or short-term basis.

5.1.2 Management Infrastructure

5.1.2.1 Water Control Structures

A variety of water control structures have been constructed within Sheldon Refuge (see Figure 5.1). Most structures were constructed on private lands prior being included in Sheldon Refuge, or were constructed to support the commercial livestock grazing operations that were permitted by Sheldon Refuge prior to 1994. A discussion of these various water control structures can be found in Chapter 3. Since commercial livestock grazing no longer occurs within Sheldon Refuge, many of these structures have not been maintained and no longer function. Other facilities function but are not currently maintained for refuge management purposes. The water control structures discussed here are those now actively maintained and managed to support administration of Sheldon Refuge.

Swan Lake Reservoir was constructed in 1929 to provide stockwater and irrigation for IXL Ranch. It is now maintained by Sheldon Refuge to provide late summer pronghorn forage. Early spring snowmelt and runoff water is stored and allowed to slowly evaporate—resulting in green palatable forage late in the year after other plants have dried. Excess water flows to the IXL wetlands. A 2002 inspection determined the condition of the Swan Lake Reservoir dam was fair (URS 2002).

The IXL wetlands are a portion of a former ranch. The historic ranch buildings are not used for administrative purposes, but the water diversion dam, canals, headgates, and ponds are maintained to provide seasonal waterfowl habitat.

NDOW maintains 18 water guzzlers for the enhancement of small-game and bighorn sheep populations within Sheldon Refuge. These facilities are authorized to support refuge wildlife management objectives. The remaining facilities and infrastructure within Sheldon Refuge were constructed and historically used to support commercial livestock grazing. This use no longer exists, and the need for these facilities and infrastructure is being evaluated as part of this CCP.

Catnip Reservoir constructed in 1910 to supply irrigation water to IXL Ranch and has a capacity of 243 acre-feet. Today this reservoir is maintained to provide habitat for Lahontan cutthroat trout and secondarily to provide recreational fishing opportunities. Current condition of the dam is considered poor due to seepage (Fox and Clayton 1988). To remain functional, the Catnip Reservoir dam will require substantial repair or replacement at some point in the future.

Water wells are located at the Thousand Creek Work Station, Sheldon Refuge Headquarters at Dufurrena, Virgin Valley Campground, and the Little Sheldon Headquarters/Work Station. A natural spring supplies water to the Badger Mountain Work Cabin.

5.1.2.2 Fencing

Fences and fence exclosures within Sheldon Refuge include a permanent perimeter boundary fence designed to inhibit the movements of horses and cattle while allowing passage of wildlife. A number of small semi-permanent and temporary fence exclosures are maintained within Sheldon Refuge to protect key habitats from overgrazing by feral horses or as part of various habitat research studies and management treatments.

5.1.2.3 Administrative Roads

Roads within Sheldon Refuge used for administrative purposes include roads designated open to general public use, and roads, routes, and trails open only to administrative use by Service employees or by refuge Special Use Permit.

5.1.2.4 Maintained Public Roads

The primary access roads within Sheldon Refuge include Nevada State Highway 140 and County Roads 34A and 8A and the Summit Lake/Badger Road (see Figure 5.1). The 34-mile portion of Highway 140 within Sheldon Refuge is a paved two-lane highway maintained by the State of Nevada Highway Department. The remaining 100 miles of maintained primary routes are gravel roads suitable for two-wheel drive passenger vehicles. County Roads 34, 34A, and 8A include 59 miles of roads, which are cooperatively maintained by Sheldon Refuge and the respective road maintenance crews from Washoe and Humboldt counties. The remaining 41 miles of gravel road are maintained solely by Sheldon Refuge.

The unimproved roads within Sheldon Refuge are not regularly maintained (Photo 5.2), but are repaired on a site-by-site basis to keep them in usable condition or to prevent undue resource damage (i.e., excessive erosion). Administrative routes within the proposed wilderness areas were historically created through vehicle access to range developments, mining claims, habitat rehabilitation projects or fenced exclosures, but are now used almost exclusively to support fire suppression activities and are not maintained or improved. A number of other vehicle routes exist within Sheldon Refuge, but these routes were created by illegal vehicle use and continue to be signed, closed, and rehabilitated as staff time and funding allows.

Photo 5.2 Most roads and routes within Sheldon Refuge like this one are of native materials, have no maintenance, and are suitable only for high-clearance vehicles (Photo Gail Collins).

5.1.2.5 Directional and Informational Signage

Because Sheldon Refuge is so large and remote, directional and information signs provide critical information to visitors. These signs are considered part of the Sheldon Refuge infrastructure and do not provide educational information or an interpretive message. These include several refuge entrance signs, refuge road direction signs, refuge boundary signs (posted primarily on the perimeter refuge boundary fence), designated vehicle route signs, designated campground signs, and closed area/road signs. While the exact numbers are not tracked, it is estimated several hundred signs are located throughout Sheldon Refuge.

5.1.3 Operations and Administration

Approximately $1.68 million annually is required to manage Sheldon Refuge. This includes funds for employee salaries, fire suppression, feral horse and burro management activities, vehicle and facilities operations and maintenance, equipment, supplies, utilities, and a variety of contracts.

Sheldon Refuge is managed by a combination of on-site and off-site staff. The Sheldon Refuge Manager, two maintenance staff members, a fire station supervisor, and a fire engine crew are stationed on Sheldon Refuge at the Dufurrena Headquarters and the Thousand Creek Work Station near Denio, Nevada. The Sheldon-Hart Mountain Refuge Complex Project Leader, Deputy Project Leader, Supervisory Wildlife Biologist, Fire Management Officer, Assistant Fire Management Officer, Prescribed Fire Specialist, Natural Resource Planner, Budget Officer, and two additional administrative staff members are stationed in Lakeview, Oregon, at the Complex Headquarters. Unlike on-refuge staff, these Complex staff members split their time between the two refuges. Salaries and benefits for work conducted on Sheldon Refuge in 2008 was estimated to be $847,000.

Surveys, monitoring, research studies, and other biological projects and programs related to wildlife, fish, and their habitats within Sheldon Refuge require additional funds to pay for aerial survey contracts, equipment, vehicles, and travel. Annual maintenance of roads, administrative buildings, water control structures, boundary fences, campgrounds, signs, and information kiosks also requires additional funds. The combined costs for these activities are $100,000 per year. In addition, volunteers, partners, and cooperating agencies annually contribute labor, transportation, and other assistance.

In addition to employee salaries, approximately $47,000 is spent annually to conduct wildfire suppression operations and for the equipment, maintenance, planning, inventory, operations, and monitoring required to conduct prescribed burning and other habitat treatment projects within Sheldon Refuge.

Management of feral horses and burros is the most expensive program at Sheldon Refuge. Implementation of the current management plan requires the removal of between 160 and 200 animals each year to maintain population levels. Excluding employee salary costs, management of feral horses and burros requires $684,000 annually (Industrial Economics 2010). The majority of these funds pay for the gathering, feeding, transporting, and adoption of the animals. If employee costs for this program are included, the feral horse and burro program consumes well over half the entire annual budget for Sheldon Refuge.

5.1.3.1 Public Access

A range of opportunities for a particular recreation activity can be achieved by combining varying degrees of management presence, interaction with other visitors, the degree of development, and types of access. Access—defined in terms the types of use, modes of transportation, and the level of development and maintenance—can be used to describe recreation settings. Access settings have been broadly categorized for planning purposes as follows: Primitive (areas without developed trails, roads, and vehicles); Semi-primitive non-motorized (areas with developed trails or routes, but without roads or motorized vehicles); Semi-primitive motorized (areas with roads and routes for motorized vehicles, but generally suitable only for ATVs, snowmobiles, or high-clearance four-wheel drive vehicles); Roaded Natural (roads are maintained, may be either native material, gravel or asphalt, and are suitable for most types of vehicles); Rural; and Urban.

Generally, the remoteness of the physical setting within Sheldon Refuge falls into the Semi-primitive Nonmotorized and Semi-primitive Motorized categories. Only two small areas on Big Spring Table and Gooch Table, which are more than 3 miles from a road or motorized route, meet the criteria for a Primitive recreation opportunity setting. A relatively small percentage of Sheldon Refuge, which includes the corridors along Summit Lake/Badger Road, County Roads 34A, 8A, and State Highway 140, would be categorized as Roaded Natural, and the Dufurrena/Virgin Valley area would be considered a Rural recreation opportunity setting where land use and development are readily noticeable and numerous facilities and buildings are evident. The majority of public use occurs within these Roaded Natural and Rural settings. With the exception of a few administrative areas, all public lands within Sheldon Refuge are open to public use and fall into one of these three access settings. There are no areas of Sheldon Refuge within the Urban settings.

As with much of northwest Nevada, public use and recreation activities typically involve a variety of motorized vehicles, especially OHVs. Over the past several decades, more than 400 miles of unimproved motorized routes and trails within Sheldon Refuge have been pioneered by ranchers, mining prospectors, fire suppression crews, staff, and visitors. While many of these primitive routes continue to be used today by visitors, the Service has not evaluated the adverse impacts from these routes to the natural, aesthetic, or scenic values of Sheldon Refuge and has not determined if their location minimizes damage to soils; harassment of wildlife or significant disruption of wildlife habitats, or other existing recreational uses as required by Executive Order 11644. Furthermore, the Service has never officially designated any of these routes open to use by OHVs as required by Executive Order 11644 and 50 CFR 27.31.

Currently visitors can drive to within 4.5 miles of any point on Sheldon Refuge using a variety of roads, routes, and trails (see Figure 2.1). With the exception of 34A, 8A, Dufurrena, and the Summit Lake/Badger Road, Sheldon Refuge conducts the minimum maintenance necessary to keep routes in useable condition and to prevent undue resource degradation. As a result, most routes within Sheldon Refuge require a high-clearance and/or four-wheel drive vehicle and are impassible after heavy rain or snowfall.

The boundaries of the proposed wilderness areas within Sheldon Refuge are primarily defined by adjacent roads and routes. Visitors typically access the proposed wilderness areas along these adjacent boundary roads and routes before taking day trips or short overnight trips into Sheldon Refuge backcountry for hunting and other recreation activities. There are no maintained routes or trails within the proposed wilderness areas, but existing user created trails do provide limited access. The Primitive setting characterizes access within each of the proposed wilderness areas.

5.1.3.2 Public Use Overview

Recreation activities within Sheldon Refuge include hunting for birds and large game, fishing for both cold- and warm-water fish, wildlife observation and photography, and rock collecting. Hunting is the most common of these activities. In addition to the system of roads, routes, and trails within Sheldon Refuge, 12 semi-primitive and primitive campgrounds, one developed campground, a horse corral, reservoirs, a fishing dock, and a number of information signs and kiosks are maintained to support these recreation activities.

Sheldon Refuge provides outstanding opportunities for primitive and unconfined recreation characterized by solitude, remoteness, and a variety of terrain and scenery. These opportunities are recognized by the fact nearly 60% of Sheldon Refuge has been proposed for wilderness

designation—in part due to these outstanding opportunities. Aside from a number of undeveloped primitive roads and semi-primitive campgrounds, Sheldon Refuge is undeveloped and can be experienced in its natural state with little or no evidence of human presence, habitation, or alteration. When compared with other large, primitive, undeveloped areas in the region, it is the almost complete absence of modern human use (primarily ongoing commercial livestock grazing operations) that sets Sheldon Refuge apart.

Annual recreation visits

Sheldon Refuge received approximately 17,000 visitors in 2008, mostly enjoying hunting, fishing, wildlife viewing, camping, and rock collecting. Generally, the majority of visitors in the spring are rock collecting, camping, and wildlife viewing, and the majority of visitors in the fall are hunting. In 2008 there were 4,198 visitors to Sheldon Refuge for the purpose of hunting. An estimated 488 anglers fished at Catnip Reservoir and Dufurrena Ponds in 2007 (which represents nearly all sport fishing within Sheldon Refuge). There are no visitation numbers for the other visitor activities.

Outdoor recreation rates and trends

Overall, recreation visits to Sheldon Refuge have increased in recent decades. It was estimated that in 1974 there were 12,000 visitors to Sheldon Refuge (USFWS 1974). In 2008 it was estimated there were 17,000 visitors.

More recently, the rate of use in Virgin Valley Campground was increasing, until higher gas prices in 2008; hence, due to the remoteness of Sheldon Refuge, visitation decreased notably from 2007 to 2008. Refuge staff also noted a decrease in hunter scouting trips in 2008 prior to the hunting season.

Recreation opportunities in the surrounding area

Commercial operators provide fee-based recreation rock collecting and mining opportunities for precious opal on private lands and patented mining claims in the Virgin Valley area within Sheldon Refuge. Private commercial developed campgrounds are provided in conjunction with these rock collecting opportunities. However, the majority of use at refuge public use facilities in the Virgin Valley area are visitors to these private rock collecting and mining areas.

Sheldon Refuge is surrounded by public lands managed by the BLM, which include WSAs, a national conservation area, and a variety of primitive and semi-primitive facilities which provide a wide range of recreation opportunities including hunting, fishing, camping, rock collecting, horseback riding, hang gliding, bicycle riding, photography, OHV use, and wildlife viewing.

5.2 Wildlife-dependent Recreation and Public Uses

5.2.1 Waterfowl Hunting

Waterfowl hunting is permissible in accordance with NDOW regulations. All of Sheldon Refuge is open to waterfowl hunting except Virgin Valley, the Little Sheldon area, and Big Spring and Catnip reservoirs. There are no official data on the number of hunters. It is estimated that waterfowl hunting draws less than 100 visitors to Sheldon Refuge a year. Harvest statistics are not available for waterfowl hunting. The water control structures near the historic IXL Ranch support waterfowl hunting on Sheldon Refuge.

5.2.2 Upland Bird/Small-game Hunting

All of Sheldon Refuge is open to upland game bird hunting except Virgin Valley and the Little Sheldon area. Upland game birds open to hunting include Greater sage-grouse, chukar, and California quail. There were 40 California quail and chukar hunters in 2007.

Hunting of Greater sage-grouse within Sheldon Refuge is allowed with permits issued from NDOW. The primary purpose for this hunt is to collect bird wings for use in estimating population productivity, reproduction, and sex and age ratios (see previous discussion under Section 4.2.2.1). A secondary benefit from this hunt is that hunting opportunities are provided for up to 75 hunters drawn by lottery from a pool of roughly 400 applicants each year. Hunting for sage-grouse within Sheldon Refuge is restricted to two separate two-day seasons in September. Seasons and harvest limits are coordinated by NDOW and Sheldon Refuge to maintain healthy populations and adequate data collection. Harvest levels are currently lower than in past years because harvest limits were reduced from three birds to two), possession limits were reduced six birds to four, and the number of annual permits reduced from 150 to 75 in 2007. From 2002 through 2010, a minimum of 1,296 Greater sage-grouse were harvested within Sheldon Refuge (based on the number of wings hunters provided). Harvest ranged from 75 birds in 2007 to 230 in 2004 and averaged 144 birds per year (Collins 2010). The sage-grouse hunt is important for determining the success of reproduction for the year. Every hunter is required to deposit one wing from each grouse into a collection barrel before leaving Sheldon Refuge. Wings are then examined each year during the annual NDOW wing bee to estimate population productivity and nesting success.

Small-game hunting is not allowed on Sheldon Refuge.

Other than wing collection barrels, there are no facilities specifically in support of these activities.

5.2.3 Big-game Hunting

Big-game hunting is a very popular activity and a priority public use on Sheldon Refuge. There is considerable public support for hunting on Sheldon Refuge. All of Sheldon Refuge is open to big-game hunting except for two large sanctuary areas. The sanctuary areas are Virgin Valley on the east end of Sheldon Refuge and the Little Sheldon area on the western end. Big-game species open to hunting are mule deer, pronghorn, and California bighorn sheep in accordance with NDOW regulations. Sheldon Refuge staff works closely with NDOW to set big-game tag numbers and season dates for the upcoming year. NDOW administers the hunt including tag issuance, data collection, and the preparation of summary reports, which provide excellent hunt participation information for Sheldon Refuge. Because hunting activities are managed cooperatively, ongoing coordination is required to ensure that hunter numbers and restrictions are consistent with refuge purposes, Service policies, and refuge biological goals and objectives. In 2008 there were five California bighorn sheep, 87 pronghorn, and 185 mule deer tags issued. Sheldon Refuge encompasses State hunt management unit number 033.

Sheldon Refuge is managed to provide a quality big-game hunting experience. A lottery system limits the number of harvest tags, which is set to provide a high-quality recreational experience. This system is used in conjunction with phased season openings to reduce overcrowding and disperse hunter activities. Sheldon Refuge is renowned for its big-game hunting and hunters come from throughout Nevada as well as 10 or more additional states each year. Hunt quality is considered high, as measured by the number of animals seen, the quality and health of the animals, the lack of

interference from other hunters or refuge users, and the scenic quality and biological integrity of the areas visited while hunting. Sheldon Refuge has a reputation for producing exceptional trophies, and tags are highly sought after.

Demand for commercial guides and outfitters is growing in popularity for non-Nevada resident hunters. Guiding and outfitting within Sheldon Refuge is discussed further under Section 5.3.

There are limited developed camping opportunities on Sheldon Refuge, forcing hunters to camp in close quarters with others. NDOW splits the hunting seasons on Sheldon Refuge to ease the crowding in the campgrounds. This cuts the number of hunters in the field by half for each season. Several of the campgrounds have meat hanging poles, providing the only facilities maintained expressly for this program.

5.2.4 Fishing

Fishing opportunities on Sheldon Refuge are managed in cooperation with NDOW and are characterized by ease of access to remote quiet settings with semi-primitive facilities. Stocking non-native fish has occurred on Sheldon Refuge, although it is not preferred under Service policy. Restocking of fish to Catnip and Big Spring reservoirs continues to occur periodically. Fishing is allowed in the Dufurrena Ponds and Catnip and Big Spring reservoirs (Photo 5.3). The fisheries at these locations are typically described as either cold-water fisheries (i.e., trout) or warm-water fisheries (e.g., bass). There are no current data available for the number of visitors fishing on Sheldon Refuge. In 2007 NDOW estimated that 312 anglers fished Catnip Reservoir and that 176 anglers fished the Dufurrena Ponds (NDOW 2010). The most recent estimate for Big Spring Reservoir was in 1998 when NDOW estimated 1,906 anglers fished this reservoir (NDOW 2010). Fishing is regulated by NDOW in consultation with the Service.

Photo 5.3 Big Spring Reservoir is popular for sport fishing but only has water during certain years.

Big Spring and Catnip reservoirs have facilities in support of fishing; Big Spring Reservoir has a campground and a boat launch, and Catnip Reservoir has a campground. The Virgin Valley Campground is located 1½ miles from Dufurrena Ponds 19 and 20. Dufurrena Pond 20 and McGee Pond have fishing docks that are accessible to people with physical disabilities. The Alvord cutthroat trout, an undescribed subspecies, is considered to be extinct and the population found in Virgin Creek likely no longer exists in its pure form; however, individuals described as Alvord cutthroat trout-rainbow trout hybrids have been documented within the watershed. Native Sheldon tui and Alvord chubs are not impacted by management of sport fisheries in Big Spring and Catnip reservoirs.

The popularity of fishing on Sheldon Refuge results in visitation which approaches or exceeds campground capacity at some sites during short periods of the summer and fall. Additionally, the stocking of non-native fish to waters within Sheldon Refuge is in conflict with Service Policy 7 RM 10 and 601 FW 3. Fish stocking in conjunction with maintenance and management of existing reservoirs, other water control structures, and campgrounds continues to affect the natural hydrologic systems of various watersheds, associated riparian, wetland, and aquatic habitats, and various aquatic native species.

All opportunities are provided by previous NDOW stocking or periodic restocking of non-native fish species to constructed reservoirs. Catnip Reservoir is located within a closed basin that has no native or indigenous species of trout. Big Spring Reservoir is located within the Alvord Basin, which at one time supported a native subspecies of cutthroat trout. However, due to hybridization with rainbow trout, which were stocked in the 1930s, the pure form of this subspecies has been extirpated. Two species of trout considered indigenous to the region are the Lahontan cutthroat trout, which occurs in the Quinn River Basin (Lahontan Basin drainage) east and south of Sheldon Refuge, and the redband trout which occurs in Columbia River Basin north of Sheldon Refuge. Both Catnip and Big Spring reservoirs are constructed impoundments with limited to no spawning or rearing habitat that would facilitate self-sustaining trout populations large enough to support a recreational fishery (NDOW 2011). Therefore, to maintain recreation trout fishing opportunities and a quality fishing experience for the public within Sheldon Refuge, periodic restocking of hatchery fish would need to continue. Adjacent or nearby campgrounds accessible by unimproved roads are maintained by Sheldon Refuge. The quality of these opportunities makes fishing on Sheldon Refuge a popular recreational activity in northern Nevada, part of the Great Basin. Fishing opportunities can be further subdivided into warm-water and cold-water fishing opportunities.

5.2.4.1 Warm-water Fishery

Dufurrena Ponds 19 and 20 and McGee are non-native warm-water fisheries that are extremely popular with anglers from northern Nevada. These ponds provide opportunities to fish for large-mouth bass, crappie, sunfish, and yellow perch. The fish populations in these ponds are considered self-sustaining, do not require continual restocking by NDOW, and do not pose a risk to native species. Considering these factors, Sheldon Refuge has made a commitment to maintain the existing fishery.

McGee Pond provides fishing opportunity only for individuals who are age 12 or under, age 65 or older, or disabled. It was most recently stocked with fish in 2006 at the request of refuge staff after it was drained for maintenance. The Biological Integrity Diversity and Environmental Health Policy (601 FW 3) addresses the management of non-native species in Section 3.16 which states: “We require no action to reduce or eradicate self-sustaining populations of non-native, noninvasive species (e.g., pheasants) unless those species interfere with accomplishing refuge purpose(s). We do

not, however, manage habitats to increase populations of these species unless such habitat management supports accomplishing refuge purpose(s)." Because these ponds have self-sustaining populations and are popular with fishing residents in northern Nevada, these populations can continue to exist. Currently, these fish cannot enter into the Thousand Creek/Virgin Creek system and establish additional non-native populations. They are separated by meadow complexes that did not allow passage of fish during a recent 500-year flood event into the Thousand Creek/Virgin Creek system. There is some risk that fish may be transferred to other water bodies on Sheldon Refuge.

5.2.4.2 Cold-water Fishery

Management of cold-water fish on Sheldon Refuge has been conducted by NDOW with minimal involvement by refuge staff. Two popular sport fisheries (e.g., Big Spring and Catnip reservoirs) are supported by NDOW on Sheldon Refuge.

Catnip Reservoir

Catnip Reservoir has been historically used by NDOW as brood stock for the Walker Lake strain of Lahontan cutthroat trout and was opened in 1998 to fishing with a limit of one trout. Although the Lahontan cutthroat trout is a threatened species, the population on Sheldon Refuge is designated as experimental non-essential under an ESA 4D ruling (Sheldon Refuge is outside of this species' historical distribution), and NDOW is allowed to permit harvest in accordance with state laws.

Inspections, done by the Service (in 2002) and by the State of Nevada (in 2006) classified Catnip Reservoir dam as being in an unsafe, non-emergency condition due to heavy seepage. The dam was classified as non-emergency due to the low chance of loss of life in the event of dam failure. The reservoir will eventually need to be drained in order for the dam to be repaired. The reservoir is very shallow due to siltation brought in from its tributaries. Draining the reservoir to repair the dam would allow for some dredging to deepen the reservoir and to restock with Lahontan cutthroat trout.

Big Spring Reservoir

Big Spring Reservoir has been stocked with trout, and the fishing limit is five fish. Big Spring Reservoir is subject to periodic drying and filling depending on precipitation amounts. When the reservoir holds water for several years, the fishing is very good and becomes very popular. However, when the reservoir becomes dry, it is necessary to restock to re-establish the fishery. NDOW and refuge staff are interested in developing brood stock for this hybrid to breed out the rainbow trout genome, if possible. The current put-and-take program is not consistent with the following Service policies: 7 RM 1.1 (Population Management), 7 RM 10 (Fisheries Resource Management), 7 RM 12 (Propagation and Stocking), or 601 FW 3 (Biological Integrity, Diversity, and Environmental Health). These policies indicate that only stocking of native and indigenous species is acceptable in refuge waters. In addition, the 7 RM 10 policy states that only fingerling/juvenile fish can be stocked as opposed to catchable-size fish. Stocking Lahontan cutthroat or redband trout in Big Spring Reservoir, which are considered indigenous to the region, would be more consistent with Service policy in Big Spring Reservoir.

5.2.5 Wildlife Viewing and Photography

Wildlife viewers and photographers are free to roam Sheldon Refuge and use personally provided temporary blinds. Professional photographers currently use Sheldon Refuge and are required to

obtain a Special Use Permit. There are not any available data to estimate the number of visitors participating in wildlife viewing and photography (Photo 5.4).

Parts of Sheldon Refuge are very remote and access is limited by the terrain and adverse seasonal conditions. The wilderness character is an important part of the Sheldon's attractiveness.

Sheldon has no facilities managed and maintained specifically for this activity other than a few unimproved areas posted as a place to view wildlife. There are several places on Sheldon Refuge where photography blinds could be placed. The Dufurrena Ponds are one such area and would provide opportunities to photograph many species of wildlife. Another possibility is Swan Lake Reservoir, where many pronghorn congregate during the summer.

Photo 5.4 Although no estimates are available, most people likely participate in wildlife viewing or photography while visiting Sheldon Refuge.

5.2.6 Environmental Education

The remoteness of Sheldon Refuge does not lend itself to many opportunities for environmental education in a traditional format where school children are presented programs on-site. The nearest population centers are Denio to the east and Adel to the west of Sheldon Refuge. Both areas have elementary schools but older children are bused to other areas with larger populations. Both Denio and Adel have populations of less than 200. In the past few years the visitor numbers have ranged from zero to 12.

The current refuge office, a single-wide trailer, does not have the space for an adequate visitor contact station and is not set up to serve as a visitor contact facility. There are no facilities managed or maintained for environmental education.

5.2.7 Interpretation

Sheldon Refuge provides brochures and signs at key visitor contact locations. Sheldon Refuge Complex also maintains a website (http://www.fws.gov/sheldonhartmtn) where current information can be obtained at any time.

Sheldon hosts wildlife viewing tours twice a year: in the spring and fall to volunteer groups. Tours are available on request to the staff; however, refuge staffing is extremely limited. There is no visitor contact station or regular staffing at the Sheldon Refuge Office (Dufurrena).

5.3 Supporting Uses and Facilities

5.3.1 Camping

Camping itself is not a priority public use on Service lands, but because of the size, remoteness, and quality of roads on Sheldon Refuge, it is important in supporting priority uses including fishing, hunting, wildlife observation, and wildlife photography. Camping on Sheldon Refuge is allowed in designated campgrounds or under special backcountry permit with a 14-day camping limit at any one location. There are four types of camping opportunities currently provided on Sheldon Refuge: developed, semi-primitive, primitive, and backcountry/wilderness.

Campgrounds at Sheldon Refuge can be classified as either developed, semi-primitive, or primitive depending upon types of facilities and development and levels of use. Currently, there are 13 campgrounds available to visitors on Sheldon Refuge (see Figure 5.1).

5.3.1.1 Developed Camping

Developed camping opportunities are provided in the Virgin Valley Campground, which is easily accessible year-round for all vehicles, including recreational vehicles (RVs). The campground, located at Dufurrena, offers shade trees, potable water, two vault toilets, 16 picnic tables, 24 fire rings, a bath-house, and a hot spring developed for swimming. The campground can hold approximately 100 camping parties on a first-come, first-served basis without designated sites. From 2005 through 2007 an average of 18 campsites were occupied per day during the days surveyed for a seasonal average of 6,573 visitor use days (USFWS Undated Report).

Between mid-May and early September the Virgin Valley Campground is extensively used by individuals collecting rocks and/or mining for opals at nearby commercial mining sites, with visitation highest during June; camping in support of these activities is not an identified priority public use. From mid-August through mid-November, the Virgin Valley Campground is heavily used by hunters. Others stay at the campground to participate in nearby fishing and birding opportunities; however, the number of individuals using the campground to enjoy fishing and birding activities is not known. The proportion of camping to support these uses may be incidental in comparison to mining and hunting activities. At the Virgin Valley Campground individual campsites are not delineated nor is there a reservation or fee system. During peak seasons, overcrowding and user conflicts have been a concern as well as overflow into the surrounding uplands, which may result in further environmental damage. There is also a private developed campground at the Royal Peacock Mine located in the Virgin Valley Mining District, which has RV hookups.

Virgin Valley Campground is situated at the site of a former CCC work camp. The campground has few vegetated areas and is mostly gravel roadway or bare volcanic soil, which naturally has little or no organic matter. The campground is includes Virgin Valley Hot Springs and is immediately adjacent to McGee Pond, both of which are extensively developed and altered habitats.

5.3.1.2 Semi-primitive Camping

The second type of camping opportunity is semi-primitive. Five of the 13 designated campgrounds (Catnip Reservoir, West Rock Spring, Fish Spring, Badger, and Big Spring Reservoir) within Sheldon Refuge are considered semi-primitive and include outhouses, fire rings, meat-hanging poles, and in the case of Fish Spring and Badger campgrounds, horse corrals. These semi-primitive campgrounds are accessible from primary roads or improved secondary roads suitable for most types of vehicles. The semi-primitive sites are primarily used by hunters, and campsite capacity, in part, limits the number of tag holders that can be accommodated during big-game seasons. Individuals seeking fishing opportunities use campgrounds at Catnip and Big Spring reservoirs.

Catnip Reservoir and Big Spring Reservoir campgrounds are located immediately adjacent to artificial reservoirs. The remaining three semi-primitive campgrounds are all located immediately adjacent to or include wet meadows, spring, or springbrook habitats. Catnip Reservoir and Big Spring Reservoir campgrounds receive the greatest amounts of use and exhibit the greatest amount of impact. The core areas of use at these campgrounds no longer support vegetation, water infiltration is considered low due to soil compaction, and gravel has been placed in some areas to reduce erosion. Most of the remaining semi-primitive campgrounds have moderate amounts of vegetation loss and soil compaction, which is limited to areas at areas adjacent to fire rings and outhouses, but these impacts are generally not continuous throughout the campground.

5.3.1.3 Primitive Camping

Seven campgrounds (Little Catnip Spring, Gooch Spring, North Hell Creek, Wheeler Spring, Bateman Spring, Devaney, and East Rock Spring) are considered primitive campgrounds and have only fire rings or no improvements, are remote, and accessible to four-wheel drive or high-clearance vehicles when road conditions are passable. These primitive campgrounds receive intermittent and low amounts of use, occurring mostly during the hunting seasons (early August through October). All of these campgrounds are located immediately adjacent to or include wet meadows, spring, or springbrook habitats. Three primitive campgrounds (Wheeler Spring, Devaney, and East Rock Spring) also include aspen woodland habitats.

Primitive campgrounds generally exhibit few impacts to vegetation or soils due to low amounts of intermittent use, which occurs during late summer and fall after when most annual and biannual plants have finished growing for the season and when soils are typically drier and more resistant to impact. Some primitive campgrounds have no visible bare ground, and because they are located in meadow habitats, vegetation is generally able to recover from the low amounts of use. Other primitive campgrounds exhibit small areas of bare ground, generally lack forbs that are not resistant to trampling, and in the case of Wheeler Spring, Devaney, and East Rock Springs, exhibit some impacts to aspen trees from soil compaction, root exposure, and cutting.

5.3.1.4 Backcountry/Wilderness Camping

The fourth type of camping opportunity on Sheldon Refuge is considered backcountry or wilderness camping, and use is relatively low at present. This activity requires a backcountry camping permit issued by the Sheldon Refuge Manager. There are currently no limits on the number of permit holders. To date, the majority of visitors utilizing this opportunity are hunters pursuing game on the tablelands, which are generally within the designated WSAs. There is also moderate dispersed use by campers and bathers at Bog Hot Springs. The spring itself is privately owned, but campers on that inholding spill over onto refuge lands.

Restrictions on backcountry camping are few, but currently include no camping within 100 yards of a water source, or within 0.5 mile of a road or vehicle. All trash must be packed out and the permit must be carried by the user as well as a tear-off sheet displayed in his or her vehicle.

Most campgrounds on the Sheldon Refuge are located at or near springs and riparian areas and are primarily used during the hunting season. The proximity of these campgrounds to water could potentially contaminate water sources, and disturb and displace wildlife from critical habitats. Other direct impacts include soil compaction, erosion, and trampling and removal of vegetation. Campfires are a seasonal concern during dry periods when campfires are not allowed, resulting in numerous violations are observed each year. Data regarding camping demographics are generally lacking across the landscape and need to include where, when, how many, duration, and purpose for visiting Sheldon Refuge.

5.3.2 Horseback Riding

Horseback riding has been allowed as a recreational activity on Sheldon for many years. However, there have been less than 10 horseback visitors a year, and as a result, horseback riding is considered a very low impact activity on Sheldon Refuge. Horseback riding gives the public an opportunity to visit remote parts of Sheldon Refuge, and to enjoy the wildlife viewing, solitude, and expansive views that Sheldon Refuge is known for. In addition, visiting Sheldon Refuge via horseback can give the user a sense of history. Pack trips are allowed with a backcountry permit.

Currently, horseback riding is allowed refuge wide except in small areas that are closed to all public entry. The areas closed to horseback riding are the administrative facilities at the Dufurrena subheadquarters, which include the shop area and the horse corrals.

There are very few facilities designed for horseback use; only two of the 12 semi-primitive and primitive campgrounds, Badger and Fish Spring campgrounds, provide facilities for domestic horses. There is a concern that the number of visitors engaging in horseback riding may increase, particularly with hunting guides and their clients. There is also a potential for an increase in horseback riding use with the designation of wilderness.

5.3.3 Bicycling

On Sheldon Refuge, bicycle use occurs but is light. Bicycling is allowed only on roads open to motor vehicles.

5.3.4 Outfitting and Guiding

Several professional guides have permits to guide on Sheldon Refuge. The use of hunting guides is growing in popularity for non-resident hunters; however, the total number of guides is currently limited to 10 annually. On average, between nine and 10 guided hunt permits were issued from 2005 through 2009, each for outfitting and guiding big-game hunters. Guiding is viewed as a commercial use and requires a Special Use Permit from Sheldon Refuge. Hunting guides can provide a valuable service by offering a quality hunting experience for non-resident hunters who are unfamiliar with Sheldon Refuge and high desert hunting conditions. However, Sheldon Refuge has received a number of complaints about guides and associated subguides interfering with other hunters. There is also the perception that spotter aircraft are being used increasingly by guides, in turn disrupting wildlife and the quality of other hunters' experience.

Professional guides are occasionally permitted to provide services in support of other recreational uses such as photography or upland bird hunting. However, the demand and number of requests for these permits are rare and typically issued on a case-by-case basis.

5.4 Other Refuge Uses

5.4.1 Rock Collecting

Collecting rocks and minerals on Sheldon Refuge has long been a popular pastime, and it is currently open to the public. Collection of 7 pounds of rocks a day is allowed anywhere on Sheldon Refuge except on mining claims. Mining on established claims within the Virgin Valley Mining District is not considered rock collecting.

Rock collecting is not allowed under Refuge System regulations or policies, and may be in direct conflict with Refuge System regulations (e.g., 50 CFR 27.61). However, under current refuge policy, the public can collect up to 7 pounds of surface rock per day including petrified wood, opal, and agate. No digging or excavation is allowed outside of the mining district.

5.5 Law Enforcement and Illegal Activities

Illegal uses that occur on Sheldon Refuge include illegal OHV use, camping outside of designated areas, poaching, hunting and fishing violations, archaeological theft, vandalism, and theft of refuge signs. The President's proposal for eight wilderness areas within Sheldon Refuge in 1974 included closing all permanent roads and motorized trails within the proposed areas. However, recurring illegal vehicle use has been a persistent problem throughout Sheldon Refuge. The remoteness, size, existing staffing, and existing funding have made public education and enforcement of these existing closures difficult.

There is also concern that certain segments of the public, intentionally or inadvertently, may be collecting archaeological artifacts that are prohibited from collection by the Archaeological Resources Preservation Act of 1979.

Illegal uses persist partly because of the lack of public support, insufficient public education, and limited law enforcement capability. There is one dual-function officer assigned to Sheldon Refuge

and a full-time officer assigned to the Sheldon-Hart Mountain Complex. Due to travel distances, remoteness, and the vast area to patrol, additional law enforcement personnel are necessary.

In 2008, there were three citations issued on Sheldon Refuge: two citations for reckless driving and one citation for operating an ATV on a closed road. There were two cases of abandoned property: a car and a horse.

5.6 Cultural Resources and Historic Properties

Cultural resources are the physical remains, sites, objects, records, oral testimony, and traditions that connect people to our nation's past. They include archaeological and historical artifacts, traditional ecological knowledge, sites, landscapes, sacred locations, and traditional cultural properties. Cultural resources are integral components of the landscape. They tell us how people have used the land and its wildlife. At Sheldon Refuge, cultural resources remind us that human beings had already been part of the web of life for thousands of years before the arrival of Euro-Americans in the mid-1800s.

5.6.1 Native American Cultural History

Archaeological evidence indicates that humans have lived in northern Nevada for at least 12,000 years. The earliest radiocarbon dates of human occupation (about 8,800 years ago) come from Last Supper Cave. However, most of the prehistory of the area is represented by open-air lithic scatters. The Native American cultural history at Sheldon Refuge is based on interpretation of the archaeological record on and near Sheldon Refuge. Several scholars have presented the history and archaeology of the region in detail (e.g., Elston and Earl 1979; Layton 1970; Leach 1988; Smith et al. 1983).

5.6.2 Native American Ethnography and Recent History

Sheldon Refuge occurs in the homeland the *Aga'I'paninadokada* ("fish lake eaters") and *Moado'kado* ("wild onion eaters") Northern Paiute (Raymond 2000). They were a semi-nomadic people who made their living by hunting (pronghorn, bighorn, rabbits, ground squirrels, waterfowl), gathering (roots, berries, seeds), and fishing (trout, suckers, chub). The nuclear family was the principal socio-economic unit (Steward 1938).

Prior to Euro-American incursion into northern Nevada, Northern Paiute families congregated for the winter at lower elevation village sites near dependable water, fuel, and food. The people at the winter villages lived on stored food, supplemented by hunting game, and fishing. With the arrival of spring the Indians harvested wild roots (camas, ipos, bitterroot, biscuitroot) by the bushel. Some were roasted and eaten on the spot while many were dried and stored for the following winter. In summer, the families dispersed to higher elevations following game and the seasonal ripening of plants. In autumn, the families would gather again for communal rabbit and pronghorn hunts. They often held *fandangos,* a sort of harvest celebration where far-flung families met to exchange food and other resources, share information, make acquaintances, form alliances, and find mates. With the first snow of the season, Northern Paiute families reconvened at their winter village locations. (Fowler 1989; Fowler and Liljeblad 1986; Steward 1938; Stewart 1939).

As Euro-American immigrants settled northwestern Nevada, the Northern Paiute began raiding ranches for their livestock while trying to avoid directly fighting with the new arrivals (Layton

1977:244, 1978). Many of the raids appear to have been perpetrated by the same band led by Captain Tom, or Black Rock Tom as he was also known, who was easily identified by his white horse. Black Rock Tom based his operations in the High Rock region, including the Black Rock Range and probably parts of the Sheldon Refuge.

In response to raids and associated casualties, the U.S. Army established several forts in northwest Nevada between 1860 and 1865 to protect the area from Indians and Confederate sympathizers. After a series of deadly skirmishes and retributions eventually ended and the Northern Paiute were removed to nearby reservations and began to assimilate with the new order by working on ranches as cowhands, laborers, and domestic help. Today the Northern Paiute live at Summit Lake Indian Reservation, Fort McDermitt Indian Reservation, Fort Bidwell Indian Reservation, Cedarville Indian Rancheria, and in the towns and ranches that surround Sheldon Refuge.

5.6.3 Euro-American History

5.6.3.1 Early Exploration

The earliest Euro-American exploration of the Sheldon area was led by Colonel C.S. Drew in 1864 in search of a wagon route from Fort Klamath, Oregon, to the Owyhee Mining District in Idaho. Drew's report contains topographic information and information about the Indians, flora, and water sources. In July 1866, Major Robert S. Williamson of the U.S. Army led an exploratory party from Fort McDermitt to Lassen's Meadow in California but found the area to be too sandy and too arid for a decent wagon route (Elston and Earl 1979:35). Under the direction of Andrew J. Hatch, the Office of the U.S. Surveyor General began systematic surveys in the vicinity of Sheldon Refuge in 1872. The maps created from these surveys record old roads between Denio and Virgin Valley, Denio and Cedarville, Virgin Ranch to Denio, and Thousand Creek Canyon to Rock Spring Valley.

5.6.3.2 Nineteenth Century Ranching

Euro-Americans began settling the Sheldon Refuge area in the 1860s. They were attracted to the numerous springs and the grassy meadows for grazing livestock. But the warm season verdure was offset by the long and occasionally harsh winters. Particularly difficult winters in the 1880s decimated livestock herds and many ranches failed. Ranchers sold their properties to the stock raising companies such as Miller and Lux. Between 1886 and 1888, Miller and Lux purchased huge tracts of land and many of the early ranches in northwestern Humboldt County. By 1905, Miller and Lux owned much of northwestern Nevada.

Although cattle ranching remained the primary economic activity of the region in the late nineteenth and early twentieth centuries (Elston and Earl 1979), some ranchers also raised European horse breeds as saddle and working stock for the U.S. Cavalry and the burgeoning population of nearby California (USFWS 1985). George B. Hapgood built ranches at Calcutta Lake and Last Chance Ranch in 1880. Both ranches were geared to diversified livestock production, although for many years a focus of summer activities at Last Chance Ranch was horses (Hapgood 1984 in USFWS 1985:26; Speulda 2002). Starting in 1890, William K. Ebeling built the ranches now known as Dufurrena, Thousand Creek, and Kinney Camp. Buzz Miller, Ebeling's "vaquero boss" in the 1910s, reported that Ebeling ran a mixed outfit including cattle, a few sheep, and predominately horses (Miller 1984 in USFWS 1985:40). Inevitably, horses escaped from these ranches and formed herds that roamed the landscape (Raymond et al. 2007).

Some ranchers capitalized on the growing population of feral horses at Sheldon Refuge by gathering and selling them. In 1891, Eugene Gooch established a livestock operation that was strategically located to gather, trap, and ship feral horses. "Gooch Camp" is located in a narrow canyon between Gooch Table and Catnip Mountain historically known to harbor herds of feral horses.

In 1905, newspaper reporter Allen Bragg visited ranches in Virgin Valley and described the James McGhee ranch as "140 acres of meadow land…a bunch of cattle and horses…the cellar is walled up by flat stone of various colors and products of the valley" (Bragg 1976:44). Another ranch owned by William Ebeling about 2 miles from the McGhee place also had cattle and horses, and a milk house made of the flat rock (Bragg 1976:44). Further up the valley, Miller and Lux owned the ranch at Virgin Valley, along with "nine other ranches in this part of the county along with numerous camps" (Bragg 1976:39-40).

Basque sheep-herder Thomas Dufurrena moved to the Sheldon area from California in 1905. His herd of 40,000 sheep was among the largest operations in the area. He had diversified into cattle ranching by 1911. Dufurrena bought several other ranches in the 1920s and 1930s as drought and the Depression forced many ranchers to sell. By the mid-1930s, most of the ranchers including Dufurrena sold their property to the U.S. Fish and Wildlife Service for inclusion in the Sheldon Refuge.

5.6.3.3 Mining

Prospectors began exploring the Sheldon Refuge area in the 1860s and 1870s. Opals were discovered in Virgin Valley in 1908, and the Virgin Valley Mining District was established in 1909. Private individuals and enterprise have worked the deposits since. The Rainbow Ridge Mining Company, incorporated in 1918, is the only opal mining company that has a significant record. In 1919, the mine produced the largest opal ever found in the United States. It weighed 16.95 troy ounces and was valued at $250,000 (Elston and Earl 1979:39). The gem joined the famed Roebling Collection and was later donated to the Smithsonian Institution in Washington, D.C., where it is on display in the Hall of Gems and Minerals at the National Museum of Natural History. Opal mining continues on Sheldon Refuge to this day.

A large formation of pink and buff sandstone occurs in the Virgin Valley at the confluence of Virgin Creek and Thousand Creek. The stone has been quarried, knapped, and cut for use as a building material since the late nineteenth century. Known today as the Dufurrena Sandstone, blocks from the quarry were used to construct many of the early ranch structures on Sheldon Refuge. From 1935 to 1942 the CCC quarried the sandstone to construct a pool, bridge, pathways, loading dock, and other buildings at their Virgin Valley Camp. In the 1950s, a commercial operation worked the quarry and marketed the stone under the name "Owyheeite."

A cinnabar mine was located 4 miles southeast of the headquarters, on the south slope of Bald Mountain and was developed in the late 1920s.

With the exception of the area in and around Virgin Valley, the majority of Sheldon Refuge has been formally withdrawn from mineral entry.

5.6.3.4 Creation of the Sheldon Refuge

In the early twentieth century, pronghorn populations in Nevada had plummeted as a result of several years of cold dry weather, unchecked livestock grazing, degraded rangelands, and unregulated hunting. By 1920, conservationists including members of the Audubon Society, the Boone and Crockett Club of New York City, employees of the U.S. Biological Survey (later renamed the U.S. Fish and Wildlife Service), and the State of Nevada raised concerns about the plight of the pronghorn. E.R. Sans, an employee of the U.S. Biological Survey, mobilized prominent members of the conservation movement including Dr. Gilbert Pearson, president of the National Association of Audubon Societies, and Charles Sheldon of the Boone and Crockett Club, to address Nevada's pronghorn problem (Elston and Earl 1979:39-45).

The Nevada pronghorn conservationists recognized that forage and habitat were essential for the survival of pronghorn populations and observed that non-native animals including sheep, cattle, and feral horses competed for the same forage and habitat as pronghorn. E.R. Sans convinced the group that Hapgood's Last Chance Ranch would make an ideal pronghorn sanctuary. For 10 years the conservationists organized, raised money, and lobbied county, state, and Federal governments. Their efforts paid off in 1931 when President Herbert Hoover signed Executive Order No. 7511 purchasing Hapgood's Ranch and establishing the Charles Sheldon National Antelope Range for the conservation of pronghorn antelope and other native wildlife species. Franklin Roosevelt followed with Executive Order No. 7522, enlarging Sheldon Refuge to over 539,000 acres (Elston and Earl 1979:39-45).

5.6.3.5 Civilian Conservation Corps

The Works Progress Administration (WPA) began construction of a refuge office/residence on the west side of Sheldon Refuge, but the WPA was replaced by the CCC in 1935. The CCC efforts at Sheldon were directed toward "improvement and development of the present habitat for wildlife now inhabiting the area, plus development of water resources for migratory waterfowl and other migratory birds" (records of the Civilian Conservation Corps: Record Group 35, Box No. 133).

By 1936, CCC established Camp Sheldon BF-1 on the west side of Sheldon Refuge (Speulda 1995). The camp, named Camp Board Corrals, was in the northern part of Long Valley. From this camp the CCC enrollees built boundary fences, telephone lines, and roads. Their largest effort was constructing the steep west side hill road and entrance sign. They also built an overnight cabin halfway up the grade. The road remains a primary entrance to Sheldon Refuge.

In 1938, the CCC set up a camp in Virgin Valley on the McGee Ranch on the east side of the Sheldon Refuge. An advance U.S. Army crew led the construction effort with help from the CCC enrollees. In addition to the usual bunk, mess, and work facilities, they built a four-table pool hall with a fine sandstone floor, a ping-pong table, barber shop, and a shoe shine stand. They also constructed a 40-by-60-foot stone swimming pool within the camp area which is filled by a steady stream of warm (artesian) water. This historic swimming pool and campground (now called the Virgin Valley Campground) continue to attract visitors to Sheldon Refuge.

The CCC operated out of the Virgin Valley camp for more than three years without a break. They built dikes and ponds and enhanced wildlife habitat in the Virgin Valley. They improved roads, built fence lines, and restored old homesteads making them suitable for refuge employees. The CCC also built "Badger Cabin," a place for refuge workers to overnight in the Sheldon hinterlands. As the

prospect of war loomed, the U.S. Army closed the CCC camp and dismantled and removed all the portable buildings in 1941. But the craftsmanship of the CCC endures in the roads, water impoundments, and stonework on cabins that are still in use by the Service.

5.6.4 Current Knowledge of Cultural Resources Sites on Sheldon Refuge

A systematic or comprehensive sample inventory of cultural resources has never been conducted on Sheldon Refuge. Archaeologists have conducted 35 relatively small archaeological surveys covering 5,955 acres or slightly more than 1% of the 575,000-acre Sheldon Refuge. Almost all of the surveys have been carried out in advance of proposed development projects in compliance with Section 106 of the NHPA. Archaeologists have done surveys for refuge maintenance and construction (e.g., fences, guzzlers, roads, and prescribed burns) and to address the impacts of feral horses and rangeland wildfires. Utility companies have stimulated archaeological surveys for pipe and fiber optic lines. The archaeological surveys have recorded 251 cultural resource sites on Sheldon Refuge. These include 211 prehistoric sites, 23 historic building sites, and 17 sites recorded as dual component sites, which contain both prehistoric and historic archaeological deposits. We suspect that several hundred, if not thousands, of archaeological sites occur on Sheldon Refuge. But vast stretches of Sheldon Refuge have never been examined by archaeologists and even a broad outline of its human prehistory remains mostly unknown.

5.6.4.1 Prehistoric Sites

Among the 251 recorded cultural resources sites on Sheldon Refuge, 211 (84%) are prehistoric sites. Many of the recorded sites occur near water. Perennial springs and streams at Sheldon Refuge were magnets for human occupation throughout the past. The water sources are oases compared to the relatively dry and monotonous landscape beyond them. Although a formal inventory has not been conducted, we suspect that every permanent spring and stream on Sheldon Refuge is bounded by archaeological sites. Springs and stream-side sites are characterized by lithic scatters, fire-affected rock, ground stone tools, and residential features. Few such sites are small, most exceed an acre in size, while several encompass a dozen or more acres around the spring or stream. Some spring and stream-side sites harbor buried cultural deposits in the deeper soil that often characterizes these environments. These archaeological sites offer the challenge and opportunity to sort out multiple periods of human occupation at Sheldon Refuge and describe the cultural changes that mark the different occupations.

Lithic scatters make up the majority (n=188, or 89%) of the known prehistoric sites on Sheldon Refuge. The remaining 23 sites consist of rock art, village sites, caves, rockshelters, rock cairns, hunting facilities, and obsidian quarries. The following sections describe some of the common types of prehistoric archaeological sites on Sheldon Refuge.

Lithic scatters

Lithic scatter refers to a prehistoric archaeological site consisting of stone artifacts and the debris from the manufacture and use of stone artifacts. Flaked stone tools (e.g., projectile points, knives, scrapers) and the waste flakes (a.k.a. debitage) generated from the manufacture of flaked stone tools are the most ubiquitous elements at lithic scatters. The most common toolstone at archaeological sites on Sheldon Refuge is obsidian, but chert, chalcedony, flint, agate, basalt, and jasper are also present. Lithic scatters may contain ground stone stools (e.g., manos, metates, mortors, pestles) but usually in small numbers. Fire-affected rock (a.k.a. fire cracked rock, hearth rocks, oven rocks) may

also occur at lithic scatters. Lithic scatters range in size from a few square meters containing about 10 artifacts to several acres in size with thousands of stone artifacts. Lithic scatters are often confined to the surface, but many lithic scatters also contain buried cultural deposits. Some lithic scatters occur in conjunction with other archaeological sites and features described below.

At Sheldon Refuge, the size and complexity of the lithic scatters are governed by their proximity to naturally occurring toolstone and water, as well as elevation. Large and complex lithic scatters generally occur in places with abundant obsidian on low-elevation alluvial plains in well-watered valleys like Virgin Creek and Thousand Creek. Such sites tend to have many flaked stone tools, cultural features such as hearths, ground stone tools, abundant debitage, and good potential for buried archaeological deposits. Absent nearby water and toolstone, archaeological sites tend to be small, lack many tools, and are limited to the surface.

Isolated finds

An isolated find is a lithic scatter of less than 10 items. Isolated finds do not contain buried cultural deposits or other features such as hearths or middens. Isolated finds are common throughout Sheldon Refuge.

Villages

An archaeological village appears as a large lithic scatter with additional evidence of long-term residential occupation such as hearths, house foundations (stone rings, earthen pits, or depressions), and middens (trash dumps containing debris from food, clothing, shelter, and food preparation). Archaeological and ethnographic records have documented winter villages of the Northern Paiute and their ancestors in places surrounding Sheldon Refuge. By analogy, we suspect Native American villages occur at well-watered, low-elevation, sheltered areas on Sheldon Refuge. Although no formal archaeological investigation has been conducted, places like Bog Hot Springs, Virgin Creek Valley, Alkali Reservoir, and the mouth of Thousand Creek Gorge are likely areas where future investigations should be focused.

Caves and rockshelters

Caves and rockshelters are archaeological sites characterized by stone artifacts and often middens that occur in and around the mouths of caves and in sheltered areas among rock outcrops and canyon walls. Caves and rockshelters are often important sites because they preserve better than most archaeological sites a variety of evidence of human occupation for thousands of years.

Last Supper Cave is a large and deeply stratified archaeological site on Hell Creek. It was completely excavated in the 1970s by a team of archaeologists from the American Museum of Natural History, Louisiana State University, and University of Nevada, Reno (Layton 1970). The cave contains an abundance of surface and subsurface deposits, including a large midden, stone tools and debitage, faunal remains, basketry, sandals and other perishable items. The earliest cultural materials within the cave predate 9,000 years ago. The artifacts are from the early Holocene and are relatively abundant. The large artifact and sample collection from the cave has been recently inventoried, repackaged, and stabilized at the Nevada State Museum, where it is periodically studied by graduate students and other scholars (Lyman 1988). Other similar but smaller caves are known to occur on Sheldon Refuge, but a systematic inventory of them has not been conducted.

Rock art (petroglyphs and pictographs)

Rock art is characterized by markings, either painted (pictographs) or engraved (petroglyphs), on the surface of rock and by geoglyphs (large figures produced by either removing the surface of the ground or alignments of stone on the surface of the ground). Rock art sites are often associated with lithic scatters and other archaeological features and are usually found at places with smooth surfaces of basalt or rhyolite, often at the base of canyons and rimrock. Rock art is located at several locations within Sheldon Refuge, many of which can be easily seen and have little or no evidence of disturbance or vandalism by visitors.

Rock cairns, walls, and rings

Archaeological features built with large cobble- and boulder-sized stones include cairns, walls, and rings. Cairns are stacks of stones built with one or more rocks. Prehistoric cairns can be distinguished from historical cairns built by hikers and ranchers by their location and apparent antiquity. Prehistoric cairns are often located on rimrock and are associated with lithic scatters. Prehistoric cairns also often show extensive lichen growth. Short low rock walls in association with lithic scatters are often interpreted as hunting blinds. Rock circles or rings may be house foundations, especially if lithic scatters, artifacts, and/or a midden occur close by. Small rock rings lacking any artifacts are often interpreted as spiritual prayer or vision quest locations.

Quarries

Prehistoric quarries for toolstone are common on Sheldon Refuge. Obsidian occurs naturally on much of the northern half of Sheldon Refuge. Obsidian is widely available at the surface as secondary deposits of pebbles and cobbles, which occur as lag left by the erosion of rhyolite facies. In most cases the prehistoric quarrying simply involved picking up the stone. Prehistoric acquisition and use of obsidian at the source locations is characterized by vast lithic scatters displaying evidence of testing and reducing obsidian cobbles into smaller more portable packages.

Traditional cultural properties

A traditional cultural property (TCP) is a cultural resource whose significance is derived from the role it plays in the traditional and continuing lifeways of a community. TCPs include locations associated with the traditional beliefs of a Native American group about its origins, cultural history, or the nature of the world. TCPs are often locations where a community has traditionally carried out religious, economic, artistic, or other cultural practices important in maintaining its historical identity. According to the Summit Lake Tribe, a TCP exists in the vicinity of 10-mile Spring on Sheldon Refuge.

5.6.4.2 Historic Sites

Among the 251 recorded cultural resources sites on Sheldon Refuge, 23 (16%) are Euro-American historic sites. Many of these occur near water and roads, particularly in and near Virgin Valley and Thousand Creek. There has been no formal effort to find historic-period sites beyond the largest and most obvious early ranches and CCC-era facilities on Sheldon Refuge. The known historic sites can be allocated into one or more themes.

- The Ranching Theme includes sites with one or more of the following features: residence, barn, corral (stone and willow), chicken house, small out-building, bunkhouse, root cellar, road, pasture, fencing, machine shed, and windmill. Features that are outside the ranch complex but relevant to the ranching theme include sheep camps, livestock trails, branding camps, and line camps.

- The Depression-Era (CCC) Theme includes sites with one or more of the following features: road, bridge, culvert, pond, refuge infrastructure, residence/office, overnight cabin, and spike camp.

- The Mining Theme includes sites with one or more of the following features: mine, adit, quarry, haul road, tailing, claim, camp, and quarry equipment (Speulda 2000).

- Miscellaneous historic-period sites small dispersed domestic dumps, dispersed campsites, landing strips, and crash sites.

The principal historic-period sites on record are listed in Table 5.1 and are shown on Figure 5.1. Many sites are considered extremely significant cultural resources, and five have been determined to be eligible or potentially eligible for inclusion in the National Register of Historic Places (Speulda 1998; USFWS 1985).

Table 5.1 Principal Historic Period Sites at Sheldon Refuge

Name	Construction Date	Historic Associations	NRHP Status*
Last Chance Ranch	1890-1910	Early ranching, architecture, early refuge management	Eligible
IXL Ranch	1890s	Early ranching	Not potentially eligible (USFWS 1985)
Gooch Camp Horsetrap (stone corral)	1890s	Early ranching, architecture	Potentially eligible
Kinney Camp/a.k.a. McKenny Ranch (house, barn, chicken house, willow corral, cellar)	1890s-1910s	Early ranching, architecture	Potentially eligible
Dufurrena Ranch (barn, chicken house)	1890s-1910s	Early ranching, architecture	Not potentially eligible (USFWS 1985)
Virgin Valley Ranch (stone buildings and site)	1890s	Early ranching, architecture	Eligible (Speulda 1998)
Alkali Ranch	1910s	Early ranching	Not evaluated
Thousand Creek Ranch (house, barn, chicken house, corral)	1890s-1910s	Early ranching, architecture	Eligible (NVSHPO 2001)
Little Sheldon refuge office and residence	1930s	WPA, CCC, architecture	Potentially eligible
Little Sheldon Overnight Cabin	1930s	WPA, CCC, architecture	Eligible (USFWS 2000)
Badger Cabin	1930s	CCC	Potentially eligible

Name	Construction Date	Historic Associations	NRHP Status*
Virgin Valley Campground (metal warehouse, camp features—excluding bathhouse)	1930s	CCC camp	Potentially eligible

* NRHP Status refers to status under the National Register of Historic Places.

National Register of Historic Places

Established under the NHPA of 1966, the National Register has identified and documented, in partnership with state, Federal, and tribal preservation programs, nearly 77,000 districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture. The documentation on each property consists of photographs, maps, and a National Register registration form, which provides a physical description of the place, information about its history and significance, and bibliography. Last Supper Cave is the only site within Sheldon Refuge currently listed on the National Register.

The NHPA also requires that any structure or historic place that is generally more than 50 years old be inventoried and evaluated to determine whether or not it is eligible to be included on the National Register of Historic Places. Sheldon Refuge contains a number of historic resources that are more than 50 years old (pre-1959 for the purposes of this document) and are awaiting evaluation or have already been evaluated and determined eligible, but not yet included on the National Register.

Last Chance, Virgin Valley, and Thousand Creek historic ranches located within Sheldon Refuge have officially been determined eligible for the National Register of Historic Places. Nine other structures within Sheldon Refuge associated with historic ranching or the CCC have not been formally evaluated.

5.6.5 Special Designation Areas

In 1974 the President proposed that Congress designate 341,500 acres of Sheldon National Wildlife Refuge as Wilderness under the 1964 Wilderness Act. Despite the fact this proposal has never been acted upon, it is Service policy that all proposed wilderness areas be managed consistent with policy and guidance for designated wilderness until further action is taken by Congress.

The majority of lands within the proposed wilderness areas appear essentially natural and undisturbed to the casual observer. Exceptions to this level of natural appearance consist of portions of the Big Spring Table, Catnip Mountain, and Alkali Peak proposed wilderness areas, which were developed with water troughs, catchment basins, and primitive vehicle routes for commercial grazing or disturbed by prospecting prior to mineral withdrawal. Other scattered developments to support past commercial livestock grazing and associated undeveloped vehicle trails are visible within the proposed wilderness areas, but very few permanent structures remain, which are used for management purposes. Feral horses and burros and fire suppression have caused more severe impacts to habitat condition and ecological function.

Aggressive fire suppression, prescribed burning, weed control, and grazing both from commercial livestock in the past and presently from feral horses and burros continue to trammel wilderness character. Conditions within most of the proposed wilderness areas have progressed to the point that further management manipulation and intrusion is often determined necessary to prevent further

impacts to habitats or to restore natural conditions and ecological function. Other management activities within the proposed wilderness areas include inventory and monitoring, research studies, removal of abandoned fences, and construction of temporary fences to protect springs. These activities are temporary and do not typically result in any long-term trammeling or alteration of wilderness character.

With the exception of a few portions of the proposed wilderness areas near developed campsites and maintained roads opportunities for solitude and primitive and unconfined types of recreation are considered outstanding. Visitors are free to explore and travel throughout Sheldon Refuge and the proposed wilderness areas on foot or by horseback with few regulations or restrictions, and very little contact with refuge staff.

Descriptions and maps depicting the proposed wilderness areas are included in Appendix F.

5.6.6 Social and Economic Conditions

Sheldon Refuge is a large remote national wildlife refuge in northwest Nevada that also shares a border with and includes a small portion within Oregon and is located less than 30 miles from California. Therefore, the affected social and economic setting for Sheldon Refuge has been identified to include the five counties that include and surround Sheldon Refuge. The five counties are Washoe and Humboldt counties in Nevada, Lake and Harney counties in Oregon, and Modoc County in California. This affected region encompasses a massive land area of 38,995 square miles. For perspective, this region is larger than Maine, Kentucky, Indiana, or South Carolina.

Conversely, the region is one of the most sparsely populated areas in the contiguous 48 states. Total population in 2009 was 459,322 people which equates to a population density of 11.8 people per square mile. However, excluding the 300,214 residents of Reno and Sparks, located in the southernmost portion of the affected region, the population density falls to 4 people per square mile—which is only slightly less than the population density of Wyoming (5.1 people per square mile). Despite the enormous size and sparse population of this region, refuge management and visitation affect the economies of all five counties both directly and indirectly.

U.S. Census data collected in 2000 indicate the industry of arts, entertainment, recreation, accommodation, and food services employed the highest percentage of people in the region. However, this figure is heavily skewed by the economies of Reno and Sparks in Washoe County, Nevada, where casino gambling, winter skiing, and other recreation and entertainment activities dominate the local economy. Excluding Washoe County, the leading employment industry is agriculture, forestry, fishing and hunting, and mining followed by educational, health and social services. Government employment was a significant portion of the regional economy in 2000, employing 14.5% of all workers over 16 years in age throughout the five-county region, and 24.8% of all workers in the four-county area (Washoe County excluded) (U.S. Census Bureau 2000). More recent data indicate that government employment now accounts for a substantially larger percentage of the workforce following the recent economic downturn (Industrial Economics 2010).

It is estimated the management and visitation to Sheldon Refuge contributes directly or indirectly to the employment of 119 people throughout the region, and the total regional economic contribution generated by activities on Sheldon Refuge is estimated at $8.3 million annually (in 2010 dollars) (Industrial Economics 2010). When considering the 575,000-acre size of Sheldon Refuge, the economic contribution would also be estimated at $14 per acre per year. Refuge budgetary

expenditures make a significant contribution to the local economy, contributing approximately $5.0 million annually to gross state product (GSP) (value added[1]), or 60% of the quantified regional contribution to GSP. Wildlife observation and wildlife photography are the most common wildlife-dependent recreational activities taking place on Sheldon Refuge, resulting in an estimated 17,900 annual visits. As a result, expenditures associated with wildlife observation and photography are the largest contributor to GSP of the wildlife-dependent recreational activities assessed, contributing $2.5 million to GSP (30%). Annual expenditures associated with 1,691 annual sport hunting days (associated with mule deer, pronghorn, and bighorn sheep hunting) have been found to comprise 5% of current contribution to GSP ($0.4 million), while expenditures associated with 1,122 annual sport-fishing days contribute another 1% ($0.1 million).[2] Revenue payments by Sheldon Refuge to local governments contribute the remaining 5% to GSP ($0.3 million). Expenditures associated with camping have not been expressly quantified but are expected to largely overlap with other wildlife observation and photography expenditures (Industrial Economics 2010).

In addition to quantified benefits associated with Sheldon Refuge management and visitation, Sheldon Refuge provides other nonuse and ecological benefits. In his seminal piece, Krutilla (1967) suggests that "when the existence of a grand scenic wonder or a unique and fragile ecosystem is involved, its preservation and continued availability are a significant part of the real income of many individuals." For example, Freeman (1993) explains that people may gain utility from the knowledge that a natural area is preserved despite the fact that they do not expect to visit that area. Similarly, people may be willing to pay to protect endangered species even though they do not expect to see one of them (Freeman 1993). These values may be motivated by desires to maintain intergenerational equity and the option of future resource use, as well as other factors (Industrial Economics 1998).

Various attempts have been made to quantify nonuse or existence values of natural resources and special areas such as national wildlife refuges. Economists have estimated that every U.S. household would be willing to pay $29 per year to preserve bighorn sheep and $15 per year to preserve Greater sage-grouse (Industrial Economics 2010). Sheldon Refuge is one of the only areas of public land in the United States set aside specifically to conserve species such as California bighorn sheep, Greater sage-grouse, pronghorn, and other priority sagebrush-steppe wildlife species. Even if the more than 100 million households in the United States were only willing to pay $0.10 per year to preserve wildlife within Sheldon Refuge, the value would exceed the estimated $8.3 regional economic contribution from management and use of the Sheldon Refuge for wildlife viewing, photography, hunting, fishing, and other consumptive uses. Other estimates have been derived for habitat types and even entire ecosystems and have ranged from $156 per acre per year to as much as $2,400 per acre per year, but these values are questionable given the uncertainty associated with the assumptions made and the quality of the underlying information and data (Industrial Economics 2010).

[1] Value added is considered the final value or revenue, less the value of goods or services purchased to produce the final product or service.

[2] Big Spring Reservoir does not currently support sport fishing and is not included in estimates of current contribution to GSP.

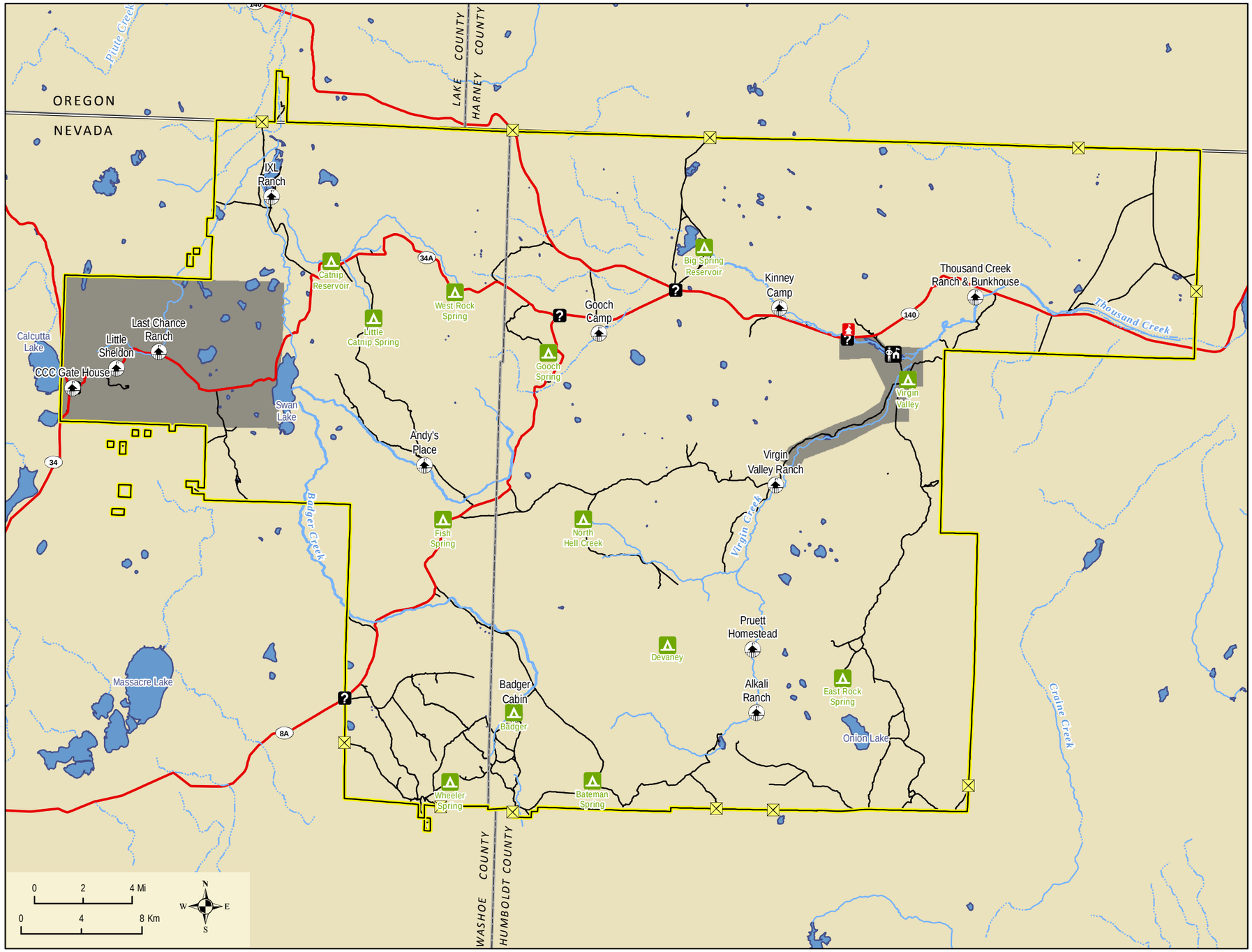
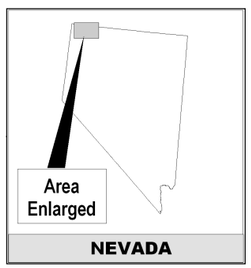


Figure 5.1
Public Use and Facilities

LEGEND

- Approved Refuge Boundary
- Refuge Headquarters
- Proposed Visitor Contact Station
- Campgrounds
- Historic Structures
- Kiosk
- Sign
- Hunting Not Allowed
- Lakes
- County Boundary
- State Line
- Public Vehicle Routes (clipped to Refuge)
- Highway
- Intermittent Stream
- Perennial Stream



Produced by USFWS Region 1
Refuge Information Branch
Portland, Oregon
Map Date: 3/21/2011
File: 10-068-1.mxd

The back sides of map pages are blank to facilitate map readability.

Chapter 6. Environmental Consequences

This chapter provides an analysis of the environmental consequences of implementing the alternatives described in Chapter 2 on the resources described in Chapters 3 through 5 including physical, biological, cultural, and socioeconomic resources. Alternatives are compared against the goals and policy objectives for Sheldon Refuge management, not current management strategies or existing conditions. In many instances, continuing current management strategies would result in adverse impacts. Cumulative impacts associated with implementing the various alternatives are addressed in the final section of this chapter.

The information used in this CCP/EIS was obtained from relevant scientific literature, existing databases and inventories, consultations with other professionals, and professional knowledge of resources based on field visits and experience. The thresholds and severity ratings defined below were used to analyze the scope, scale, and intensity of effects on natural, cultural, and recreational resources.

- **Negligible.** Resources would not be affected, or the effects would be at or near the lowest level of detection. Resource conditions would not change or would be so slight there would not be any measurable or perceptible consequence to a population, wildlife, or plant community; recreation opportunity; visitor experience; or cultural resource.
- **Minor.** Effects would be detectable but small, and of little consequence to a population, wildlife, or plant community; recreation opportunity; visitor experience; or cultural resource. Mitigation, if needed to offset adverse effects, would be easily implemented and likely to be successful.
- **Moderate.** Effects would be readily detectable, with consequences to a population, wildlife, or plant community; recreation opportunity; visitor experience; or cultural resource. Mitigation measures would be needed to offset adverse effects and would be extensive, moderately complicated to implement, and probably successful.
- **Significant (major).** Effects would be obvious and would result in substantial consequences to a population, wildlife, or plant community; recreation opportunity; visitor experience; or cultural resource. Extensive mitigating measures may be needed to offset adverse effects and would be large scale in nature and very complicated to implement, and may not have a guaranteed probability of success. In some instances, major effects would include the irretrievable loss of the resource.

Duration of effects has been defined as follows.

- **Short-term or Temporary.** Effects end when action is completed.
- **Long-term.** Effects occur and/or persist at least 10 to 15 years after an action is completed and possibly much longer.

6.1 Effects to Habitats and Associated Wildlife

Assessing the impacts to habitats and associated wildlife species included analysis of effects to various attributes of biological integrity and diversity. The biological composition of plant communities/habitat types for both plant and animal populations was considered. Analysis of the biological function of plant communities/habitat types for plant and animal populations included

consideration of natural plant community succession, natural fire regimes, and migration patterns. Habitat connectivity was assessed relative to activities that could improve or worsen levels of habitat fragmentation. In considering plant breeding populations, self-sustained genetic viability and function were taken into account. Self-sustaining capabilities of habitat types and populations were assessed relative to historical conditions. Finally, restoration potential was assessed in terms of Sheldon Refuge actions and capabilities. These effects are summarized in Table 6.1.

Table 6.1 Summary of Effects under CCP Alternatives

	Alternative 1 (No Action)	Alternative 2 (Preferred)	Alternative 3
EFFECTS TO HABITATS AND ASSOCIATED WILDLIFE			
Effects from Horse and Burro Management	Continued major site-specific negative effects from habitat degradation and species competition for resources.	Major positive effects following removal of all feral horses/burros within 5 years.	Major positive effects following removal of all feral horses/burros within 15 years.
Effects from Other Invasive Animal Species Management	Major negative effects to native habitat and wildlife species due to inadequate management strategies being available to remove or control nuisance species.		
Effects from Invasive Vegetation Management	Continued moderate negative effects refuge-wide without strategies to detect threats from invasive vegetation. Minor site-specific positive effects where treatment strategies are implemented.	Major positive effects from implementing detection, control, containment, and treatment strategies to as much as 1,000 acres per year.	Same as Alternative 1.
Effects from Fire Management	Minor negative effects from trampling and removal of vegetation during mechanical treatments for fuel breaks. Localized minor negative effects to wildlife from prescribed fire implementation. Major negative effects to the historical fire regime, associated nutrient cycling, and historical natural plant community succession. Positive effects from post-fire rehabilitation strategies.		Increased risk for large fires without the more effective and versatile tools and methods of Alternatives 1 and 2. Potentially major negative effects in the event of natural fires.
Effects from Road Management	Continued moderate negative effects from existing road network's contribution to spread of invasive vegetation, fragmentation of habitat, alteration of plant community composition, and disturbance of soils.	Similar to Alternative 1 except that effects would be minor with the closure of duplicative roads and relocation of roads away from sensitive habitats.	Continued moderate negative effects throughout habitats where roads are located. Benefits of relocating and closing some roads do not negate the negative effects.

Effects from Hunting Management	Minor negative effects to species populations as a result of individual mortality and to habitats as a result of hunters moving through hunting areas.		
Effects from Campground Management	Continued minor negative impacts from vegetation trampling, soil compaction, water quality degradation, and potential for invasive species introduction in sensitive riparian habitats.	Minor positive effects when campgrounds are consolidated and relocated away from sensitive habitats. Minor negative impacts to other habitats when existing campgrounds are enlarged.	Similar effects to Alternative 2.
Effects from Construction of Public-Use Facilities	No changes to public use facilities.	Minor negative impacts during construction and development of facilities. Some minor positive effects may be realized with increased public awareness and education related to habitats and their species.	Neutral effect.
Sagebrush Steppe and Associated Upland Habitats	Minor positive effects from restoration of 400 acres per year of plant communities. Negligible negative effects from mechanical removal of vegetation and prescribed fire applications.	Moderate positive effects from horse and burro removal and subsequent restoration of 1,500 acres per year of plant communities and restoration of hydrologic processes and functions.	Minor positive effects from conservation strategies including 10 to 100 acres of restoration per year from natural fire.
Semi-desert Grasslands and Steppes	Similar effects to those described above for sagebrush-steppe habitats.		
Emergent Marshes and Wet Meadows	Major negative effects from applying restoration and conservation strategies while horses and burros are present on the refuge. The feral horses and burros will continue to exert increased negative impacts on these areas.	Major beneficial effects from removing feral horses and burros and implementing restoration and conservation strategies following feral horse and burro removal.	Major positive effects of removing feral horses and burros and minor positive effects from restoration strategies primarily dependent upon natural fire after feral horse and burrow removal.
Springs, Streams, and Springbrooks	Minor positive effects from removal of up to 4 spring developments followed by natural	Major positive effects from removing horses and burros and removing and restoring	Major positive effects from feral horse and burro removal. Moderate negative

	habitat recovery. Negligible to minor positive effects from maintaining the 18 guzzlers located on the refuge.	more than 20 spring developments. Negligible positive effects from maintaining the 18 guzzlers located on the refuge. Moderate positive effects from restoring and rehabilitating 1 mile of Virgin Creek habitat.	effects from relying on natural recovery and/or restoration of at least 20 spring development removals. Major negative effects to species that use the guzzlers in place of the springs; guzzlers would not be maintained and the springs may take more than 15 years to recover following removal of spring developments.
Reservoirs	Moderate positive effects to pronghorn with maintenance of Swan Lake Reservoir. Continued moderate negative effects from continuing to stock non-native fish species.	Same as Alternative 1 except major positive effects from replacing non-native rainbow trout in Virgin Creek with trout indigenous to the region. Moderate positive effects from replacing the non-native rainbow trout in Big Spring Reservoir with trout indigenous to the region (i.e., Lahontan cutthroat or redband trout).	Moderate negative effects when maintenance of Dufurrena Ponds and Big Spring Reservoir are discontinued. Moderate positive effects from replacing the non-native rainbow trout in Big Spring Reservoir with fish indigenous to the region (i.e., Lahontan cutthroat or redband trout), but afterward, no stocking of fish to Big Spring Reservoir.
Ephemeral Wetlands	Major negative effects from the continued maintenance of 21 playa dug-outs.	Moderate positive effects with the restoration of at least 20% of playas to natural conditions and restoring hydrologic function on the refuge.	Minor positive effects from discontinued maintenance of playa dug-outs and restoration dependent upon natural processes.
Cliffs, Canyons, Talus Slopes, and Barren Lands	Continued moderate positive effects from current management strategies.		Minor positive effects from limited management strategies.
Deciduous Woodlands and Shrublands	Minor positive effects from restoration strategies that continue to be affected by feral horse and burro impacts.	Major positive effects from restoration strategies that include protection from feral horse and burro grazing until they are removed from the refuge.	Negligible positive effects from limited restoration and protection strategies.

Mature Old-growth Mountain Mahogany and Western Juniper Habitat Types	Major positive effects from proactive fuel reduction strategies for fire prevention.		Minor positive effects from limited strategies to protect against fire; strategies do not include proactive fuel reduction efforts.
EFFECTS TO PHYSICAL ENVIRONMENT			
Effects to Soils	Continued minor to moderate negative effects from horse and burro, habitat, campground, and transportation management strategies.	Major positive effects from removal of feral horses and burros and general habitat management strategies. Minor negative effects from vegetation removal for fire management. Minor positive effects from campground and transportation management strategies. Minor adverse effect during construction activities for new visitor facilities.	Similar to Alternative 2 except some positive effects would be delayed while feral horses and burros are removed from the refuge over a longer period of time and while natural processes are allowed to prevail.
Effects to Water Quality and Quantity	Continued major negative effects from feral horse and burro management. Continued moderate negative effects from habitat management strategies that maintain altered hydrology features. Minor negative effects from campground and transportation management. Minor positive effects from removing 4 spring developments and eventual habitat restoration results.	Major positive effects from feral horse and burro removal and several habitat management strategies. Moderate negative effects from strategies for maintaining artificial water sources. Minor positive effects from campground and transportation management strategies.	Major positive effects from feral horse and burro removal would be delayed 10 additional years from Alternative 2. Moderate positive effects from habitat management strategies. Minor positive effects from campground and transportation management strategies.
Effects to Air Quality	Minor to moderate negative effects from use of prescribed fire.		
Effects to Climate	Negligible negative effects from use of prescribed fire.		
Effects to Visual Quality	Negligible negative effects from development of new kiosks and signs and use of prescribed fire.	Minor negative effects from development of a new visitor contact station, new campground facilities,	Same as Alternative 1 and minor negative effects from additional primitive unmaintained roads. Minor positive

		a new interpretive trail, and additional primitive roads. Minor positive effects from habitat management strategies to remove artificial features.	effects from habitat management strategies to remove artificial features.
Effects from Camping	Moderate negative effects from management strategies that do not improve campground facilities, continue to allow camping in sensitive areas, and do not address issues of overcrowding and user conflicts.	Moderate positive effects from improvement of campground facilities, including the conversion of two semi-primitive campgrounds into developed campgrounds and relocation of campgrounds away from sensitive areas.	Similar to Alternative 1 except negative effects would be minor due to consolidating up to four semi-primitive campgrounds away from sensitive areas.
Effects from Public Access	Minor positive effects from continued maintenance of existing primary access vehicle-accessible routes and primitive access along existing user-created trails and routes.	Minor negative effects to primitive access opportunities due to the addition of new motorized vehicle access roads. Minor positive effects from converting an existing road into a maintained hiking trail.	Minor to moderate negative effects from eliminating maintenance of Virgin Valley roads. Negative effects to primitive access opportunities would be similar to Alternative 2.
Effects from Recreational Facilities	Major negative effects from maintaining the existing visitor contact space, which does not meet visitor expectations.	Major positive effects from building and staffing a new, conveniently located visitor contact station.	Major negative effects from closing and not replacing the existing visitor contact space.
Opportunities for Quality Hunting	Moderate negative effects from maintaining current levels of feral horses and burros. Moderate positive effects from continued hunting management strategies, including coordination with NDOW. Moderate temporary negative effects from habitat management and fire management	Similar effects to Alternative 1 except major positive effects following complete removal of feral horses and burros within 5 years.	Major positive effects following complete removal of feral horses and burros within 15 years. Moderate positive effects from continued hunting management strategies. Negligible to minor negative effects from habitat and fire management strategies that allow natural processes to occur.

	strategies and subsequent minor, long-term positive effects.		
Opportunities for Quality Fishing	Moderate positive effects from continued maintenance of Dufurrena Ponds, Catnip Reservoir, and Big Spring Reservoir, and fishing docks at Dufurrena Pond 20 and McGee Pond. Moderate beneficial effect from providing fishing opportunity for trout.	Similar to Alternative 1 except negligible to minor negative effects to quality fishing from the visitor's standpoint from stocking native fish, which are smaller and considered less sporting to catch.	Moderate negative effects from decreased fishing opportunities from discontinued maintenance and restocking at Big Spring Reservoir.
Opportunities for Quality Wildlife Observation and Photography	Moderate negative effects from maintaining current levels of feral horses and burros, which degrade the environment and displace native wildlife.	Major positive effects following complete removal of all feral horses and burros within 5 years. Construction of an interpretive trail with wildlife observation decks would result in minor positive effects from increased opportunities and minor negative effects because improvements may be detrimental to some species and may detract from the overall primitive recreational experience. Minor negative effects from limited access due to seasonal area closures. Moderate positive effects from invasive weed management.	Major positive effects following complete removal of all feral horses and burros within 15 years.
Opportunities for Quality Interpretation and Environmental Education	Major negative effects from maintaining the existing visitor contact space, which does not meet visitor expectations.	Major positive effects from building and staffing a new visitor contact station that would meet visitor needs and promote environmental education and interpretation. Minor	Major negative effects from closure of the existing visitor contact space. Some positive effects from increased public awareness, outreach, and interpretation.

		positive effects from increased public awareness, outreach, education, and public access.	
Opportunities for Rock Collecting	Negligible positive effects trending toward minor from continued allowance of rock collecting activities.		
EFFECTS TO CULTURAL AND HISTORIC RESOURCES			
Effects to Cultural and Historic Resources	Major negative effects to cultural resources, including irretrievable and irreversible loss from continued trampling by feral horses and burros and subsequent erosion. Minor negative effects to prehistoric sites from continued camping and vehicle traffic at semi-primitive and primitive campgrounds. Negligible to minor negative effects from habitat and fire management activities. Continued negative effects from rock collecting resulting from inadvertent or unintentional collection of prehistoric artifacts or fossils.	Major positive effects following the removal of feral horses and burros within 5 years, relocation of semi-primitive and primitive campgrounds away from sensitive areas, efforts to document and stabilize 20% of historic structures, increased interpretation, and collection of fees to fund restoration and maintenance.	Major positive effects following the removal of feral horses and burros within 15 years. Minor to moderate negative effects to historic structures from discontinuing maintenance and allowing structures to naturally weather and decay. Benefits from relocation of campgrounds away from sensitive areas would be less than those described for Alternative 2 due to only relocating campgrounds with the most severe impacts.
EFFECTS TO LOCAL ECONOMY			
Effects to the Economy	Moderate positive effect to the regional economy from direct expenditures and employment of approximately 131 jobs; Sheldon Refuge budget is assumed to remain consistent with current levels.	Largest economic value and contribution to the regional economy (of all alternatives) from direct expenditures and employment of approximately 142 jobs. Overall visitation expected to increase over current levels by 5,000 visitors over the 15-year planning period.	Economic value and contribution to the economy from direct expenditures and employment of 123 jobs would be less than Alternatives 1 and 2. Visitation is expected to decrease due to degradation of existing facilities, but overall visitation is assumed to be similar to Alternative 1.

EFFECTS TO SPECIAL DESIGNATED USE AREAS			
Effects to Wilderness and WSA Values	Major negative effects to naturalness with continued degradation in large portions of the refuge. Major negative effect to untrammeled conditions as major refuge processes are altered for habitat succession and general condition. Major negative effects to solitude during peak visitation periods coinciding with management activities. Moderate negative effects to solitude at various locations throughout the refuge with more lasting evidence of management activities. Continued major positive effect to primitive and unconfined recreation opportunities throughout the refuge.	Moderate positive effects to naturalness with the natural appearance and ecological conditions restored to the majority of the refuge. Similar impacts to untrammeled conditions as Alternative 1 except ultimately these management strategies lead to less interference and manipulation. Effects to opportunities for solitude are similar to Alternative 1 with a greater intensity to a larger number of visitors. Negligible to minor positive effect to opportunities for primitive and unconfined types of recreation due to fewer roads for public vehicle access, which would be retained for administrative use.	Major positive effects to naturalness from removal of feral horses and burros and abandoned livestock developments would be overshadowed by continued negative effects from lack of natural fire and additional motorized routes. Negligible to moderate negative effects to untrammeled conditions from various management and maintenance strategies. Moderate positive effects to solitude due to fewer management activities and negligible to minor positive effects to solitude and opportunities for primitive types of recreation from fewer roads open to public vehicle access, which would be retained for administrative use.

6.1.1 Effects Common to All Habitats and Associated Wildlife

Under all alternatives, habitat impacts within Sheldon Refuge are expected to result in similar, corresponding impacts that indirectly affect fish and wildlife associated with those habitats. These include impacts from management strategies aimed at restoring and protecting habitats characteristic of the Great Basin as well as unique and rare habitats.

6.1.1.1 Effects from Horse and Burro Management

Feral horses and burros have a negative impact on Sheldon Refuge ecosystems. Regardless of their population size, their presence as a non-indigenous species contributes to the deterioration of the biological integrity, diversity, and environmental health of Sheldon Refuge. Grazing by feral horses and burros is one of two primary factors preventing restoration of Sheldon Refuge habitats (Davis 1995), and the negative effects their grazing has on native plants, wildlife, and ecosystems are numerous. Grazing pressure has contributed to changes in sagebrush-steppe habitats by altering the composition of vegetation (i.e., increased density of large shrubs and reduction in perennial grasses), lowering species diversity, and contributing to habitat fragmentation. Trampling and grazing by feral

horses and burros is extremely detrimental to riparian habitats. Most springs and the adjacent meadows on Sheldon Refuge have been trampled by feral horses, resulting in reduced plant vigor, deterioration of meadows, and destruction of riparian vegetation (USFWS 2008a). Deciduous woodlands have also experience negative impacts as a result of grazing, including general declines in deciduous woodlands, particularly aspen (Dobkin et al. 1995). Studies conducted on Sheldon Refuge in 2002 indicated extreme differences between protected vegetation and vegetation exposed to horse grazing. By erecting fenced structures to protect areas from large animals, vegetation was able to grow two to 11.5 times taller than vegetation outside of the grazing exclosure fences (USFWS 2008a).

As described in Chapter 4, feral horses and burros have a direct negative impact on Sheldon Refuge wildlife, including sensitive and native species. Feral horses and burros contribute to the decline and deterioration of various habitats on Sheldon Refuge, resulting in indirect, adverse impacts on the wildlife species that depend on those habitats for survival (see Section 4.1.1). 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 associated with livestock grazing, with a few focused on effects of feral horses and burros. Beever and Herrick (2006) and Beever et al. (2007) examined the response of upland sagebrush communities to removal of horse grazing on 19 sites in nine mountain ranges across 3.03 million hectares (7.49 million acres) of Nevada. The sites were either grazed by feral horses and had horses completely removed for 10 to 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, and lower species richness. 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).

One of the most serious impacts by horses on Sheldon Refuge 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 (Barnett 2002; LaRouche 2007; Steblein 2007). 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 (Gregg 2007). 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 livestock excluded showed maximum vegetation heights that were 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 ungrazed plots (highest) versus sites with both horses and cattle grazing (lowest).

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. Deterioration of sagebrush habitats has likely resulted in adverse impacts to other sagebrush-obligate species, such pronghorn. Greater sage-grouse, a candidate species under the ESA, depend upon sagebrush shrub habitats for nesting and forage and are adversely impacted by feral horses. Pronghorn, a focal species on Sheldon Refuge, use low sagebrush habitats for wintering and fawning and rely on this habitat type as an important year-round source of forage. In addition to the impacts

pronghorn experience from the degraded habitat, pronghorn are also displaced from watering sites by horses and directly compete with horses for food during years when vegetation conditions are poor. Other species that are directly impacted by feral horses or burros include California bighorn sheep, American pika, mule deer, and pygmy rabbit. Bighorn sheep and pika, both listed on the Nevada Species of Conservation Priority list, are almost exclusively associated with cliffs, canyons, talus slopes, and barren land habitat types like those within Sheldon Refuge. California bighorn sheep share the same range as feral burros and compete for water; burros have been implicated as contributing to declining bighorn sheep numbers (Seegmiller and Ohmart 1981). American pika feed on grasses found near talus slopes; feral horses compete with pika for this important forage. Pika are also indirectly impacted by horses when the soil and vegetation are trampled while horses graze (Beever et al. 2003a). Mule deer are also on the Nevada Species of Conservation Priority list and depend on various Sheldon Refuge habitats for forage and cover during different life stages. Pygmy rabbit are a sagebrush habitat specialist and are currently undergoing a status review as a potential federally endangered species under the ESA. They depend on dense sagebrush for thermal cover and protection from predators, and sagebrush is the dominant food source in the pygmy rabbit diet.

Under Alternative 1, maintaining current population levels of feral horses and burros on Sheldon Refuge would allow the continued decline and deterioration of habitats and prevent habitats from returning to natural conditions. In addition to the indirect impacts to wildlife discussed previously, several wildlife species would be directly impacted, including Greater sage-grouse, pronghorn, mule deer, pika, pygmy rabbit, and California bighorn sheep. Overall, impacts as a result of current horse and burro management would be long-term, because the population would continue to exert pressure on the various Sheldon Refuge habitats and wildlife. Individual adverse impacts would range from minor to major and would be both direct and indirect. For example, competition for water between bighorn sheep and burros would result in a major, adverse impact to bighorn sheep, as displacement from this vital resource threatens the viability of this small population on Sheldon Refuge. Other impacts, such as habitat degradation due to trampling of vegetation, would occur refuge-wide but would likely result in major, adverse impacts only in site-specific sensitive habitats, such as riparian areas, and would be minor in other habitat areas.

Under Alternative 2, major, refuge-wide, beneficial impacts to habitats and wildlife would occur following the removal of all feral horses and burros from Sheldon Refuge within five years. Restoration efforts would be more likely to succeed, and habitats would be more likely to reach a state where natural processes could be maintained with little or no human intervention. This alternative is aligned with the Service's Biological Integrity, Diversity, and Ecological Health Policy and Wilderness Policy and, in the long term, Sheldon Refuge would be returned to a more natural state. Impacts associated with removing horses and burros through gathers would likely result in minor, adverse impacts to Sheldon Refuge wildlife. These impacts are likely to be site-specific and short-term because wildlife present in the area of a gather event may be temporarily displaced during gathering activities. Impacts may occur as horses and burros are being directed toward the temporary sorting corral location as well as a result of low-flying helicopters (Efroymanson et al. 2000).

Effects from Alternative 3 would be similar to those described for Alternative 2; however, the removal of feral horses and burros would occur over a 15-year period. As a result, it would take longer for the beneficial impacts resulting from removal to be realized, and Sheldon Refuge habitats and wildlife would be subjected to the adverse impacts from horses and burros for an additional 10 years.

6.1.1.2 Effects from Other Invasive Animal Species Management

In addition to feral horses and burros, other non-native animal species, such as bullfrogs and guppies, can have a significant impact on native habitats. As discussed in Chapter 4, expanding populations of nuisance species may cause adverse direct and indirect impacts on habitat biodiversity, habitat connectivity, and vegetation community stability, and their spread may facilitate expansion of non-native invasive species (see Section 4.1.2.2). Invasive species can also directly impact native species by displacement, predation, and disease transmission.

Under all alternatives, the strategy to address non-native species that have been determined to have negligible impacts on native species or habitats is to take no corrective action, which is consistent with Service policy. Other wildlife, primarily bullfrogs, guppies, and warm-water fishes (i.e., perch, sunfish, crappie) within the Virgin Valley of Sheldon Refuge are causing adverse impacts or have the potential to cause impacts should they escape from reservoirs or ponds into Thousand Creek. However, these habitats have also been substantially altered and impacted by irrigation developments, road building, mining, homesteading, and other activities that have been ongoing for more than 100 years. The risk of fish escaping into Thousand Creek is considered low and would require an extreme flood event, which can occur every 50 to 100 years. Virgin Valley represents a closed watershed, which does not connect with a larger stream system, but instead flows into a dry basin typical of streams through the region. Because these habitats otherwise have poor ecological integrity, none of the alternatives include management actions that would actively address harmful and invasive wildlife or fish within Virgin Valley. Instead, we propose to focus efforts and resources toward the recovery and restoration of less substantially impacted habitats that have greater importance and value for pronghorn, sage-grouse, bighorn sheep, and other priority wildlife species. Alternatives 1 and 2 include measures to investigate mitigation techniques; however, there is no strategy developed to implement these techniques. As a result of inadequate management strategies available to control or remove nuisance species, all alternatives would result in major, long-term, adverse impacts to native habitats and wildlife species. These impacts would be confined to Virgin Valley and the Dufurrena Ponds, which have already been substantially altered and impacted by past development.

6.1.1.3 Effects from Invasive Vegetation Management

Invasive plant species displace native vegetation and alter the composition and structure of plant communities. On Sheldon Refuge, approximately 30 introduced, non-native, and often noxious plant species have been documented within upland and riparian habitats (Sheldon Refuge files). Invasive plants typically need transportation to spread to new areas (Trombulak and Frissell 2000), and on Sheldon Refuge several methods are possible, including highway and off-highway vehicles, people, wild and domestic animals, and firefighting equipment. Increased efforts are needed to detect and control newly introduced non-native plant species, and to control or decrease existing infestations in order to prevent impacts from becoming considerably worse.

Alternative 1 emphasizes an opportunistic treatment regime that does not include adequate strategies to detect new infestations from invasive species and is not sufficient to control and decrease these threats. This alternative is not adequate to support Service policy for maintaining and restoring biological integrity, diversity, and environmental health. The lack of strategies to detect the threat from invasive species would result in moderate, long-term, direct, adverse impacts to habitats. These impacts would occur throughout Sheldon Refuge over the course of the CCP implementation period of 15 years. However, implementation of treatment strategies (e.g., mechanical removal of

vegetation, application of herbicides) would likely eliminate or prevent the spread of noxious weed populations when detected and provide some conservation of native habitats, resulting in minor, site-specific, short-term, direct, beneficial impacts to habitat on approximately 50 to 100 acres each year.

Under Alternative 2, various methods including systematic inventory and monitoring for invasive plants, mowing, use of herbicides, elimination of grading road shoulders, and reseeding and/or replanting areas disturbed by fire would be used to detect new infestations, control and contain existing infestations, and treat up to 1,000 acres per year. Roadside corridors would be emphasized and strategies include discontinuing roadside grading practices, which promote the spread and persistence of invasive species. Management strategies to combat invasive plants support the Service policy for biological integrity and diversity on Sheldon Refuge. With a more systematic approach for inventory of noxious weeds and other invasive plants, populations are more likely to be detected when they are small and more easily managed and controlled. Increased treatment and reduced soil disturbance along road corridors would reduce the spread of invasive plants already present and would reduce the potential for new populations. As a result, we anticipate these actions would result in major, long-term, direct, beneficial impacts to all habitats. Direct impacts from implementation of the alternative would be similar to those from Alternative 1 but would occur over approximately 1,000 acres per year.

Strategies under Alternative 3 are not sufficient to control and decrease the threat from invasive species. Alternative 3 emphasizes early detection and eradication of new and/or small infestations but does not include strategies to control the spread of established or large populations (e.g., *Cardara* sp., *Halogeton* sp., Russian thistle, and other species currently well established along road corridors, in meadows, and other disturbed habitats). Impacts would be similar to those described above for Alternative 1.

6.1.1.4 Effects from Fire Management

Ecological diversity of shrub-steppe habitats was historically maintained by fire. For example, big sagebrush is seldom browsed sufficiently to stop its development, and it has few biological controls. Therefore, fire is the primary agent responsible for periodically reducing sagebrush density (Clark and Starkey 1990). Following fire, habitats progress through various stages of plant community succession toward a climax plant community type. This progression will continue and eventually reach a stable climax condition unless another fire or other disturbance occurs. The first communities to appear following fire are dominated by grasses, forbs, and some shrubs, which resprout quickly following removal of the shrub overstory. Subclimax communities contain a mixture of shrubs, forbs, and grasses. As conditions progress toward climax, the density and cover of sagebrush continues to increase, and juniper may begin to encroach, until plant communities are essentially a monoculture of shrubs and trees with few grasses or forbs in the understory. These climax conditions are more susceptible to soil erosion and have lower plant diversity but do provide important wildlife habitat.

Through millennia, wildlife coevolved with shrub-steppe plant communities and adapted to natural processes, including fire. Some wildlife species specialized in early seral communities, such as grasslands, which follow soon after fire. Still others favored climax communities of trees and shrubs. These habitats reflect a complex interaction of environmental variables including soil and climate, but fire has been an important influence on wildlife populations in these habitats (Clark and Starkey 1990). Therefore, fire is not just beneficial to shrub-steppe habitats; it is necessary to maintain plant and wildlife diversity. If fire is excluded, habitat conditions trend toward larger and larger

continuous expanses of climax shrub- and tree-dominated vegetation, which is unable to support a diversity of wildlife populations.

Habitats with sagebrush monocultures are extremely difficult to burn safely, and if burning is accomplished, there are few residual understory plants to take advantage of the overstory removal (Clark and Starkey 1990). Natural fire, under undesirable conditions, can be a threat to the present ecosystem and the various habitats on Sheldon Refuge. Fire management is especially important because the natural fire regime on Sheldon Refuge has been severely altered by human influences, including fire suppression, historical cattle grazing, proliferation of non-native species, and development. With the altered fire regime, Sheldon Refuge is more susceptible to natural fires that can burn more intensely and more rapidly over larger areas.

Prescribed burning can be used to mimic habitat conditions created by natural fire and avoid the potential risk from natural fire burning very large areas or area where fire is undesirable or may be detrimental to habitats and wildlife. The mosaic pattern of a prescribed fire created by the size of habitat patches burned and left unburned and the overall intensity of a prescribed burn are key factors that influence structural diversity of habitats and benefits to wildlife.

Management strategies under Alternative 1 include a variety of fire protection methods and options for post-fire rehabilitation actions. Strategies include the use of mechanical methods for developing fuel breaks and completion of an MTA to determine appropriate activities and equipment for fire suppression within proposed wilderness and WSAs that are generally prohibited under the Wilderness Act. An MTA identifies the least intrusive means necessary to obtain management objectives in a wilderness area. Mechanical removal of vegetation could involve the use of mechanized hand tools or motorized equipment. Impacts are expected to be short-term and minor and would include trampling and crushing of vegetation from people or equipment and direct loss of vegetation from removal to construct the fire break itself. Other impacts include increased potential for invasive species introduction, and associated indirect impacts to wildlife species that use those habitats.

In addition to the impacts described under Alternative 1 from mechanical removal of vegetation to create fire fuel breaks, prescribed fire is likely to cause environmental impacts to the quality of air, soil, and water, which could indirectly impact wildlife species; impacts to air, soil, and water are discussed in Section 6.2. Prescribed fire is also more likely to directly impact wildlife species. For example, burrowing animal species may be displaced by fire or fire-related activities. Plants within the prescribed burn area are killed, and associated wildlife is affected as well. The magnitude of these effects is determined by the size of the prescribed burn area and the fire intensity in areas actually burned. Within any particular area burned, altered habitat conditions will benefit some plants and wildlife and not others. However, at the scale of Sheldon Refuge, the disturbance of fire that maintains an irregular mosaic of habitats at various stages of plant community succession is beneficial to both individual species and ecosystem biodiversity. Localized, adverse impacts from prescribed fire are expected to be of short-term, minor intensity, because each prescribed fire is expected to burn less than 1,500 acres, and we anticipate burned areas will recover to more natural conditions capable of sustaining native vegetation and wildlife species. The use of prescribed fire under this alternative is expected to reduce the risk of major, adverse impacts from natural fires, but as discussed in Chapter 4 (see Section 4.1.4), the timing, size, intensity, and return interval of prescribed fires within Sheldon Refuge do not mimic the natural historical fire regime and have not created conditions suitable for allowing natural fire to burn with minimal fire suppression activity. As a result, the use of prescribed fire under this alternative would continue a major departure from

historical conditions and would have major, long-term, adverse impacts relative to the historical natural fire regime, associated nutrient cycling, and historical natural plant community succession. Based upon the average number of acres burned by prescribed fire within Sheldon Refuge in recent years and the strategies identified for Alternative 1, we anticipate the impacts from prescribed burning under this alternative would affect an average of 1,500 acres or less per year.

Strategies for Objective 7b under Alternative 1 also allow for implementation of various post-fire methods (see Objective 7b in Section 2.2.7) to reduce long-term negative impacts resulting from wildfires and fire suppression activities, which could damage refuge resources. Post-fire rehabilitation actions would be predominantly beneficial and would mitigate for many of the adverse impacts from fire and fire suppression. In addition to native plants for emergency stabilization and restoration, non-indigenous plants may also be used, Alternative 1 supports management goals of protecting, maintaining, and restoring plant communities characteristic of the Great Basin and also supports policy for maintaining and restoring biological integrity, diversity, and environmental health.

Management strategies under Alternative 2 are similar to those discussed for Alternative 1. Strategies in Alternative 2 include using only native seed for emergency stabilization and rehabilitation and no non-indigenous plants. Impacts would be similar to those described above for Alternative 1 and under Section 6.2.

Under Alternative 3, management actions would focus on allowing natural fire to occur. When permitted to burn, wildfires are expected to burn larger areas, and the intensity of natural fires would be greater than would otherwise occur under natural conditions (see Section 2.1.3.3), when types of vegetation and fuel across the landscape had not been altered. Under most situations, only aircraft (for dropping water or fire retardant), hand tools, and other non-motorized equipment for fire suppression would be allowed within wilderness areas and WSAs. Although they are less intrusive, these methods are rarely sufficient to protect sensitive habitats against large, fast-moving, intense fires. If the suppression methods under this alternative were not sufficient to prevent a fire from becoming a threat to private property or public safety, the fire would likely be much larger, would require a greater number of people and resources, would be much more dangerous to contain, and would be much more expensive than if the more effective and versatile tools and methods proposed under Alternatives 1 and 2 had been initially used (i.e., helicopter transport of fire fighters and equipment, chainsaws, motorized water pumps). As a result, the suppression methods proposed under Alternative 3 would increase the risk for very large fires, fires with major impacts to natural resources, and fires that could pose a threat to public safety and private property. The post-fire strategy would focus on natural recovery and not restoration or rehabilitation. Because the natural habitat has been greatly altered, natural recovery after either natural or prescribed fire is not expected to result in more natural conditions and in some instances, plant communities could be replaced by an entirely different set of plants. Under Alternative 3, prescribed fire would only be used within sagebrush-steppe habitats (as compared to most habitats under Alternatives 1 and 2). Impacts to sagebrush habitats (approximately 133,617 acres) from prescribed burning would be similar to those described for all habitats under Alternatives 1 and 2, but we anticipate these impacts would affect an average of 300 acres or less per year. Alternative 3 strategies do not support Sheldon Refuge goals and policy pertaining to protection and restoration of Sheldon Refuge habitats and conditions of environmental health but would better accomplish other management direction and goals for ecological integrity, diversity, and wilderness character (see subsequent sections in this chapter related to habitats and wilderness). Fire management strategies would not be likely to protect sensitive resources against major, natural fires, and without active suppression and restoration

actions, natural fires would be more likely to result in larger-scale disturbances that could impact Sheldon Refuge and the Great Basin region.

6.1.2 Public Use Effects

6.1.2.1 Effects from Road Management

Although all alternatives include strategies that would minimize impacts to sensitive resources, adverse impacts would be expected to continue as a result of the network of developed and undeveloped roads throughout Sheldon Refuge and associated maintenance. Road development has led to habitat fragmentation and continues to adversely impact the biological integrity on Sheldon Refuge by contributing to the altered composition of plant communities, soil disturbance, facilitation of the spread of invasive vegetation, changes in the natural fire regimes, and habitat fragmentation.

Among the most widespread forms of natural landscape modification during the past century has been the construction and maintenance of roads. To date, more than 550,000 miles of roads have been built on Federal lands to facilitate resource extraction, recreation, and transportation (Havlick 2002). It has been estimated that over 22% of the contiguous United States is ecologically altered by the road network, and that roads in rural areas have the greatest total ecological effect (Forman 2000; Riitters and Wickham 2003). Further, the typical western watershed has more than 20% of its total land area within 0.2 mile of a road, and many have more than 40% (Riitters and Wickham 2003).

OHV use has been rapidly increasing and has become highly concentrated on public lands with a visible influence at a landscape scale through road and trail corridors, soil compaction, increased wind and water erosion, and vegetation alteration (see summary by Tull and Brussard 2007). Although roads of all types, including OHV trails, provide important services, their construction and presence can influence hydrology, geomorphology, and ecosystem processes. Many direct effects are obvious during construction, but other effects are permanent and can extend substantially beyond the actual road surface (road-effect zone; Forman and Alexander 1998, Forman 2000). At the landscape scale, major ecological impacts of a road network include fragmentation, the disruption of landscape processes, and loss of biodiversity. Biodiversity declines as the road network impacts interior species (species cut off by roads), species with large home ranges, stream and wetland species, and rare native species (Forman and Alexander 1998). Physical impacts related to roads include increased soil compaction, reduced moisture content, dust mobilization, and increased sources of fine sediments, erosion, and alteration of slope hydrology (see summary by Switalski et al. 2004). Soil compaction by vehicle tires invariably reduces infiltration capacity and renders the surface more susceptible to wind and water erosion; in fact, accelerated soil loss may be the most long-lasting and difficult to alleviate of all off-road vehicle impacts (Eckert et al. 1979; Iverson et al. 1981).

Further, data suggest that in arid environments, recovery may require tens of years in some areas to hundreds of years at severely disturbed sites (Iverson et al. 1981). In particular, altered hydrology can have major physical or chemical effects on associated habitats; roads accelerate water flows and sediment transport, which degrade aquatic ecosystems (Forman and Alexander 1998). Chemical environment modifications include heavy metal contamination from gasoline additives, and the application of de-icing agents (e.g., salt) and herbicides (Forman and Alexander 1998; Trombulak and Frissell 2000). For example, pollution, in the form of vehicular emissions and road runoff that contains toxic chemicals, petroleum, de-icing salts, and sediment, can have a negative effect on amphibian populations (see Carr and Fahrig 2001). Roads and trails also provide dispersal

mechanisms for exotic species (see Section 6.1.1.3). Indeed, it has been demonstrated that habitats distant from roads may provide significant refuge for native grassland species, and that this effect may be even more pronounced in predominately intact landscapes such as those in parts of the Great Basin (Gelbard and Harrison 2003). Human access and disturbance effects on remote areas tend to increase with higher road densities, as well as human-caused fire ignitions (Forman and Alexander 1998).

Fragmentation of previously extensive landscapes can influence the distribution and abundance of a host of wildlife species through redistribution of habitat types and through the pattern of habitat fragmentation, including characteristics such as decreased patch area and increased habitat edge (see Vander Haegen et al. 2000). Fragmentation has been associated with reduced avian productivity through increased rates of nest predation, increased nest parasitism, and reduced pairing success of males (see Knick and Rotenberry 1995; Vander Haegen et al. 2000). Over half of sagebrush-steppe obligate bird species have recently experienced long-term population declines (Saab and Rich 1997), for which the abundance of some (e.g., sage thrasher, Brewer's sparrow; Vander Haegen et al. 2000) and others (e.g., golden eagle; Marzluff et al. 1997) has been negatively correlated with habitat fragmentation beyond the size of individual home ranges (Knick and Rotenberry 1995). In contrast, other species, including some predators, can benefit from habitat modification (i.e., coyote, mountain lion, black bear [*Ursus americanus*]; see summary by Mosnier et al. 2008). Increasingly, islands of native vegetation embedded within otherwise disturbed environments have high potential ecological and conservation value (Longland and Bateman 2002). However, because fragmentation and habitat loss typically occur together, details of how habitats are spatially arranged are unlikely to mitigate the risks of absolute habitat loss (Fahrig 1997).

As discussed previously, the construction and maintenance of roads is among the most widespread forms of natural landscape modification during the past century. Roads (including OHV trails) are commonly identified as important correlates or indicators of loss of ecological health and affect terrestrial and aquatic ecosystems in several general ways: 1) increased mortality from road construction; 2) increased mortality from collision with vehicles; 3) modification of animal behavior; 4) alteration of physical environment; 5) alteration of chemical environment; 6) spread of exotic species; and 7) increased alteration and use of habitats by humans (Trombulak and Frissell 2000; Wildlife Action Plan Team 2006). Roads also serve as barriers or filters to some animal movement (Forman and Alexander 1998). Road width and traffic density are major determinants of the barrier effect (Forman and Alexander 1998), but as barriers to movement, roads can create smaller patches and increase patch isolation. Smaller populations are at a greater risk of extinction by chance from demographic, genetic, and environmental events (Wilcox and Murphy 1985). If the barrier effect of the road continually prohibits immigration or emigration of a species, isolation will eventually affect fundamental population and community dynamics (Andrews and Gibbons 2005). In contrast, some species appear to benefit from an increase in linear features in a landscape. For example, footpaths, roads, rights-of-way, and similar openings into a habitat may serve as corridors for predators (e.g., raccoon, skunk, red fox), increasing access into an environment (see Frey and Conover 2006). Such corridors may also serve to attract and funnel predators into an area, thereby increasing prey exposure and risk. Ease of travel provided by small roads or paths can increase predator travel speed, thus allowing predators to cover more ground in less time (Frey and Conover 2006).

The ecological effect of road avoidance is likely related to traffic density and speed of travel, as well as traffic noise levels (Forman and Alexander 1998). Road-effect zones generally result in lower breeding densities and reduced species richness; species demonstrated to avoid or be negatively impacted by roads include arthropods, reptiles, small mammals, ungulates, and forest and grassland

birds (see Andrews and Gibbons 2005; Carr and Fahrig 2001; Forman and Alexander 1998; McGrann et al. 2006; Rost and Bailey 1979). For example, proximity to OHV trails (<1,000 meters [3,280 feet]) was found to have a direct correlation with reduced-quality habitat for nesting songbirds in sagebrush-steppe habitats, including nest desertion, nest predation, and abandonment (Barton and Holmes 2007). Behavioral disturbance from recreation, including that associated with trails and roads, may also have both immediate and long-term effects on wildlife (see Taylor and Knight 2003). In one study of pronghorn, deer, and bison, individuals exhibited a 70% probability of flushing within 1,000 meters (3,280 feet) on either side of a trail used by hikers and mountain bikers (Taylor and Knight 2003); presumably responses would be similar in the presence of vehicles such as OHVs. Road density can be used as an overall index to average patterns over an area. For example, road densities of approximately 1.0 mile per square mile have been recommended as the maximum for a naturally functioning landscape containing sustained populations of large predators (Forman and Alexander 1998). However, the effects of road density are likely sensitive to road width or type, traffic density, network connectivity, and the frequency of spur roads into remote areas (Forman and Alexander 1998).

Under all alternatives, strategies to minimize the impacts from roads would be employed. Alternative 1 strategies for minimizing impacts include closing some roads on a seasonal basis to reduce soil erosion and protect sensitive wildlife species. Although these actions would be generally beneficial, they would not negate the inherent adverse impacts from the existing road network. As a result, moderate, long-term, direct, adverse impacts would continue throughout localized areas of Sheldon Refuge habitats where roads are located.

Additional beneficial impacts resulting from Alternative 2 strategies would include closing duplicative roads and re-routing roads that pass through sensitive resource areas. Signage would also be placed to clearly identify all roads that are open for public use. These strategies would minimize the adverse impacts to Sheldon Refuge habitats and wildlife species. Overall impacts from Alternative 2 road management would be minor, direct, and adverse to habitats on a localized and long-term basis.

Under Alternative 3, duplicative roads would also be closed, and roads that pass through sensitive resource areas would also be re-routed, resulting in beneficial impacts to habitats and wildlife, similar to those of Alternative 2. However, like Alternative 1, beneficial effects would not negate the inherent adverse impacts from the overall existing road network. The adverse impacts would not negate the beneficial impacts. Moderate, long-term, direct, adverse impacts would continue throughout localized areas of Sheldon Refuge habitats where roads are located.

6.1.2.2 Effects from Hunting Management

By its very nature, recreational hunting results in direct, adverse impacts to individual animals that are targeted. Under all alternatives, Sheldon Refuge staff would continue to cooperate with the State of Nevada to ensure protection and stability of wildlife populations. Under all alternatives hunting opportunities would be managed to maintain primitive and semi-primitive natural settings that are not habituated by people and that have few developments or facilities; hunters would encounter few other people, face little competition from other hunters, and have the opportunity to pursue game largely undisturbed.

Even though the hunting of Greater sage-grouse is conducted to collect data, this activity is proposed as a wildlife-dependent recreation activity. A number of studies suggest hunting of upland species,

including sage-grouse, is compensatory to natural mortality and has little or no measurable effect on the population, but that some local, isolated populations may be vulnerable to hunting (Sage-grouse Conservation Team 2004). The validity of the idea that hunting is a form of compensatory mortality for upland game birds has been questioned in recent years (Reese and Connelly 2011:6). Connelly et al. (2005:660, 663) cite many studies suggesting that hunting of upland game, including the Greater sage-grouse, is often not compensatory. Other studies have sought to determine whether hunting mortality in sage-grouse is compensatory or additive (USFWS 2010a). Results of those studies have been contradictory. For example, Braun (1987:139) found that harvest levels of 7% to 11% had no effect on subsequent spring breeding populations based on lek counts in North Park, Colorado. Johnson and Braun (1999:83 as cited in USFWS 2010a) determined that overwinter mortality correlated with harvest intensity in North Park, Colorado, and hypothesized that hunting mortalities may be additive. In general, hunting is not considered an additive mortality factor in areas where habitat is of sufficient quality and quantity. However, hunting may be additive where habitat is limited or degraded, or where other factors are limiting the population (e.g., West Nile virus outbreak) (Stiver et al. 2006).

In its 2010 finding (USFWS 2010a), the Service evaluated the impact of hunting on sage-grouse throughout their current range and has determined that although the allowable harvest of sage-grouse through hunting was very high in past years, substantial reductions in harvest began during the 1990s and have continued; since approximately 2000, total mortality due to hunting has been lower than in the last 50 years. The present level of hunting mortality shows no sign of being a significant threat to the species. However, in light of present and threatened habitat loss and other considerations (e.g., West Nile virus outbreaks in local populations), states and Tribes will need to continue to carefully manage hunting mortality, including adjusting seasons and harvest levels, and imposing emergency closures if needed. The Service concluded that the Greater sage-grouse is not threatened by overutilization for commercial, recreational, scientific, or educational purposes now or in the foreseeable future. WAFWA recommends that, where populations are hunted, harvest rates should be 10% or less than the estimated fall population to minimize negative effects on the subsequent years breeding population (Armentrout et al. 2004).

In 2004 NDOW estimated the sage-grouse population within Sheldon Refuge was 2,896 to 3,475 birds, and the minimum harvest was 230 birds (calculated from wings provided by hunters), or 7.9% to 6.6% of the population. In 2001, the Sheldon Refuge fall population estimate was 3,652 birds and harvest was 180 birds, or 5% of the fall population. Based on the number of grouse wings provided by hunters, the minimum number of birds harvested from Sheldon Refuge from 2002 through 2010 was 1,296. Harvest ranged from 75 birds in 2007 to 230 in 2004 and averaged 144 birds per year (Collins 2010). Based upon these estimates, total harvest is likely less than 10% of the total sage-grouse population within Sheldon Refuge (which is the WAFWA guideline used by NDOW for Sheldon Refuge), and we anticipate that continued hunting as proposed under all alternatives would not pose a threat that would lead to the likely endangerment of the species in the foreseeable future. Sage-grouse populations within Sheldon Refuge and population productivity estimates derived from wing analyses would continue to be evaluated and considered in future sage-grouse population management decisions and recovery efforts as appropriate under all alternatives. The purpose of these evaluations and considerations is to ensure the overall harvest does not exceed 10% of the population and that wing data is appropriate and necessary for sage-grouse management within the refuge.

In addition to the minor, adverse impacts to the species or population as a result of individual animal mortality (e.g., mule deer, pronghorn, bighorn sheep, and Greater sage-grouse), short-term, direct,

adverse impacts (e.g., trampling of vegetation, wildlife displacement) would be expected from hunters moving throughout the region while hunting. Impacts are expected to be minor and would likely be limited to specific areas scattered throughout Sheldon Refuge.

6.1.2.3 Effects from Campground Management

The principal impacts associated with campground and campsite use are loss of vegetation, soil compaction, and erosion from trampling; reduced water quality from improper disposal of food, dishwater, and feces; the displacement or habituation of wildlife from the presence and activities of people; unintentional fire from misuse of stoves and campfires; and visual impacts which detract from the visitor experience. The impacts of camping on the vegetation and soil of natural areas can be locally severe. These impacts compromise the integrity of natural ecosystems and diminish the quality of recreational experiences (Hammitt and Cole 1987). Although some disturbance is inevitable with recreational use, the magnitude and extent of its impact at campsites are both spatially and temporally variable. Spatial variation is readily apparent even to the casual observer. At fine scales, the magnitude of disturbance is typically negatively correlated with distance from the center of the campsite (Stohlgren and Parsons 1986). Differences at coarse spatial scales are also apparent; certain campsites are more severely impacted than others and the areal extent of these changes varies widely across landscapes (Cole and Marion 1988). Variation in campsite impact is a function of use levels and characteristics and of the resistance and resilience of sites (Cole 1987).

Trampling has at least three effects: abrasion of vegetation, abrasion of organic soil horizons, and compaction of soil. Plants can be damaged and even uprooted by trampling. Trampling reduces plant size, leaf area, and seed production, as well as in the number of plants that flower (Liddle 1997). These changes typically result in reductions in plant vigor and reproduction. Many plants are killed by trampling. At moderate levels of trampling, however, some species increase in abundance, often as a result of decreased competition or a change in microhabitat. Generally, where trampling is intense, plant cover and biomass are low, most plants are short, species richness is reduced, and species composition has shifted (Cole 2004). In a study of 29 paired campsites and undisturbed control sites (Marion and Cole 1996), results showed most vegetation had been eliminated from campsites and the vegetation that remained primarily consisted of grasses, while forbs dominated the undisturbed control sites. Organic soil horizons on campsites were only about one-third as thick as on the control sites; mineral soil was exposed over most of the campsite. These mineral soils were compacted—exhibiting increased bulk density and penetration resistance. A substantial number of trees had been felled, and tree reproduction was dramatically reduced, suggesting that the overstory trees would not be replaced on these campsites.

The greatest difference in durability between vegetation types occurs at moderately low use levels (Cole 1985). Sites that are used frequently are likely to be highly impacted regardless of their fragility. Because vegetation loss usually occurs more rapidly than loss of organic soil horizons, sites with either no vegetation or resistant vegetation (e.g., grasses as opposed to forbs) recover more quickly and are less likely to be impacted by low levels of use, while sites with thick organic soil horizons are less susceptible to erosion and are more likely to withstand high amounts of use.

Experimental studies suggest that there is an important difference between a site's resistance (its ability to tolerate use without being damaged) and its resilience (its ability to recover from damage). Cole (1995) has shown, for groundcover plants, that resistance decreases with erectness and that broad-leaved herbs are typically less resistant than grass-like plants and shrubs. Herbs growing in shade are particularly intolerant of trampling because adaptations to shading—possession of large,

thin leaves and tall stems—make these plants vulnerable when trampled. This explains the common finding that trampling of forested sites generally results in more rapid loss of vegetation than trampling of open woodlands or meadows. Low shrubs, such as heather, are relatively resistant to trampling stress but their resilience is low. Once damaged, they recover slowly. Grass-like plants are most tolerant of trampling (Cole 1989).

The compaction of soils from campsite use reduces water infiltration and water holding capacity which leads to increased runoff and erosion potential (Cole 2004; Monti and Mackintosh 1979). Compacted soils also can inhibit seed germination and plant growth. Alessa and Earnhart (2000) have shown that plants in compacted soils may be less able to utilize available nutrients because they grow fewer lateral roots and root hairs and because cytoplasmic streaming within root hairs is reduced. Soil compaction effects are exacerbated by abrasion and loss of organic soil horizons, which shield underlying mineral soil horizons from excessive compaction and erosion. Loss of organic litter directly affects plant and animal populations, both above and below the ground, which can cause species composition to shift toward species that germinate most frequently on mineral soil and cause an adverse effect on soil microbial populations. Zabinski and Gannon (1997) report substantial reductions in the functional diversity of microbial populations on a backcountry campsite. Microbial populations contribute to ecosystem functioning by metabolizing nutrients, transforming soil organic matter, producing phytohormones, and adding to soil food webs.

When evaluating the various impacts from campground use, spatial descriptors of impact and scaling issues are important considerations, particularly in assessing how much of a problem impacts are and in devising strategies for managing them. Cole (1981) noted that hiking and camping impacts on soil and vegetation, while severe when measured at small scales, are minimal at large spatial scales. This suggests that while recreation impacts can be serious for individual plants and animals and perhaps localized rare populations, they are generally of little significance to landscape integrity or regional biotic diversity. Moreover, unless much of a population is impacted by a single impacted site, the intensity, size, and distribution of impacts are not relevant to the significance of impacts assessed at large spatial scales (Cole 1989).

Camping would continue to be allowed under all alternatives, resulting in adverse, site-specific impacts to Sheldon Refuge habitats as described in Section 5.3.1. Under Alternative 1, all existing campgrounds would remain in their current locations, which include sensitive riparian and cultural areas. Minor, direct habitat impacts would continue in site-specific areas from trampling of vegetation, soil compaction, potential for invasive species introduction, and degradation of water quality. Trash bins are not provided at any of the 13 campgrounds. Visitors generally follow campground rules, and litter is generally not a problem. Campfires are allowed at designated campgrounds but are occasionally prohibited during periods of high fire danger. Wildfires have been started by refuge visitors in the past. We expect some wildfires will occasionally start as a result of escaped campfires or misuse of stoves, but that fire engine crews will continue to respond quickly and effectively to minimize impacts.

Under Alternative 2, up to nine semi-primitive and primitive campgrounds would be relocated away from sensitive riparian habitats and cultural areas. Recovery of vegetation and soils at campgrounds would be directly related to the kinds of impact, magnitude of impact, and environment present at individual campsites. Variation in the resilience of different ecosystem types is pronounced. Hartley (1999) reports residual effects of trampling after 30 years, in alpine meadows in Glacier National Park, while most evidence of camping on closed riparian campsites disappeared within six years (Marion and Cole 1996). Cole and Monz (2002) report that an alpine grassland trampled 1,000 times

recovered more rapidly than a neighboring forest, with an understory of low shrubs, that was trampled just 75 times. Given the same environmental setting, sites that receive more use and that are more heavily impacted will take longer to recover. We anticipate primitive campgrounds located in meadow habitats that receive low amounts of use would recover most quickly and would require little or no active restoration. Aspen stands associated with some of these primitive campgrounds are also expected to recover, but regeneration of the understory shrubs and younger trees would recover slowly and would likely require some active restoration and/or replanting to occur within the 10- to 15-year timeframe of the CCP. Recovery of semi-primitive campgrounds with areas of bare ground, soil compaction, and a loss of organic horizons would require active restoration to improve water infiltration, seed germination, and plant growth, and we anticipate restoration to natural conditions would require more than 15 years. As a result, we anticipate that consolidating up to nine campgrounds with other existing campgrounds would have long-term, direct and indirect, beneficial impacts to wildlife, plants, and their habitats by removing the trampling of vegetation, soil compaction, and wildlife disturbance, displacement, and habituation associated with the use and development of campsites in sensitive riparian habitats.

However, through consolidation, other existing campgrounds would need to be enlarged and additional campsites constructed (the most likely candidates for enlargement include Catnip Reservoir, Big Spring Reservoir, Fish Spring, and West Rock Spring campgrounds). Consolidation would result in additional impacts from increased use of existing facilities and campsites and from the designation and construction of new campsites. Impacts associated with use of existing campsites and facilities have already occurred, resulting in loss of vegetation, soil compaction, and loss of organic soil horizons. As a result, increased use of these existing campsites and facilities would have little or no measurable impact. Impacts to expanded portions of these campgrounds would occur quickly as vegetation is trampled and soil compacted within the first two or three seasons of use, but would then stabilize over the long-term. For example, on newly established canoe campsites, most of the impact that occurred over the six years following creation of the campsite occurred during the first year of use (Marion and Cole 1996). Impact did increase over the first three years, but at a decelerating rate. This phase is followed by a more stable phase in which impacts change little unless there are dramatic changes in amount of use. For example, on long-established campsites in the Eagle Cap Wilderness, mean vegetation cover was 15% in 1979, 12% in 1984, and 19% in 1990 (Cole and Hall 1992). We expect enlargement of existing campgrounds would result in minor, site-specific, long-term, direct adverse impacts to plants and their habitat from removal of vegetation, soil compaction, and loss of organic soil horizon at these sites.

Enlargement of these existing campgrounds would have little or no indirect impact to wildlife because most wildlife disturbance, displacement, or habituation impacts from camping and public use at these sites have already occurred.

Under Alternative 3, four semi-primitive and primitive campgrounds would be relocated. Resulting impacts would be of lesser extent but similar to those described under Alternative 2.

6.1.2.4 Effects from Construction of Public Use Facilities

Construction of new visitor facilities, such as a visitor contact station, trails, kiosks, and campground facilities, would result in a small loss of habitat and may temporarily displace wildlife or influence wildlife behavior. Under Alternative 1, no new visitor facilities would be constructed; therefore, there would be no resulting impacts to habitats or wildlife.

Under Alternative 2, construction of new visitor facilities would result in a small permanent loss of habitat in site-specific areas, which would represent a moderate to major, long-term, adverse impact to plant communities located within construction areas; however, the impact would be negligible at the refuge scale because the area of lost habitat would represent an extremely small percentage of Sheldon Refuge lands and would not impact sensitive or rare habitats. Site-specific adverse impacts to individual or small populations of wildlife species would be likely to occur during construction activities and continue due to visitor and staff use of the facilities in the long term; these direct impacts would be minor and would not be likely to affect the health or diversity of wildlife species or communities on Sheldon Refuge. New facilities intended for wildlife observation and photography may result in long-term, adverse impacts to some species by affecting wildlife behavior. These impacts would likely be similar to the temporary construction impacts previously described. Beneficial impacts may occur as well because many of the new facilities would include educational or interpretive components that would increase public awareness and educate visitors about Sheldon Refuge resources, including wildlife and their habitats. This could possibly result in minor, long-term, indirect, impacts to vegetation and wildlife as visitor appreciation of the importance of Sheldon Refuge habitats and wildlife increases and behaviors are subsequently adjusted to reflect this knowledge. Impacts from construction of camping facilities are discussed under Section 6.1.2.3.

Under Alternative 3, new visitor facilities would be limited to those associated with consolidation of campgrounds. These impacts are discussed under Section 6.1.2.3.

6.1.3 Sagebrush-steppe and Associated Upland Habitats

Maintaining low densities of western juniper on portions of the landscape increases the abundance, diversity, and richness of avian and small mammal populations in the shrub steppe. However, as western juniper dominance increases, wildlife abundance, species richness, and diversity decline. This will also occur as the proportion of area dominated by western juniper at the landscape level increases (Miller et al. 2005). Noson (2002) concluded that although fire had an immediate negative impact on several shrub-nesting species, periodic burning was important in limiting western juniper encroachment into shrub-steppe communities. Wall et al. (2001) also concluded that fire was an important factor in preventing the conversion of aspen stands to western juniper woodlands. Maintaining small, scattered stands of dense western juniper may be desirable to provide thermal cover from severe winter conditions for large ungulates. However, management strategies that maintain a balance of grasslands, shrub-steppe, and open western juniper woodlands will provide the greatest abundance and diversity of wildlife populations at the landscape level. Old-growth woodlands that provide valuable habitat for cavity-nesting birds should be maintained.

Cheatgrass is known to occur at various locations throughout the refuge but is not present in high density. Research shows that weedy annuals, cheatgrass in particular, will usually increase immediately after juniper trees are killed, whether it is by fire, chaining, cutting, or herbicides. Much of the research indicates this response will be transient or that it may not even occur (Miller et al. 2005). The risks from cheatgrass in areas above 4,500 feet in elevation (such as areas of Sheldon Refuge where juniper encroachment has occurred) are lower.

The primary factors that will influence post-burn response are plant composition and seed pools prior to treatment, ecological site (site potential), fire severity and extent, pre- and post-fire climate conditions, and post-treatment management (Miller et al. 2005). The initial response to fire of plant communities in relatively good condition is typically increased cover, density, and biomass of perennial grasses and perennial and annual forbs. However, this initial response is accompanied by a

decrease of litter and woody plant cover, resulting in more bare ground (EOARC Unpublished Data; Koniak 1985; Quinsey 1984).

Alternative 1: Management of sagebrush-steppe and associated upland habitats includes conservation and restoration strategies such as mechanical removal of vegetation and prescribed fire. Under Alternative 1, moderate, long-term, beneficial impacts would indirectly result from proactive conservation strategies that protect these habitats against fires that would cause major, adverse impacts. Restoration strategies under Alternative 1 include management actions intended to mimic natural disturbance and restore a mosaic of plant communities and seral stages. These direct, beneficial impacts would be site-specific and minor because restoration would only address 400 acres per year of these habitat types over the course of 15-year CCP implementation period

Site-specific, short-term, direct, adverse impacts would be expected as a result of mechanical removal of vegetation and prescribed fire. Impacts from mechanical removal of vegetation and prescribed fire would be similar to those previously described in Sections 6.1.1.3 and 6.1.1.4. Adverse impacts from mechanical removal of vegetation and prescribed fire would be overshadowed by the long-term, beneficial impacts that would consequently occur as a result of habitat protection and restoration. Implementing these strategies follows Service policy for restoring habitats to historical conditions by assisting areas in returning to natural fire regimes without the unintended consequences of fire suppression, combating invasive species, and promoting natural vegetation.

Alternative 2: Impacts from conservation and restoration management strategies under Alternative 2 would be similar to and slightly more beneficial than those previously described for Alternative 1. A larger area (1,500 acres) would be restored each year, with the focus of this restoration on western juniper encroaching upon sagebrush habitats. In addition, restoration of hydrologic processes and functions would occur, which would further benefit the environmental health of these habitats; hydrologic restoration is addressed in further detail in Sections 6.1.5 and 6.2.2.

Alternative 3: Under Alternative 3, impacts from conservation management strategies would be similar to those described under Alternative 2; however, Alternative 3 focuses on allowing natural processes to transpire and as such, active restoration would not occur. It is anticipated that approximately 10 to 100 acres would be restored each year from natural fire; beneficial impacts are expected to be minor within the context of the entire refuge and moderate within the context of the habitat type.

6.1.4 Semi-desert Grasslands and Steppes

Under all alternatives, impacts to semi-desert grasslands and steppes would be similar to those resulting from restoration strategies discussed under Section 6.1.3.

6.1.5 Emergent Marshes, Wet Meadows, Streams, Reservoirs, Springs, Springbrooks, and Ephemeral Wetlands

6.1.5.1 Emergent Marshes and Wet Meadows

Alternative 1: Emergent marshes and wet meadows are extremely important for the conservation of biodiversity on Sheldon Refuge and provide habitat for approximately 80% of all Great Basin species. These habitats have been extremely altered and impacted from water developments, prior grazing regimes, and current feral horse and burro use. Under Alternative 1, management strategies

include the continued use of mechanical treatments and prescribed fire to mimic natural disturbance, reduce litter, and increase herbaceous vigor; this would occur on a maximum average of 1,200 acres per year. Because these treatments would occur while horses and burros roam Sheldon Refuge, the negative impacts that horses and burros continue to exert on wet meadow and marsh habitats (i.e., trampling vegetation, compacting soil, and contributing to erosion) would potentially increase if the treatment methods are used while horses and burros continue to inhabit these areas. As a result, long-term, major, indirect, adverse impacts would be likely in areas where treatments are applied.

Alternative 2: Under Alternative 2, management strategies addressing emergent marsh and wet meadow habitats would include those described under Alternative 1; however, the treatments would only occur following the removal of horses and burros. Additional strategies include the removal of water control structures, diversions, or developments that alter natural hydrology and implementation of wetland restoration, such as plantings and bank stabilization. This suite of strategies would avoid adverse impacts described in Sections 4.1.1, 4.1.5.1, and 6.1.5.2. By restoring natural water flow regimes for native riparian vegetation, fish, and wildlife, the restoration actions proposed under this alternative would help restore the biological integrity and function of these altered habitats by returning emergent marsh and wet meadow habitats back to natural conditions; long-term, major, direct, beneficial impacts would result.

Alternative 3: Under Alternative 3, management strategies for emergent marsh and wet meadow habitats would focus on allowing natural fire to serve as the primary restoration mechanism. Following removal of horses and burros, approximately 10 to 100 acres of emergent marsh and wet meadow habitats are expected to be restored each year. Indirect, beneficial impacts from restoration of 100 to 1,500 acres of emergent marsh and wet meadow habitat through natural fire over the next 10 to 15 years are likely to be minor.

6.1.5.2 Springs, Streams, and Springbrooks

Springs, streams, and springbrooks are rare habitats on Sheldon Refuge and serve as important sources of water for wildlife. The majority of water sources within Sheldon Refuge were developed to water livestock and include dug-out basins and ditch and pipeline diversions to troughs and reservoirs. These water control structures were created in several locations to create subirrigated pastures or hay meadows (Steblein 2007). A number of water developments such as water pipelines, troughs, reservoirs, and playa dug-outs throughout the refuge also influence the natural timing and rates of water flow. These developments degrade hydrologic processes and wildlife habitat (Sada et al. 2001). Sada and Vinyard (2002) concluded that approximately 50% of the aquatic taxa endemic to the Great Basin (78% of which occupy springs) had declined because of diversion impacts. There is comparatively little information that quantifies the biological impacts of spring developments. However, Sada and Nachlinger (1996, 1998) found that biological diversity was greater in larger and undisturbed springs and that non-native taxa made up a greater proportion of the riparian vegetation at disturbed springs. They concluded that diversions decreased biological diversity by reducing aquatic habitat and reducing soil moisture in riparian zones. Functional changes in spring biota also occur when flowing habitats are impounded. Under these circumstances, species that require lotic habitats are extirpated and replaced by lentic taxa (Sada et al. 2000). Hershler (1989) documented local extirpation of the Fish Slough springsnail (*Pyrgulopsis perturbata*) following impoundment of a spring source. Water developments also affect timing and amount of water available to wildlife. For example, during the summer months, sage-grouse seek out water usually associated with wet meadows and succulent vegetation (Call and Maser 1985). If the year has been unusually dry, sage-

grouse will use any water source available including reservoirs but do not use livestock watering troughs as readily since access to the water is more difficult than from a reservoir (BLM 2006).

Water developments negatively impact riparian habitats by collecting and concentrating snowmelt and runoff, which would otherwise flow into downstream habitats for use by fish, wildlife, and plants. Water developments within the refuge were designed to allow downstream passage of overflow so that water not used for livestock would be returned to the natural channel and habitat downstream. When fully functional, water developments most often affect water flows during drought conditions when overflow does not occur, and during periods of rapid snowmelt and storm events when overflow is reduced by the amount of water stored in the development. A number of studies and research articles have evaluated the effect of large water developments and resulting changes in water flow regimes. We expect similar impacts occur as a result of water developments within the refuge, but at a much smaller scale. In almost all cases, dams reduce peak flows associated with spring runoff and change the timing, duration, and magnitude of the natural hydrograph (WGFD 2010). Auble et al. (1994) noted that substantial changes in riparian vegetation can occur without changing the mean annual flow because riparian vegetation is especially sensitive to changes in minimum and maximum flows. Bovee and Scott (2002) also observed this phenomenon and noted that changes in peak flows can reduce seedling recruitment and lead to gradual decline of certain riparian woodlands.

With the exception of the largest water developments (i.e., Dufurrena Ponds, IXL wetlands, and Swan Lake, Catnip, and Big Spring reservoirs), most habitats impacted by water development are perennial and ephemeral springs and associated intermittent streams. Because the flows from these streams do not reach perennial streams lower in the watershed except during storm events or years with high snowpack, the effects of water developments on perennial streams and wetlands is negligible. Of 137 water sources evaluated in 2008, 24 (18%) were classified as highly disturbed (Collins 2009). This classification includes a determination that the springbrook contains less than 50% of natural discharge and that the water source has been impounded or dredged. All impounded springs are considered highly disturbed because flow has been interrupted and functional characteristics of the aquatic system have been highly altered (LaRouche 2007). Results from 2008 show an improvement in spring condition since 2007 when 43% of the 37 springs inventoried were determined to be highly disturbed. These differences are likely due to the fact the region experienced drought conditions in 2007 and a number of water developments would have diverted or retained most or all water flow, which as was noted previously, is a primary way in which livestock water development impact riparian habitats and dependent fish, wildlife, and plants.

Many water developments have been abandoned for years, and due to the lack of maintenance are no longer functional or are only partially functional. In some cases water is being diverted or impounded, but does not reach areas downstream. In such cases the reduced amount of water is likely limiting or reducing the extent of wetland and riparian habitats which in turn is limiting the overall wildlife diversity and abundance which would otherwise exist. Even though these impacts are affecting relatively small portions within the refuge, the habitat types being affected are considered some of the most important for the health of wildlife and overall biodiversity throughout Sheldon Refuge (see Section 4.2.4.1). In 2008, Service staff documented developments such as berms, canals, dams, dug-outs, impoundments, spring boxes, and troughs at 81 (57%) of 143 inventoried water sources within Sheldon Refuge. Of these 81 water developments, 39 (48%) were determined to be no longer functional or only partially functional.

Alternative 1: Removal of spring developments under Alternative 1 would likely improve the natural timing and flow of water to associated habitats and benefits to aquatic taxa and wildlife over the long term. Benefits would have a moderate to major impact for those springs where nonfunctional water developments are diverting water away from riparian habitats. When considering the 81 developed springs present across the entire refuge, including the 39 developments considered nonfunctional, the removal of up to four spring developments over the next 10 to 15 years represents a relatively small number. Although this would be a beneficial action for spring habitats, wildlife and hydrology, these strategies address only a small fraction of the existing water developments, and active restoration would not be performed. Natural recovery of these habitats may require several decades, and it is possible that habitats may not be restored to historical conditions without additional restoration. As a result, minor, indirect, long-term, beneficial impacts would be likely in areas where developments are removed. Removal of these developments is consistent with Sheldon Refuge goals of restoring natural function to aquatic habitats. In addition to removing developments, active restoration of these habitats may also be needed to return natural function and conditions consistent with those historically present before development.

Artificial water guzzlers collect rainwater and provide it for wildlife, specifically California bighorn sheep and chukar (an introduced non-native game bird). Many managers and biologists have long assumed the availability of freestanding water to be a limiting factor for large desert mammals. However, this assumption has often been inferred from observational data on animal distribution and resource use rather than physiological studies (Krausman et al. 2006). Cain et al. (2008) conducted a study which demonstrated that desert bighorn sheep showed no response to removal of water catchments including no changes in diet, foraging area selection, home-range size, movement rates, mortality, productivity, or recruitment. The authors noted that an increase in precipitation resulting in increased forage moisture content and availability of naturally occurring sources of free water likely minimized the impact of removing water catchments. Similar studies have also failed to detect changes in habitat use by mule deer and desert bighorn sheep in response to the addition of water sources (see summary by Cain et al. 2008). Although it has been observed that some bighorn sheep populations decline during periods of extreme drought (USFWS 2007b), this is an expected natural ecological response to changes in habitat condition and is consistent with wildlife population management goals for the Refuge System and Sheldon Refuge. A number of studies have demonstrated pronghorn are well adapted to dry desert conditions and rarely utilize freestanding water but instead obtain most necessary water from forage (Monson 1968, Seton 1937, O'Connor 1939, Phelps 1974, Nowak and Paradiso 1983, Beale and Smith 1970, and Reynolds 1984 as cited in USFWS 1998b). We do not dispute the fact that wildlife utilize freestanding water when available and gain some benefit (Arizona Desert Bighorn Sheep Society 2004; AZFGD 2004; USFWS 2002b), but study results suggest providing water sources to desert ungulates during drought periods may do little to prevent the adverse consequences of a limited forage supply (Cain et al. 2008). The introduction of year-round human-made water sources has, however, been shown to contribute to increases in other species such as coyote and red fox (Arjo et al. 2007). Similar research to measure the effects of water catchments (guzzlers) on populations of California bighorn sheep has not been conducted, but we anticipate the effects would be similar to those found for desert bighorn sheep. There is no evidence to suggest the presence or maintenance of water guzzlers is having a measurable impact on native fish or wildlife populations within Sheldon Refuge. Under Alternative 1, the 18 guzzlers located on Sheldon Refuge would be maintained, resulting in a direct, long-term, negligible or minor benefit to bighorn sheep and chukar. The impacts of guzzlers and their maintenance to wilderness character are discussed in Section 6.6.

Alternative 2: Management strategies to address springs, streams, and springbrooks under Alternative 2 include the complete removal and restoration of over 20 spring developments. Removal of water developments and spring restoration would improve natural water flow regimes for native riparian vegetation, fish, and wildlife, the restoration actions proposed under this alternative would help restore the biological integrity and function of these altered habitats. This is consistent with Sheldon Refuge goals and Service policy of restoring biological integrity and habitat function and would result in direct, major, long-term, beneficial impacts to areas where spring restoration occurs.

Under Alternative 2, the 18 water guzzlers on Sheldon Refuge would be maintained similar to Alternative 1, resulting in a direct benefit to bighorn sheep and chukar. However, with the previously described strategies to restore natural function to springs and streams, and the elimination of competition for water from feral horses and burros, these structures would no longer be necessary. The resulting direct overall benefit to wildlife would likely be negligible and trending toward minor.

Another management strategy under Alternative 2 includes the restoration and rehabilitation of approximately 1 mile of Virgin Creek habitat. This area in particular has been drastically altered from mining activities as well as intense historical livestock grazing. Restoring this section of Virgin Creek watershed to historical conditions would occur following removal of feral horses and burros and would improve the health and self-sustaining capacity of native plant communities, soil conditions, and hydrology. Direct, beneficial impacts to the watershed around the restoration area would be long-term and moderate.

Alternative 3: Under Alternative 3, management strategies for springs, streams, and springbrooks are similar to those from Alternative 2, including the removal of at least 20 spring developments. However, unlike Alternative 2, active restoration would not occur and natural recovery of spring habitats would be expected to take over 15 years and in some instances may not occur at all. Therefore we expect many water sources would continue to exhibit effects from altered water flow regimes, reduced riparian areas, non-native plants, low biodiversityresulting in only minor, long-term, beneficial impacts to habitats in areas where spring developments are removed. Benefits at the refuge scale would be somewhat greater than anticipated under Alternative 1, which proposes removal of up to only four water developments.

Under Alternative 3, the 18 artificial water guzzlers would not be maintained. Loss of these artificial water sources would be major for the chukar that rely on these developments for water, but likely negligible to minor for bighorn sheep which utilize, but are not dependent upon, guzzlers for their water supply. The direct, adverse impacts to these animals are likely to be long-term.

6.1.5.3 Reservoirs

Alternative 1: Several reservoirs are located on Sheldon Refuge. Under Alternative 1, strategies to maintain artificial reservoirs would benefit various native and non-native fish and wildlife species by providing habitat. Adverse impacts to riparian habitats, biodiversity, aquatic taxa, and wildlife due to altered water flow regimes created by reservoirs as described in Section 6.1.5.2 would continue under this alternative. These impacts are expected to be moderate to major for associated downstream habitats and dependent wildlife over the long term but are expected to be minor at the refuge scale. Although reservoirs are not natural and require human manipulation to maintain, these habitats are especially important to wildlife given the degraded condition of many water resources on Sheldon Refuge and are consistent with Refuge goals and Service policy.

Under Alternative 1, artificial reservoirs on Sheldon Refuge would be maintained, including Swan Lake Reservoir. Maintenance of Swan Lake Reservoir would result in long-term, moderate, indirect, beneficial impacts to pronghorn by providing approximately 1,200 acres of vital high-quality summer forage. This is consistent with management priorities to retain water in habitats directly associated with Swan Lake. As an additional benefit, surplus water, when available, would be released from Swan Lake to provide stop-over habitat at IXL Ranch for migratory birds.

Alternative 2: Under Alternative 2, impacts would be similar to those previously discussed for Alternative 1.

Alternative 3: Under Alternative 3, impacts from maintenance of Swan Lake would be similar to those discussed under Alternative 1. However, maintenance of Dufurrena Ponds and Big Spring Reservoir would be discontinued, resulting in a loss of habitat for waterfowl, other wildlife, and the fish species that currently depend upon these impoundments. Adverse impacts would be indirect, long-term, and moderate. Over the long term and beyond the 10- to 15-year life of this CCP, more natural water flow regimes would return as sediments gradually fill the excavated Dufurrena Ponds and the dams and dikes use to create Big Spring Reservoir and other Dufurrena Ponds would eventually be eroded away. More natural water flow regimes would benefit downstream habitats and dependent wildlife in Big Spring Creek and Thousand Creek drainages. Due to the extensive excavation and alterations to create the Dufurrena Ponds and Big Spring Reservoir, we anticipate natural conditions would return to these areas very slowly if at all.

Effects from fishing management

Under Alternative 2, non-native rainbow trout in Virgin Creek would be replaced trout indigenous to the region. While reintroduction of the native Alvord cutthroat trout would be preferable, hybridization with introduced rainbow trout has eliminated this as a management option. This strategy is consistent with Service policy for restoring biological integrity and diversity, resulting in a site-specific, major, long-term, direct benefit to this habitat. In addition, non-native rainbow trout in Big Spring Reservoir would be replaced with fish indigenous to the region, such Lahontan cutthroat or redband trout. The current program of restocking rainbow trout further exacerbates adverse impacts to natural species composition and biodiversity as a result of impoundments created by Catnip and Big Spring reservoirs. A number of adverse impacts to aquatic ecosystems can occur when fish species are introduced to waters that historically did not support such populations. These include adverse impacts to amphibians, invertebrates, and large zooplankton (Braña et al. 1996; Dunham et al. 2004). These impacts can range from reduced survival and productivity to complete elimination of native species. The impacts, in turn, affect populations of other predators such as other fish and birds and cause an overall loss of biodiversity. Introduced trout can alter nutrient cycles, productivity, and community structure either by acting as nutrient sinks or by removing nutrients from lake systems altogether. Restocking of non-native fish is not consistent with Service policy, which indicates only native and indigenous species should be stocked in refuge waters; therefore, this strategy would result in a moderate, site-specific, direct, long-term, beneficial effect. Alternatives 1 and 3 do not include strategies for replacing stocked non-native fish with native or indigenous fish species, resulting in continued site-specific, long-term, moderate, direct, adverse impacts to biological integrity.

6.1.6 Ephemeral Wetlands

Because the playa ecosystem primarily depends on resident species (e.g., plants, invertebrates, and amphibians) being able to persist despite harsh environmental conditions for initiation and maintenance of ecological functions, any alteration of the playa hydroperiod that hinders the ability of the species to respond to changes in the environment will have drastic effects on all species that depend on playas to exist (Haukos and Smith 2003). The most common disturbance to playas within Sheldon Refuge has been the excavation of pits and dug-outs to concentrate water for livestock use. The presence of pits or dug-outs decreases the water available to the entire playa, thereby influencing hydroperiod and thus life-cycle events for the biota (Haukos and Smith 2003). In many cases pits and dug-outs are sufficiently large that some playas no longer flood and do not function as playa habitat.

Alternative 1: Under Alternative 1, management strategies include the restoration of one playa to natural conditions but also include the continued maintenance of 21 artificial playa dug-outs. Playa dug-outs have adversely contributed to the alteration of hydrologic processes, thus affecting physical, chemical, and biological conditions, as previously noted. As a result, the continued maintenance of 21 dug-outs would overshadow the site-specific, beneficial impacts from the one playa restoration and would result in overall, long-term, direct, major, adverse impacts to playa habitats.

Alternative 2: Under Alternative 2, playa management strategies would include restoring at least 20% of playas to natural conditions and determining and applying appropriate techniques to restore natural hydrologic function on Sheldon Refuge. These strategies should improve playa habitats and improve conditions for a variety of plants and wildlife resulting in greater biological diversity and ecological integrity for Sheldon Refuge. These restoration activities support Service policy and are aligned with Sheldon Refuge goals, resulting in direct, beneficial impacts to playa habitats that would be long-term and moderate. Indirect, beneficial impacts would result from strategies to minimize soil disturbing activities resulting from recreational and management activities.

Alternative 3: Under Alternative 3, playa maintenance would be discontinued and all playas would be left to recover naturally. Strategies to minimize soil disturbance would be similar to Alternative 2. Although discontinuing playa maintenance and minimizing soil disturbance is beneficial to the biological and physical components of the habitat, natural restoration of these habitats is likely to be a very slow process and active restoration would help return playas to historical conditions in line with Service policy. As noted in the previous discussion, playas likely form through the dissolution and deposition of materials and minerals. These natural formation processes require hundreds and possibly thousands of years to create a playa habitat in the arid environment of the Great Basin, and we expect a similar length of time would be required for pits and dug-outs to naturally fill and form soils required for playa habitats. In the shorter term, plant species composition associated with playa habitats is a function of available the seed bank, environmental conditions of the previous year, and environmental conditions of the current growing season (see previous discussion). Where dug-outs and pits have been constructed in playas, adequate conditions for seed germination and growth may not have occurred for several decades, and a viable seed bank to recolonize these habitats may no longer exist. In such cases, natural playa conditions would not return without active restoration. As a result, indirect, long-term, beneficial impacts from Alternative 3 would likely be minor.

6.1.7 Cliffs, Canyons, Talus Slopes, and Barren Lands

Alternative 1: Cliffs, canyons, talus slopes, and barren land areas on Sheldon Refuge are generally stable and in good condition. They provide habitat for a variety of wildlife species including many that are particularly sensitive to human disturbance. Under Alternative 1, management strategies are aligned with Sheldon Refuge goals and would focus on protecting and maintaining these habitats through treatments, including the use of prescribed fire and mechanical removal of vegetation, to control the encroachment of western juniper. Juniper naturally occurs in cliff and talus slope habitats where they are protected from fire. Removal of juniper would occur on only a few acres in the periphery of these habitats to prevent the establishment of dense closed canopy juniper stands susceptible to fire and encroachment into sagebrush and aspen habitats. These actions would protect ecological habitat integrity and maintain historical habitat types and natural plant compositions is consistent with Service policy and would result in long-term, direct, moderate, and beneficial impacts. Site-specific, short-term, direct, adverse impacts resulting from mechanical removal of vegetation and prescribed fire would be similar to those described under Sections 6.1.1.3 and 6.1.1.4.

Alternative 2: Impacts under Alternative 2 would be similar to those described for Alternative 1. However, baseline plant and animal surveys would also be conducted and would inform future management decisions, potentially resulting in additional benefits to habitats and species.

Alternative 3: Habitat management strategies under Alternative 3 would only involve management of natural fires to reduce encroachment of western juniper. This strategy is less protective of cliff, canyon, talus slope, and barren land habitats and would likely result in indirect, minor, long-term benefits to habitat.

6.1.8 Deciduous Woodlands and Shrublands

Alternative 1: Deciduous woodland and shrubland habitats have been extensively degraded by overgrazing, changes in the fire regime, and encroachment by sagebrush and western juniper. Under Alternative 1, restoration strategies to mimic natural disturbance regimes and control encroachment would include prescribed fire and the mechanical removal of vegetation, resulting in long-term, direct, beneficial impacts to these habitats. Although these strategies are aligned with Service policy and Sheldon Refuge goals, natural recovery of vegetation would take many years and active restoration could be required to produce desired conditions. However, the continued presence of horses and burros on Sheldon Refuge would allow the overgrazing pressure to continue and would likely negate many of the beneficial impacts on these habitats resulting from restoration strategies. As a result, overall beneficial impacts from these strategies would likely be minor. Site-specific, short-term, direct, adverse impacts resulting from mechanical removal of vegetation and prescribed fire would be similar to those described under Sections 6.1.1.3 and 6.1.1.4.

Alternative 2: Under Alternative 2, in addition to strategies to control the encroachment of western juniper and sagebrush similar to Alternative 1, native species would be planted and temporary protective fencing would be installed to prevent severe overgrazing from feral horses and burros. Fencing would be removed once horse and burro management objectives are achieved. These additional strategies would benefit the biological integrity and diversity on Sheldon Refuge by restoring historical habitat conditions and creating a likely situation for self-sustaining populations to thrive. These changes would represent long-term, major, direct, beneficial impacts.

Alternative 3: Under Alternative 3, natural fire would be used to restore disturbance regimes and maintain natural abundance and distribution of western juniper and sagebrush. Due to accumulation of dead woody material and the high density of trees and shrubs in the absence of fire, the likelihood that conditions would be favorable for allowing natural fire to safely burn in these habitats to reduce or remove sagebrush or juniper without escaping into adjacent areas is considered very low. As a result, this strategy is not likely to be sufficient in producing desired goals of restoring and protecting deciduous woodland and shrubland habitats on Sheldon Refuge. Impacts are likely to be indirect, long-term, beneficial, and negligible, trending toward minor.

6.1.9 Mature Old-growth Mountain Mahogany and Western Juniper Habitat Types

Mountain mahogany and late-successional western juniper provide unique and often irreplaceable biological and ecological values. Mountain mahogany is sensitive to stand-replacing fires, does not easily resprout after fire, and is difficult to establish from seed. Western juniper woodlands provide important habitat for a number of wildlife species (see Section 4.2.7). As discussed in Section 6.1.3, maintaining low densities of western juniper is important for the abundance, diversity, and richness of avian and small mammal populations, and periodic burning is important in limiting juniper encroachment and preventing conversion of aspen stands to juniper woodlands.

Alternative 1: The use of proactive preventative measures (mechanical treatments and prescribed fire) to reduce fuel loads, protect against fires that would cause major adverse impacts and other large-scale disturbances, as well as active restoration measures (native seeding and planting) following stand-replacing fire or large-scale disturbance would result in major, long-term, direct, and beneficial impacts to mountain mahogany and western juniper habitats under Alternative 1. Some early and mid-successional western juniper stands would also be maintained for recruitment due to decreased seedling establishment in late-successional western juniper. Site-specific, short-term, direct, adverse impacts resulting from mechanical removal of vegetation and prescribed fire would be similar to those described under Sections 6.1.1.3 and 6.1.1.4.

Alternative 2: Protection and restoration strategies under Alternative 2 would be like those previously described under Alternative 1, resulting in the same impacts to mountain mahogany and western juniper habitats.

Alternative 3: Under Alternative 3, existing stands would be protected from fires that would cause major adverse impacts and other large-scale disturbances, resulting in indirect, beneficial impacts to mountain mahogany and western juniper habitats. However, proactive preventative measures to reduce fuel loads and active restoration measures are not included; therefore, impacts are likely to only be minor.

6.2 Physical Environment

6.2.1 Effects to Soils

Alternative 1: The refuge-wide decline and deterioration of soils would continue under Alternative 1 as a result of strategies that maintain current population levels of feral horses and burros. Impacts include indirect effects such as reducing plant vigor or eliminating vegetation by grazing and trampling. This may result in compaction or disturbance to floodplain soils, increased erosion,

entrenchment, instability of stream banks, and lowered water tables (Barnett 2002; Belsky et al. 1999; Herbst 1996; LaRouche 2007; Ohmart 1996; USFWS 2008a). Horses and burros trample the landscape and disrupt natural soil processes by causing soil compaction, increasing erosion, and contributing to soil instability. Erosion and high levels of turbidity are common water-related issues on Sheldon Refuge (Barnett 2002; Steblein 2007). Most springs and adjacent meadows have been trampled by previous livestock and current feral horse use, resulting in weakened vegetation, erosion, and headcutting. In particular, grazing on Sheldon Refuge has resulted in deterioration of spring-associated meadows and destruction of riparian vegetation (including willows and aspen), which can reduce streamside shading, elevate stream temperatures, and contribute to stream bank erosion and excessive sedimentation (Earnst et al. 2001; Ohmart 1996; USFWS 1980). Without plants to slow water movement and associated headcutting, the water table has dropped at some sites, and sagebrush, primarily on the periphery, has invaded associated riparian meadows.

Studies of livestock impacts to biological soil crusts have documented reductions in crust cover and species richness due to trampling (see Kaltenecker et al. 1999). Soil and nutrient loss resulting from damage to the crust can impact the vascular plant community and ultimately result in desertification (Belnap 1995). Protection from grazers and other disturbance can assist in the recovery of these communities, resulting in an increase in the percentage of soil surface covered with crust, and conversely a decrease in the percentage of bare soil (Kaltenecker et al. 1999; Rice and Westoby 1978).

Under Alternative 1, we anticipate the adverse impacts identified would be long-term and moderate.

Habitat management strategies, such as mechanical vegetation removal and prescribed fire, would cause mostly minor, site-specific, short-term adverse impacts to soils in most instances by removing vegetation and increasing the rate of erosion. These management strategies would be undertaken to restore and protect native habitats, including soils and vegetation, and would ultimately benefit the soil in a long-term, moderate manner. One notable exception involves vegetation removal in wet meadow habitats, where vegetation removal treatments are not likely to succeed in restoring the ecosystem with horses and burros present. Vegetation removal treatments may be detrimental, resulting in moderate, long-term, adverse impacts to emergent marsh and wet meadow soils.

Mostly minor, adverse impacts resulting from the use of mechanical vegetation removal and prescribed fire associated with fire management would be localized and similar in nature to those described from the use of these strategies for habitat management.

Under Alternative 1, campground management strategies would result in long-term, direct, adverse impacts to soils. Campgrounds would remain in their existing locations, allowing the continued compaction of soils, especially near riparian areas. Adverse impacts would be minor and site-specific.

Most vehicle routes within Sheldon Refuge were established as access to developments for livestock, homesteads, or water sources, or were established through use by hunters. The establishment of these routes seldom involved planning which considered the potential for erosion and impact to soils and typically did not include culverts, bridges, waterbars, or other erosion control structures. Over time the location and continued use of these routes has resulted or contributed to rill erosion, washouts, stream bank destabilization, and in extreme cases—headcutting or diversion of springbrook and stream segments into the route itself. Transportation management strategies would also allow these adverse impacts on soils to continue. Almost all vehicle routes within Sheldon

Refuge would have some adverse impact from wind and rain erosion of soils from the road surface and from movement of soils by vehicle tires. For most routes, these impacts are minor and only noticeable over a period of many years. For certain routes or route segments, soil erosion impacts are readily apparent and are substantially noticeable from year to year. As part of the route inventory and assessment for the CCP, two route segments were identified as having substantial impacts to soils. Other routes were identified as have no impact or minor impacts to soils. Under Alternative 1, all existing roads would be remain at their current locations and levels of maintenance, including roads that pass through sensitive resource areas. In an effort to decrease erosion, some roads would be seasonally closed; however, overall soil erosion would continue in site-specific areas due to poorly routed roads. Site-specific impacts would primarily occur on unimproved primitive road segments located in loose friable soils where the road base has not been stabilized with gravel or other material to reduce erosion and on road segments which lack culverts or other structures at springbrooks and stream channel crossings. Direct, adverse impacts to soils would be long-term and minor and would occur near the existing Sheldon Refuge road network.

Alternative 2: Alternative 2 would result in more beneficial impacts to soils than either of the other alternatives. Strategies to remove feral horses and burros within five years would result in refuge-wide, long-term, direct and indirect, beneficial impacts by eliminating the continued deterioration of soils from horse and burro presence and providing conditions in which habitat management strategies can succeed at restoring depleted soil conditions.

Indirect, beneficial impacts to soils from habitat management strategies would be long-term and major, and they would result primarily from restoration efforts aimed at aquatic resources. These include the removal of water control structures and diversions that alter natural hydrology, restoration of at least 20 springs, and restoration of at least 20% of playas to natural conditions. Moderate, beneficial impacts would occur from conservation and restoration of sagebrush-steppe and associated habitats. Restoration of 1 mile of Virgin Creek watershed would decrease surface runoff, stream sedimentation, soil compaction, and erosion.

Management strategies under Alternative 2 that involve the use of prescribed fire and mechanical removal of vegetation would be similar to those described under Alternative 1.

Under Alternative 2, relocating up to nine semi-primitive and primitive campgrounds away from sensitive riparian habitats would have long-term, minor, direct, beneficial impacts to soils by eliminating soil compaction resulting from campground use. However, soil compaction would occur at the new campground locations, resulting in site-specific, long-term, direct, adverse impacts to soils.

Transportation management strategies would include closing duplicative roads and re-routing roads that pass through sensitive resource areas. Both route segments identified by the planning team during the route inventory and assessment as having substantial impacts to soils would be closed to public use of vehicles. Several other route segments would be realigned or erosion control structures installed to eliminate or minimize impacts to soils. This would result in long-term, minor, direct and indirect, beneficial impacts to soils by decreasing erosion in sensitive areas that are currently affected.

Additional administrative and visitor facilities, kiosks, and trails would be constructed under Alternative 2, resulting in minor, site-specific, short-term, direct, adverse impacts to soils during construction. Signage would also be placed to clearly identify all roads that are open for public use,

minimizing potential soil impacts (e.g., erosion, compaction) from travelers that inadvertently drive on closed roads.

Alternative 3: Under Alternative 3, moderate, beneficial impacts to soils would be similar to those described under Alternative 2; however, this benefit would begin to occur many years later. An additional 10 years of potential damage would also be allowed to continue because complete removal of horses and burros would occur within 15 years of implementation of the CCP, whereas it would only be five years before complete removal with Alternative 2.

Under Alternative 3, fewer short-term, adverse impacts and long-term, beneficial impacts would occur from habitat management strategies because Alternative 3 strategies focus on allowing natural processes to prevail. Mechanical removal of vegetation and prescribed fire would only rarely be used. Long-term, minor, direct and indirect, beneficial impacts to soils would occur from strategies to remove 20 spring developments and minimize soil disturbing activities. Based upon playa formation processes and necessary soil conditions needed (see Section 6.1.6), we estimate it would take more than 50 years for the playas to naturally recover.

Under Alternative 3, transportation management strategies would include closing duplicative roads and re-routing roads that pass through sensitive resource areas. Beneficial impacts to soils would be similar to those described under Alternative 2.

Under Alternative 3, four campgrounds would be relocated by consolidating with existing campgrounds. Impacts would be of lesser extent, but similar to those described under Alternative 2.

6.2.2 Effects to Water Quality and Quantity

The most common water-related problems on Sheldon Refuge are erosion and increased turbidity levels caused by feral horses (Barnett 2002; Steblein 2007); other issues include entrenchment and instability of stream banks, reduced vigor and loss of riparian vegetation from trampling and grazing, increased numbers of headcuts, lowered water tables, and degraded water quality from fecal contamination. Habitat implications for water resources are discussed above in Section 6.1.5. Other impacts to water quality occur from increased soil erosion associated with vehicle routes or are due to runoff and erosion from burned areas.

Alternative 1: Trampling and fecal contamination by feral horses are the greatest contributors to deteriorated water quality on Sheldon Refuge. Under Alternative 1, feral horse and burro management strategies would maintain current population levels and allow the continued deterioration of water quality; this would result in major, long-term, direct, refuge-wide, adverse impacts to water resources.

Habitat management strategies would also result in mostly adverse impacts to water resources. Artificial water developments, such as playa dug-outs, guzzlers, spring developments, reservoirs, and stock ponds have altered the natural hydrology on Sheldon Refuge. These water catchment devices divert water to specific locations so that the water is no longer able to naturally infiltrate the ground, evaporate, or flow to naturally occurring streams or ponds. Under Alternative 1, maintenance of nearly all playa developments, water guzzlers, and reservoirs would result in localized, moderate, direct and indirect, long-term, adverse impacts to Sheldon Refuge waters from altered timing, distribution, and use of water. Direct, minor, beneficial impacts would result from removal of four spring developments.

All herbicides can potentially enter streams and other water bodies through water transported by runoff, leaching, or percolation. Water contamination from rain events could transport chemicals to waterways, and convey them to aquatic species habitat. Soil type and chemical stability, solubility, and toxicity can determine the extent to which an herbicide will migrate and impact surface waters and groundwater. For example, picloram is highly soluble and readily leaches through sandy soil. It is also resistant to biotic and abiotic degradation processes. It can also move from target plants, through roots, down into the soil, and into nearby non-target plants. Other herbicides such as glyphosate and 2,4-D, though very soluble, bind well with organic matter in soils and are not easily leached (USFS 2005).

Soils within Sheldon Refuge are generally low in organic material, poorly developed, and unconsolidated. Many soils are shallow with high clay content, while soils in valley and drainage bottoms typically are deeper with high sand and gravel content—which generally make these areas more conducive for transport and movement of herbicides in a relatively short amount of time, particularly following a rain event. As such, the potential for transport of herbicides used along roads, campgrounds, burned areas, and other locations where weeds typically occur is considered high. Many of the herbicides that would be used on Sheldon Refuge are susceptible to transport in surface runoff, especially if applications are followed immediately by high rainfall events. However, the chemical formulations used and the concentrations applied (in accordance with the chemical labels) present a minor risk to the environment. Most studies have shown when herbicides do enter surface waters, concentrations are very low (BLM 2007) and below thresholds that would adversely affect the health of fish, wildlife, plants, and people. Some populations of noxious weeds and other invasive plants would require repeated annual herbicide application, which would likely result in indirect, minor, localized, long-term, adverse impacts to water quality from the transport of chemicals to waterways.

Removal of vegetation through prescribed burn or mechanical vegetation removal would likely result in minor, localized, short-term, adverse impacts to water quality from temporary increases in turbidity; however, refuge-wide water quantity and quality would benefit in the long term due to improvement in hydrological functions and development of stable habitat conditions.

Under Alternative 1, campground management strategies would maintain all campgrounds in their existing locations, including those that are near sensitive riparian areas. The continued proximity of campgrounds to streams would result in localized, long-term, indirect, minor, adverse impacts to water quality.

Transportation management strategies would maintain all roads in their existing locations, including those that are routed near or through waterways. Vehicles transport pollutants, stir up dust and other sediments that may enter waterways, and contribute to erosion. As a result, Alternative 1 would result in long-term, refuge-wide, minor, adverse impacts to water quality.

Alternative 2: Under Alternative 2, removing all feral horses and burros within five years would eliminate the primary source of water-related problems on Sheldon Refuge, resulting in major, refuge-wide, direct and indirect, beneficial impacts to water quality and quantity.

Under Alternative 2, major, long-term, refuge-wide, direct and indirect, beneficial impacts to water resources and water quality would result from the following habitat management strategies: restoration of emergent marshes and wet meadows through strategies to remove water control structures and relocate campgrounds away from water resources; removal of 20 spring developments,

discontinued maintenance of playa dug-outs, and active restoration of these habitats; and restoration of sagebrush-steppe communities through strategies to restore hydrologic functions. All of these habitat management strategies would improve water quantity by removing sources of water degradation, restoring hydrologic function and water quality, and decreasing turbidity.

Other strategies would result in indirect, adverse impacts on natural hydrology and water quality. Impacts from the continued maintenance of artificial water sources (i.e., water guzzlers and reservoirs), the use of herbicides to address invasive species, and vegetation removal would be similar to those discussed under Alternative 1.

Under Alternative 2, campground and transportation management strategies would result in beneficial impacts. Campground management strategies include relocating campgrounds away from sensitive water resources; this would result in localized, indirect, minor, long-term, beneficial impacts to water quality by removing sources of water quality degradation. Alternative 2 strategies from transportation management include re-routing roads away from sensitive resources, including waterways. This would result in minor, long-term, beneficial impacts to water quality refuge-wide by reducing transportation related soil erosion and transportation-related contaminants from entering water bodies.

Alternative 3: Under Alternative 3, long-term, beneficial impacts to water resources would be similar to those previously described under Alternative 2. However, 10 additional years would pass before feral horses and burros would be eliminated from Sheldon Refuge, thus prolonging the period of time in which adverse impacts are able to continue.

Habitat management strategies under Alternative 3 would result in some beneficial impacts to water quality and quantity that are similar to but of lesser intensity than those described under Alternative 2. Maintenance of playa dug-outs would be discontinued and 20 spring developments would be removed; however, strategies for active restoration would not occur. Under Alternative 3, fewer artificial reservoirs would be maintained compared to Alternatives 1 and 2. This would result in indirect, site-specific, moderate, beneficial impacts to water quantity from removing some reservoirs, and conversely similar adverse impacts from maintaining others. Fewer instances of prescribed fire and vegetation removal would be implemented under Alternative 3. Impacts would be similar to those described under Alternative 1; however, they would occur less frequently and/or in fewer locations.

Impacts to water quality from campground management strategies would be similar to those described under Alternative 2; however, only four campgrounds would be relocated away from sensitive water resources. Impacts from transportation management strategies would be similar to those described under Alternative 2.

6.2.3 Effects to Air Quality

Under all alternatives, minor to moderate, short-term impacts to air quality would be expected as a result of smoke from prescribed burn activities or natural wildfires. Planning for prescribed burns considers potential impacts, and burns are initiated only when ambient air quality standards can likely be met. As a result, prescribed burning generally has less impact on air quality than natural fires, which would typically burn larger areas. All alternatives allow the use of prescribed burns and natural fire for habitat management; however, Alternatives 1 and 2 allow more instances where prescribed burns could occur than Alternative 3, which focuses on natural fire. Prescribed burns

would only occur when strict environmental conditions are met and would follow guidelines established by Sheldon Refuge. In addition, all state and local smoke regulations would be adhered to.

6.2.4 Effects to Climate

Under all of the alternatives, natural and prescribed fires would be allowed to various extents as management tools. Alternatives 1 and 2 would use prescribed fire more frequently than Alternative 3, which allows for more natural burns than Alternatives 1 and 2. Under Alternative 1, prescribed fire would be one of the primary management activities used to maintain, restore, or improve habitats throughout Sheldon Refuge. Prescribed burns would be managed as smaller, more frequent, and less intense fires than those that would naturally occur within Sheldon Refuge. Under Alternative 2, the primary management emphasis of prescribed fire would be for the control of western juniper encroachment upon sagebrush habitats, mainly in the western portions of Sheldon Refuge. Under Alternative 3, less prescribed burning would occur compared to Alternatives 1 and 2, and the primary focus of prescribed burns would be to create conditions where natural fire could be allowed while maintaining an acceptable level of safety and protection for people, property, and certain unique or critical resources.

Burning of vegetation releases carbon dioxide and contributes to climate change. Impacts to climate from Alternatives 1, 2, and 3 are expected to be negligible.

6.2.5 Visual Quality

None of the alternatives are expected to result in more than minor impacts to visual quality (i.e., scenery), and under all alternatives the scenic character at Sheldon Refuge would remain mostly undisturbed. Under Alternative 1, a few visitor facilities, such as kiosks and signs, would be installed, resulting in negligible impacts to visual quality. Habitat and fire management strategies that include the use of prescribed fire and/or mechanical removal of vegetation could result in direct, adverse impacts that occur during strategy implementation and in the short term. However, the long-term benefits to the visual quality of Sheldon Refuge from implementing these strategies, such as maintaining the varied visual quality and character of the landscape through the managed use of fire or habitat restoration (habitat management), would outweigh any temporary adverse impacts; beneficial impacts would be indirect, long-term, and refuge-wide.

Under Alternative 2, more visitor facilities would be constructed than in Alternative 1, including a visitor contact center, campground facilities, and an interpretive trail. In addition, additional primitive unmaintained roads would be open to vehicle access. Adverse impacts from additional visitor facilities and open roads would be long-term, direct, localized, and minor. Impacts resulting from habitat and fire management strategies would be similar to those described under Alternative 1. Beneficial impacts to visual quality would result from habitat management strategies that include the removal of artificial water devices, such as water guzzlers and spring developments; impacts would be direct, long-term, site-specific, and minor.

Under Alternative 3, impacts to visual quality would be similar to those described under Alternative 1; however, there would be fewer visitor facilities, such as campgrounds and associated signage, and substantially less use of prescribed fire and vegetation removal due to fire and habitat management strategies. Impacts would likely be negligible. A greater number of primitive unmaintained routes would be open to public vehicle access than in Alternative 2. Visual impacts from the additional

roads would be long-term, direct, localized, and minor. Beneficial impacts from removal of water guzzlers and spring developments would be similar to those described under Alternative 2.

6.3 Social Effects

6.3.1 Effects Common to All Public Uses

Camping, public access, and recreational facilities are important public uses that support all or most wildlife-dependent public uses on Sheldon Refuge.

6.3.1.1 Effects from Camping

Although camping is not a priority public use, it does support priority wildlife-dependent uses, especially hunting, fishing, wildlife observation, and wildlife photography. On Sheldon Refuge, developed, semi-primitive, and primitive camping opportunities exist.

Alternative 1: Virgin Valley Campground is the only developed campground on Sheldon Refuge. It currently experiences issues of overcrowding and user conflict, especially during peak seasons. Semi-primitive and primitive camping is provided at 12 campgrounds and currently these campgrounds lack boundaries, individual campsites, and barriers that limit vehicle traffic. The resulting effects of this lack include sprawling campsites with unsightly visible impacts that threaten sensitive riparian areas and cultural sites. Under Alternative 1, continuing the current management strategies at developed and semi-primitive campgrounds does not support Service policy for promoting safety of visitors, promoting resource stewardship and conservation, or providing reliable and reasonable opportunities for visitors to experience a quality wildlife-dependent recreational activity. Resulting indirect, adverse impacts to quality recreation opportunities would be moderate, long-term, and site-specific.

Alternative 2: Under Alternative 2, various strategies are proposed to increase the quality of the camping experience, including construction of new campsites, potable water spigots, shade structures, kiosks, and dedicated volunteer sites at Virgin Valley, Catnip Reservoir, and Big Spring Reservoir campgrounds. Catnip Reservoir and Big Spring Reservoir campgrounds would be converted into developed campgrounds; up to nine semi-developed campgrounds would be relocated to nearby areas to minimize impacts to sensitive riparian habitats and cultural resources; and campground boundaries would be delineated. Campsite registration, overnight fees, and the other improvements planned for the developed campgrounds would increase maintenance, decrease visitor confusion (by defining and designating campsites), and decrease site competition. Campground management strategies would result in moderate, indirect, long-term, beneficial impacts to the camping experience, in support of providing quality opportunities for wildlife-dependent recreation.

Alternative 3: Under Alternative 3, existing issues of overcrowding and user conflicts would continue during peak seasons at Virgin Valley Campground, and impacts would be similar to those described under Alternative 1. However, up to four semi-primitive and primitive campgrounds would be consolidated with other existing campgrounds to reduce impacts to sensitive areas (e.g., riparian habitats and cultural sites). Although there would be fewer campgrounds, the public is predominantly in favor of moving campgrounds away from sensitive areas, so this would likely be viewed by the public as beneficial. This strategy is consistent with Service policy by promoting

resource stewardship and conservation and minimizing conflict with habitat goals; therefore, impacts would be indirect, long-term, site-specific, and minor.

6.3.1.2 Effects from Public Access

Access for wildlife-dependent recreational activities on Sheldon Refuge include both primitive access, such as hiking and horseback riding, and motorized access. Some of the most popular recreation areas include facilities such as fishing docks and outhouses designed to be accessible to people with physical disabilities. Hunting and fishing are examples of activities that often rely on primitive and motorized types of access. Within Sheldon Refuge, visitors most commonly rely on motorized access. Motorized activities, along with all other vehicle activity, are limited to open roads; vehicles may also facilitate primitive recreation by providing access to areas from which to embark upon primitive recreational activities.

All alternatives support Service policy by providing various opportunities for primitive and unconfined types of recreation throughout Sheldon Refuge. Hiking and horseback riding are also recreational activities that support wildlife-dependent recreational activities on Sheldon Refuge. None of the alternatives would provide opportunities specifically for non-motorized vehicle access (i.e., mountain bikes) or would manage for semi-primitive recreation and solitude while still providing opportunities for the use of game carts or other non-motorized vehicles, and therefore provide a limited range of recreation opportunities. The somewhat narrow range of access opportunities represents a direct, adverse, moderate, long-term impact to quality recreation opportunities within Sheldon Refuge.

Alternative 1: Under Alternative 1, approximately 365 miles of vehicle-accessible routes would remain open to the public and all primary access routes would continue to be maintained. Currently, visitors can drive to within 4.5 miles of any point on Sheldon Refuge. Primitive access would continue to be allowed along existing user created trails and routes and within undeveloped portions of Sheldon Refuge, primarily within the 341,500 acres of proposed wilderness. Management strategies under Alternative 1 are consistent with Service policy by providing reasonable opportunities to experience wildlife and promoting availability to a broad spectrum of visitors; direct and indirect, beneficial impacts would be long-term, minor, and refuge-wide.

Feral horse and burro management on Sheldon Refuge would not be likely to impact public access because there are very few vehicle collisions involving horses or burros; impacts would be negligible. Similarly, occasional site-specific road closures for horse gathering activities would have a negligible effect on public access.

Alternative 2: Impacts for semi-primitive motorized access under Alternative 2 would be similar and slightly more beneficial than those described under Alternative 1. If the recommendation for wilderness designation as part of this alternative is approved, approximately 462 miles of vehicle-accessible routes would be open to the public. Duplicative roads would be closed, sections through sensitive ecological or cultural areas would be re-routed, frequency of road maintenance would increase, and signs would be installed to identify all open routes. The additional miles of roads for motorized access proposed under this alternative would eliminate primitive access opportunities within corresponding portions of the proposed wilderness. As a result, Alternative 2 would have a direct, adverse, minor, long-term impact on visitors seeking primitive access and recreation settings.

Alternative 2 would convert an existing road for use as a short interpretive hiking trail easily accessible from Highway 140. This trail would be the only maintained route for hiking within Sheldon Refuge and represents a minor, but beneficial long-term impact to public access quality recreation opportunities.

Impacts from feral horse and burro management under Alternative 2 would be similar to those described under Alternative 1.

Alternative 3: Alternative 3 provides the most miles of vehicle-accessible routes, approximately 486, and sensitive or duplicative roads would be re-routed, similar to Alternative 2. However, fewer routes would be maintained than under the other alternatives. Road maintenance would only occur on state, county, and improved roads with current agreements, thus the roads in Virgin Valley would no longer be maintained. Over time, unmaintained routes would increasingly deteriorate and likely become impassible to highway vehicles, resulting in potentially hazardous conditions to Sheldon Refuge visitors who are unaware of road conditions. Access would eventually be reduced in an entire portion of the eastern side of Sheldon Refuge.

Access for rock collectors would be especially affected. Although rock collecting is not a wildlife-dependent recreational activity, it is a compatible activity on Sheldon Refuge in which many visitors participate. Other visitors participating in hunting, wildlife observation, wildlife photography, and, to a lesser extent, environmental education and interpretation could be adversely impacted from decreased access for highway vehicles. Opportunities for visitors with highway vehicles to participate in wildlife-dependent uses are limited to only a few routes that provide access to a relatively small percentage of the refuge. Such opportunities are even more limited when considered in the context of the surrounding region. As a result of reducing accessibility, reliable opportunities to experience wildlife, and safety of visitors and facilities, Alternative 3 would result in localized, long-term, indirect, adverse impacts to opportunities for quality recreation. Impacts to opportunities for quality hunting and wildlife observation and photography would be minor to moderate; impacts to opportunities for quality environmental education and interpretation would be negligible to minor; impacts to opportunities for rock collecting would be moderate. Opportunities for quality fishing would not be impacted, as all routes that access fishing areas would remain open and maintained.

If the recommendation for wilderness designation as part of this alternative is approved, the additional areas for motorized access proposed under this alternative would eliminate primitive access opportunities within those portions of the existing proposed wilderness areas. As a result, Alternative 3 would have a direct, adverse, long-term impact on visitors seeking primitive access and recreation settings. This impact would be greater than anticipated under Alternative 2, which proposes fewer miles of roads for semi-primitive motorized access than this alternative.

Impacts from feral horse and burro management would be similar to those described under Alternative 1.

6.3.1.3 Effects from Recreational Facilities

Recreational facilities support various wildlife-dependent public uses; examples of the type of recreational facilities that may be found at Sheldon Refuge include kiosks, trails, and campground amenities. Some recreational facilities are intended to support specific wildlife-dependent recreational activities and are addressed in the section that is specific to that activity (e.g., maintenance of fishing docks is addressed in Section 6.3.3).

Alternative 1: The current visitor contact space is located within the Sheldon Refuge Office (Dufurrena). It is a very small space (approximately 100 square feet), is not regularly staffed, and like the other visitor facilities on Sheldon Refuge, does not meet the quality expected by the visiting public. Under Alternative 1, a new visitor contact station would not be built; instead the existing visitor contact space would be maintained, which would result in a continuation of the current poor quality facilities and major, long-term, adverse impact to opportunities for quality wildlife-dependent recreation at this location.

Campground facilities would not be improved at Virgin Valley, Catnip Reservoir, and Big Spring Reservoir campgrounds; the consequential perpetuation of the adverse impacts is described in Section 6.3.1.1.

Alternative 2: Alternative 2 includes multiple strategies to improve or maintain visitor facilities on Sheldon Refuge that support wildlife-dependent public uses. A new, larger visitor contact station would be conveniently located along Highway 140 and would be regularly staffed with volunteers and employees. This facility would meet the needs of the visiting public, while also promoting conservation, resource stewardship, and public understanding of natural resources and the purposes for Sheldon Refuge. The visitor contact station would also provide information on various wildlife-dependent recreation opportunities on Sheldon Refuge, including safety and compliance with the law; major, direct and indirect, long-term benefits would result.

New campsites, potable water, shade structures, kiosks, and dedicated volunteer sites would be constructed at Virgin Valley, Catnip Reservoir, and Big Spring Reservoir campgrounds. The associated beneficial impacts are described in Section 6.3.1.1.

Alternative 3: Mostly adverse impacts would result under Alternative 3. A new visitor contact station would not be built, and the existing visitor contact space would be closed. This would result in major, long-term, adverse impacts to opportunities for quality wildlife-dependent recreation.

Four campgrounds would be consolidated under Alternative 3, and similar to Alternative 1, campground facilities would not be improved at Virgin Valley, Catnip Reservoir, and Big Spring Reservoir; impacts are described in Section 6.3.1.1.

6.3.2 Opportunities for Quality Hunting

Alternative 1: Sheldon Refuge coordinates with NDOW to set season dates, bag limits, and harvest tag numbers for pronghorn, California bighorn sheep, mule deer, and Greater sage-grouse. These strategies promote resource stewardship and conservation and provide reliable hunting opportunities. Under Alternative 1, continuing these management strategies would result in moderate, long-term, refuge-wide, beneficial impacts to opportunities for quality hunting.

Feral horses and burros physically degrade the environment, reduce the quantity and quality of forage for wildlife, and displace native wildlife species. As a result, maintaining current levels of feral horses and burros under Alternative 1 conflicts with Service policy and would adversely impact opportunities for quality hunting. Indirect, adverse impacts would be moderate, long-term, and refuge-wide.

Habitat management strategies, such as the use of prescribed fire and mechanical vegetation removal, could temporarily impact opportunities for quality hunting. Management would focus on controlling

encroachment of juniper and protecting mountain mahogany and certain areas could be closed to hunting during and/or following implementation of management actions. Wildlife species could also be temporarily displaced. These strategies could temporarily minimize opportunities for hunting resulting in localized, moderate, direct, adverse impacts. In the long term, however, implementing management strategies that restore or preserve game habitats would benefit wildlife species, thus indirectly resulting in minor, beneficial impacts to opportunities for quality hunting.

In a manner similar to habitat management impacts, fire management activities have the potential to impact opportunities for quality hunting. Under Alternative 1, fire protection activities, including mechanical treatments and prescribed fire, could produce localized, short-term, adverse impacts to opportunities for quality hunting. Other fire management activities, including post-fire emergency stabilization and rehabilitation efforts, would result in minor, long-term, beneficial impacts to opportunities for quality hunting, by protecting game habitats from fire.

Alternative 2: Under Alternative 2, impacts to opportunities for quality wildlife hunting would be similar to those from Alternative 1; however the complete removal of feral horses and burros under Alternative 2 would result in major, refuge-wide, long-term, indirect, beneficial impacts to opportunities for quality hunting and habitat management would focus on restoring a variety of sites and small areas throughout Sheldon Refuge. A greater range of habitat types could be impacted but those areas would likely be smaller in size.

Alternative 3: Impacts from hunting management strategies, including coordination with NDOW, would be similar to those previously described under Alternative 1.

Removal of feral horses and burros under Alternative 3 would result in similar beneficial impacts as those described under Alternative 2. However, an additional 10 years of adverse impacts would be allowed to continue because complete removal of horses and burros would occur within 15 years of implementation of the CCP, whereas it would only be five years before complete removal with Alternative 2.

Under Alternative 3, habitat and fire management strategies would focus on allowing natural processes to occur. As a result, management actions, such as prescribed fire and vegetation removal, would occur in much fewer instances than those described in Alternative 1; short-term and subsequent long-term impacts to opportunities for quality hunting would be negligible to minor.

6.3.2.1 Effects from Outfitters and Guides

Under all alternatives, up to 10 big-game hunting guides would be issued five-year Special Use Permits allowing commercial guiding activities on Sheldon Refuge lands. Historically, an average of 10 guides has been issued Special Use Permits, and this action is not anticipated to affect the demand for or availability of outfitters or guides to visitors. Through specialized knowledge, equipment, and skills, commercial operations provide hunting opportunities for visitors who would otherwise be unable to participate, and these operations promote opportunities for a quality hunting experiences on Sheldon Refuge. Indirect, long-term impacts are expected to be negligible and trending toward beneficial.

6.3.2.2 Effects from Horseback Riding

Horseback riding is a very low impact and underutilized recreational activity on Sheldon Refuge. Although it is not a priority wildlife-dependent public use, it does support hunting and wildlife observation by providing access to areas in the Sheldon Refuge backcountry that are otherwise only accessible on foot. Under all alternatives, horseback riding would continue to be allowed, including overnight stays in areas outside of established campgrounds. It is possible that horseback riding may increase in conjunction with guided hunting trips; however, with only 10 horseback visitors per year currently, dramatic increases are not likely. Under all alternatives, and with specific stipulations to maintain compatibility (see Appendix D), the additional impacts associated with recreational horseback riding impacts are expected to be indirect, long-term, and negligible on refuge habitats and wildlife. Continuing to allow horseback riding perpetuates an existing use in support of compatible wildlife-dependent recreation opportunity, resulting in a neutral effect.

6.3.3 Opportunities for Quality Fishing

Both warm- and cold-water fishing opportunities exist on Sheldon Refuge. These opportunities are located in remote quiet settings that are easy to access and contain semi-primitive facilities. The Dufurrena Ponds are extremely popular with anglers and provide a quality opportunity for warm-water (i.e., bass) fishing on Sheldon Refuge. The warm-water fish populations in the Dufurrena Ponds are self-sustaining; however, active maintenance is necessary to prevent the ponds from filling with vegetation and silt and becoming incapable of supporting fish. Catnip and Big Spring reservoirs provide quality opportunities for cold-water (i.e., trout) fishing. They require active maintenance and periodic trout restocking to maintain conditions suitable for fishing.

Alternative 1: Under Alternative 1, opportunities for quality fishing experiences would be continued as a result of maintaining Dufurrena Ponds, Catnip Reservoir, and Big Spring Reservoir. Fishing docks at Dufurrena Pond 20 and McGee Pond would also continue to be maintained. Both of these locations provide fishing access to people with disabilities, and McGee Pond is further set aside for use by children and seniors. These strategies support Service policy by providing reliable opportunities for fishing in a rural setting that is accessible to a broad spectrum of visitors; direct and indirect, beneficial impacts would be long-term and moderate.

Alternative 2: Management strategies under Alternative 2 would be similar to those discussed under Alternative 1; however, at Big Spring Reservoir non-native trout species would be replaced with fish species that are indigenous to the region. Although this is aligned with Service policy and therefore preferable to Alternative 1, replacing rainbow trout with indigenous trout species may result in somewhat smaller fish and fish that some people consider less sporting to catch. As a result, this alternative would have a direct, adverse, minor to negligible, long-term impact on the quality of fishing opportunities.

Alternative 3: Under Alternative 3, maintenance and restocking would continue at Catnip Reservoir but would be discontinued at Big Spring Reservoir. Because Big Spring Reservoir periodically dries up, it is expected that at some time in the future, Big Spring Reservoir would no longer support a trout population or recreational fishing. This would decrease fishing opportunities on Sheldon Refuge and result in a moderate, long-term, indirect, adverse impact on opportunities for quality cold-water fishing.

6.3.4 Opportunities for Quality Wildlife Observation and Photography

Under all alternatives, impacts from habitat and fire management strategies would be similar to those described in Section 6.3.2.

Alternative 1: Feral horses and burros physically degrade the environment, noticeably impact the visual quality of the landscape, and displace native wildlife species. As a result, maintaining current levels of feral horses and burros under Alternative 1 conflicts with Service policy and would adversely impact opportunities for quality wildlife observation and photography. Indirect, adverse impacts would be moderate, long-term, and refuge-wide. Some people likely visit Sheldon Refuge to view and photograph feral horses and burros. Such activities cause competition with wildlife-dependent public uses for facilities and resources, do not contribute to the public's understanding or appreciation for the refuge, and are not considered an appropriate public use within Sheldon Refuge. Because horses are located within 42 BLM Herd Management Areas (HMAs) and Herd Areas across hundreds of thousands of acres of public land in the surrounding region, impacts to opportunities to view these animals within Sheldon Refuge are considered minor to negligible.

Alternative 2: The complete removal of feral horses and burros under Alternative 2 would result in major, refuge-wide, long-term, indirect, beneficial impacts to opportunities for quality wildlife observation and photography. Some visitors may perceive removal of feral horses and burros as an undesirable impact that would diminish opportunities for observation and photography of these animals. However, maintaining feral horses and burros on Sheldon Refuge displaces native wildlife species and is inconsistent with the Service's mission, goals, and policy and the purposes for Sheldon Refuge.

In addition to the previously described effects resulting from recreational facilities (Section 6.3.1.3), at least one interpretive trail would be constructed that includes wildlife observation decks in specific locations to enhance opportunities to view key representative species on Sheldon Refuge. This would result in minor, long-term, site-specific, direct, beneficial impacts by promoting accessibility to visitors. However, some visitors may view these physical improvements as adverse, detracting from the overall primitive recreational experience, and the improvements may be detrimental to some species. Site-specific, indirect, adverse impacts would likely be long-term and minor.

Seasonal area closures designed to protect sensitive species and habitats could be viewed by visitors as adverse if the closures are seen as limiting opportunities to view or photograph wildlife. However, this strategy is consistent with Service policy by minimizing or eliminating conflict with wildlife population goals or objectives and therefore would be beneficial. Impacts would be indirect, minor, site-specific, and long-term.

Under Alternative 2, strategies to detect and control invasive weeds would directly benefit habitat, indirectly benefit wildlife species, and result in higher quality wildlife observation and photography opportunities. Beneficial impacts would be moderate, long-term, indirect, and localized.

Alternative 3: Removal of feral horses and burros under Alternative 3 would result in similar beneficial impacts as those described under Alternative 2. However, an additional 10 years of adverse impacts would be allowed to continue because complete removal of horses and burros would occur within 15 years of implementation of the CCP, whereas it would only be five years before complete removal with Alternative 2.

6.3.4.1 Effects from Horseback Riding

Under all alternatives, beneficial impacts resulting from management strategies that allow horseback riding on Sheldon Refuge would be similar to those previously described in Section 6.3.2.2.

6.3.5 Opportunities for Quality Interpretation and Environmental Education

Alternative 1: The existing interpretation and environmental education programs on Sheldon Refuge are limited. The current visitor contact space within the Sheldon Refuge Office (Dufurrena) is very small, is not regularly staffed, and does not meet the quality expected by the visiting public. Maintaining the existing visitor contact space under Alternative 1 would result in continuing to provide poor quality facilities and opportunities for interpretation and environmental education adverse impacts; these areas are discussed in Section 6.3.1.3.

Alternative 2: Under Alternative 2, several beneficial strategies would be employed to increase opportunities for quality environmental education and interpretation experiences. Construction of a larger visitor contact station would meet the needs of the visiting public and promote environmental education and interpretation opportunities throughout Sheldon Refuge; beneficial impacts are discussed in Section 6.3.1.3.

Other strategies under Alternative 2 would result in moderate, long-term, direct and indirect benefits. These benefits include developing an environmental interpretation pedestrian trail, developing and promoting an outdoor education program supported by volunteers and partnerships, and using on- and off-site programs to educate visitors and remote schools. Minor benefits would be realized from increased public awareness, outreach, and education, and increased public access from the creation of an interpretive walking trail.

Alternative 3: Under Alternative 3, a new visitor contact station would not be built, and the existing visitor contact space would be closed. This would result in major, adverse impacts to opportunities for quality interpretation and environmental education.

Strategies to increase public awareness, outreach, and/or education relating to native fishes, invertebrates, and wildlife; noxious weeds and invasive species; and rocks and rock collecting would indirectly result in long-term, beneficial impacts to opportunities for quality environmental education and interpretation.

6.3.6 Opportunities for Rock Collecting

Although rock collecting is not a priority, wildlife-dependent public use, it is a popular activity and in the past has been found compatible with the purposes of Sheldon Refuge. Under all alternatives, beneficial impacts to rock collecting would be negligible and trending toward minor due to the continued allowance of this activity on Sheldon Refuge and management actions, such as camping and public vehicle access, which support it. Visitation associated with rock collecting occurs primarily within Virgin Valley. These visitors use various refuge public use facilities such as the Virgin Valley Campground, restrooms, and roads. Because most rock collecting occurs during late spring and early summer, there is little competition with visitors engaged in wildlife-dependent uses that either occur at other locations or later in the year. Rock collecting can cause impacts through removal of interesting or unique specimens, which could otherwise be enjoyed by future visitors. We expect these impacts are minor due to the likelihood that most valuable or unique specimens within

the Virgin Valley have been or would be collected through mining activities and the common nature of most rocks collected outside the Virgin Valley area. Of the three alternatives, Alternative 2 does the most to support Service policy by developing outreach materials to educate the public. Materials would include information on acceptable collection methods, appropriate rocks to collect, and Federal regulations, including the illegal collection of cultural resources (e.g., arrowheads). In addition, under Alternative 2, increased law enforcement would track violations and under Alternative 3, Special Use Permits would be required. Indirect, beneficial impacts associated with visitors learning about geology and gaining appreciation for the geologic processes that shaped the landscape of the refuge are likely to be negligible and trending toward minor.

6.4 Effects on Cultural and Historic Resources

6.4.1 Alternative 1

Management of Sheldon Refuge under Alternative 1 would continue to affect prehistoric sites associated with early habitation and hunting, primarily near springs and riparian areas, due to continued trampling by feral horses and burros and subsequent erosion. Sites affected include areas identified as eligible for listing on the National Register of Historic Places (USFWS 2008a). We anticipate prolonged long-term exposure to such impacts would eventually destroy the integrity of these sites to the point they may no longer be considered eligible for listing. Once lost, the information and value of these prehistoric sites cannot be restored and as a result these impacts represent an irretrievable and irreversible, long-term, major adverse impact to cultural resources. Similar impacts would also continue to occur at prehistoric sites associated with primitive campgrounds due to vehicle traffic and expansion of camping activities into areas not currently being used.

Impacts to historic and prehistoric sites from prescribed burning, mechanical thinning, mowing, watershed restoration, or emergency stabilization and rehabilitation would be mitigated or avoided as a result of site-specific inventories conducted prior to each individual project in accordance with Service policy. Prior to implementing all ground-disturbing projects, the applicable cultural resource compliance investigation would be undertaken. If cultural resources are found, appropriate procedures and protocols would be followed to protect the cultural resources. Whenever possible, resources would be avoided or mitigated. Mitigation options, in addition to site avoidance by relocating or redesigning facilities, would include data recovery, using either collection techniques or in situ site stabilization protection. As a result, we anticipate adverse impacts would be minor or negligible.

Maintenance or reservoirs, guzzlers, and other structures and the removal of abandoned spring developments would have little or no effect on cultural resources because any cultural resources at these sites have either been significantly disturbed or destroyed during construction and now have little or no historic value.

Continued management of rock collecting would do little to educate the public in an effort to prevent the inadvertent or unintentional collection of prehistoric artifacts or fossils. As a result collection and removal of these cultural resources would continue. Due to the lack of information, it is uncertain what the magnitude of these impact are currently, or would be in the future.

6.4.2 Alternative 2

Impacts to cultural resources under this alternative would be substantially less than under Alternative 1. Impacts from trampling and erosion caused by feral horses and burros would end following removal, and impacts associated with semi-primitive and primitive campgrounds would be mitigated by relocating these facilities to upland areas where impacts to both biological and cultural resources would be less. As a result, the integrity of sites eligible for the National Register of Historic Places would be protected.

Efforts to document and stabilize 20% of historic structures would improve the condition of these resources and prevent further deterioration over the long term, which could otherwise diminish their value and eligibility for inclusion on the National Register of Historic Places. Documentation, stabilization, and interpretation of Kinney Camp or the Virgin Valley Ranch along with limited fee use of the Little Sheldon Guard Station or Badger Cabin would increase public appreciation for historic resources and understanding for their protection and preservation. In addition, the use of these sites and the collection of fees would provide justification and funding for restoration work and continued maintenance. Therefore, we anticipate Alternative 2 would have a major, long-term, beneficial impact on cultural resources.

6.4.3 Alternative 3

Following removal of feral horses and burros, this alternative would have similar long-term, major, beneficial impacts to cultural resources associated with springs and riparian areas as described for Alternative 2. Consolidation of up to four semi-primitive and primitive campgrounds with other campgrounds would reduce impacts where resource impacts are most severe, but not to the extent of relocation under Alternative 2. As a result, we expect impacts from the management of campgrounds under this alternative would be between those described for Alternatives 1 and 2.

Under this alternative the collection of information and inventory of historic structures would not be a priority and the structures would be allowed to naturally weather, decay, and fall apart. As a result any remaining historic value for these structures would be lost over the long term. Because inventories have been conducted and information gathered for roughly 75% of the remaining historic structures on Sheldon Refuge (including those considered eligible for the National Register of Historic Places), under the NHPA the effects of neglect from this alternative would be adverse and require mitigation and consultation with the State Historic Preservation Office and interested parties. Long-term adverse impacts from this alternative would be minor to moderate.

6.5 Economic Effects

6.5.1 Alternative 1

In general, Alternative 1 would maintain current values from economic use of Sheldon Refuge. One exception is at Big Spring Reservoir, which is currently dry, and therefore does not allow for fishing opportunities. This analysis assumes that after four years of the plan, or 10 years after the previous attempt at stocking occurred, enough water will be in the reservoir that stocking will resume. Under this scenario, attempts would be made to stabilize the horse and burro populations at 800 horses and 90 burros, and significant refuge resources would continue to be put toward management of these animals. The annual refuge budget is assumed to remain consistent at current levels. As a result, this

alternative would continue to have a moderate beneficial impact through contributions of approximately $8.8 million in value added to the regional economy from direct expenditures for management of Sheldon Refuge, visitation expenditures, and associated direct and indirect employment of approximately 131 people. However, the continued presence and habitat degradation caused by feral horses and burros would have a long-term, moderate to major, adverse impact on nonuse and existence values associated with water quality, soil conservation, wildlife conservation, ecological integrity, biological diversity, and environmental health. Visitation is expected to increase steadily at a rate of about 1% annually, consistent with the rate of increase estimated over the past several decades

6.5.2 Alternative 2

Under Alternative 2, fishing efforts by recreational anglers would be assumed to follow the same pattern as under Alternative 1. However, due to the change in stocking from rainbow trout to a regionally indigenous species such as Lahontan cutthroat trout or redband trout in Big Spring Reservoir, the quality of the fishing experience for anglers is expected shift slightly. Some anglers prefer the larger size and more aggressive nature of rainbow trout opposed to Lahontan cutthroat trout, and for these anglers, the value from fishing within Sheldon Refuge would decrease. Other anglers prefer to catch cutthroat trout species considered indigenous to the region, and for these anglers the value of fishing would increase. These changes to the quality of the fishing experience are not expressly quantified, but overall we expect these changes would result in a negligible to minor adverse impact to the economic benefits from fishing within Sheldon Refuge due to the fact fishing opportunities for Lahontan cutthroat trout are currently provided at Catnip Reservoir, and while intermittent and somewhat unpredictable, the fishing opportunities for rainbow trout at Big Spring Reservoir would be lost. Visitation related to wildlife viewing and overall visitation to Sheldon Refuge would be assumed to increase under this alternative. This increase in visitation is an assumed result primarily of the construction of the new visitor contact station but is also expected to result from numerous other planned improvements to refuge facilities. Specifically, visitation is assumed to increase by 5,000 visitors over the course of the 15-year planning period.

Under Alternative 2, horse and burros would be removed from Sheldon Refuge within five years of initiation of the CCP. This analysis assumes that removal will occur in the fifth year of the plan's implementation, and that no additional horse and burro management costs will be incurred in later years of the plan. It is likely that stray animals may need to be removed periodically, even after the initial population removal. As such, this assumption may somewhat overstate the reduced forage consumed by these animals, as well as the reduced costs of collisions associated with these animals.

Because regional economic impacts are not easily summed across years, the impacts of the alternatives are presented for the tenth year of the plan's implementation. As shown in Table 6.2, Alternative 2 would provide the greatest contribution across all measurement categories (labor income, value added, output, and employment). Expenditures on Sheldon Refuge under Alternative 2 would contribute 142 jobs to the local economy, as compared to 131 under Alternative 1 and 123 under Alternative 3. Alternative 2 would provide $9.4 million in GSP, which is $0.6 million more than under Alternative 1 (7% more), and $1.1 million greater than under Alternative 3 (13% more). If the increase to values of soil conservation, wildlife conservation, ecological integrity, biological diversity, and environmental health from the removal of feral horses and burros are also added, Alternative 2 would have even greater short- and long-term beneficial impacts on the economic value and contribution of Sheldon Refuge to the regional economy when compared with Alternative 1 or 3.

Table 6.2 Comparison of Regional Economic Contribution of Management Alternatives (Industrial Economics 2010)

Activity	Alternative	Direct Expenditures	Regional Economic Contribution			
			Employment (Persons)	Employee Compensation	Value Added	Output
Fishing	1	$768,000	14	$377,277	$624,357	$676,878
	2	$768,000	14	$377,000	$624,000	$677,000
	3	$531,000	10	$261,000	$432,000	$468,000
Hunting	1	$494,000	10	$253,000	$409,000	$428,000
	2	$494,000	10	$253,000	$409,000	$428,000
	3	$494,000	10	$253,000	$409,000	$428,000
Wildlife Viewing	1	$3,030,000	55	$1,480,000	$2,470,000	$2,820,000
	2	$3,590,000	65	$1,750,000	$2,930,000	$3,340,000
	3	$3,030,000	55	$1,480,000	$2,470,000	$2,820,000
Revenue Payments	1	$303,000	4	$199,000	$268,000	$268,000
	2	$309,000	4	$203,000	$274,000	$274,000
	3	$285,000	4	$187,000	$252,000	$252,000
Budget expenditures	1	$3,800,000	48	$3,940,000	$5,010,000	$5,010,000
	2	$3,880,000	49	$4,020,000	$5,120,000	$5,120,000
	3	$3,570,000	45	$3,700,000	$4,710,000	$4,710,000
Total	**1**	**$8,390,000**	**131**	**$6,240,000**	**$8,780,000**	**$9,200,000**
	2	**$9,040,000**	**142**	**$6,610,000**	**$9,360,000**	**$9,840,000**
	3	**$7,910,000**	**123**	**$5,880,000**	**$8,270,000**	**$8,670,000**

Descriptions of alternatives are provided in the CCP.

6.5.3 Alternative 3

Under Alternative 3, fishing at Big Spring Reservoir is assumed to increase in the fourth year of the plan's implementation as in the other alternatives, but fade out at a steady rate until the fifteenth year of the plan's implementation, because no active management of the reservoir is planned and fish would not be restocked in the future. Visitation is expected to somewhat decrease due to degradation of existing facilities, particularly at primitive sites, which are likely to become overgrown. However, some increase in camping or other wilderness activities could occur in other areas as a result of the expected increase in quality of wildlife habitat, and thus an increase in opportunities for wildlife viewing. For the purposes of monetization of these changes, visitation is assumed to be the same as in Alternative 1. Horses and burros are removed over the course of the 15-year period under this alternative, and thus this analysis assumes that the forage consumed by these animals and the number of collisions expected decreases steadily over time to zero by the fifteenth year of the plan's implementation. Therefore, we anticipate the impacts to the regional economy from sport fishing would be somewhat less than under Alternative 1 or 2. Long-term contributions from refuge management expenditures and employment would also be less than under Alternatives 1 and 2 with no costs for feral horses and burros management after 15 years, and fewer costs for habitat management activities, and also less employment contribution from 123 jobs.

Figure 6.1 presents the regional economic contribution of Sheldon Refuge under each management alternative. In terms of net economic value, the analysis finds that Sheldon Refuge would provide $11.4 million in net economic value, which is $7.6 million more under Alternative 2 than Alternative 1, and $6.0 million more than Alternative 3. This total is estimated by subtracting the costs associated with the use of forage by horses and burros, as well as the annual costs of collisions with those animals from the consumer surplus values received from recreational activities from Sheldon Refuge.

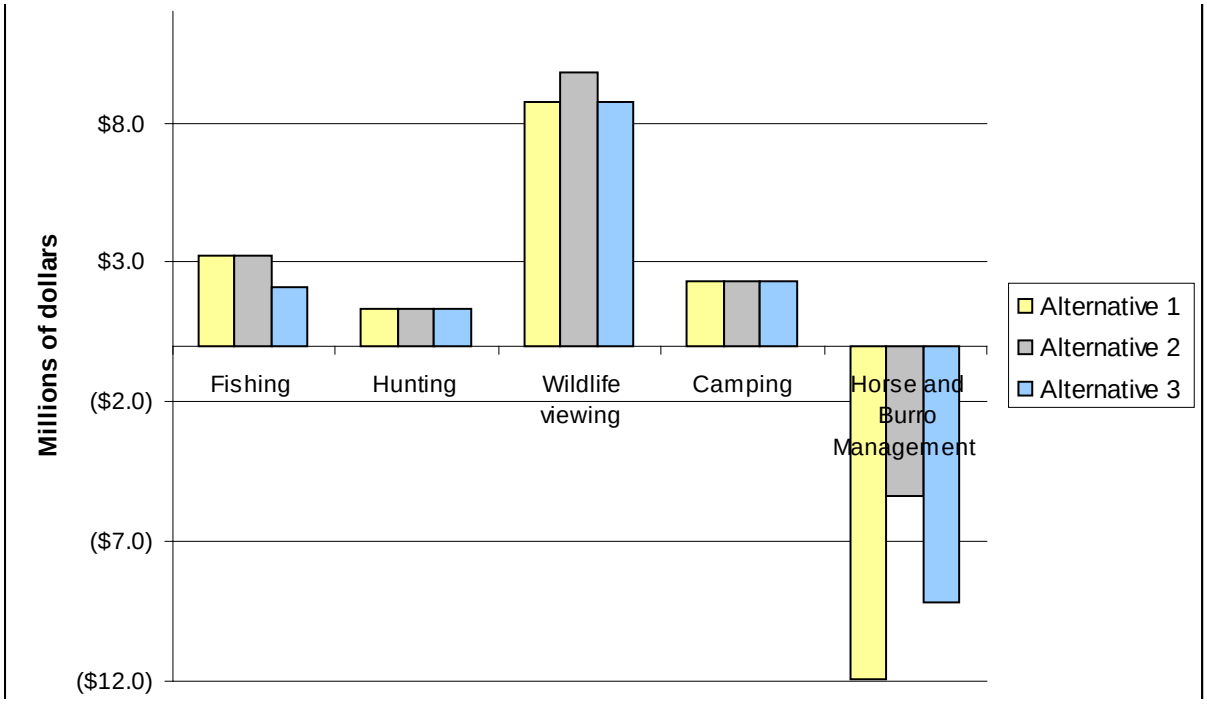


Figure 6.1 Comparison of net economic value of management alternatives, total present value over 15 years, discounted at 7% (Industrial Economics 2010).

6.6 Effects to Wilderness Character

Wilderness character has been described and defined in a variety of ways. The various definitions arise because much of wilderness quality is determined by personal perceptions and experiences. However, through the Wilderness Act of 1964 and national policy, the Service has defined four critical aspects of wilderness character: naturalness, untrammeled condition, solitude, and opportunities for primitive or unconfined recreation. These directives from the Wilderness Act, as well as Service Manual Sections 610 FW 1 through 4 and 6 RM 1.4, are summarized below.

Naturalness: Naturalness is a condition which either occurs, or appears to have occurred without human influence or interference. Recognizing that almost no lands exist without some alteration from human use or development, the Service manages wilderness to ensure natural conditions are not further degraded over time. Management activities or public uses which would cause these areas to appear less natural are therefore considered an adverse impact. For the purposes of this CCP, naturalness and impacts to naturalness are discussed throughout Chapters 3 through 6 for habitat types and associated fish and wildlife within Sheldon Refuge.

Untrammeled condition: This term is a key concept of wilderness management and is a term deliberately used in the Wilderness Act to defined wilderness character. Untrammeled condition refers to a lack of human intervention, alteration, control, or manipulation of natural conditions or processes. While management activities may be able to create conditions that appear more natural and that may in fact benefit the wilderness ecosystem, the very act of doing so is a trammeling of wilderness character. Therefore, any human activity that attempts to control or manipulate conditions or processes within wilderness represents an adverse impact to wilderness character.

Solitude: Solitude is a rather subjective condition based on an individual person's state of mind. The most effective way in which to manage for solitude is to ensure people have the opportunity to experience freedom from modern society, its inventions, and conventions. To create these opportunities we manage wilderness to provide privacy, isolation, and an absence of distractions or reminders of human activities. Therefore, any management action or public use that involves the use of mechanized or motorized equipment, unnatural noise or light, signs, structures, interaction with other groups of people, or that leaves evidence of human activities represents and adverse impact to opportunity for wilderness solitude. For the purposes of this CCP, opportunities for solitude and impacts to those opportunities are described and discussed along with opportunities for primitive undeveloped recreation and public uses.

Primitive or unconfined types of recreation: The opportunity for people to recreate and enjoy natural settings is one of the primary purposes for wilderness. To ensure these types of opportunities are provided for future generations and to protect other wilderness values, only primitive types of recreation are provided in these areas. Primitive recreation opportunities require few or no facilities and when facilities are provided their purpose is for public safety or resource protection rather than visitor convenience or comfort. Opportunities for unconfined recreation are provided by allowing visitors the freedom to explore and discover wilderness for themselves without being unnecessarily restricted by rules or regulations or confined to certain areas or destinations. As with visitor facilities, restrictions or limits on where, when, or how people can recreate within a wilderness area are developed to protect natural resources or to maintain certain opportunities for solitude. As with opportunities for solitude, opportunities for primitive or unconfined recreation and impacts to those

opportunities are described and discussed along with opportunities for primitive undeveloped recreation and public uses.

6.6.1 Alternative 1

6.6.1.1 Naturalness

Under this alternative a number of management activities would continue within Sheldon Refuge and the proposed wilderness areas. Management of water developments, wildlife guzzlers, historic structures, roads, trails, and routes, would maintain current conditions. Continued removal of abandoned fences within Sheldon Refuge and increased use of signs and law enforcement to discourage illegal OHV use are expected to somewhat improve natural appearance of Sheldon Refuge, with some adverse, minor, long-term impacts to the natural appearance along road corridors from additional signs.

Management of feral horse and burros populations would continue to have major adverse impacts on natural conditions both by the presence of these non-indigenous animals, the direct effects of trampling and grazing, and the indirect effects of competition and displacement of native wildlife. Over the long term, we anticipate these effects would increase as populations of horses and burros remain at approximately 800 and 90 animals respectively and cause further erosion, soil compaction, reduced vegetation cover and diversity, and competition with native wildlife in areas that have already been adversely impacted. These impacts would occur throughout Sheldon Refuge but would be particularly noticeable at springs and within riparian areas. In turn, the natural trends and dynamics of wildlife populations would be indirectly impacted as well. The continued presence of non-native fish would also adversely impact naturalness, but the presence of these populations in constructed reservoirs is expected to have a minor to negligible adverse impact on native aquatic plants and invertebrates.

Management direction under this alternative would include the use of mechanized equipment to mow vegetation as a means of connecting natural barriers, recently burned areas, roads, and other features to establish fire fuel breaks around priority areas for fire disturbance—from either natural fire or prescribed fire. The ultimate goal of these fuel breaks would be to reduce the level of suppression for natural fires when appropriate, and to prepare areas for planned prescribed burning. Mowing would adversely impact the natural appearance of these areas in the short term, but if successful, would improve natural conditions by requiring less than full suppression for some natural fires and restoring a more natural fire regime and mosaic of habitat types. The intensity of these benefits would increase over time as an increasing number of burned areas serve as additional fuel break further increasing the likelihood for natural fire and for restoring a more natural fire regime to Sheldon Refuge.

Prescribed burning would continue to repeatedly burn smaller areas with lower intensity than would otherwise occur as a result of natural fires. As a result, prescribed burning would indirectly lead to unnatural vegetation communities. Mechanical thinning of sagebrush and juniper would also affect natural character from the presence of sawn juniper stumps and burned piles of trees and limbs. However, in the long term, we expect the thinning of trees and shrubs from these habitats where they did not historically occur would restore a more natural vegetation composition and appearance to these portions of Sheldon Refuge. In a similar fashion, weed treatments would adversely affect natural character from the presence of dead vegetation and vehicle tracks, but in the long term, we anticipate these treatments would slow or possibly reverse the trend of weed invasion and spread,

which would restore a more natural vegetation composition and appearance to as many as 1,500 acres.

Suppression of most natural fires would continue under Alternative 1. The purpose of most fire suppression is to minimize the amount of area that would likely be invaded by non-native plants following such fires and to avoid the potential for large fires spreading across Sheldon Refuge and into adjacent lands. Invasion of cheatgrass is of particular concern, and where it has invaded following wildfire, the results have been lower plant diversity, increased soil erosion, reduced forage for native wildlife resulting lower wildlife diversity, and a much shorter return interval of lower intensity fires.

Overall, management activities would further degrade naturalness within large portions of Sheldon Refuge including all eight proposed wilderness areas. These widespread effects would result in a major, long-term adverse impact to wilderness character. It is uncertain if these actions would cause impacts beyond which natural conditions could be restored.

6.6.1.2 Untrammeled Conditions

Alternative 1 would continue to allow natural population dynamics to occur within Sheldon Refuge. The continued fishing for Lahontan cutthroat trout, rainbow trout, and various fish species in the Dufurrena Ponds and hunting of pronghorn, bighorn sheep, mule deer, and Greater sage-grouse would adversely impact individual animals, but based upon population monitoring results conducted cooperatively with the State of Nevada, we do not anticipate the level of fishing or hunting would be sufficient to alter natural population trends, fluctuations, or migrations. Sheldon Refuge would continue to capture, monitor, track, and study a variety of wildlife in pursuit of refuge purposes and the Refuge System mission. These activities interfere with the movement and activities of individual animals and often small groups of animals, but are not believed to alter longer-term movements, migration patterns, or population dynamics. As a result, study and monitoring of wildlife would continue to cause short-term, minor, but repeated, adverse impacts to untrammeled conditions.

Allowing water developments such as troughs, catchments, canals, and reservoirs to remain throughout Sheldon Refuge would continue to alter the natural timing, distribution, and flow of water and would continue to indirectly affect the location, distribution, and extent of associated riparian plant communities and wildlife. Due to the number of affected areas throughout Sheldon Refuge we anticipate direct impact impacts would be adverse, moderate to major, site specific, and long-term. Indirect impacts would be somewhat less intensive, but refuge-wide. Water guzzlers intended to increase populations of chukar partridge and bighorn sheep impound a relatively small percentage of rainfall within any particular drainage and have been shown to have little long-term effect on the target wildlife population levels or distribution. Therefore, guzzlers would continue to have negligible impact on untrammeled conditions.

The encroachment of sagebrush and western juniper into habitats where they are not thought to have historically or naturally occurred is the result of trammeling of wilderness character through aggressive fire suppression, but to the casual or uninformed observer these areas still appear natural. Additionally, several non-indigenous plants (weeds) are regularly detected or have already become well established in a variety of habitats. In an effort to restore more natural ecological condition to these habitats, continued trammeling of natural processes would occur through the mechanical removal, manipulation, and/or chemical treatment of vegetation. In addition, aggressive suppression

of natural fire would continue to alter and manipulate the natural fire regime and habitat succession throughout Sheldon Refuge.

Continued gathering and removal of feral horses and burros from Sheldon Refuge instead of allowing natural population control processes of starvation and disease would have a continued long-term impact on untrammeled wilderness character. Because gathers would continue annually under Alternative 1, these management actions represent a repeated, long-term moderate impact to untrammeled wilderness character intended to protect natural conditions and native habitats that remain.

In general, actions under this alternative would alter or attempt to alter major processes affecting habitat conditions and habitat succession throughout Sheldon Refuge. While the effects of some actions may not be readily apparent to the casual observer and may actually restore natural conditions, these actions are intended to manipulate existing conditions and represent a substantial trammeling of natural process and a major, long-term, adverse impact to wilderness character.

6.6.1.3 Solitude

Alternative 1 would maintain existing opportunities for solitude within much of Sheldon Refuge and the proposed wilderness areas. Current visitation to Sheldon Refuge has remained relatively low (less than 20,000 visits per year) when compared with surrounding areas. Opportunities for solitude in the Virgin Valley area would remain rare and would be found during winter months when few people visit for rock collecting or mining. Opportunities along County Road 8A and State Highway 140 would also remain rare as these routes are traveled throughout much of the year, weather permitting. Catnip Reservoir would remain a popular destination for anglers and hunters, but due to the limited number of campsites available at the reservoir, opportunities for solitude in the area surrounding Catnip Reservoir would continue.

Management activities within Sheldon Refuge would continue to cause some disturbance and diminish opportunities for solitude. Helicopters would continue to be used below 500 feet for gathering of horses and burros and for the inventory, monitoring, and study of large mammal populations. A variety of motorized vehicles and equipment would be used to conduct weed control treatments, fire suppression activities, prescribed burning, and thinning of sagebrush and juniper. The use of equipment and vehicles would be conducted during time of low public use when possible, but would continue to occur during the summer and fall seasons for most activities.

Additional long-term impacts to wilderness solitude would occur from the presence of stumps in areas of juniper removal and thinning, from the presence of mowed vegetation for fire suppression and prescribed burning containment lines, and from vehicle tracks created during most management activities.

Short-term adverse impacts would occur during peak periods of visitation and while management activities are conducted. For those people visiting while management activities are ongoing, these impacts would be readily seen and heard, resulting in a major impact to opportunities for solitude. Long-term, moderate, adverse impacts would occur at various locations throughout Sheldon Refuge as a result of more lasting visible evidence of multiple management activities.

6.6.1.4 Primitive and Unconfined Recreation

Opportunities for primitive and unconfined recreation would continue to be provided throughout Sheldon Refuge. With the exception of the Virgin Valley Campground, campgrounds would remain undeveloped but could include primitive fire rings for public safety and resource protection. The majority of roads would remain unmaintained, primitive vehicle routes suitable mostly for OHVs or high-clearance four-wheel drive use. Signs would continue to mark entrances to Sheldon Refuge, the refuge boundary, and trails closed to vehicle use. With the exception of the Devaney Campground, there would be no recreation facilities within the proposed wilderness areas.

Nearly the entire Sheldon Refuge is open to public recreation accessible from hundreds of miles of semi-primitive motorized routes. Backcountry areas of Sheldon Refuge are also accessible from former roads with open to cross-country hiking and horseback riding. Overnight camping is allowed throughout the refuge backcountry through an unlimited number of backcountry camping permits. Seasonal restrictions on public use would continue to occur during periods of extreme fire danger and for safety during certain management operations. Interactions with refuge staff and law enforcement officers would continue to be only occasional.

Overall, most visitors would find outstanding opportunity for primitive and unconfined recreation throughout most of Sheldon Refuge during all times of the year with little or no restrictions or interactions with refuge staff. This alternative would have a major long-term beneficial impact on opportunities for primitive and unconfined recreation.

6.6.2 Alternative 2

6.6.2.1 Naturalness

Under Alternative 2, a number of management activities would be implemented to restore the natural function and condition to various habitats throughout Sheldon Refuge. In addition to the continued removal of abandoned interior wire fences under Alternative 1, other actions would include removal of feral horses and burros, removal of abandoned livestock water developments and restoration of associated springs and riparian habitats, and restoration of approximately 1 mile of Virgin Creek watershed in the vicinity of Virgin Valley Ranch. These actions would noticeably improve both the natural appearance and natural ecological conditions and would have major, beneficial, long-term impacts on naturalness throughout Sheldon Refuge.

Prescribed burning would be substantially curtailed until feral horses and burros are removed, after which time the current program of prescribed burning would likely resume. As a result, habitats would be burned less often in the short term, but adverse, long-term, impacts from prescribed fires burning more frequently and at lower intensity than would naturally occur as identified under Alternative 1 would resume after five years. Under Alternative 2, thinning and removal of encroaching juniper would increase from the current average of 400 acres to 1,500 acres per year and would cause greater short-term, adverse impact the natural appearance of treated areas than under Alternative 1. However, greater long-term, beneficial impacts would occur with natural vegetation composition restored to approximately 16,500 more acres than under Alternative 1. These impacts would be most evident within the Rye Creek Proposed Wilderness Area where juniper has expanded into an estimated 5,000 acres of sagebrush habitat.

Compared with Alternative 1, weed treatments would increase from approximately 1,500 to 15,000 acres under Alternative 2, but the focus of treatments would be road corridors. Treatments along road corridors may be more effective in slowing the spread of weeds into undeveloped and more natural areas of Sheldon Refuge, but overall this strategy is expected to have only a slightly greater beneficial impact on naturalness when compared with Alternative 1.

Implementation of Alternative 2 would result in the designation of approximately 300 miles of roads for public vehicle access (65 fewer miles than under Alternative 1). In addition, if the wilderness recommendation is approved this alternative would re-open 38 miles that were officially closed as part of the 1974 wilderness proposal. These routes remain visible and their designation for motorized use would not result in any short-term impacts to naturalness. Several road segments have been identified for realignment and re-routing to minimize impacts to riparian areas. Approximately 12 miles of road segments that are re-routed under this alternative would be closed, rehabilitated, and camouflaged to create a more natural appearance and reduce the potential for further vehicle use and impacts to naturalness would be minimal over the short term. Over the long term, fewer roads and associated signs and other developments would be visible when compared with Alternative 1, but as public use continues to increase, we expect the need for additional signs, road maintenance, and other developments to ensure compatibility. Increased visitation to these areas would also increase the potential for introduction and spread of weeds and for the disturbance and displacement of wildlife.

We anticipate the actions under Alternative 2 would continue to result in some site-specific and localized, short- and long-term adverse impacts to naturalness, but impacts overall would be long-term and beneficial, as the natural appearance and ecological condition are restored to the majority of habitats throughout Sheldon Refuge.

6.6.2.2 Untrammeled Conditions

Under Alternative 2, hunting, fishing, monitoring and study of wildlife, prescribed burning, mechanical thinning of juniper, the maintenance and operation of several water developments (primarily the major reservoirs, Dufurrena Ponds, and guzzlers), and the gathering and removal of feral horses and burros would continue, similar to Alternative 1.

Unlike Alternative 1, this alternative would result in the manipulation of several water sources and riparian habitats in an effort to restore natural conditions, and would utilize more frequent gathers to manipulate feral horse and burro populations for removal. We expect Alternative 2 would result in more intensive manipulation and interference with natural processes over the short term, but would ultimately lead to less interference and manipulation over the long term when compared with Alternative 1.

6.6.2.3 Solitude

Under Alternative 2, most activities proposed under Alternative 1 would continue to occur—at least in the short term—and some activities (removal and thinning of juniper) would be more intensive with more frequent activities occurring over larger areas. In addition, we anticipate an additional 500 visitors per year as a result of the proposed visitor contact center located along Highway 140. Due to the limited number of campsites available and the implementation of fees for use at the Virgin Valley, Catnip Reservoir, and Big Spring Reservoir campgrounds and the opening of an additional 38 miles of roads for motorized use, we also anticipate increased use of primitive campgrounds, some increase in overnight backcountry use, and fewer opportunities for solitude near the Round,

Catnip and Devaney mountain areas, which are currently proposed for wilderness designation. Opportunities for solitude would continue to be available during substantial portions of the year, but when compared with Alternative 1, long-term and repeated short-term adverse impacts to solitude would be more intensive and would impact a greater number of visitors.

6.6.2.4 Primitive and Unconfined Recreation

The primary actions under this alternative affecting primitive and unconfined recreation would be the designation of 300 miles of semi-primitive motorized roads and the re-opening of 38 miles of additional routes for motorized use (assuming the preferred wilderness recommendation is approved). Most roads closed under this alternative would continue to be used intermittently for administrative purposes, but administrative vehicle use is expected to be less than public use and the effect would be a minor increase in opportunities for primitive recreation. This alternative would also result in greater management presence, development, and regulation at the Virgin Valley, Catnip, and Big Spring campgrounds. While these changes would be beneficial to visitors who prefer a more primitive setting, the decreased motorized access proposed under Alternative 2 would have only a minor, adverse, long-term impact on opportunities for motorized types of recreation due to the fact most roads closed to public vehicle use under this alternative are redundant with other nearby roads, are short dead-end roads, and are rarely used for access to wildlife-dependent public uses.

6.6.3 Alternative 3

6.6.3.1 Naturalness

When compared with Alternative 1 and 2, this alternative proposes the least amount of management intervention or manipulation of natural processes. However, this approach would not lead to more natural conditions in most cases, and is actually likely to result in less naturalness than under Alternative 1 or 2.

Feral horse and burros would be removed, but full implementation would take place over 15 years instead of five as proposed under Alternative 2, and current adverse impacts to soils, water quality, vegetation communities would diminish over the next 10 to 15 years. After 15 years beneficial impacts related to this action as described for Alternative 2 would occur. As a result, this alternative would have less intensive, short-term, adverse impacts throughout Sheldon Refuge when compared with Alternative 1, and would have the same major, beneficial impacts to natural appearance and ecological conditions as described for Alternative 2 over the long term.

As part of this alternative, the creation of fuel breaks would rely entirely on the location of natural barriers, recently burned areas, existing roads, and other existing features. Because mowing would not be conducted to connect these features, we expect adequate fuel breaks would be established around a fewer number of priority areas, but the size of each area would be larger than under the other alternatives. Areas identified for burning would retain their natural appearance, but the fewer number of fuel breaks and therefore fewer number of areas identified for burning throughout Sheldon Refuge would result in a higher likelihood for full suppression in response to natural fires. Consequently, this alternative would result in more natural appearing conditions in the short term without evidence of mowing or cutting to create fuel breaks or remove encroaching juniper, but a less natural fire regime and less natural ecological conditions over the long term when compared with Alternative 1 or 2.

Prescribed burning would be very limited under this alternative when compared with Alternative 1 or 2. Burning of emergent marshes and wet meadows would not resume after horses and burros are removed, mechanical treatments to reduce expanding juniper and sagebrush would not be used for habitat management, and natural fire would be the primary disturbance for most habitat types throughout Sheldon Refuge. However, the amount and type of vegetation that currently exists have resulted in a situation where natural fire has a high likelihood to burn much larger areas and with greater intensity than historically occurred under natural conditions. In addition to being more dangerous for firefighters, larger and more intense fires pose a greater risk of burning out of Sheldon Refuge where they would threaten life and/or property. Under Alternative 3 the higher potential for these risks would most likely result in continued rapid and full suppression for most fires, and without the benefit of more numerous fuel breaks as proposed under Alternative 1 or 2, would in turn increase the long-term risk for a single very large intense fire. Such a fire would not result in a mosaic of habitats thought to have historically occurred and could lead to large-scale establishment of cheatgrass and other invasive weeds causing major, long-term adverse impacts similar to those described under Alternative 1. These impacts would be expected to affect larger portions of Sheldon Refuge than under Alternative 1 or 2.

Removal of abandoned livestock developments would occur as part of Alternative 3 as under Alternative 2, but instead of active restoration work, natural erosion and hydrologic processes would be left to re-establish springbrook and stream channels, or in the case of catchment basins, to silt in over time. Over the short term this alternative would quickly improve the natural appearance through removal of human-made structures, but would have little effect on natural conditions. Natural processes will restore natural conditions over time, and this alternative would have a major, beneficial impact on previously developed sites, but impacts would only be realized over a period of 50 to 100 years or longer.

Alternative 3 proposes designating 289 miles of roads for motorized use (76 fewer miles when compared with Alternative 1) and would re-open 33 miles of routes for vehicle use (assuming the wilderness recommendation is approved). Most of the roads that would be closed to public vehicle access under this alternative would continue to be used intermittently for administrative purposes. As a result, beneficial, long-term impacts from fewer roads and associated signs would be negligible or minor and would affect a larger area in the southwest and eastern portions of Sheldon Refuge when compared with Alternative 2.

Alternative 3 would have substantial, long-term, beneficial impacts on the naturalness of Sheldon Refuge as a result of removing feral horses and burros and many abandoned livestock developments. Overall, these beneficial impacts would be offset by long-term adverse impacts from the continued lack of natural fire as a large-scale natural ecological disturbance, and designation of additional motorized routes.

6.6.3.2 Untrammeled Conditions

Under this alternative, hunting, fishing, monitoring and study of wildlife, and the maintenance and operation of several water developments (primarily the major reservoirs and Dufurrena Ponds), and the gathering and removal of feral horses and burros are the primary management activities which would adversely affect untrammeled conditions. As discussed under Alternative 1, the impacts from hunting, fishing, and the monitoring and study of wildlife would continue to cause short-term, minor, but repeated, adverse impacts to untrammeled conditions. Alternative 3 proposes maintenance of fewer water control structures, and little or no active restoration for areas where structures are

removed. As a result, this alternative has less impact on untrammeled conditions related to these structures and associated habitats than either Alternative 1 or 2. Gathering of feral horse and burros would have a medium-term impact on untrammeled conditions until removal is complete, but because the presence of these feral animals is already represents a trammeling of wilderness character, these impacts are considered negligible.

6.6.3.3 Solitude

As a result of consolidation of four existing campgrounds, discontinued stocking of Big Spring Reservoir, and continued use of the existing visitor contact space, we expect the total number of visitors to Sheldon Refuge would decrease slightly under Alternative 3. When compared with Alternative 1 or 2, Alternative 3 would result in fewer management activities and projects that would have a moderate, long-term, beneficial impact on opportunities for solitude throughout most of Sheldon Refuge. The designation of 76 fewer miles of roads for public vehicle access when compared with Alternative 1 would improve opportunities for solitude. However, impacts to solitude would only be minor because most roads would continue to be used intermittently for administrative purposes and because of redundancy with other routes nearby, their short length, or the lack public use. These benefits would be further diminished if the wilderness recommendation is approved and 33 miles of routes are re-opened for motorized vehicles in the Round, Catnip, and Devaney mountain portions of the refuge.

Except for those portions of Sheldon Refuge opened to public use of motorized vehicles and at the nine remaining designated campgrounds, this alternative would have the least overall impact on opportunities for solitude.

6.6.3.4 Primitive and Unconfined Recreation

Even though up to four campgrounds would be consolidated (resulting in a fewer number of larger campgrounds), the current level of development at designated campgrounds would continue to maintain the primitive condition of these facilities.

The primary actions under this alternative affecting primitive and unconfined recreation would be the designation of 76 fewer miles of semi-primitive motorized roads compared with Alternative 1 and the re-opening of 33 miles of routes (assuming the preferred wilderness recommendation is approved). However, routes closed under this alternative would continue to be used, but less frequently and only intermittently for administrative purposes. Beneficial impacts to opportunities for primitive recreation would be negligible or minor. Because the routes closed to public vehicle access under this alternative are considered redundant, are short dead-end routes, or are rarely used as access for wildlife-dependent uses—adverse impacts to opportunities for semi-primitive motorized recreation opportunities would also be considered negligible or minor.

6.7 Cumulative Effects

Cumulative effects can result from the incremental effects of a project when added to other past, present, and reasonably foreseeable future projects in the area. Cumulative impacts can result from individually minor but cumulatively significant actions over a period of time. This analysis is intended to consider the interaction of activities at Sheldon Refuge and with other actions occurring over a larger spatial and temporal frame of reference.

The Council on Environmental Quality regulations for implementing the provisions of NEPA define several different types of effects that should be evaluated in an EIS including direct, indirect, and cumulative. Direct and indirect effects are addressed in the resource-specific sections of this Draft CCP/EIS. This section addresses cumulative effects.

The CEQ provides the following definition of cumulative effects (40 CFR § 1508.7):

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.

It should be noted that the cumulative effects analysis has essentially been completed by virtue of the comprehensive nature by which direct and indirect effects associated with implementing the various alternatives was presented. The analysis in this section primarily focuses on effects of the preferred alternative actions associated with reasonably foreseeable future events and/or actions regardless of what entity undertakes that action.

6.7.1 Non-CCP Actions Occurring within Sheldon Refuge

6.7.1.1 Ongoing Mining Claim Access and Development within Virgin Valley

Within the boundaries of Sheldon Refuge, Virgin Valley contains many active mining claims. Access to claims must be made available. Additional refuge facilities in the Virgin Valley area are likely to attract additional visitors to that part of Sheldon Refuge. The proposed visitor contact station would be located along Highway 140 at the turnoff for the Virgin Valley region of Sheldon Refuge. In addition, an auto tour route is proposed in the area (likely using the Virgin Valley Road between Highway 140 and the Virgin Valley Ranch). It is likely that some increased road congestion may be experienced in the areas also used for mining claims access. Developed vehicle pullouts should lessen potential congestion impacts. It is also likely that competition may increase for facilities such as campsites primarily used by rock collectors.

A variety of activities associated with use of mining claims occurs within the Virgin Valley area of Sheldon Refuge. Major impacts associated with these activities are loss of habitat through mine development and excavation; wildlife displacement; increased soil erosion; reduced water quality in Virgin Creek from sedimentation, runoff, and drainage from mines and discarded rock debris; and introduction and spread of invasive non-native species,

Impacts from public use within Virgin Valley are considered minor or negligible in comparison to those from mining activities. However, public uses and associated facilities proposed in the preferred alternative would have a slightly greater cumulative adverse impact on refuge resources.

6.7.1.2 Ruby Pipeline Project

Ruby Pipeline, LLC (Ruby) has been issued permission through a Special Use Permit to use certain roads within Sheldon Refuge to access the pipeline construction route. The pipeline is being constructed south of Sheldon Refuge and not within any portion of Sheldon Refuge. In order to gain the extent of access Ruby required for pipeline construction, they have exchanged a 20-acre private inholding property for an easement to approximately 3.64 acres of Sheldon Refuge lands along Wall Canyon Road. The effects of this action were fully assessed in the Ruby Pipeline Project NEPA

process (FERC 2010; USFWS 2010b). The actions of the proposed CCP are not expected to have additional impacts to the habitats or refuge facilities associated with the Ruby Pipeline Project. The proposed CCP would apply management strategies consistently within Sheldon Refuge, including along the roads within Sheldon Refuge that are being used by Ruby for access to its construction zone.

6.7.1.3 Sheldon Refuge Mineral Withdrawal Renewal

Sheldon Refuge is currently in the process of extending the reviewing the existing (temporary) mineral withdrawal (slated to expire in April 2011) for another 20 years. The existing mineral withdrawal plan removes all but approximately 65,000 acres of Sheldon Refuge from mineral exploration. That means that approximately 446,000 acres of Sheldon Refuge are not longer open to staking mining claims and mineral exploration under the 1872 Mining Law. The strategies for management that are proposed in the CCP will be applied to the lands that are withdrawn from mineral location. The lands that remain open to mineral location/mining will need special consideration in the application of many of the CCP strategies. It will be challenging to apply some strategies to areas that are being actively mined. Cumulatively, the restricted ability to implement strategies is likely to result in continued negative impact to the resources occurring on those lands as described in Section 6.7.1.1.

6.7.2 Past and Present Actions/Decisions Occurring outside Sheldon Refuge

6.7.2.1 Pronghorn Management

The actions proposed in the CCP/EIS support improved pronghorn habitats. As a result, it is expected that the regional populations of the species will also experience a positive effect when considered in the context of other regional management decisions. Little scientific information is available to substantiate the migration corridors for the regional pronghorn populations. Anecdotal information and incidental observations support the opinion that pronghorn migrate between Sheldon Refuge and Hart Mountain to the north, parts of the Black Rock Desert-High Rock Canyon Emigrant Trails National Conservation Area to the south, and the Long Valley and Coleman, Nevada areas to the west. The NDOW objective of pronghorn management is to protect, maintain, or increase the resource for the enjoyment and use by the people now and in the future (Tsukamoto 1983). The management actions in the preferred alternative support the State's management objective and will aid in maintaining the migration corridors in northwestern Nevada.

6.7.2.2 Sage-grouse Management

Sheldon Refuge Greater sage-grouse habitat management strategies reinforce management guidelines developed for Nevada. The Greater Sage-Grouse Conservation Plan for Nevada and Eastern California (Sage-grouse Conservation Team 2004) identifies several conservation strategies including implementation and coordination approaches. USFWS is described in the conservation plan as an active partner in sage-grouse conservation efforts in both planning and implementing conservation strategies in Nevada and California. The Sheldon Refuge CCP strategies parallel and support the 2004 Greater Sage-Grouse Conservation Plan for Nevada and Eastern California. Habitat management actions of the preferred alternative would focus on improving sagebrush habitats. Sagebrush habitat improvements would primarily occur in the western portions of Sheldon Refuge. CCP management strategies for juniper removal in areas of encroachment also support improving

and increasing sage-grouse habitat. Oregon has also drafted a Greater sage-grouse strategy for conservation (see Section 6.7.3.3).

6.7.2.3 Wilderness Management

The areas proposed for wilderness management within Sheldon Refuge will complement the adjacent areas proposed or actively managed for wilderness by surrounding BLM districts. There are several areas within Sheldon Refuge that are proposed for wilderness areas (PWA) or wilderness study areas (PWSA). Of these, five are bounded by the refuge boundary in one area or another. Those five are Round Mountain PWA, Rye Creek PWA, Sage Hen Hills PWA, Big Mountain PWA, and Big Spring Table PWSA. Areas outside the refuge boundaries and adjacent to these PWAs and PWSA are BLM lands and are either currently managed as wilderness or have the potential for designation as wilderness. Management of the PWAs and PWSA within Sheldon Refuge will have a positive effect on the greater wilderness character of the adjacent BLM areas. The management strategies proposed for the Sheldon Refuge units will not only complement the wilderness character of the adjacent units, it will have a regionally beneficial impact of greater opportunities for a wilderness experience.

6.7.2.4 BLM Resource Management Plans

Lakeview, Andrews, Sonoma-Gerlach, Surprise, and Black Rock Desert—High Rock Canyon Emigrant Trails National Conservation Area

Grazing allotments

The BLM lands surrounding Sheldon Refuge are managed for multiple uses including grazing allotments. Grazing impacts to habitat have been discussed in detail in earlier sections of this analysis. It is expected that the animals that migrate on and off Sheldon Refuge (pronghorn, Greater sage-grouse, mule deer, etc.) will be impacted by the lesser quality habitat. Grazing reduces the quality of the habitat for the species that rely upon it and creates competition as those species vie for reduced resources.

Herd Management Areas

During the five-year removal period, it is likely that there will be a higher level of competition for adoption facility services. BLM manages several HMAs on the lands surrounding Sheldon Refuge and also relies on the same adoption market and facilities as does the Service. In addition, the current wild/feral horse and burro adoption market is relatively saturated. As a result, Sheldon Refuge and BLM may be in direct competition for both adoption facility services as well as the adoption market.

In addition, most of the HMAs surrounding Sheldon Refuge are exceeding their appropriate management levels. As a result, the same habitat degradation resulting from grazing pressures discussed above will also be present in the HMAs. Animals that migrate on and off Sheldon Refuge will be subjected to competing for this degraded habitat as well. Sheldon Refuge has entered into a cooperative agreement with BLM offices in Nevada, California, and Oregon to improve horse population monitoring and maintenance of management facilities such as boundary fences. Coordinated efforts as part of this agreement should improve the effectiveness and efficiency for management of Sheldon Refuge and the surrounding HMAs.

Amount of habitat open/closed to vehicle use

The preferred alternative includes opening a number of existing primitive unmaintained routes that are currently closed to public use. Many of the resource management plans for surrounding BLM areas include reducing the number of roads that are open to the public. Cumulatively, the increased road access areas on Sheldon Refuge may reduce pressure on BLM lands for access to remote areas.

Amount of habitat open/closed to livestock grazing, energy development, mining, rights-of-way, and other developments

As surrounding BLM districts implement their respective resource management plans, which include areas for livestock grazing, energy development, mining, rights-of-way development, and other economic use developments, habitat will be incrementally degraded. Like the impacts described above for grazing and HMA strategies, species migrating on and off Sheldon Refuge will face increased competition for degraded habitat resources.

6.7.3 Reasonably Foreseeable Actions Adjacent to or near Sheldon Refuge

6.7.3.1 Winnemucca Resource Management Plan

The BLM Winnemucca District is developing a resource management plan. The draft management plan EIS has been published; however, a ROD has not been signed and, thus, the selected alternative has not yet been published. Similar to the cumulative impacts described above regarding effects from the Sheldon Refuge CCP on other resource management plans, it is expected the CCP will have little, if any, cumulative impacts with the Winnemucca District Resource Management Plan.

6.7.3.2 Greater Sage-grouse Conservation Assessment and Strategy for Oregon

As with Nevada and eastern California sage-grouse conservation plan, the CCP's preferred alternative strategies support the Oregon sage-grouse conservation plan, which is currently in draft form. The management strategies outlined in the CCP's preferred alternative are in alignment with action guidelines described in the draft Oregon plan. The cumulative impacts expected from the CCP actions in relation to the Oregon sage-grouse conservation plan are beneficial.

Appendix A. Sheldon National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Impact Statement Public Involvement

Public involvement for the draft Sheldon CCP/EIS involved a number of announcements, Refuge planning updates, and meetings, both formal and informal. In response to these efforts, Sheldon Refuge received thousands of letters, emails, and phone calls from interested members of the public, non-profit organizations, state government agencies, and other federal agencies. This appendix summarizes the process used to involve the public and other interested parties.

Formal scoping for the EIS occurred between May 12, 2008, and June 30, 2008. As part of the formal scoping process, Sheldon Refuge issued a notice in the Federal Register and a planning update to notify the affected public of the opportunity to participate in the preparation of the CCP and encourage them to comment on preliminary refuge vision and goals; help identify potential issues, management actions and concerns, significant problems or impacts; and pursue opportunities or alternatives to resolve them (602 FW 3, 3.4(2b)). In addition, public meetings were held in area communities, and several additional meetings were held with the State of Nevada and key stakeholder groups. Following this formal scoping period, Sheldon Refuge contracted with an independent third party to produce a written report and summary of all scoping comments received. The full scoping report is available at the Sheldon Refuge planning webpage or upon written request.

After public scoping the planning team reviewed and evaluated all potential issues, management concerns, and problems and the opportunities to resolve them that the planning team, other Service personnel, partners, and the public identified in order to determine significant issues. The Service defines an issue as: "Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition (602 FW 1 1.6 K)." Significant issues typically are those that are within our jurisdiction, suggest different actions or alternatives, and will influence our decision (602 FW 3, 3.4(3b)).

After significant planning issues were identified, a second planning update for the Sheldon Refuge CCP was distributed to the public in April 2009. This planning update summarized the significant planning issues and scoping comments submitted. A preliminary set of draft management alternatives was developed based on scoping comments, expert opinion, and management policy. These preliminary draft alternatives, including the Service's preferred alternative, were presented to the public in a third planning update in June 2010, and comments from the public were solicited at that time. Following the release of the planning update, additional meetings were held with the State of Nevada and key stakeholder groups. Based upon comments received, Sheldon Refuge modified the preliminary draft alternatives to develop the draft alternatives presented in this CCP.

Outreach Efforts

Federal Register Notice of Intent to Prepare a CCP—published May 12, 2008

The Federal Register Notice included background information on Sheldon Refuge and preliminary issues with request for scoping comments.

Planning Update #1

The May 2008 Planning Update #1 was made available to USFWS staff and the general public throughout the scoping period, with 450 of 500 hardcopies distributed to Refuge office visitors and partners, scoping meeting attendees, and 66 individuals and 35 organizations on the mailing list. An electronic copy of the Planning Update was available for visitors to the USFWS website (http://www.fws.gov/pacific/planning/main/docs/NV/docssheldon.htm), and the website address was also included in a Dear Interested Party notification e-mail to 2,722 interested parties and USFWS staff members nationwide. The planning update included background information on Sheldon Refuge in addition to the preliminary goals and issues to be considered in the CCP. Information about the CCP process, an invitation to attend four public open house meetings, and a solicitation for comments were also included.

Planning Update #2

The April 2009 Planning Update #2 was mailed to all interested parties and summarized the results of the formal scoping process as part of the NEPA planning process.

Planning Update #3

The June 2010 Planning Update #3 was mailed to all interested parties and outlined the Service's preliminary draft alternatives for the Sheldon Refuge CCP.

Media Outreach and Press Coverage

A news release, entitled "Sheldon National Wildlife Refuge Kicks Off Comprehensive Conservation Planning with Four Public Open House Meetings," was released on May 5, 2008. The release was sent to a list serve of 45 media contacts and it was also posted on the Service's Region 1 website (accessed at: http://www.fws.gov/pacific/news/2008/SheldonCCPNR.pdf). The news release and associated planning activities resulted in various subsequent media articles.

Scoping Meetings

The scoping meetings began with a PowerPoint presentation giving an overview of Sheldon Refuge and the importance and logistics of the CCP process. Following the presentation, there were four informational tables staffed by refuge employees available to receive public questions.

The informational tables each featured different topics: wildlife and habitat management, public use and facilities, feral horses and burros, and the planning process. Presentations were given by the Project Leader with support from the Deputy Project Leader and Natural Resource Planner. Scoping meeting locations, dates, and times were as follows:

- Lakeview, Oregon, May 14, 2008, 6:00-9:00 pm
- Denio, Nevada, May 21, 2008, 6:00-9:00 pm
- Winnemuccca, Nevada, May 22, 2008, 6:00-9:00 pm
- Alturas, California, June 4, 2008, 6:00-9:00 pm
- Reno, Nevada, June 11, 2008, 6:00-9:00 pm

Meeting Invitations Mailed to Tribal Officials

A letter soliciting input from representatives of five tribes was mailed on September 4, 2008. This letter was mailed on behalf of Paul Steblein to the Burns Paiute Tribe, Fort Bidwell Paiute Tribe, Cedarville Rancheria Paiute Tribe, Fort McDermitt Paiute and Shoshone Tribe, and Summit Lake Paiute Tribe to invite their participation throughout the process.

An e-mail soliciting input from the Summit Lake Paiute Tribe to conduct formal consultation was sent August 6, 2010.

Meetings with Congressional Representatives and Senators or their Aides

Nevada State Legislature, Committee on Public Lands, Lovelock, Nevada, August 22, 2008

- USFWS Participants: Paul Steblein
- Other Participants: Approximately 60 people including citizens and staff from state agencies, federal agencies, and non-governmental organizations

Nevada Congressional Representatives, August 2010

- USFWS Participants: Robin West, Paul Steblein
- Other Participants: Congressman Heller's staff representative, Senator Reid's staff representative

Meetings with State Agency Representatives

Nevada Department of Wildlife (NDOW), Reno, Nevada, March 19, 2008

- USFWS Participants: Paul Steblein, Regional Refuge Chiefs, Field Supervisors, Planning Chief, and Project Leaders for Sheldon-Hart Mountain Refuge Complex and Desert Refuge Complex
- Other Participants: NDOW Director, Deputy Director, and Division Chiefs

NDOW, Reno, Nevada, August 26, 2010

- USFWS Participants: Paul Steblein, Regional Refuge Chiefs, Field Supervisors, Planning Chief, and Project Leaders for Regions 1 and 8, Sheldon-Hart Mountain Refuge Complex, Desert Refuge Complex, Stillwater Refuge, and Ruby Lake Refuge
- Other Participants: NDOW Director, Deputy Director, and Division Chiefs

Meetings with County Representatives

Modoc/Washoe Experimental Stewardship Program, Cedarville, Nevada, May 29, 2008

- USFWS Participants: Paul Steblein
- Other Participants: Approximately 30 people including public land managers and supporting staff, Natural Resource Conservation Service staff, local government officials, ranchers, and small business owners

Humboldt County Supervisor and Commissioners, Winnemucca, Nevada, July 21, 2008

- USFWS Participants: Paul Steblein
- Other Participants: Humboldt County supervisors and commissioners and approximately 20 citizens

Meetings with Federal Agency Representatives

Bureau of Land Management (BLM) District Managers, Lakeview, Oregon, November 7, 2007

- USFWS Participants: Paul Steblein, Sheldon-Hart Mountain staff
- Other Participants: BLM District Managers for Lake County District, Burns District, Winnemucca District, Surprise Valley Resource Area, Oregon State Horse Specialist, U.S. Geological Survey Project Leader for Horse and Burro Research

Meetings with Non-government Organizations

Nevada Bighorn Unlimited and Nevada Wildlife Coalition, Board of Directors, Reno, Nevada, June 10, 2008

- USFWS Participants: Paul Steblein
- Other Participants: Approximately 35 members of both Boards of Directors

Sierra Club, Tioyobe Chapter, Reno, Nevada, June 11, 2008

- USFWS Participants: Paul Steblein
- Other Participants: Three members of Board of Directors

Friends of Nevada Wilderness, Reno, Nevada, June 12, 2008

- USFWS Participants: Paul Steblein
- Other Participants: President of organization

Friends of Sheldon, Winnemucca, Nevada, August 21, 2008

- USFWS Participants: Paul Steblein
- Other Participants: Approximately 20 members, including wildlife sportsmen group members

Friends of Nevada Wilderness, Sierra Club, Nevada Bighorn Unlimited, Nevada Wildlife Coalition, and Safari Club International, Reno, Nevada, August 26, 2010

- USFWS Participants: Paul Steblein and Aaron Collins
- Other Participants: Approximately 60 members from the attending organizations.

Appendix B. Species List

Common Name	Scientific Name	Native, Introduced, or Hybrid	Sagebrush-Steppe Habitats[1]	Montane Sagebrush Steppe[2]	Emergent Marshes and Wet Meadows	Springs and Springbrooks	Ephemeral Wetlands[3]	Reservoirs and Other Artifical Riparian Habitats	Deciduous Woodlands and Shrublands (Aspen)	Mountain Mahogany and Western Juniper Woodlands	Cliffs, Canyons, and Barren Lands	Federal Status
			A= All life history requirements; B= Breeding; C=Cover; F=Foraging; M=Migrant; N=Nesting/Rearing/Fauning/Lambing; R= Roosting; S=Seasonal; X= Benefiting Species									
Amphibians												
Bullfrog	*Rana catesbeiana*	Int			A	A						
Columbia Spotted frog	*Rana luteiventris*	Nat			X	A		A				Candidate
Great Basin spadefoot toad	*Scaphiopus intermontanus*	Nat	X	X								
Pacific treefrog	*Hyla regilla*	Nat										
Birds												
American avocet	*Recurvirostra americana*	Nat			N	N	N, M, B, F	N				
American bittern	*Botaurus lentiginosus*	Nat			N	N	X	N				
American coot	*Fulica americana*	Nat										
American goldfinch	*Carduelis tristis*	Nat							X			
American kestrel	*Falco sparverius*	Nat		F	F	F	F	F				
American robin	*Turdus migratorius*	Nat										
American wigeon	*Anas americana*	Nat										
Ash-throated flycatcher	*Myiarchus cinerascens*	Nat							B	X		
Bald eagle	*Haliaeetus leucocephalus*	Nat	F		F	F	F	F	X			Listed Threatened
Bank swallow	*Riparia riparia*	Nat									X	
Barn swallow	*Hirundo rustica*	Nat										
Belted kingfisher	*Megaceryle alcyon*	Nat										
Black rosy finch	*Leucosticte atrata*	Nat									X	
Black swift	*Cypseloides niger*	Nat										

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Black tern	*Chlidonias niger*	Nat			S	S	S	S				
Black-billed magpie	*Pica pica*	Nat										
Black-capped chickadee	*Parus atricapillus*	Nat										
Black-crowned night heron	*Nycticorax nycticorax*	Nat			SM	SM	SM	SM				
Black-headed grosbeak	*Pheucticus melanocephalus*	Nat							X	X		
Black-necked stilt	*Himantopus mexicanus*	Nat			N	N	N	N				
Black-throated gray warbler	*Dendroica nigrescens*	Nat								B		
Black-throated sparrow	*Amphispiza bilineata*	Nat										
Blue-gray gnatcatcher	*Polioptile caerulea*	Nat							B	X		
Blue-winged teal	*Anas discors*	Nat			N	N	N	N				
Bobolink	*Dolichonyx oryzivorus*	Nat			X	X	X	X				
Brewer's blackbird	*Euphagus cyanocephalus*	Nat			X	X	X	X				
Brewer's sparrow	*Spezella breweri*	Nat	X	X						X		
Broad-tailed hummingbird	*Selasphorus platycercus*	Nat			X				B			
Brown-headed cowbird	*Molothrus ater*	Nat										
Bufflehead	*Bucephala albeola*	Nat										
California gull	*Larus californicus*	Nat										
California quail	*Lophortyx californicus*	Nat										
Calliope hummingbird	*Stellula calliope*	Nat			X	X	X	X	B			
Canada goose	*Branta candensis*	Nat			N	N	N	N				
Canvasback	*Aythya valisineria*	Nat			N	N	N	N				
Canyon wren	*Catherpes mexicaus*	Nat									B	

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Caspian tern	*Hydoprogne caspia*	Nat										
Cassin's finch	*Carpodacus cassinii*	Nat							B	X		
Cedar waxwing	*Bombycilla cedrorum*	Nat							X			
Chipping sparrow	*Spizella passerina*	Nat								X		
Chukar	*Alectoris graeca*	Nat										
Cinnamon teal	*Anas cyanoptera*	Nat	N	N	N	N		X				
Clark's grebe	*Aechmophorus clarkii*	Nat			S	S	S	S				
Cliff swallow	*Petrocelidon pyrrhonota*	Nat									B	
Common bushtit	*Psaltriparus minimus*	Nat										
Common crow	*Corvus brachyrhynchos*	Nat										
Common egret	*Casmerodius albus*	Nat										
Common goldeneye	*Bucephala clangula*	Nat										
Common loon	*Gavia immer*	Nat						A				
Common merganser	*Mergus merganser*	Nat										
Common nighthawk	*Chordeiles minor*	Nat										
Common poorwill	*Phalaenoptilis nuttallii*	Nat										
Common raven	*Corvus corax*	Nat									B	
Common snipe	*Capella galliango*	Nat			N	N	N	N				
Common yellowthroat	*Geothlypis trichas*	Nat										
Cooper's hawk	*Accipiter cooperii*	Nat							X	N, M		
Curve-billed thrasher	*Toxostoma cirvirostre*	Nat										
Dark-eyed junco	*Junco hyemalis*	Nat										
Dipper	*Cinclus mexicanus*	Nat										
Double-crested cormorant	*Phalacrocorax auritus*	Nat			SM	SM	SM	SM				
Downy woodpecker	*Dendrocopos pubescens*	Nat							X			

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Dusky flycatcher	*Empidonax oberholseri*	Nat							B	B		
Eared grebe	*Podiceps caspicus*	Nat			S	S	S	S				
Eastern kingbird	*Tyrannus tyrannus*	Nat										
European starling	*Sturnus vulgaris*	Nat										
Ferruginous hawk	*Buteo regalis*	Nat	F	F	F	F	F	F		N	X	Candidate
Forster's tern	*Sterna forsteri*	Nat			S	S	S	S				
Fox sparrow	*Passerella iliaca*	Nat			X	X	X	X		B		
Gadwall	*Anas strepera*	Nat			N	N	N	N				
Golden eagle	*Aquila chrysaetos*	Nat		F	F	F	F	F		N	B	
Golden-crowned kinglet	*Regulus satrapa*	Nat								X		
Gray flycatcher	*Empidonax wrightii*	Nat	S							N, B		
Great blue heron	*Ardea herodias*	Nat										
Great horned owl	*Bubo virginianus*	Nat							X	N		
Greater sage-grouse	*Centrocerus urophasianus*	Nat	N	N, B	X	N	N	N				Candidate
Greater sandhill crane	*Grus canadensis*	Nat			N,SM	SM	N, S, M, B, F	X				
Greater yellowlegs	*Tringa melanoleucus*	Nat			S	S	S	S				
Green-tailed towhee	*Chlorura chlorura*	Nat	X	X								
Green-winged teal	*Anas carolinensis*	Nat	N	N	N	N						
Hairy woodpecker	*Dendrocopos villosus*	Nat							X			
Hammond's flycatcher	*Empidonax hammondii*	Nat								X		
Hermit thrush	*Cathearus guttata*	Nat										
Hooded merganser	*Lophodytes cucullatus*	Nat										
Horned grebe	*Podiceps auritus*	Nat			S	S	S	S				
Horned lark	*Eremophila alpestris*	Nat	S	B								

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House finch	*Carpodacus mexicanus*	Nat										
House sparrow	*Passer domesticus*	Nat										
House wren	*Troglodytes aedon*	Nat										
Hungarian (gray) partridge	*Perdix peridix*	Nat										
Juniper titmouse	*Baeolophus ridgwayi*	Nat								N, B		
Killdeer	*Charadrius vociferus*	Nat			N	N	N	N				
Lark sparrow	*Chondestes grammacus*	Nat	S									
Lazuli bunting	*Passerina amoena*	Nat			B, N, M				B			
Least sandpiper	*Calidris minutilla*	Nat			X							
Lesser scaup	*Aythya affinis*	Nat										
Lesser yellowlegs	*Trina flavipes*	Nat			S	S	S	S				
Lewis' woodpecker	*Asyndesmus lewis*	Nat							B			
Lincoln's sparrow	*Melospinza lincolnii*	Nat										
Loggerhead shrike	*Lanius ludovicianus*	Nat	S	X						X		
Long-billed curlew	*Numenius americanus*	Nat			B, F	X	X	X				
Long-billed dowitcher	*Limnodromus scolopaceus*	Nat			X							
Long-billed marsh wren	*Telmatodyts palustris*	Nat										
Long-eared owl	*Asio otus*	Nat	F	F	F	F	F	F	X			
MacGillivray's warbler	*Oporornis tolmiei*	Nat							B	X		
Mallard	*Anas platyrynchos*	Nat			N	N	N	N				
Merlin	*Falco columbarius*	Nat										
Mountain bluebird	*Sailia Currucoides*	Nat		B	X					X	X	
Mountain chickadee	*Parus gambeli*	Nat								B		
Mountain quail	*Oreortyx pictus*	Nat				S						

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Mourning dove	*Zenaida macroura*	Nat										
Nashville warbler	*Vermivora ruficapilla*	Nat								X		
Northern flicker	*Colaptes auratus*	Nat							B			
Northern goshawk	*Accipiter gentilis*	Nat							N, R, F	N		Candidate
Northern harrier	*Circus cyaneus*	Nat		F	F	F	F	F				
Northern oriole	*Icterus galbula*	Nat							B			
Northern phalarope	*Lobipes lobatus*	Nat										
Northern phalarope	*Lobipes lobatus*	Nat					X					
Northern pintail	*Anas acuta*	Nat			N	N	N	N				
Northern saw-whet owl	*Aegolius acadicus*	Nat							X	N		
Northern shoveler	*Anas clypeata*	Nat			N	N	N	N				
Northern shrike	*Lanius excubitor*	Nat		F					X	X		
Olive-sided flycatcher	*Nuttallornis borealis*	Nat							X	X		
Orange-crowned warbler	*Vermivora celata*	Nat							B	X		
Osprey	*Pandion haliaetus*	Nat							X			
Peregrine falcon	*Falco peregrinus*	Nat									X	Listed Endangered
Pied-billed grebe	*Podilymbus podiceps*	Nat			S	S	S	S				
Pine siskin	*Spinus spinus*	Nat								X		
Plain titmouse	*Parus inornatus*	Nat										
Prairie falcon	*Falco mexicanus*	Nat	F	X							N, B	
Purple finch	*Carpodacus purpureus*	Nat										
Red-breasted nuthatch	*Sitta canadensis*	Nat								X		
Red-breasted	*Sphyrapicus ruber*	Nat							X			

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sapsucker												
Redhead	*Aythya americana*	Nat			N	N	N	N				
Red-naped sapsucker	*Sphyrapicus nuchalis*	Nat							R, N, F	X		
Redtailed hawk	*Buteo jamaicensis*	Nat	F	F					X	N		
Red-winged blackbird	*Agelaius phoeniceus*	Nat			X	X	X	X				
Ring-billed gull	*Larus delawarensis*	Nat										
Ring-necked duck	*Aythya colalris*	Nat										
Ring-necked pheasant	*Phasianus colchicus*	Nat										
Rock wren	*Salpinctes obsoletus*	Nat									B	
Rough-legged hawk	*Buteo lagopus*	Nat		F	F	F	F	F		N		
Rough-winged swallow	*Stelgidopteryx ruficollis*	Nat									B	
Ruby-crowned kinglet	*Regulus calendula*	Nat								B		
Ruddy duck	*Oxyura jamaicensis*	Nat			N	N	N	N				
Rufous hummingbird	*Selasphorus rufus*	Nat			X		X	X	B			
Rufous-sided towhee	*Pipilo erythophthalmus*	Nat										
Sage sparrow	*Amphispiza belli*	Nat	N	X								
Sage thrasher	*Oreoscoptes monatus*	Nat	N	X								
Savannah sparrow	*Paserculus sandwichensis*	Nat		B	X	X	X	X				
Say's phoebe	*Sayornis saya*	Nat	S								B	
Screech owl	*Otus asio*	Nat										
Sharp-shinned hawk	*Accipiter striatus*	Nat							X	N		
Short-eared owl	*Asio flammeus*	Nat		F	F	F	F	F				
Snow goose	*Chen caerulescens*	Nat										

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Snowy egret	*Egretta thula*	Nat			X			X				
Solitary sandpiper	*Tringa solitaria*	Nat			S	S	S	S				
Song sparrow	*Melospinza melodia*	Nat										
Sora rail	*Porzana carolina*	Nat			N	N	N	N				
Spotted sandpiper	*Actitis macularia*	Nat			N	N	N	N				
Swainson's hawk	*Buteo swainsoni*	Nat		X	F	F	F	F	X	X		
Swainson's thrush	*Catharus ustulatus*	Nat							B			
Townsend's solitare	*Myaestes townsendi*	Nat								B		
Townsend's warbler	*Dendroica townsendi*	Nat								X		
Tree swallow	*Iridoprocne bicolor*	Nat							B			
Turkey vulture	*Cathartes aura*	Nat										
Varied thrush	*Ixoreus naevius*	Nat							X			
Vesper sparrow	*Pooecetes gramineus*	Nat	S	B	X	X	X	X				
Violet-green swallow	*Tachycineta thalassina*	Nat									B	
Virginia rail	*Rallus limicola*	Nat			N	N	N	N				
Warbling vireo	*Vireo gilvus*	Nat							B			
Water pipit	*Anthus spinoletta*	Nat										
Western bluebird	*Sialia mexicana*	Nat			X	X	X	X	X	N		
Western burrowing owl	*Speotyto cunicalaria*	Nat	X	N, B								
Western grebe	*Aechmophorus occidentalis*	Nat			X			A				
Western kingbird	*Tyrannus verticalis*	Nat	S									
Western least bittern	*Ixobrychus exilis hesperis*	Nat			X			X				
Western meadowlark	*Sturnella neglecta*	Nat	S	B								
Western sandpiper	*Calidris mauri*	Nat			S	S	S	S				
Western screech owl	*Otus asio*	Nat			F	F	F	F	X			

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Western scrub jay	*Aphelocoma californica*	Nat								B		
Western snowy plover	*Charadrius alexandrinus*	Nat			S	S	S	S				
Western tanager	*Piranga ludoviciana*	Nat								X		
Western wood pewee	*Contopus sordidulus*	Nat										
Whistling swan	*Olor columbianus*	Nat										
White pelican	*Pelecanus erythrorhynchos*	Nat										
White-crowned sparrow	*Zonotrichia leucophrys*	Nat										
White-faced ibis	*Plegadis chihi*	Nat										Vulnerable
White-fronted goose	*Anser albifrons*	Nat										
White-throated swift	*Aeronautes saxatalis*	Nat	S								B	
Willet	*Catoptrophorus semipalmatus*	Nat			N	N	N	N				
Willow flycatcher	*Empidonax traillii*	Nat							X			
Wilson's phalarope	*Steganopus tricolor*	Nat			N	N	N	N				
Wilson's warbler	*Wilsonia pusilla*	Nat							N, B			
Wood duck	*Aix sponsa*	Nat										
Yellow warbler	*Dendroica petechia*	Nat							B			
Yellow-bellied sapsucker	*Sphyrapicus varius*	Nat										
Yellow-breasted chat	*Icteria virens*	Nat							N, B			
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	Nat						A				
Yellow-rumped warbler	*Dendrocia coronata*	Nat								B		
Fishes												

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Alvord chub	*Gila alvordensis*	Nat				A						
Alvord cutthroat trout	*Oncorhynchus clarki alvordensis*	Nat				A		A				Extinct / Endangered
Brown trout	*Salmo trutta*	Int										
Guppy	*Poecilia reticulata*	Int										
Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	Nat				X		A				Reintroduced /Threatened
Largemouth bass	*Micropterus salmoides*	Int										
Mosquitofish	*Gambusia affinis*	Int										
Pumpkinseed sunfish	*Lepomis gibbosus*	Int										
Rainbow / Alvord cutthroat trout hybrid	*Salom gairdneri* x *Oncorhynchus clarki*	Hyb						X				
Rainbow trout	*Salmo gairdneri*	Int				X						
Sheldon tui chub	*Gila bicolor eurysoma*	Nat				A		A				
White crappie	*Poxomis annularis*	Int										
Yellow perch	*Perca flavescens*	Int										
Invertebrates (aquatic)												
	Aeschna interrupta nevadensis	Nat				A	X					
	Agabus spp.	Nat				A	X					
	Agapetus sp.	Nat				A	X					
	Ametor scabrosus	Nat				A	X					
	Amphiagrion abbreviatum	Nat				A	X					
	Apsectrotanypus sp.	Nat				A	X					
	Argia nr. *vivida*	Nat				A	X					

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	Argia sp. (nr. *Hyponeura lugens*)	Nat				A	X					
	Arrenurus sp.	Nat				A	X					
	Artemia nr. *franciscana*	Nat				A	X					
	Baetis sp.	Nat				A	X					
	Belonia saturata	Nat				A	X					
	Belostoma bakeri	Nat				A	X					
	Berosus nr. *styliferus*	Nat				A	X					
	Bezzia/Palpomyia sp.	Nat				A	X					
	Branchinecta coloradensis	Nat				A	X					
	Branchinecta gigas	Nat				A	X					
	Brillia sp.	Nat				A	X					
	Buenoa sp.	Nat				A	X					
	Caenestheriella setosa	Nat				A	X					
	Caenis sp.	Nat				A	X					
	Callibaetis nr. *californicus*	Nat				A	X					
	Cenocorixa wileyae	Nat				A	X					
	Ceratopogon sp.	Nat				A	X					
	Ceriodaphnia reticulata	Nat				A	X					
	Chaetocladius nr. *vitellinus group*	Nat				A	X					
	Chaoborus sp.	Nat				A	X					
	Chironomus sp.	Nat				A	X					
	Chrysops sp.	Nat				A	X					
	Cinygmula spp.	Nat				A	X					
	Cleptelmis addenda	Nat				A	X					
	Clinocera (*Hydrodromia*) sp.	Nat				A	X					

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	Coenagrion/Enallagma sp.	Nat				A	X					
	Colymbetes nr. *rugipennis*	Nat				A	X					
	Coptotomus nr. *longulus*	Nat				A	X					
	Coptotomus sp.	Nat				A	X					
	Corynoneura lobata	Nat				A	X					
	Corynoneura nr. *lacustris*	Nat				A	X					
	Corynoneura scutellata	Nat				A	X					
	Cricotopus nr. *bicintus group*	Nat				A	X					
	Cricotopus sp.	Nat				A	X					
	Cricotopus sylvestris group	Nat				A	X					
	Cricotopus tremulus group	Nat				A	X					
	Cricotopus trifascia group	Nat				A	X					
	Cryptotendipes sp.	Nat				A	X					
	Cypridopsis nr. *vidua*	Nat				A	X					
	Daphnia middendorffiana	Nat				A	X					
	Daphnia nr. *schodleri*	Nat				A	X					
	Daphnia pulex	Nat				A	X					
	Derotanypus sp.	Nat				A	X					
	Diamesa sp.	Nat				A	X					
	Diaphanosoma birgei	Nat				A	X					
	Dicranota sp.	Nat				A	X					
	Dixa sp.	Nat				A	X					
	Dixella sp.	Nat				A	X					
	Dugesia nr. *dorotocephala*	Nat				A	X					
	Dytiscus nr. *marginicollis*	Nat				A	X					
	Dytiscus sp.	Nat				A	X					

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	Enallagma boreale	Nat				A	X					
	Enallagma civile	Nat				A	X					
	Enallagma clausum	Nat				A	X					
	Enochrus nr. *cristatus*	Nat				A	X					
	Enochrus nr. *hamiltoni*	Nat				A	X					
	Epeorus (*Iron*) *albertae*	Nat				A	X					
	Ephemerella infrequens	Nat				A	X					
	Ephydra (*Hydropyrus*) *hians*	Nat				A	X					
	Erpetogomphus (nr. *designatus*)	Nat				A	X					
	Erpobdella punctata	Nat				A	X					
	Eubrianax edwardsi (*?*)	Nat				A	X					
	Eukiefferiella claripennis group	Nat				A	X					
	Eukiefferiella gracei group	Nat				A	X					
	Eukiefferiella nr. *brehmi*	Nat				A	X					
	Eukiefferiella nr. *pseudomontana*	Nat				A	X					
	Eukiefferiella sp. *undetermined*	Nat				A	X					
	Gammarus lacustris	Nat				A	X					
	Gerris incognitus	Nat				A	X					
	Gerris incurvatus	Nat				A	X					
	Gerris nr. *gillettei*	Nat				A	X					
	Gerris nyctalis	Nat				A	X					
	Gerris remigis	Nat				A	X					
	Glossiphonia complanata	Nat				A	X					
	Glyptotendipes sp. *Group A* (*Wiederholm*)	Nat				A	X					
	Gordius sp.	Nat				A	X					

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	Graphoderus sp.	Nat				A	X					
	Gumaga sp.	Nat				A	X					
	Gyraulus sp.	Nat				A	X					
	Gyrinus consobrinus	Nat				A	X					
	Haemopis marmorata	Nat				A	X					
	Haliplus robertsi	Nat				A	X					
	Haliplus sp. *undetermined*	Nat				A	X					
	Helisoma sp.	Nat				A	X					
	Helobdella stagnalis	Nat				A	X					
	Helophorus nr. *lecontei*	Nat				A	X					
	Hesperocorixa laevigata	Nat				A	X					
	Hesperodiaptomus eiseni	Nat				A	X					
	Hesperodiaptomus franciscanus	Nat				A	X					
	Hesperodiaptomus nevadensis	Nat				A	X					
	Hesperophylax sp.	Nat				A	X					
	Heterlimnius corpulentus	Nat				A	X					
	Hyallela azteca	Nat				A	X					
	Hydrachna sp.	Nat				A	X					
	Hydrobius fuscipes	Nat				A	X					
	Hydroporus sp.	Nat				A	X					
	Hydropsyche oslari	Nat				A	X					
	Hydroptila sp.	Nat				A	X					
	Hygrotus masculinus	Nat				A	X					
	Hygrotus nr. *collatus*	Nat				A	X					
	Hygrotus nr. *tumidiventris*	Nat				A	X					
	Hygrotus sp. *undetermined*	Nat				A	X					

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	Ischnura cervula	Nat				A	X					
	Ischnura sp. *undetermined*	Nat				A	X					
	Isoperla nr. *quinquepunctata*	Nat				A	X					
	Juga (*Oreobasis*) *laurae*	Nat				A	X					
	Laccobius nr. *agilis*	Nat				A	X					
	Laccobius nr. *nevadensis*	Nat				A	X					
	Laccophilus decipiens	Nat				A	X					
	Lamproscatella (*Haloscatella*) nr. *nivosa*	Nat				A	X					
	Larsia sp.	Nat				A	X					
	Lepidostoma sp. (*turret case*)	Nat				A	X					
	Lepidurus lemmoni	Nat				A	X					
	Lestes congener	Nat				A	X					
	Libellula (nr. *forensis*)	Nat				A	X					
	Limnephilus sp.	Nat				A	X					
	Limnesia sp.	Nat				A	X					
	Limnophora sp.	Nat				A	X					
	Limoniinae sp. (*undetermined*)	Nat				A	X					
	Listronotus sp.	Nat				A	X					
	Lynceus brachyurus	Nat				A	X					
	Malenka sp.	Nat				A	X					
	Megalocypris nr. *alba*	Nat				A	X					
	Meropelopia sp.	Nat				A	X					
	Metriocnemus hygropetricus group	Nat				A	X					
	Microcylloepus similis	Nat				A	X					
	Microcylloepus thermarum	Nat				A	X					

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	Micropsectra sp.	Nat				A	X					
	Microtendipes pedellus group	Nat				A	X					
	Nanocladius nr. *bicolor group*	Nat				A	X					
	Narpus concolor	Nat				A	X					
	Notonecta kirbyi	Nat				A	X					
	Notonecta sp.	Nat				A	X					
	Notonecta undulata	Nat				A	X					
	nr. *Ergasilus* sp.	Nat				A	X					
	nr. *Huitfeldtia rectipes*	Nat				A	X					
	nr. *Hyperodes* sp.	Nat				A	X					
	Ochrotrichia sp.	Nat				A	X					
	Ochthebius nr. *interruptus*	Nat				A	X					
	Ochthebius sp. *undetermined*	Nat				A	X					
	Odondomyia (*Odontomyia*) sp.	Nat				A	X					
	Odontomyia (*Catatasina*) sp.	Nat				A	X					
	Oecetis nr. sp. *A* (*Floyd 1995*)	Nat				A	X					
	Oecetis sp. *undetermined*	Nat				A	X					
	Oigochaeta - unidentified	Nat				A	X					
	Ophiogomphus nr. *morrisoni*	Nat				A	X					
	Optioservus divergens	Nat				A	X					
	Optioservus quadrimaculatus	Nat				A	X					
	Ormosia sp.	Nat				A	X					
	Orthocladinae spp. (*undetermined*)	Nat				A	X					
	Ostracoda - unidentified	Nat				A	X					
	Oxyethira sp.	Nat				A	X					
	Pagastia sp.	Nat				A	X					

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	Paraleptophlebia sp.	Nat				A	X					
	Parapsyche sp.	Nat				A	X					
	Paratanytarsus sp.	Nat				A	X					
	Parochlus sp.	Nat				A	X					
	Parydra (*Chaetoapnaea*) nr. *pedalis*	Nat				A	X					
	Pelina trunculata	Nat				A	X					
	Peltodytes callosus	Nat				A	X					
	Pericoma sp.	Nat				A	X					
	Phaenopsectra sp.	Nat				A	X					
	Physa sp.	Nat				A	X					
	Physella sp.	Nat				A	X					
	Piona sp.	Nat				A	X					
	Pisidium sp.	Nat				A	X					
	Polycentropus sp.	Nat				A	X					
	Potamocypris sp. *A*	Nat				A	X					
	Potamocypris sp. *B* (*thermal*)	Nat				A	X					
	Potamonectes griseostriatus	Nat				A	X					
	Potamonectes striatellus	Nat				A	X					
	Procladius (nr. *Holotanypus*) sp.	Nat				A	X					
	Procladius sp.	Nat				A	X					
	Psectrocladius nr. *flavus*	Nat				A	X					
	Psectrocladius nr. *psilopterus group*	Nat				A	X					
	Psectrocladius sordidellus group	Nat				A	X					
	Psectrotanypus sp.	Nat				A	X					

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	Pseudodiamesa (*Pseudodiamesa*) sp.	Nat				A	X					
	Pyrgulopsis sp.	Nat				A	X					
	Rhantus binotatus	Nat				A	X					
	Rhantus gutticollis	Nat				A	X					
	Rheotanytarsus sp.	Nat				A	X					
	Rhyacophila sibirica group (nr. *visor*)	Nat				A	X					
	Scatella (*Scatella*) *obsoleta group*	Nat				A	X					
	Scirtes sp.	Nat				A	X					
	Setacera aldrichi	Nat				A	X					
	Sialis sp.	Nat				A	X					
	Sigara nr. *nevadensis*	Nat				A	X					
	Sigara omani	Nat				A	X					
	Simulium sp.	Nat				A	X					
	Stagnicola sp.	Nat				A	X					
	Sweltsa sp.	Nat				A	X					
	Synorthocladius sp.	Nat				A	X					
	Tanytarsus sp.	Nat				A	X					
	Thaumalea sp.	Nat				A	X					
	Thermacarus - sp. *nova* (*new species*)	Nat				A	X					
	Thermacarus nevadensis	Nat				A	X					
	Thienemannia nr. *gracilis*	Nat				A	X					
	Thienemanniella nr. *clavicornis*	Nat				A	X					
	Thienemanniella nr. *similis*	Nat				A	X					
	Thienemannimyia sp.	Nat				A	X					

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	Triaenodes nr. *ignitus*	Nat				A	X					
	Tricorythodes nr. *minutus*	Nat				A	X					
	Tropisternus ellipticus	Nat				A	X					
	Tropisternus lateralis	Nat				A	X					
	Tvetenia bavarica group	Nat				A	X					
	Unidentified sp.	Nat				A	X					
	Wormaldia sp.	Nat				A	X					
	Zaitzevia parvula	Nat				A	X					
Invertebrate - Butterfly												
Alexander's sulpher	*Colias alexandra*	Nat										
Alpine green hairstreak	*Callophrys lemberti*	Nat										
Ampelo ringlet	*Coenonympha ampelos*	Nat										
Anicia checkerspot	*Euphydryas anicia*	Nat										
Anise Swallowtail	*Papilio zelicaon*	Nat										
Arrowhead Blue	*Glaucopsyche piasus*	Nat										
Becker's White	*Pontia beckerii*	Nat										
Behr's hairstreak	*Satyrium behrii*	Nat										
Blue cooper	*Lycaena heteronea*	Nat										
Blue spp.	*Euphilotes* spp.	Nat										
Boisduval's blue	*Plebejus icarioides*	Nat										
Branded skipper	*Hesperia comma*	Nat										
California hairstreak	*Satyrium califonicum*	Nat										
California tortoiseshell	*Nymphalis californica*	Nat										
Callipi fritialley	*Speyeria callippe*	Nat										

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Chalcedon checkerspot	*Euphydryas chalcedona*	Nat										
Checkered skipper	*Prygus communis*	Nat										
Checkered White	*Pontia protodice*	Nat										
Clouded Sulphur	*Colias philodice*	Nat										
Colon's checkerspot	*Euphydryas colon*	Nat										
Coronis' fritialley	*Speyeria coronis*	Nat										
Edith's checkerspot	*Euphydryas editha*	Nat										
Edith's cooper	*Lycaena editha*	Nat										
Field cresent	*Phyciodes campestris*	Nat										
Great Basin sooty skipper	*Pholisora libya*	Nat										
Great Basin woodnymph	*Cercyonis sthenele*	Nat										
Great spangled fritillary	*Speyeria cybele*	Nat										
Greenish blue	*Plebejus saepiolus*	Nat										
Hoary comma	*Polygonia gracilis*	Nat										
Juba skipper	*Hesperia juba*	Nat										
Large heath	*Coenonympha tullia*	Nat										
Large marble	*Euchloe ausonides*	Nat										
Large white skipper	*Heliopetes ericetorum*	Nat										
Large woodnymph	*Cercyonis pegala*	Nat										
Leanira checkerspot	*Chlosyne leanira*	Nat										
Lorguins admiral	*Limenitis lorguini*	Nat										
Lupine blue	*Icaricia icarioides*	Nat										
Lustrous copper	*Lycaeides cuprea*	Nat										
Melissa blue	*Plebejus melissa*	Nat										

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Milbert's tortoiseshell	*Nymphalis milberti*	Nat										
Monarch butterfly	*Danaus plexippus*	Nat										
Mormon fritillary	*Speyeria mormonia*	Nat										
Mourning cloak	*Nymphalis antiopa*	Nat										
Mylitta crescent	*Phyciodes mylitta*	Nat										
Nivalis copper	*Lycaeides nivalis*	Nat										
Northern checkerspot	*Chlosyne palla*	Nat										
Northwest ringlet	*Coenonympha ampelos ampelos*	Nat										
Olive hairstreak	*Mitoura grynea*	Nat										
Orange sulphur	*Colias eurytheme*	Nat										
Painted lady	*Vanessa cardui*	Nat										
Pearly marblewing	*Euchloe hyantis*	Nat										
Pine butterfly	*Neophasia menapia*	Nat										
Purplish copper	*Lycaena helloides*	Nat										
Ridings satyr	*Neominois ridingsii*	Nat										
Ruddy cooper	*Lycaena rubidus*	Nat										
Sagebrush checkerspot	*Chlosyne acastus*	Nat										
Sandhill skipper	*Polites sabuleti*	Nat										
Sara's orangetip	*Anthocharis sara*	Nat										
Satyr comma	*Polygonia satyrus*	Nat										
Shasta blue	*Icaricia shasta*	Nat										
Sheridan's hairstreak	*Callophrys sheridanii*	Nat										
Silvery blue	*Glaucopsyche lygdamus*	Nat										
Small white	*Pieris rapae*	Nat										

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Small woodnymph	*Cercyonis oetus*	Nat										
Soatz hairstreak	*Satyrium fuliginosum*	Nat										
Spring white	*Pieris sisymbrii*	Nat										
Tailed copper butterfly	*Tharsalea arota*	Nat										
Two-tailed wwallowtail	*Papilio multicaudatus*	Nat										
Uncas skipper	*Hesperia uncas*	Nat										
West coast lady	*Vanessa annabella*	Nat										
Western pygmy-blue	*Brephidium exile*	Nat										
Western square-dotted blue	*Euphilotes battoides*	Nat										
Western tiger swallowtail	*Papilio rutulus*	Nat										
Western white	*Pieris occidentalis*	Nat										
Woodland skipper	*Ochlodes sylvanoides*	Nat										
Zephyrus angelewing	*Polygonia zephyrus*	Nat										
Zerene's fritialley	*Speyeria zerene*	Nat										
Mammals												
American badger	*Taxidea taxus*	Nat		X								
American pika	*Ochotona princeps*	Nat									X	
Beaver	*Castor canadensis*	Nat							X			
Belding's ground squirrel	*Spermophilus beldingi*	Nat		X	X	X	X	X				
Black-tailed jack rabbit	*Lepus californicus*	Nat	X	X								
Bobcat	*Felis rufus*	Nat	X	X					X	X	X	

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Bushy-tailed woodrat	*Neotoma cinerea*	Nat								X	X	
California bighorn sheep	*Ovis canadensis*	Nat	X	X	X	X	X	X			C, F	
Coyote	*Canis latrans*	Nat	X	X					X			
Dark kangaroo mouse	*Microdipodops megacephalus*	Nat	X	X								
Deer mouse	*Peromyscus maniculatus*	Nat										
Desert wood rat	*Neotoma lepida*	Nat	X	X							X	
Domestic wild burro (Feral)	*Equus asinus*	Int										
Domestic wild horse (Feral)	*Equus caballus*	Int										
Ermine	*Mustela erminea*	Nat							X			
Fringed myotis	*Myotis thysanodes*	Nat							X		X	
Golden-mantled ground squirrel	*Spermophilus lateralis*	Nat								X		
Great Basin pocket mouse	*Perognathus parvus*	Nat	X	X						X		
Hoary bat	*Lasiurus cinereus*	Nat			X	X	X	X	X	X		
Kit fox	*Vulpes macrotis*	Nat	X	X								
Least chipmunk	*Tamias minimus*	Nat							X	X	X	
Little brown myotis	*Myotis lucifugus*	Nat						X	X		X	
Long-legged myotis	*Myotis volans*	Nat			X	X	X	X				
Long-tailed weasel	*Mustela frenata*	Nat							X			
Merriam's shrew	*Sorex merriami*	Nat			X	X	X	X				
Montane vole	*Microtus montanus*	Nat			X	X	X	X				
Mountain lion	*Felis concolor*	Nat	X	X					X	X	X	
Mule deer	*Odocoileus hemionus*	Nat	X	F, N	X	X	X	X	F	C, F	C	
Muskrat	*Ondatra zibethicus*	Nat				S						

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Northern grasshopper mouse	*Onychomys leucogaster*	Nat	X	X								
Nuttall's cottontail	*Sylvilagus nuttallii*	Nat	X	X					X			
Ord's kangaroo rat	*Dipodomys ordii*	Nat		X								
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii*	Nat									X	
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	Nat									X	
Pallid bat	*Antrozous pallidus*	Nat									X	
Pinyon mouse	*Peromyscus truei*	Nat										
Pocket gopher	*Thomomys talpoides*	Nat										
Porcupine	*Erethizon dorsatum*	Nat			X	X	X	X	X	X	X	
Preble's shrew	*Sorex preblei*	Nat	X	X	X	X	X	X	X			
Pronghorn antelope	*Antilocapra americana*	Nat	N	X	X	X	X	X		C	C	
Pygmy rabbit	*Brachylagus idahoensis*	Nat	A									
River otter	*Lontra canadensis*	Nat				S						
Sagebrush vole	*Lagurus curtatus*	Nat	X	X						X		
Spotted bat	*Euderma maculatum*	Nat			X	X	X	X			X	
Stripped skunk	*Mephitis mephitis*	Nat			X	X	X	X				
Townsend's ground squirrel	*Spermophilus townsendii*	Nat										
Vagrant shrew	*Sorex vagrans*	Nat			X	X	X	X	X			
Water shrew	*Sorex palustris*	Nat			X	X	X	X	X			
Western small-footed myotis	*Myotis ciliolabrum*	Nat							X			
White-tailed antelope ground squirrel	*Ammospermophilus leucurus*	Nat			X	X	X	X				
White-tailed jackrabbit	*Lepus townsendii*	Nat		X								

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Yellow pine chipmunk	*Tamias amoenus*	Nat							X	X		
Yellow-bellied marmot	*Marmota flaviventris*	Nat		X							X	
Yuma myotis	*Myotis yumanensis*	Nat										
Plants												
	Abronia turbinata	Nat										
	Acer negundo californicum	Nat										
	Achillea millefolium var. *occidentalis*	Nat										
	Achnatherum lettermanii	Nat										
	Achnatherum nelsonii ssp. *dorei*	Nat										
	Achnatherum nevadense	Nat										
	Achnatherum webberi	Nat										
	Aesculus californica	Nat										
	Agastache urticifolia	Nat										
	Ageratina occidentalis	Nat										
	Agoseris glauca glauca	Nat										
	Agoseris heterophylla	Nat										
	Agropyron elongatum	Nat										
	Agropyron smithii smithii	Nat										
	Agrostis exarata exarata	Nat										
	Agrostis idahoensis	Nat										
	Agrostis scabra	Nat										
	Aliciella leptomeria	Nat										
	Aliciella micromeria	Nat										

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	Aliciella triodon	Nat										
	Allium acuminatum	Nat										
	Allium anceps	Nat										
	Allium bisceptrum	Nat										
	Allium nevadense	Nat										
	Allium parvum	Nat										
	Allium platycaule	Nat										
	Allium punctum	Nat										
	Allium tolmiei var. *tolmiei*	Nat										
	Alopecurus aequalis	Nat										
	Alopecurus geniculatus	Nat										
	Alopecurus pratensis	Nat										
	Alyssum simplex	Nat										
	Amelanchier utahensis	Nat										
	Amsinckia tessellata	Nat										
	Antennaria dimorpha	Nat										
	Antennaria microphylla	Nat										
	Antennaria rosea	Nat										
	Antennaria stenophylla	Nat										
	Aquilegia formosa var. *formosa*	Nat										
	Arabis cobrensis	Nat										
	Arabis divaricarpa	Nat										
	Arabis holboellii	Nat										
	Arabis puberula	Nat										
	Arabis sparsiflora var. *sparsiflora*	Nat										
	Arenaria aculeata	Nat										

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	Arenaria congesta var. *simulans*	Nat										
	Arenaria franklinii var. *franklinii*	Nat										
	Argentina anserina	Nat										
	Arnica chamissonis	Nat										
	Arnica chamissonis foliosa	Nat										
	Arnica longifolia	Nat										
	Arnica sororia	Nat										
	Asclepias speciosa	Nat										
	Astragalus agrestis	Nat										
	Astragalus alvordensis	Nat										
	Astragalus curvicarpus var. *curvicarpus*	Nat										
	Astragalus filipes	Nat										
	Astragalus iodanthus var. *diaphanoides*	Nat										
	Astragalus iodanthus var. *iodanthus*	Nat										
	Astragalus lentiginosus var. *chartaceus*	Nat										
	Astragalus malacus	Nat										
	Astragalus newberryi var. *castoreus*	Nat										
	Astragalus newberryi var. *newberryi*	Nat										
	Astragalus obscurus	Nat										
	Astragalus purshii var. *lectulus*	Nat										
	Astragalus purshii var. *purshii*	Nat										
	Astragalus salmonis	Nat										

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	Astragalus tetrapterus	Nat										
	Balsamorhiza hookeri	Nat										
	Balsamorhiza sagittata	Nat										
	Balsamorhiza serrata	Nat										
	Bassia americana	Nat										
	Beckmannia syzigachne	Nat										
	Berula erecta	Nat										
	Blepharidachne kingii	Nat										
	Blepharipappus scaber scaber	Nat										
	Brickellia microphylla	Nat										
	Bromus carinatus	Nat										
	Bromus commutatus	Nat										
	Bromus hordeaceus ssp. *hordeaceus*	Nat										
	Callitriche hermaphroditica	Nat										
	Callitriche verna	Nat										
	Calochortus bruneaunis	Nat										
	Calyptridium roseum	Nat										
	Calyptridium umbellatum	Nat										
	Camassia quamash ssp. *breviflora*	Nat										
	Camissonia andina	Nat										
	Camissonia boothii alyssoides	Nat										
	Camissonia claviformis ssp. *integrior*	Nat										
	Camissonia pterosperma	Nat										
	Camissonia pusilla	Nat										
	Camissonia subacaulis	Nat										

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	Camissonia tanacetifolia ssp. *tanacetifolia*	Nat										
	Canbya aurea	Nat										
	Carex athrostachya	Nat										
	Carex douglasii	Nat										
	Carex microptera	Nat										
	Carex nebrascensis	Nat										
	Carex pellita	Nat										
	Carex petasata	Nat										
	Carex rossii	Nat										
	Carex simulata	Nat										
	Carex vesicaria var. *vesicaria*	Nat										
	Castilleja applegatei	Nat										
	Castilleja chromosa	Nat										
	Castilleja exilis	Nat										
	Castilleja linariifolia	Nat										
	Castilleja pilosa var. *longispica*	Nat										
	Castilleja pilosa var. *pilosa*	Nat										
	Castilleja tenuis	Nat										
	Caulanthus crassicaulis	Nat										
	Cerastium glomeratum	Nat										
	Ceratophyllum demersum	Nat										
	Cercocarpus ledifolius ledifolius	Nat										
	Cercocarpus ledifolius var. *intercedens*	Nat										
	Chaenactis douglasii var. *douglasii*	Nat										

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	Chaenactis macrantha	Nat										
	Chaenactis stevioides	Nat										
	Chaetadelpha wheeleri	Nat										
	Chamaebatiaria millefolium	Nat										
	Chenopodium desiccatum	Nat										
	Chenopodium nevadense	Nat										
	Chenopodium salinum	Nat										
	Chorispora tenella	Nat										
	Chorizanthe watsonii	Nat										
	Claytonia rubra ssp. *depressa*	Nat										
	Cleome platycarpa	Nat										
	Cleomella hillmanii	Nat										
	Cleomella parviflora	Nat										
	Collinsia parviflora	Nat										
	Collomia grandiflora	Nat										
	Collomia linearis	Nat										
	Collomia tinctoria	Nat										
	Cordylanthus maritimus ssp. *canescens*	Nat										
	Cordylanthus ramosus	Nat										
	Crassula aquatica	Nat										
	Crepis acuminata	Nat										
	Crepis atribarba	Nat										
	Crepis modocensis ssp. *modocensis*	Nat										
	Crepis occidentalis	Nat										
	Crepis runcinata ssp. *imbricata*	Nat										

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	Cryptantha ambigua	Nat										
	Cryptantha circumscissa var. *circumscissa*	Nat										
	Cryptantha gracilis	Nat										
	Cryptantha humilis	Nat										
	Cryptantha intermedia	Nat										
	Cryptantha micrantha	Nat										
	Cryptantha pterocarya var. *pterocarya*	Nat										
	Cryptantha watsonii	Nat										
	Cuscuta californica var. *breviflora*	Nat										
	Cymopterus corrugatus	Nat										
	Cymopterus purpurascens	Nat										
	Cystopteris fragilis	Nat										
	Damasonium californicum	Nat										
	Danthonia californica	Nat										
	Danthonia unispicata	Nat										
	Delphinium andersonii	Nat										
	Delphinium nuttallianum	Nat										
	Deschampsia danthonioides	Nat										
	Deschampsia elongata	Nat										
	Descurainia incana ssp. *procera*	Nat										
	Descurainia paradisa ssp. *paradisa*	Nat										
	Descurainia pinnata ssp. *filipes*	Nat										
	Descurainia pinnata ssp. *nelsonii*	Nat										

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	Dimeresia howellii	Nat										
	Dodecatheon conjugens ssp. *conjugens*	Nat										
	Downingia bacigalupii	Nat										
	Downingia bicornuta	Nat										
	Downingia laeta	Nat										
	Draba verna	Nat										
	Eatonella nivea	Nat										
	Elatine brachysperma	Nat										
	Ephedra nevadensis	Nat										
	Epilobium brachycarpum	Nat										
	Epilobium ciliatum ssp. *ciliatum*	Nat										
	Epilobium pygmaeum	Nat										
	Epilobium torreyi	Nat										
	Equisetum arvense	Nat										
	Equisetum hyemale var. *affine*	Nat										
	Equisetum laevigatum	Nat										
	Eragrostis orcuttiana	Nat										
	Eriastrum wilcoxii	Nat										
	Ericameria bloomeri	Nat										
	Erigeron aphanactis	Nat										
	Erigeron austiniae	Nat										
	Erigeron bloomeri var. *bloomeri*	Nat										
	Erigeron compositus	Nat										
	Erigeron divergens	Nat										
	Erigeron filifolius var. *filifolius*	Nat										

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	Erigeron linearis	Nat										
	Erigeron lonchophyllus	Nat										
	Eriogonum baileyi var. *baileyi*	Nat										
	Eriogonum brachyanthum	Nat										
	Eriogonum caespitosum	Nat										
	Eriogonum collinum	Nat										
	Eriogonum esmeraldense var. *esmeraldense*	Nat										
	Eriogonum heracleoides var. *heracleoides*	Nat										
	Eriogonum hookeri	Nat										
	Eriogonum maculatum	Nat										
	Eriogonum microthecum var. *ambiguum*	Nat										
	Eriogonum microthecum var. *laxiflorum*	Nat										
	Eriogonum nidularium	Nat										
	Eriogonum nudum var. *publiflorum*	Nat										
	Eriogonum nutans var. *nutans*	Nat										
	Eriogonum ochrocephalum var. *alexandrae*	Nat										
	Eriogonum ovalifolium var. *ovalifolium*	Nat										
	Eriogonum ovalifolium var. *purpureum*	Nat										
	Eriogonum palmerianum	Nat										
	Eriogonum rubricaule	Nat										
	Eriogonum sphaerocephalum	Nat										

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	Eriogonum strictum	Nat										
	Eriogonum umbellatum var. *nevadense*	Nat										
	Eriogonum vimineum	Nat										
	Eriophyllum lanatum var. *integrifolium*	Nat										
	Erysimum asperum	Nat										
	Erysimum capitatum	Nat										
	Euphorbia glyptosperma	Nat										
	Floerkea proserpinacoides	Nat										
	Frasera albicaulis var. *albicaulis*	Nat										
	Fritillaria atropurpurea	Nat										
	Fritillaria pudica	Nat										
	Galium aparine	Nat										
	Galium bifolium	Nat										
	Galium multiflorum	Nat										
	Gayophytum diffusum	Nat										
	Gayophytum racemosum	Nat										
	Gayophytum ramosissimum	Nat										
	Gentianopsis simplex	Nat										
	Geranium viscosissimum var. *viscosissimum*	Nat										
	Geum macrophyllum	Nat										
	Geum triflorum	Nat										
	Gilia brecciarum ssp. *brecciarum*	Nat										
	Gilia inconspicua	Nat										

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	Gilia salticola	Nat										
	Gilia sinuata	Nat										
	Glyptopleura marginata	Nat										
	Gnaphalium palustre	Nat										
	Gymnosteris parvula	Nat										
	Hackelia micrantha	Nat										
	Helianthus annuus	Nat										
	Heliotropium curassavicum var. *oculatum*	Nat										
	Hesperochiron californicus	Nat										
	Heterocodon rariflorum	Nat										
	Heuchera rubescens var. *alpicola*	Nat										
	Hieracium scouleri var. *nudicaule*	Nat										
	Hieracium scouleri var. *scouleri*	Nat										
	Hippuris vulgaris	Nat										
	Hordeum brachyantherum	Nat										
	Hordeum jubatum	Nat										
	Horkelia fusca ssp. *capitata*	Nat										
	Hutchinsia procumbens	Nat										
	Hydrophyllum capitatum var. *alpinum*	Nat										
	Hymenopappus filifolius var. *filifolis*	Nat										
	Hypericum scouleri ssp. *scouleri*	Nat										
	Ionactis alpina	Nat										
	Ipomopsis congesta ssp.	Nat										

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	congesta											
	Ivesia baileyi var. *baileyi*	Nat										
	Juncus arcticus ssp. *littoralis*	Nat										
	Juncus longistylis	Nat										
	Juncus nevadensis	Nat										
	Juncus orthophyllus	Nat										
	Juncus saximontanus	Nat										
	Lactuca tatarica var. *pulchella*	Nat										
	Lappula occidentalis var. *occidentalis*	Nat										
	Lathrocasis tenerrima	Nat										
	Layia glandulosa	Nat										
	Lemna minor	Nat										
	Leptochloa fusca ssp. *fascicularis*	Nat										
	Leptosiphon septentrionalis	Nat										
	Lesquerella kingii ssp. *kingii*	Nat										
	Lesquerella kingii ssp. *kingii* var. *cobrensis*	Nat										
	Leucocrinum montanum	Nat										
	Leucophysalis nana	Nat										
	Lewisia rediviva	Nat										
	Leymus triticoides	Nat										
	Lilaea scilloides	Nat										
	Limosella aquatica	Nat										
	Linanthus pungens	Nat										
	Linum lewisii var. *lewisii*	Nat										

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	Lithophragma glabrum	Nat										
	Lithophragma parviflorum	Nat										
	Lithophragma tenellum	Nat										
	Lithospermum ruderale	Nat										
	Lolium perenne	Nat										
	Lomatium austiniae	Nat										
	Lomatium bicolor	Nat										
	Lomatium canbyi	Nat										
	Lomatium cous	Nat										
	Lomatium dissectum	Nat										
	Lomatium donnellii	Nat										
	Lomatium foeniculaceum	Nat										
	Lomatium macrocarpum	Nat										
	Lomatium nevadense	Nat										
	Lomatium nevadense var. *parishii*	Nat										
	Lomatium triternatum var. *macrocarpum*	Nat										
	Lomatium vaginatum	Nat										
	Lotus unifoliolatus var. *unifoliolatus*	Nat										
	Lupinus argenteus ssp. *argenteus*	Nat										
	Lupinus argenteus ssp. *argenteus* var. *laxiflorus*	Nat										
	Lupinus aridus ssp. *aridus*	Nat										
	Lupinus brevicaulis	Nat										
	Lupinus caudatus	Nat										

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	Lupinus nevadensis	Nat										
	Lupinus polyphyllus	Nat										
	Lupinus pusillus ssp. *intermontanus*	Nat										
	Lupinus saxosus	Nat										
	Lupinus uncialis	Nat										
	Lygodesmia spinosa	Nat										
	Machaeranthera canescens	Nat										
	Madia glomerata	Nat										
	Madia gracilis	Nat										
	Maianthemum stellatum	Nat										
	Malacothrix glabrata	Nat										
	Malacothrix sonchoides	Nat										
	Malacothrix torreyi	Nat										
	Marsilea vestita	Nat										
	Melica bulbosa	Nat										
	Melica fugax	Nat										
	Melica stricta	Nat										
	Mentzelia albicaulis	Nat										
	Mentzelia congesta	Nat										
	Mentzelia laevicaulis	Nat										
	Mentzelia veatchiana	Nat										
	Mertensia ciliata var. *ciliata*	Nat										
	Mertensia longiflora	Nat										
	Mertensia oblongifolia	Nat										
	Microseris nutans	Nat										
	Microseris troximoides	Nat										

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	Microsteris gracilis var. *humilior*	Nat										
	Mimulus floribundus	Nat										
	Mimulus guttatus	Nat										
	Mimulus nanus	Nat										
	Mimulus pilosus	Nat										
	Mimulus suksdorfii	Nat										
	Monardella glauca	Nat										
	Monolepis nuttalliana	Nat										
	Monolepis pusilla	Nat										
	Montia chamissoi	Nat										
	Montia fontana	Nat										
	Montia linearis	Nat										
	Muhlenbergia asperifolia	Nat										
	Muhlenbergia richardsonis	Nat										
	Myosurus apetalus var. *borealis*	Nat										
	Myosurus minimus	Nat										
	Nama aretioides var. *aretioides*	Nat										
	Nama densum	Nat										
	Navarretia breweri	Nat										
	Navarretia capillaris	Nat										
	Navarretia intertexta ssp. *propinqua*	Nat										
	Nemacladus rigidus	Nat										
	Nemophila breviflora	Nat										
	Nemophila pedunculata	Nat										
	Nestotus stenophyllus	Nat										

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	Nothocalais troximoides	Nat										
	Oenothera deltoides	Nat										
	Orobanche fasciculata	Nat										
	Orobanche uniflora	Nat										
	Orthocarpus cuspidatus ssp. *copelandii*	Nat										
	Osmorhiza occidentalis	Nat										
	Oxytheca dendroidea	Nat										
	Packera cana	Nat										
	Paeonia brownii	Nat										
	Parietaria pensylvanica	Nat										
	Pectocarya setosa	Nat										
	Pediocactus simpsonii	Nat										Protected
	Penstemon deustus var. *pedicellatus*	Nat										
	Penstemon gracilentus	Nat										
	Penstemon humilis	Nat										
	Penstemon laetus	Nat										
	Penstemon rydbergii var. *oreocharis*	Nat										
	Penstemon rydbergii var. *rydbergii*	Nat										
	Penstemon speciosus	Nat										
	Perideridia bolanderi	Nat										
	Perideridia lemmonii	Nat										
	Phacelia adenophora	Nat										
	Phacelia glandulifera	Nat										
	Phacelia gymnoclada	Nat										

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	Phacelia hastata var. *hastata*	Nat										
	Phacelia humilis	Nat										
	Phacelia inundata	Nat										
	Phacelia linearis	Nat										
	Phacelia lutea var. *calva*	Nat										
	Phacelia lutea var. *lutea*	Nat										
	Phacelia mutabilis	Nat										
	Phacelia ramosissima	Nat										
	Phacelia rattanii	Nat										
	Phlox austromontana	Nat										
	Phlox diffusa ssp. *longistylis*	Nat										
	Phlox hoodii	Nat										
	Phlox longifolia ssp. *longifolia*	Nat										
	Phoenicaulis cheiranthoides	Nat										
	Pinus ponderosa	Nat										Protected
	Plagiobothrys kingii var. *harknessii*	Nat										
	Plagiobothrys leptocladus	Nat										
	Plagiobothrys scouleri var. *hispidulus*	Nat										
	Plectritis macrocera	Nat										
	Poa ampla	Nat										
	Poa cusickii	Nat										
	Poa fendleriana	Nat										
	Poa juncifolia	Nat										
	Poa nevadensis	Nat										
	Poa pratensis	Nat										

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	Poa sandbergii	Nat										
	Poa scabrella	Nat										
	Polemonium micranthum	Nat										
	Polyctenium fremontii	Nat										
	Polygala subspinosa	Nat										
	Polygonum amphibium var. *stipulaceum*	Nat										
	Polygonum bistortoides	Nat										
	Polygonum douglasii ssp. *douglasii*	Nat										
	Polygonum heterosepalum	Nat										
	Polygonum lapathifolium	Nat										
	Polygonum polygaloides ssp. *kelloggii*	Nat										
	Polygonum watsonii	Nat										
	Porterella carnosula	Nat										
	Potamogeton diversifolius	Nat										
	Potamogeton foliosus ssp. *foliosus*	Nat										
	Potamogeton pusillus	Nat										
	Potentilla glandulosa ssp. *nevadensis*	Nat										
	Potentilla glandulosa ssp. *pseudorupestri*	Nat										
	Potentilla gracilis var. *fastigiata*	Nat										
	Potentilla newberryi	Nat										
	Potentilla rivalis	Nat										
	Psilocarphus brevissimus	Nat										
	Psoralea lanceolata	Nat										

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	Puccinellia lemmonii	Nat										
	Puccinellia nuttalliana	Nat										
	Puccinellia pauciflora	Nat										
	Pyrrocoma lanceolata	Nat										
	Ranunculus andersonii	Nat										
	Ranunculus aquatilis	Nat										
	Ranunculus cymbalaria	Nat										
	Ranunculus glaberrimus	Nat										
	Ranunculus sceleratus var. *multifidus*	Nat										
	Ranunculus trichophyllus var. *trichophyllus*	Nat										
	Ranunculus uncinatus var. *uncinatus*	Nat										
	Rorippa cruvisilaqua var. *curvisiliqua*	Nat										
	Rosa woodsii var. *ultramontana*	Nat										
	Rumex maritimus	Nat										
	Rumex salicifolius var. *denticulatus*	Nat										
	Rumex salicifolius var. *mexicanus*	Nat										
	Rumex venosus	Nat										
	Sagittaria cuneata	Nat										
	Salix fragilis	Nat										
	Salix geyeriana	Nat										
	Salix ligulifolia	Nat										
	Salix lucida ssp. *caudata*	Nat										
	Salix melanopsis	Nat										

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	Salix scouleriana	Nat										
	Salvia dorrii ssp. *dorrii* var. *incana*	Nat										
	Salvia dorrii ssp. *dorrii* var. *pilosa*	Nat										
	Sambucus nigra ssp. *cerulea*	Nat										
	Saxifraga nidifica var. *nidifica*	Nat										
	Schedonorus phoenix	Nat										
	Schoenoplectus acutus	Nat										
	Schoenoplectus americanus	Nat										
	Schoenoplectus maritimus	Nat										
	Schoenoplectus pungens var. *longispicatus*	Nat										
	Scirpus microcarpus	Nat										
	Scrophularia lanceolata	Nat										
	Scutellaria nana	Nat										
	Senecio hydrophilus	Nat										
	Senecio integerrimus var. *exaltatus*	Nat										
	Senecio integerrimus var. *major*	Nat										
	Senecio serra	Nat										
	Sidalcea oregana ssp. *oregana*	Nat										
	Silene menziesii ssp. *menziesii* var. *viscosa*	Nat										
	Silene scaposa var. *lobata*	Nat										
	Sisyrinchium idahoense	Nat										
	Solanum triflorum	Nat										
	Solidago spectabilis	Nat										

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	Sparganium angustifolium	Nat										
	Spergularia salina	Nat										
	Sphaeralcea grossulariifolia	Nat										
	Spirodela polyrhiza	Nat										
	Sporobolus airoides	Nat										
	Sporobolus cryptandrus	Nat										
	Stanleya pinnata var. *pinnata*	Nat										
	Stellaria longipes	Nat										
	Stenotus acaulis	Nat										
	Stephanomeria exigua ssp. *exigua*	Nat										
	Stephanomeria minor var. *minor*	Nat										
	Streptanthella longirostris	Nat										
	Streptanthus cordatus	Nat										
	Stuckenia pectinata	Nat										
	Stylocline psilocarphoides	Nat										
	Suaeda calceoliformis	Nat										
	Suaeda moquinii	Nat										
	Symphoricarpos longiflorus	Nat										
	Symphoricarpos oreophilus	Nat										
	Symphoricarpos oreophilus var. *utahensis*	Nat										
	Symphyotrichum eatonii	Nat										
	Symphyotrichum frondosum	Nat										
	Symphyotrichum spathulatum	Nat										
	Tetradymia glabrata	Nat										
	Tetradymia spinosa	Nat										

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	Thelypodium flexuosum	Nat										
	Thelypodium integrifolium ssp. *complanatum*	Nat										
	Thelypodium laciniatum	Nat										
	Thelypodium milleflorum	Nat										
	Thelypodium sagittatum ssp. *sagittatum*	Nat										
	Thermopsis montana var. *montana*	Nat										
	Tiquilia nuttallii	Nat										
	Trifolium cyathiferum	Nat										
	Trifolium gymnocarpon ssp. *plummerae*	Nat										
	Trifolium kingii	Nat										
	Trifolium longipes ssp. *Hansenii*	Nat										
	Trifolium macrocephalum	Nat										
	Trifolium productum	Nat										
	Trifolium variegatum	Nat										
	Trifolium wormskioldii	Nat										
	Triglochin concinna	Nat										
	Triteleia hyacinthina	Nat										
	Typha domingensis	Nat										
	Typha latifolia	Nat										
	Urtica dioica ssp. *holosericea*	Nat										
	Valeriana edulis	Nat										
	Veratrum californicum var. *californicum*	Nat										
	Veronica americana	Nat										

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	Veronica peregrina ssp. *xalapensis*	Nat										
	Vicia americana ssp. *americana*	Nat										
	Viola nephrophylla	Nat										
	Viola purpurea	Nat										
	Viola vallicola var. *vallicola*	Nat										
	Vulpia microstachys var. *pauciflora*	Nat										
	Woodsia oregana	Nat										
	Zannichellia palustris	Nat										
	Zigadenus paniculatus	Nat										
	Zigadenus venenosus var. *venenosus*	Nat										
Alkali pepperweed	*Lepidium dictyotum*	Nat				X						
American yellowrocket	*Barbarea orthoceras*	Nat										
Annual bluegrass	*Poa annua*	Int										
Annual bursage	*Ambrosia acanthicarpa*	Nat										
Antelope bitterbrush	*Purshia tridentata*	Nat										
Austin's knotweed	*Polygonum douglasii* ssp. *austiniae*	Nat										
Barbwire Russian thistle	*Salsola paulsenii*	Int										
Barnyardgrass	*Echinochloa crus-galli*	Int										
Basin big sagebrush	*Artemisia tridentata* ssp. *tridentata*	Nat										
Beatley's clover	*Trifolium andersonii* ssp. *beatleyae*	Nat										
Biennial wormwood	*Artemisia biennis*	Nat /Int										

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Black sagebrush	*Artemisia nova*	Nat										
Bluebunch wheatgrass	*Pseudoroegneria spicata*	Nat										
Boraxweed	*Nitrophila occidentalis*	Nat				X						
Buckwheat	*Polygonaceae* spp.	Nat										
Bud sagebrush	*Artemisia spinescens*	Nat										
Bulbous bluegrass	*Poa bulbosa*	Int										
Bull thistle	*Cirsium vulgare*	Int										
Canada thistle	*Cirsium arvense*	Int										
Cereal rye	*Secale cereale*	Int										
Cheatgrass	*Bromus tectorum*	Int										
Chokecherry	*Prunus virginiana* var. *melanocarpa*	Nat										
Clasping pepperweed	*Lepidium perfoliatum*	Int										
Coast buckthorn	*Amsinckia menziesii*	Nat										
Common cocklebur	*Xanthium strumarium canadense*	Nat										
Common dandelion	*Taraxacum officinale*	Int										
Common mallow	*Malva neglecta*	Int										
Common oats	*Avena sativa*	Int										
Common reed	*Phragmites australis*	Nat										
Common sowthistle	*Sonchus oleraceus*	Int										
Common wheat	*Triticum aestivum*	Int										
Coyote tobacco	*Nicotiana attenuata*	Nat										
Creeping bentgrass	*Agrostis stolonifera*	Int										
Crested wheatgrass	*Agropyron cristatum*	Int										
Curly dock	*Rumex crispus*	Int										

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Curveseed butterwort	*Ceratocephala testiculata*	Int										
Desert cantaury	*Centaurium exaltatum*	Nat				X						
Desert dodder	*Cuscuta denticulata*	Nat										
Desert gooseberry	*Ribes velutinum*	Nat										
Diffuse knapweed	*Centaurea diffusa*	Int										
Disc mayweed	*Matricaria matricarioides*	Int										
Douglas' draba	*Cusickiella douglasii*	Nat										
Dwarf phacelia	*Phacelia tetramera*	Nat										
Dwarf rush	*Juncus hemiendytus*	Nat										
Elk thistle	*Cirsium foliosum*	Nat										
Field bindweed	*Convolvulus arvensis*	Int										
Field mint	*Mentha arvensis*	Nat										
Field pennycress	*Thlaspi arvense*	Nat										
Filaree	*Erodium cicutarium*	Int										
Fivehorn smotherweed	*Bassia hyssopifolia*	Int										
Flat topped broom rape	*Orobanche corymbosa*	Nat										
Flixweed	*Descurainia sophia*	Int										
Fourwing saltbrush	*Atriplex canescens*	Nat										
Golden currant	*Ribes aureum*	Nat										
Gray horsebrush	*Tetradymia canescens*	Nat										
Greasewood	*Sarcobatus vermiculatus*	Nat										
Great Basin wildrye	*Leymus cinereus*	Nat										
Green bristlegrass	*Setaria viridis*	Int										
Grimy ivesia	*Ivesia rhypara* var. *rhypara*	Nat	X									Endangered
Hairy whitetop	*Cardaria pubescens*	Int										

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Hoary cress	*Cardaria draba*	Int										
Horehound	*Marrubium vulgare*	Int										
Horseweed	*Conyza canadensis*	Nat										
Idaho fescue	*Festuca idahoensis*	Nat										
Indian hemp	*Apocynum sibiricum*	Nat										
Indian ricegrass	*Achnatherum hymenoides*	Nat										
Kellogg's rush	*Juncus kelloggii*	Nat										
Kochia	*Bassia scoparia*	Nat										
Lambsquarter	*Chenopodium album*	Int										
Lombardy poplar	*Populus nigra*	Int										
Low sagebrush	*Artemisia arbuscula*	Nat										
Matrimony vine	*Lycium barbarum*	Int										
Mediterranean barley	*Hordeum geniculatum*	Int										
Mountain big sagebrush	*Artemisia tridentata* ssp. *vaseyana*	Nat										
Needle-and-thread	*Hesperostipa comata* ssp. *comata*	Nat										
New Mexico thistle	*Cirsium utahense*	Nat										
Nodding beggertick	*Bidens cernua*	Nat										
Oceanspray	*Holodiscus discolor*	Nat										
Oregon checkerbloom	*Sigina saginoides*	Nat										
Perennial pepperweed	*Lepidium latifolium*	Int										
Pond lily	*Nuphar* spp.	Nat										
Povertyweed	*Iva axillaris*	Nat						X				
Prairie junegrass	*Koeleria macrantha*	Nat										
Prickly lettuce	*Lactuca serriola*	Int										

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Prickly russian thistle	*Salsola tragus*	Int										
Prostrate knotweed	*Polygonum aviculare*	Int										
Prostrate pigweed	*Amaranthus blitoides*	Int										
Quaking aspen	*Populus tremuloides*	Nat										
Rabbitbrush	*Ericameria nauseosa*	Nat										
Rabbitfootgrass	*Polypogon monspeliensis*	Int										
Rattlesnake stickweed	*Hackelia ophiobia*	Nat									X	
Red clover	*Trifolium pratense*	Int										
Reed canarygrass	*Phalaris arundinacea*	Nat										
Rose biscuitroot	*Lomatium roseanum*	Nat	X								X	
Rough bluegrass	*Poa trivialis*	Int										
Rough pigweed	*Amaranthus retroflexus*	Nat										
Rubber rabbitbrush	*Ericameria nauseosa* ssp. *consimilis* var. *oreophila*	Nat										
Rubber rabbitbrush	*Ericameria nauseosa* ssp. *nauseosa* var. *speciosa*	Nat										
Russian olive	*Elaeagnus angustifolia*	Int										
Sagebrush mariposa lilly	*Calochortus macrocarpus*	Nat										
Saline saltbrush	*Atriplex subspicata*	Nat										
Saltgrass	*Distichlis spicata*	Nat										
Saltlover	*Halogeton glomeratus*	Int										
Sandberg's bluegrass	*Poa secunda*	Nat										
Scotch thistle	*Onopordum acanthium*	Int										
Sea-blight	*Suaeda torreyana*	Nat										
Shadscale saltbrush	*Atriplex confertifolia*	Nat										

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Silver sagebrush	*Artemisia cana*	Nat										
Silver saltbrush	*Atriplex argentea* ssp. *argentea*	Nat										
Smooth brome	*Bromus inermis*	Int										
Snowbrush ceanothus	*Ceanothus velutinus*	Nat										
Spear saltbrush	*Atriplex patula*	Nat										
Spikesedge	*Eleocharis acicularis*	Nat						X				
Spikesedge	*Eleocharis palustris*	Nat						X				
Spikesedge	*Eleocharis quinqueflora*	Nat						X				
Spiny hopsage	*Grayia spinosa*	Nat										
Spotted knapweed	*Centaurea maculosa*	Int										
Spotted ladysthumb	*Polygonum persicaria*	Int										
Spreading wallflower	*Erysimum repandum*	Int										
Squirreltail	*Elymus elymoides* ssp. *elymoides*	Nat										
Squirreltail	*Elymus trachycaulus*	Nat										
Stinkgrass	*Eragrostis cilianensis*	Int										
Strict forget-me-not	*Myosotis micrantha*	Int										
Tall tumblemustard	*Sisymbrium altissimum*	Int										
Threetip sagebrush	*Artemisia tripartite*	Nat										
Thurber's needlegrass	*Achnatherum thurberianum*	Nat										
Timothy	*Phleum pratense*	Int										
Toad rush	*Juncus bufonius*	Nat										
Tufted evening-primrose	*Oenothera caespitosa* ssp. *marginata*	Nat										
Tumble pigweed	*Amaranthus albus*	Int										
Tumbling saltbrush	*Atriplex rosea*	Nat										

Common Name	Scientific Name	Native, Introduced, or Hybrid	Sagebrush-Steppe Habitats[1]	Montane Sagebrush Steppe[2]	Emergent Marshes and Wet Meadows	Springs and Springbrooks	Ephemeral Wetlands[3]	Reservoirs and Other Artifical Riparian Habitats	Deciduous Woodlands and Shrublands (Aspen)	Mountain Mahogany and Western Juniper Woodlands	Cliffs, Canyons, and Barren Lands	Federal Status
Twoscale saltbrush	*Atriplex heterosperma*	Nat										
Valley sedge	*Carex vallicola*	Nat										
Water hemlock	*Cicuta douglasii*	Nat										
Watercress	*Nasturtium officinale*	Int										
Wax currant	*Ribes cereum*	Nat										
Wedgeleaf dock	*Rumex triangulivalvis*	Nat										
Wedgescale saltbrush	*Atriplex truncata*	Nat										
Weeping alkaligrass	*Puccinellia distans*	Nat /Int										
Western blue flag	*Iris missouriensis*	Nat										
Western juniper	*Juniperus occidentalis occidentalis*	Nat										Protected
White poplar	*Populus alba*	Int										
White sagebrush	*Artemisia ludoviciana* ssp. *ludoviciana*	Nat										
Whitestem gooseberry	*Ribes inerme* var. *inerme*	Nat										
Winterfat	*Krascheninnikovia lanata*	Nat										
Witchgrass	*Panicum capillare*	Nat										
Wyoming big sagebrush	*Artemisia tridentata* ssp. *wyomingensis*	Nat										
Yellow rabbitbrush	*Chrysothamnus viscidiflorus*	Nat										
Yellow rabbitbrush	*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*	Nat										
Yellow rabbitbrush	*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*	Nat										
Yellow salsify	*Tragopogon dubius*	Int										
Yellow sweetclover	*Melilotus officinalis*	Int										

Common Name	Scientific Name	Native, Introduced, or Hybrid	Sagebrush-Steppe Habitats[1]	Montane Sagebrush Steppe[2]	Emergent Marshes and Wet Meadows	Springs and Springbrooks	Ephemeral Wetlands[3]	Reservoirs and Other Artifical Riparian Habitats	Deciduous Woodlands and Shrublands (Aspen)	Mountain Mahogany and Western Juniper Woodlands	Cliffs, Canyons, and Barren Lands	Federal Status
Reptiles												
Collared lizard	*Crotaphytus collaris*	Nat	X	X							X	
Desert horned lizard	*Phrynosoma platyrhinos*	Nat	X	X								
Gopher snake	*Pituophis melanoleucus*	Nat										
Long-nosed leopard lizard	*Gambelia wislizenii*	Nat	X	A								
Night snake	*Hypsiglena torquata*	Nat									X	
Northern alligator lizard	*Elgaria coerulea*	Nat							X			
Pygmy short-horned lizard	*Phrynosoma douglasii*	Nat	X	X						X		
Racer	*Coluber constrictor*	Nat								X		
Rubber boa	*Charina bottae*	Nat		X								
Sagebrush lizard	*Sceloporus graciosus*	Nat	X	X								
Short-horned lizard	*Phrynosoma douglassi*	Nat										
Side-blotched lizard	*Uta stansburiana*	Nat									X	
Striped whipsnake	*Masticophis taeniatus*	Nat	X	X								
Western fence lizard	*Sceloporus occidentalis*	Nat									X	
Western rattlesnake	*Crotalus viridis*	Nat		X								
Western terrestrial garter snake	*Thamnophis elegans*	Nat										
Western whiptail	*Cnemidophorus tigris*	Nat	X	X								

[1] Sagebrush-Steppe Habitats: Big Basin, Wyoming, Low sagebrush, salt desert scrub/ greasewood
[2] Montane Sagebrush Steppe[2]: mountain big sage, bitterbrush, semi-desert grassland
[3] Ephemeral Wetlands: playas, salt flats, and mudflats

Appendix C. Appropriate Use Determinations

Introduction

The Appropriate Refuge Uses Policy (603 FW 1 [2006]) outlines the process that the Service uses to determine when general public uses on refuges may be considered. Priority public uses previously defined as wildlife-dependent uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) under the National Wildlife Refuge System Improvement Act of 1997 are generally exempt from appropriate use review. Other exempt uses include situations in which the Service does not have adequate jurisdiction to control the activity, as well as refuge management activities.

In essence, the appropriate use policy provides refuge managers with a consistent procedure to first screen and then document decisions concerning a public use. When a use is determined to be appropriate, refuge managers must then decide if the use is compatible before allowing it on a refuge. The policy also requires review of existing public uses.

During the CCP process, the Refuge Manager evaluated all existing and proposed refuge uses at Sheldon National Wildlife Refuge using the following guidelines and criteria as outlined in the appropriate use policy:

- Do we have jurisdiction over the use?
- Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?
- Is the use consistent with applicable Executive Orders and Department and Service policies?
- Is the use consistent with public safety?
- Is the use consistent with goals and objectives in an approved management plan or other document?
- Has an earlier documented analysis not denied the use or is this the first the use has been proposed?
- Is the use manageable within available budget and staff?
- Will this be manageable in the future within existing resources?
- Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?
- Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of the appropriate use policy for recreational uses description), compatible, wildlife-dependent recreation into the future?

Using this process and these criteria, and as documented on the following pages, the Refuge Manager determined the following use(s) are not appropriate: None.

The Refuge Manager also determined the following refuge use(s) were appropriate and directed that compatibility determinations be completed for each use: Hunting (big-game guiding and outfitting); Rock Collecting; and Research, Scientific Collecting, and Survey Activities.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Sheldon National Wildlife Refuge

Use: Hunting (big-game guiding and outfitting)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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Attachment 1

Supporting documentation for appropriateness finding based on sound professional judgment for:

Hunting (big-game guiding and outfitting)

Commercial guide services for sport hunting of big-game animals support an existing priority compatible wildlife-dependent public use of Sheldon Refuge. In particular, the services of a licensed hunting guide are often a critical factor when determining the quality of sport-hunting opportunities for animals such as bighorn sheep that inhabit remote and difficult terrain often unfamiliar to sport hunters.

As an economic refuge use, big-game guiding and outfitting is generally authorized by Special Use Permit. Special Use Permits and associated stipulations provide the refuge with an enforceable mechanism that promotes safety and compliance with laws and regulations, minimizes conflict with other visitors, promotes resource stewardship and conservation, provides reliable opportunities to experience wildlife, and uses client satisfaction to help define and evaluate services provided—all of which increase the quality of sport-hunting experiences for the visiting public.

Commercial guides are generally expected to provide specialized services and equipment of equal or greater quality that are often not available to the general public. These specialized services and equipment offer hunting opportunities to a wider segment of the public than would otherwise be provided by the Service, including wilderness and backcountry opportunities and opportunities for hunters with disabilities.

Based upon the findings listed on the preceding form and this attached justification, it is my professional judgment big-game guiding and outfitting contributes the Mission of the Refuge System, does not conflict with the purposes for Sheldon Refuge, and is an appropriate use of Sheldon Refuge.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Sheldon National Wildlife Refuge

Use: Recreational Rock Collecting

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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Attachment 1

Supporting documentation for appropriateness finding based on sound professional judgment for:

Rock Collecting

Recreational surface collection of rocks and minerals from what is now Sheldon Refuge is a long-standing and traditional use that pre-dates establishment of Sheldon Refuge, and that has been repeatedly found compatible with the purposes for Sheldon Refuge.

The management of wildlife- and wildlands-oriented recreation activities on refuges is guided by the Public Use Management Policy of the Refuge Manual (8 RM 9). Section 9.5G of this policy specifically addresses the collection of non-renewable resources including minerals, crystals, and rocks and directs that these resources must be protected, but also states such uses may be allowed for scientific collection or investigation and in unusual cases involving renewable crystals. However, Section 9.2 recognizes that there are some unique refuges where non-wildlife-oriented recreation activities have co-existed in harmony with wildlife needs since the refuges were established. Furthermore, on these refuges where traditional forms of non-wildlife oriented activities have taken place for many years and have proven to be compatible with the primary purposes for which the refuges were established, such recognized uses will be incorporated into the Refuge Plan.

After comparing and contrasting the resource benefits from protecting and preserving rocks and minerals commonly collected from Sheldon Refuge, the public recreation benefits from limited surface collection of these rocks and minerals, and the potential for refuge environmental education and interpretation related to these activities and Sheldon Refuge natural history and geology, it is my sound professional judgment the continued surface collection of mineral specimens and small amounts of common rocks and from Sheldon Refuge is an appropriate non-wildlife-dependent public use that does not conflict with the purposes for Sheldon Refuge or other priority wildlife-dependent public uses.

Consistent with public use management policy for the Refuge System, the Sheldon Refuge Comprehensive Conservation Plan and the Compatibility Determination for Recreational Rock Collecting will contain specific, detailed guidance as to how the use will be managed, including stipulations to ensure rock collecting remains compatible with the purposes for Sheldon Refuge and the System Mission.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Sheldon National Wildlife Refuge

Use: Research, scientific collecting, and survey activities

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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02/06

Attachment 1

Supporting documentation for Appropriateness finding based on sound professional judgment for:

Research, scientific collecting, and survey activities

Research, scientific collecting, and survey activities conducted within Sheldon Refuge by independent third parties including non-profit organizations, colleges, universities, and consulting companies may have purposes that support objectives and strategies for the management of Sheldon Refuge. With limited resources and budgets, activities conducted by third parties often meet identified but lower project priorities that Sheldon Refuge would not have the staff or funding to complete.

Proposals for research, scientific collecting, and survey activities are reviewed on a case-by-case basis to determine whether the purpose for the activities would benefit Sheldon Refuge and whether the proposed methods and techniques are sound, defensible, and necessary. When conducted in accordance with a refuge Special Use Permit and applicable permit conditions, these activities generally do not conflict with other management activities or wildlife-dependent public uses.

Based upon the findings listed on the preceding form and this attached justification, it is my professional judgment that research, scientific collecting, and survey activities contribute to the Mission of the Refuge System, do not conflict with the purposes for Sheldon Refuge, and are an appropriate use of Sheldon Refuge.

Appendix D. Compatibility Determinations

D. Introduction

Compatibility is a tool refuge managers use to ensure that recreational and other uses do not interfere with wildlife conservation, the primary focus of refuges. Under the Compatibility Policy (603 FW 2), refuge managers are directed to determine if a proposed or existing refuge use is compatible with refuge purposes and the National Wildlife Refuge System mission. Refuge uses are defined as recreational or economic/commercial or management use of the refuge by the public or a non-Refuge System entity. The Service does not, however, prepare compatibility determinations for uses when the Service does not have jurisdiction. Compatibility determinations are re-evaluated concurrently with the preparation of a CCP and are required to be in writing. The Service is also required to provide the public with an opportunity for review and comment on compatibility determinations. The purpose of this appendix is to meet these requirements.

The Service recognizes that compatibility determinations are complex. For this reason, refuge managers are required to consider principles of sound fish and wildlife management and best available science in making these determinations. If an existing use is not compatible, the refuge manager is directed to modify the use to make it compatible or terminate it, as expeditiously as practicable.

Compatibility Determinations Evaluated at This Time

This set of compatibility determinations evaluates uses projected to occur under the Comprehensive Conservation Plan and Environmental Impact Statement for Sheldon Refuge (CCP/EIS). The evaluation of funds needed for management and implementation of each use also assumes implementation as described under the plan. Compatibility determinations are based on the professional judgment of refuge personnel, including observations of existing refuge uses.

Refuge Use	Compatible	Page
Wildlife Observation, Wildlife Photography, Environmental Education, and Interpretation	Yes	D-4
Sport Fishing	Yes	D-12
Sport Hunting	Yes	D-21
Guiding	Yes	D-30
Rock Collecting	Yes	D-37
Research	Yes	D-44

D.1 Compatibility Determination for Wildlife Observation, Wildlife Photography, Environmental Education, and Interpretation on Sheldon National Wildlife Refuge

Use(s): Wildlife observation, wildlife photography, environmental education, and interpretation

Supporting Uses: Temporary viewing blinds, camping, boating, hiking, backpacking, horseback riding, and off-highway vehicle use

Refuge Name: Sheldon National Wildlife Refuge

City/County and State: Washoe County, Nevada; Humboldt County, Nevada; Lake County, Oregon

Establishing and Acquisition Authority(ies):

What is today known as the Sheldon National Wildlife Refuge was initially established by Executive Order 5540 dated January 26, 1931, and later enlarged by Executive Order 7364 dated May 6, 1936, and Executive Order 7522 dated December 21, 1936.

The authorities for nearly all Federal lands within Sheldon Refuge are the Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715r) and the National Wildlife Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee). A small portion of Sheldon Refuge was acquired under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1231-1544).

Refuge Purpose(s):

> "...as a refuge and breeding ground for wild animals and birds..." Executive Order 5540 dated January 26, 1931.
>
> "... 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 ..." Executive Order 7522 dated December 21, 1936.
>
> "... to conserve (A) 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)

Consistent with Service Policy (601 FW 2), proposed wilderness areas are to be managed as designated wilderness. The Wilderness Act of 1964 creates additional purposes within and supplemental to other refuge purposes. Proposed wilderness areas are to be managed for the purposes of securing an enduring resource of wilderness, protecting and preserving wilderness character, and providing opportunities for public use and enjoyment and for "solitude or a primitive and unconfined type of recreation" in ways that will leave the wilderness unimpaired for future use and enjoyment as wilderness.

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):

Wildlife observation, wildlife photography, environmental education, and interpretation occur throughout Sheldon Refuge but are concentrated along highways, improved roads, and unimproved vehicle routes.

While precise visitation and participation are unknown, certain locations, such as the Virgin Valley campground, are popular and consistently used throughout the summer months. Wildlife photography and wildlife observation within Sheldon Refuge are most often conducted in conjunction with other activities and by motorists and tourists passing through Sheldon Refuge. The number of people who visit Sheldon Refuge specifically to observe and photograph wildlife is estimated to be smaller than the number of people fishing, hunting, or participating in non-wildlife-dependent uses such as rock hounding. A more detailed discussion of wildlife observation and photography can be found in the Draft Sheldon Refuge Comprehensive Conservation Plan and Environmental Impact Statement.

Of particular interest is the viewing and photographing of Greater sage-grouse when concentrated at lek locations to display their annual mating dances. This activity is becoming increasingly popular both with amateur and professional photographers. High-quality full-frame photographs, even when using telephoto camera lenses, are only possible from relatively close distances due to early morning low light conditions and vegetation.

The environmental education and interpretation program at Sheldon Refuge is minimal, with most interpretation conducted opportunistically during visitor contacts or through printed materials, kiosk information and displays, and signs at various locations most often associated with refuge entrance points and campgrounds. The majority of environmental education and interpretation activities are conducted primarily by the Refuge Manager and volunteers at the Sheldon Refuge Office (Dufurrena) and the Virgin Valley Campground.

Refuge-specific regulations that apply to the use of motorized boats and temporary hunting blinds specifically apply to sport fishing and sport hunting, but are interpreted as applying to other compatible wildlife-dependent public uses as well. In particular, the use of non-motorized boats and boats with electric motors in Big Spring Reservoir, Catnip Reservoir, and Dufurrena Ponds consistent with 50 CFR 32.47 is considered a compatible activity that supports wildlife observation and wildlife photography. Consistent with 50 CFR 32.47, temporary ground blinds are considered a compatible supporting activity when consistent with the stipulations listed below. The location and number of blinds are controlled through refuge Special Use Permit issued on a first-come, first-served basis. Other secondary uses of Sheldon Refuge that support wildlife observation and wildlife photography include hiking, horseback riding, and vehicle use on designated access routes. Overnight camping in support of the use occurs at all 13 designated campgrounds and by permit in backcountry areas.

As part of the Draft Sheldon Refuge CCP/EIS preferred alternative, several visitor facilities would be constructed or enhanced to increase environmental education, interpretation, and participation in wildlife viewing and photography. These facilities include a larger visitor contact facility along Highway 140, an interpretive hiking trail at McKinney Ranch, designating a wildlife viewing auto tour route with roadside pullouts and interpretive signs, and a wildlife observation deck. These facilities would be more noticeable and accessible to people traveling Highway 140, and as a result we anticipate visitation to Sheldon Refuge would increase by approximately 500 visitors per year.

Availability of Resources:

Administration and management of wildlife observation and photography include information kiosks at Sheldon Refuge entrances; Sheldon Refuge websites, brochures, and leaflets; and certain Special Use Permits. Maintenance of the campgrounds, access roads, and other supporting facilities and routine law enforcement patrols are also conducted by Sheldon Refuge.

As part of the preferred alternative, a visitor facility would be constructed, staffed, and maintained. This facility represents the majority of costs associated with the environmental education and interpretation program. The visitor contact facility would be constructed when necessary funding and staffing become available.

Category and Itemization	One-time	Annual
Administration and management (volunteer host site development, volunteer campground hosts, law enforcement patrols, backcountry use permits, fee collection and processing, administration and staffing of the visitor contact facility):	$15,000	$70,000
Maintenance (trails, signs, and visitor contact facility):	$15,000	$10,000-$15,000
Monitoring:	$500	$500
Special equipment, facilities, or improvements (visitor contact facility, campgrounds and access roads):	$3,000,000	$500-$1,500
Offsetting revenues[1]:	$5,500	$5,500

[1] Anticipated campsite fee revenues as proposed in the CCP based on $5/site/day for 1,100 site-use days.

The proposed facilities are analyzed in the Sheldon Refuge Comprehensive Conservation Plan and Environmental Impact Statement, and submitted as funding needs under a variety of appropriate funding sources (e.g., Deferred Maintenance, Construction, Refuge Roads, Visitor Facility Enhancements).

Anticipated Impacts of the Use(s):

Wildlife observation and photography within Sheldon Refuge are supported by 13 primitive, semi-primitive and developed campgrounds. The 13 campgrounds are located near water and partially within riparian habitats and several prehistoric cultural sites. While the majority of impacts occurred following the initial establishment of these campgrounds, some impacts continue due to ongoing soil disturbance and compaction within existing campsites, occasional use of previously unused areas adjacent to the campgrounds, and vehicle use outside designated areas. It is anticipated actions to relocate campgrounds to alternative sites, protect sensitive habitats at each of these campgrounds, and confine use to designated campsites in heavily used campgrounds will mitigate or avoid additional impacts altogether (see Section 6.1.2.3 of the Draft Sheldon Refuge CCP/EIS).

Wildlife observation and photography activities have both direct and indirect impacts on wildlife distribution, behavior, and habitats. The most frequent impacts are disturbance to large birds and mammals from people approaching too close and from vehicle presence. These impacts are most severe during periods of mating, nesting, lambing, and fawning. However, because people participating in wildlife observation and photography generally do not venture far from roads and campgrounds, impacts from these visitors are only a portion of the overall wildlife disturbance.

One exception is the potential for disturbance of Greater sage-grouse from viewing and photography activities during the mating display. Greater sage-grouse return to specific lek locations each spring to perform mating displays, and public use activities at these sites can disrupt mating behavior and possibly cause one or more birds to abandon the lek. To minimize adverse effects and still provide high-quality wildlife viewing and photography opportunities, use near active leks will be controlled through Special Use Permit stipulations (see stipulations section).

Access for wildlife observation and photography is provided by approximately 300 miles of motorized vehicle routes and several established routes and trails in the refuge backcountry. Roads and vehicle use can cause a number of impacts to soils, water, habitat, fish, and wildlife (see Section 6.1.2.1 of the Draft Sheldon Refuge CCP/EIS). Vehicle use is allowed on routes within the refuge where these impacts are anticipated to be minimal, or where planned management actions such as rerouting, realignment, and seasonal closures will acceptably minimize impacts. Route segments identified for re-routing, realignment, or other action were identified in the Draft Sheldon Refuge CCP preferred alternative.

Impacts related to environmental education and interpretation would primarily be associated with the proposed visitor contact facility along Highway 140. This facility would require approximately 3 to 5 acres of wildlife habitat be eliminated or permanently impacted through construction and facility maintenance. Large wildlife within the area of the visitor contact facility would likely be displaced by construction and increased use of the area by visitors. Because wildlife is currently being impacted by use of Highway 140, we anticipate these impacts would be minor. A detailed discussion of the impacts related to wildlife observation and photography and other public uses occurring within Sheldon Refuge can be found in Section 6.1.2.4 of the Draft Sheldon Refuge Comprehensive Conservation Plan and associated Environmental Impact Statement.

Monitoring of public use in identified sensitive wildlife habitats (i.e., Thousand Creek Gorge) would be used to determine if impacts from wildlife observation and photography could impact the health, vigor, or productivity of fish, wildlife, or their habitats in these areas. If such potential for impact is identified, Sheldon Refuge would increase public interpretation and education regarding those impacts and/or close the areas to public use for critical periods or longer if necessary. If impacts from public use in general are documented, access for wildlife observation and photography will receive priority over non-wildlife-dependent public uses.

Impacts to wildlife populations and other public uses from wildlife observation, photography, environmental education, and interpretation within the refuge, including both direct and indirect impacts, are considered minor (see Section 6.1.2 of the Draft Sheldon Refuge CCP/EIS). Actions proposed to manage public uses within the refuge, including wildlife observation, photography, environmental education, and interpretation, are expected to have both adverse and beneficial impacts to wildlife and wildlife habitat and to increase opportunities for high-quality wildlife-dependent public uses. When considered with other existing and proposed public uses and proposed management actions at Sheldon Refuge, cumulative impacts from wildlife observation, photography, environmental education, or interpretation would be minor, and cumulative impacts from management of supporting uses such as temporary viewing blinds, camping, and vehicle access would be beneficial and minor to moderate. Continued monitoring of public uses and visitation to sensitive habitats will provide necessary information and management to ensure impacts from wildlife observation, photography, environmental education, or interpretation within the refuge remain minor. It is anticipated the overall amount of refuge visitation associated with wildlife observation, photography, environmental education or interpretation would increase but would not interfere with or detract from the quality of other refuge public uses.

Public Review and Comment:

This and other compatibility determinations were prepared concurrently with the Draft Comprehensive Conservation Plan and Environmental Impact Statement for the Sheldon National Wildlife Refuge (in press). Open houses were held, multiple planning updates were mailed, and written comments were solicited from the public during development of the Draft CCP/EIS for the refuge. Appendix A of the Draft CCP/EIS further details public involvement during development of the CCP. Additional public review and comment will be solicited during the Draft CCP/EIS comment period.

Determination: (check one below)

____ Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Management direction is provided in the Comprehensive Conservation Plan for Sheldon Refuge. This directs monitoring of wildlife observation and photography activities. Findings from these monitoring efforts would be used in determining what additional management actions, if any, are needed to ensure public use activities remain compatible with refuge purposes. Additional stipulations which apply to wildlife viewing and observation and all other public uses within Sheldon

Refuge are listed in Exhibit D-1 and are incorporated into this compatibility determination by reference.

1. The construction and use of temporary blinds for wildlife observation, wildlife photography, environmental education, or outreach is allowed only by refuge Special Use Permit and are subject to the following conditions:
    i. Blinds may not be constructed earlier than one week prior to use.
    ii. All blinds must be portable, temporary, and constructed of synthetic material.
    iii. Blinds must be removed no later than 14 days after construction.
    iv. Blinds must be tagged with the date of construction, owner's full name, physical address of residence, and contact phone number or contact email address.
    v. Destruction of natural vegetation or belowground excavation are prohibited (see 50 CFR 27.51).
    vi. All blinds within 100 yards of any active Greater sage-grouse lek must be specifically authorized for the viewing and/or observation of Greater sage-grouse and will be located 50 yards or greater distance from all active Greater sage-grouse lek locations as directed by the Refuge Manager. Permittees will construct blinds the afternoon prior to use, will occupy blinds no less than two hours prior to sunrise, and will leave blinds only after all birds have departed the lek.
    vii. Blinds within 100 yards of active Greater sage-grouse leks not specifically authorized by permit will be removed and the owner contacted by Sheldon Refuge.
2. Any person participating in or attempting to participate in the viewing and/or photography of Greater sage-grouse between March 1 and June 1 must be in possession of a valid refuge Special Use Permit specifically authorizing such activities.
3. Applications to view or photograph Greater sage-grouse must be received no later than 60 days prior to the proposed activity. The availability of permits will be limited to regularly scheduled refuge lek count days and staff availability. Permits will be granted on a first-come, first-served basis, unless otherwise determined.
4. A maximum of one (1) Refuge special use permit per person per year may be issued for the viewing and/or photography of Greater sage-grouse.

Justification:

The National Wildlife Refuge System Administration Act of 1966 (as amended) identifies wildlife observation and wildlife photography as two of six priority public uses on national wildlife refuges. The law states that, when managed in accordance with principles of sound fish and wildlife management and administration, wildlife observation, wildlife photography, and the other priority wildlife-dependent recreational uses "have been and are expected to continue to be generally compatible uses." The Act further states that these priority public uses should receive enhanced consideration over other general public uses in refuge planning and management, and directs the U.S. Fish and Wildlife Service to provide increased opportunities for the public to safety engage in traditional outdoor activities such as fishing and hunting.

Wildlife photography, observation, interpretation, and environmental education can result in disturbance, displacement, and habituation of wildlife. However, overall visitation to the refuge is

approximately 17,000 people per year, and the majority of visitors who engage in these activities remain on improved gravel roads and highways. There is a sufficient amount of undisturbed habitat available to refuge wildlife for escape and cover. Regulating the use of wildlife-viewing blinds, sage-grouse viewing, and photography will ensure the use of established leks continues with only minimal disturbance or disruption. Other requirements for the use of non-motorized boats, use of designated campgrounds, and requirement for backcountry camping permits will also minimize wildlife disturbance and displacement from important habitats and habitat impacts while maintaining opportunities for solitude within proposed wilderness areas and wilderness study areas. Stipulations identified in this compatibility determination and included in Exhibit D-1 are expected to minimize impacts from wildlife observation, photography, interpretation, and environmental education within Sheldon Refuge to fish, wildlife, plants, and their habitats.

Closure of the Virgin Valley and Little Sheldon areas to all hunting and closure of Big Spring and Catnip reservoirs to migratory bird hunting will continue to provide outstanding opportunities for observation and photography of wildlife, including large animals and birds in their natural habitats and exhibiting behavior not influenced by hunting pressure. Construction of a visitor contact station along Highway 140 would provide better interpretive opportunities for a larger number of people than is currently available. In combination with other refuge interpretive materials, displays, and signs we expect visitors would be better informed and more knowledgeable about Sheldon Refuge public use regulations, refuge resources, and the need for conservation of refuge resources.

Mandatory 10- or 15-Year Re-evaluation Date: (provide year for "allowed" uses only)

___2026___ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

____ Categorical Exclusion without Environmental Action Statement

____ Categorical Exclusion and Environmental Action Statement

____ Environmental Assessment and Finding of No Significant Impact

_X_ Environmental Impact Statement and Record of Decision

Refuge Determination

Prepared by: _____ _____

(Signature) (Date)

Refuge Manager/
Project Leader
Approval: _____ _____

(Signature) (Date)

Concurrence

Refuge Supervisor: _____ _____

(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System:

_____ _____

(Signature) (Date)

D.2 Compatibility Determination for Sport Fishing on Sheldon National Wildlife Refuge

Use(s): Fishing

Supporting Uses: Camping, boating, and vehicle use

Refuge Name: Sheldon National Wildlife Refuge

City/County and State: Washoe County, Nevada; Humboldt County, Nevada; Lake County, Oregon

Establishing and Acquisition Authority(ies):

What is today known as the Sheldon National Wildlife Refuge was initially established by Executive Order 5540 dated January 26, 1931, and later enlarged by Executive Order 7364 dated May 6, 1936, and Executive Order 7522 dated December 21, 1936.

The authorities for nearly all Federal lands within Sheldon Refuge are the Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715r) and the National Wildlife Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee). A small portion of Sheldon Refuge was acquired under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1231-1544).

Refuge Purpose(s):

> "...as a refuge and breeding ground for wild animals and birds..." Executive Order 5540 dated January 26, 1931.
>
> "... 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 ..." Executive Order 7522 dated December 21, 1936.
>
> "... to conserve (A) 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)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):

Fishing on Sheldon Refuge occurs within artificial ponds and reservoirs originally constructed to increase late-summer water availability for livestock and to supply irrigation for pastures and fields. Because commercial livestock grazing, haying, and farming no longer occur on Sheldon Refuge, the purposes for these artificial waters are now primarily to provide habitat for fish and wildlife and secondarily to provide recreational fishing opportunities. Currently fishing is allowed at Big Spring Reservoir for rainbow trout, at Catnip Reservoir for Lahontan cutthroat trout, and at Dufurrena Ponds (which includes McGee Pond) for bass, crappie, sunfish, and perch. McGee Pond is managed to provide fishing opportunities only for individuals who are age 12 or under, age 65 or older, or disabled. The waters listed are closed to migratory bird hunting, but the use of non-motorized boats is allowed.

In the past Big Spring Reservoir has been a popular and productive fishing destination for anglers, with more than 1,900 anglers reporting an average of five fish caught per day in 1998 (NDOW 2009). For comparison, 2007 angler questionnaire results indicate 1,116 anglers fished Squaw Creek Reservoir (the next closest highway-accessible reservoir fishery in the state), and 3,111 anglers fished Rye Patch Reservoir located just north of Interstate 84 near Winnemucca, Nevada (NDOW 2009). More recently, drier weather and the resulting lack of water at Big Spring Reservoir has at least temporarily eliminated fishing opportunities. The fishing season is open from the second Saturday in May through the last day of February. The fishing limit is five trout.

At 22 acres and accessible by gravel road, Catnip Reservoir experiences angler use more typical of reservoirs scattered throughout northwest Nevada. Questionnaire results indicate 312 anglers fished Catnip Reservoir in 2007 (NDOW 2009). We assume at least some anglers who fished at Big Spring Reservoir in the past are now visiting Catnip Reservoir. The Nevada Department of Wildlife (NDOW) has periodically stocked up to 3,000 fish in Catnip Reservoir. The fishing season is open the second Saturday in June through November 15. The fishing limit is one trout. Only artificial lures with single barbless hooks may be used. The least amount of recreational fishing within Sheldon Refuge occurs at Dufurrena Ponds with 176 anglers reporting 577 fishing days in 2007 (NDOW 2009). McGee Pond includes a small dock and is located at the Virgin Valley Campground. Fishing season is open year around. The fishing limit is 15 fish. The Dufurrena Ponds are easily accessible and are located along a maintained gravel road between Highway 140 and the Virgin Valley Campground. Catnip and Big Spring reservoirs are more remote but accessible by maintained gravel roads. Both have primitive campgrounds, which include tables, fire pits, and vault toilets. Because there are few people in Nevada, the limited amount of angler visitation data can be misleading. Fishing opportunities provided within Sheldon Refuge represent important regional destinations for recreation fishing and anglers consistently travel more than 200 miles to reach these locations throughout the summer months. Additional details related to recreation fishing can be found in the Draft Sheldon Refuge CCP/EIS.

Secondary uses of Sheldon Refuge that support fishing include overnight camping at three designated campgrounds, motorized and non-motorized boating, and vehicle use on designated access routes.

Availability of Resources:

Most administration and management of recreational fishing, including periodic restocking, is conducted by NDOW and does not represent a refuge cost for managing sport-fishing opportunities.

Maintenance of the reservoirs, ponds, docks, campgrounds, access roads, and other supporting facilities and routine law enforcement patrols are conducted by Sheldon Refuge.

All fishing opportunities within Sheldon Refuge are dependent upon constructed ponds and reservoirs, which require occasional dredging and repair to maintain public safety and water depths sufficient for self-sustaining fish populations and their habitats. Both Catnip and Big Spring reservoirs are constructed impoundments with limited to no spawning and rearing habitat, which would facilitate self-sustaining trout populations large enough to support a recreational fishery.

The earth dam at Catnip Reservoir is currently in poor condition due to leaking caused by burrowing animals. Extensive repair or possibly complete replacement would be necessary to maintain the Lahontan cutthroat trout population over the long term. The reservoir has gradually filled with sediment, bringing the current depth to approximately 4 feet. To maintain sufficient water depth for a sustainable trout population, Catnip Reservoir will need to be dredged. Previous estimates for the repair of Catnip Reservoir dam range from $334,000 to $795,000 (Sverdrup Corporation 1991). We estimate an additional $2-$2.25 million would be necessary to complete the necessary dredging today. However, over the next 10 to 15 years we anticipate Catnip Reservoir will hold water sufficient to support the Lahontan cutthroat trout fishery without major reconstruction or dredging.

Category and Itemization	**One-time**	**Annual**
Administration and management (volunteer host site development, volunteer campground hosts, law enforcement patrols, fee collection and processing):	$15,000	$5,000
Maintenance (includes Catnip Reservoir dredging and dam repairs):	$3,000,000	$500-$1,500
Monitoring:	$500	$500
Special equipment, facilities, or improvements (campgrounds, docks, and access roads):	$150,000	$500-$1,500
Offsetting revenues[2]:	$5,500	$5,500

[2] Anticipated campsite fee revenues as proposed in the CCP based on $5/site/day for 1,100 site-use days.

Anticipated Impacts of the Use(s):

Lahontan cutthroat trout were first stocked into Catnip Reservoir in 1947 (Williams et al. 1980). Catnip Reservoir is located outside the Lahontan cutthroat recovery area and the introduced fish are considered a non-essential population for recovery of this species. Big Spring Reservoir has been repeatedly stocked with rainbow trout since at least 1973. Because both Catnip and Big Spring are constructed reservoirs with limited to no spawning and rearing habitat, regular restocking will be necessary to maintain these sport fishing opportunities in the future. No short-term or long-term adverse impacts to other Sheldon Refuge resources or uses have been identified as a result of recreational fishing at Catnip or Big Spring reservoirs, and none are anticipated over the next 15 years. However, rainbow trout are not considered native or indigenous to the region, and stocking Big Spring Reservoir with Lahontan cutthroat or redband trout—which are indigenous to the region—would be more desirable and consistent with Service policy.

Non-native fish populations in the Dufurrena Ponds are typically confined to the ponds themselves, but during high flows these fish have escaped into other portions of the Thousand Creek and Virgin Creek watersheds where they have established viable populations. These fish populations likely cause minor adverse impacts to invertebrates and other aquatic wildlife within the ponds themselves. Of greater concern are the moderate adverse impacts to native fishes and the natural ecology of Virgin Creek from non-native fish that escape from Dufurrena Ponds. Under management for Sheldon Refuge included in the CCP/EIS preferred alternative, these impacts are expected to continue (see Section 6.1.1.2 of the Draft Sheldon Refuge CCP/EIS). Over the long term it would be necessary to dredge the various ponds and reservoirs to maintain open water with depths sufficient to support recreational fisheries. This periodic dredging is expected to have both short-term and long-term adverse impacts to water quality and native downstream riparian habitats.

Recreational fishing within Sheldon Refuge is supported by the Catnip, Big Spring, and Virgin Valley campgrounds. These three campgrounds are located near water and partially within riparian habitats and prehistoric cultural sites. While the majority of impacts occurred following the initial establishment of these campgrounds, some impacts continue due to continued soil disturbance and compaction within existing campsites, occasional use of previously unused areas adjacent to the campgrounds, and vehicle use outside designated areas. It is anticipated that actions to define each of these campgrounds and confine use to designated campsites would mitigate or avoid additional impacts altogether (see Section 6.1.2.3 of the Draft Sheldon Refuge CCP/EIS).

The three ponds near Dufurrena that provide recreation fishing opportunities are interconnected within the same watershed. Sediment from upper ponds are trapped by lower ponds, but periodic dredging of these lower ponds is expected to have an adverse cumulative impact on the Thousand Creek Gorge portion of the watershed. These impacts are associated with the primary purpose of maintaining open water habitat for wildlife; benefits to fish from dredging are secondary and would occur regardless of the fishing opportunity provided. Most anglers fish from shore or in non-motorized boats, or in boats with electric motors. Only non-motorized boats or boats with electric motors are allowed at Dufurrena Ponds, Big Spring Reservoir, and Catnip Reservoir. No impacts related to the use of boats have been documented within Sheldon Refuge. Angler activities have both direct and indirect impacts on aquatic habitats and dependent wildlife. Other than fish mortality from angling, the most frequent impact is disturbance of birds and mammals. However, because all fishing areas are located near developed roads and campgrounds, impacts from recreational fishing are only a portion of the overall wildlife disturbance at these locations.

Annual NDOW fishing regulations and publications educate anglers about invasive aquatic species and suggest methods to avoid introducing these pests into new areas. Anglers have not been identified as the cause for any invasive species introduced to Sheldon Refuge.

No fishing or supporting activities occur within proposed wilderness, and no activities to maintain fishing opportunities are anticipated to affect nearby proposed wilderness areas. More detailed analyses of impacts from habitat management and recreation fishing are included in Sections 6.1.5.2 and 6.1.5.3 of the Draft Sheldon Refuge CCP/EIS.

Public Review and Comment:

This and other compatibility determinations were prepared concurrently with the Draft Comprehensive Conservation Plan and Environmental Impact Statement for the Sheldon National Wildlife Refuge (in press). Open houses were held, multiple planning updates were mailed, and written comments were solicited from the public during development of the Draft CCP/EIS for the refuge. Appendix A of the Draft CCP/EIS further details public involvement during development of the CCP. Additional public review and comment will be solicited during the Draft CCP/EIS comment period.

Determination: (check one below)

___ Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Management direction is provided in the CCP for Sheldon Refuge. This directs monitoring of wildlife-dependent recreational fishing activities. Findings from these monitoring efforts would be used in determining what additional management actions, if any, are needed to ensure all fishing activities remain compatible with refuge purposes. Additional stipulations to ensure compatibility of fishing and other public uses are included in Exhibit D-1 and are incorporated into this compatibility determination by reference.

The primary purpose for maintaining Catnip Reservoir and the associated Lahontan cutthroat trout fishery as a non-essential population outside the species recovery area is to support Lahontan cutthroat reintroduction and recovery efforts elsewhere in the region (Sheldon CCP Objective 3d). Sport fishing at Catnip Reservoir would be allowed to continue to the extent the activity does not interfere with the implementation of this primary objective.

The primary management objective for McGee Pond will be to provide sustainable fishing opportunities for individuals who are age 12 or under, age 65 or older, or disabled.

Special State of Nevada sport fishing regulations apply to recreational fishing on Sheldon Refuge. Sheldon Refuge staff would continue to work cooperatively with the State's regulatory process to maintain harvest regulations necessary and appropriate to minimize adverse impacts to fisheries resources. To minimize impacts on refuge lands and resources, law enforcement patrols would routinely be conducted in an effort to maximize compliance with applicable policies, rules, and/or regulations.

Catnip Reservoir would continue to be stocked with Lahontan cutthroat trout, and Big Spring Reservoir would be stocked with Lahontan cutthroat, redband trout, or other trout indigenous to the region when sufficient water is available. Sport fishing at these reservoirs is considered secondary to other refuge management objectives. Therefore, the funding and staffing necessary for restocking these fisheries to maintain recreation opportunities will remain the responsibility of NDOW and the State of Nevada. To further restore biological integrity, diversity, and environmental health to Sheldon Refuge, all fish stocked or restocked to the Virgin Creek watershed, Catnip Reservoir, or Big Spring Reservoir would be regionally indigenous native fish species. Consistent with Refuge System policy (7 RM 10, 7 RM 12), restocking of fish to these locations may be allowed when and where determined necessary to maintain healthy populations but would not be conducted primarily to maintain or enhance recreation opportunity.

Impacts to fish populations and other public uses from sport fishing within the refuge, including both direct and indirect impacts, are considered minor (see Section 6.3.3 of the Draft Sheldon Refuge CCP/EIS). Actions proposed to manage public uses within the refuge, including sport fishing, are expected to reduce impacts to fish, wildlife, and habitat and to maintain opportunities for high-quality wildlife-dependent public uses. Sport fishing has a negligible impact on refuge fisheries and habitat conditions when compared with past water development and refuge management actions to maintain wetland conditions. When considered with other existing and proposed public uses and management actions at Sheldon Refuge, sport fishing is secondary and cumulative impacts would be negligible. Cumulative impacts from management of supporting uses such as camping would be minor and beneficial. It is anticipated the overall amount of refuge visitation associated with sport fishing would remain relatively stable and would not interfere with or detract from the quality of other refuge public uses.

Justification:

The National Wildlife Refuge System Administration Act of 1966 (as amended) identifies recreational fishing as one of six priority public uses on national wildlife refuges. The law states that, when managed in accordance with principles of sound fish and wildlife management and administration, fishing and the other priority wildlife-dependent recreational uses “have been and are expected to continue to be generally compatible uses.” The Act further states that these priority public uses should receive enhanced consideration over other general public uses in refuge planning and management, and directs the U.S. Fish and Wildlife Service to provide increased opportunities for the public to safety engage in traditional outdoor activities such as fishing and hunting.

Management of sport fisheries and sport fishing opportunity are considered secondary to other management objectives and purposes for Sheldon Refuge. Management of the Dufurrena Ponds is primarily to benefit migratory birds and other wildlife, and management of Catnip Reservoir is primarily to aid in the recovery of the threatened Lahontan cutthroat trout. Impacts and costs associated with management and maintenance of the Dufurrena Ponds and Catnip Reservoir would occur regardless of any benefits or impacts to sport fishing opportunities. There are no plans to modify Big Spring Reservoir or the impoundment dam, but maintenance would continue to provide seasonal migratory bird habitat.

Because fishing opportunities are made possible by constructed ponds and reservoirs, there is little associated wetland habitat, and aquatic ecosystems are not considered natural or fully intact. As a result, fish populations have little adverse impact. Requirements for non-motorized boats or boats

with electric motors will reduce impacts to other wildlife and maintain opportunities for solitude on an around these water bodies.

Allowing only non-motorized boats or boats with electric motors on Big Spring Reservoir, Catnip Reservoir, and Dufurrena Ponds will continue to minimize disturbance to migratory birds and other wildlife, eliminate the risk of pollution associated with use of internal combustion boat motors, and maintain opportunities for solitude.

To reduce impacts to fishery resources and to provide the continued opportunity for recreational uses of these species by the American public, NDOW regularly adopt regulations in response to fish population levels and management needs. These regulations currently provide adequate protection for Sheldon Refuge's fishery resources, continued recreation opportunities, and other refuge purposes. Requirements for future stocking by NDOW will ensure fisheries management remains consistent with Service policy.

Mandatory 10- or 15-Year Re-evaluation Date: (provide year for "allowed" uses only)

___2026___ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

____ Categorical Exclusion without Environmental Action Statement

____ Categorical Exclusion and Environmental Action Statement

____ Environmental Assessment and Finding of No Significant Impact

_X_ Environmental Impact Statement and Record of Decision

References Cited:

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Sverdrup Corporation. 1991. Advanced project planning for the repair of Catnip Dam at the Sheldon National Wildlife Refuge near Lakeview, Oregon. Prepared for Department of the Interior, U.S. Fish and Wildlife Service. Portland, OR.

Williams, J.E., C.D. Williams, and C.E. Bond. 1980. Fishes of the Sheldon National Wildlife Refuge. Pages 1-58 in: R.A. Tubb, compiler. Survey of fishes, amphibians, and reptiles on the Sheldon National Wildlife Refuge. Oregon State University, Department of Fisheries and Wildlife. Corvallis, OR.

Refuge Determination

Prepared by:	_____	_____
	(Signature)	(Date)
Refuge Manager/ Project Leader Approval:	_____	_____
	(Signature)	(Date)
Concurrence		
Refuge Supervisor:	_____	_____
	(Signature)	(Date)
Regional Chief, National Wildlife Refuge System:	_____	_____
	(Signature)	(Date)

D.3 Compatibility Determination for Sport Hunting on Sheldon National Wildlife Refuge

Use(s): Hunting

Supporting Uses: Camping, boating, hiking, backpacking, horseback riding, and vehicle use

Refuge Name: Sheldon National Wildlife Refuge

City/County and State: Washoe County, Nevada; Humboldt County, Nevada; Lake County, Oregon

Establishing and Acquisition Authority(ies):

What is today known as the Sheldon National Wildlife Refuge was initially established by Executive Order 5540 dated January 26, 1931, and later enlarged by Executive Order 7364 dated May 6, 1936, and Executive Order 7522 dated December 21, 1936.

The authorities for nearly all Federal lands within Sheldon Refuge are the Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715r) and the National Wildlife Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee). A small portion of Sheldon Refuge was acquired under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1231-1544).

Refuge Purpose(s):

> "...as a refuge and breeding ground for wild animals and birds..." Executive Order 5540 dated January 26, 1931.
>
> "... 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 ..." Executive Order 7522 dated December 21, 1936.
>
> "... to conserve (A) 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)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):

Hunting considered in this compatibility determination is limited to the following specific animals or groups of animals as defined by state and Federal hunting regulations: pronghorn, mule deer,

California bighorn sheep, chukar, California quail, Greater sage-grouse, and migratory birds. It is estimated slightly more than 4,000 visitors participate in hunting within Sheldon Refuge each year.

Hunting is allowed throughout much of Sheldon Refuge. However, all hunting is prohibited at Catnip and Big Spring reservoirs, within the Dufurrena Ponds Closed Area, and within the Little Sheldon Closed Area (see Figure 5.1 in Chapter 5 of the Draft Sheldon Refuge CCP/EIS). Big-game hunting seasons, which vary by wildlife species and weapon type, begin in early August and end in early November. Hunting seasons for upland game birds begin in mid- to late September and end in early February.

Big-game hunting areas are established in cooperation with the Nevada Department of Wildlife (NDOW) and the Oregon Department of Fish and Wildlife (ODFW). Big-game hunting units within the Nevada portion of Sheldon Refuge include all of Hunt Management Unit 033. The relatively small portion of Sheldon Refuge within Oregon is within Wildlife Management Unit 70 (Beaty's Butte). Big-game hunting activities have remained relatively stable within Sheldon Refuge due to the limited number of hunting tags issued by each state.

Big-game hunting is managed to provide high-quality opportunities and is characterized by opportunities for large trophy-sized animals; the opportunity to use a wide range weapons, hunting techniques, means of access, and modes of transportation; the opportunity for solitude and little crowding or competition with other hunters; and natural settings characterized by few structures or evidence of people. Multiple seasons for pronghorn, mule deer, and bighorn are provided from August through October to maintain low hunting pressure and reduce hunting competition; allow for non-overlapping bow, rifle, and muzzleloader seasons; and reduce crowding at campgrounds. Most hunting tags are issued for mule deer hunting, with slightly fewer tags issued for pronghorn, and only a handful of tags issued for bighorn sheep hunting (see Section 5.2.3 of the Draft Sheldon Refuge CCP/EIS for more details).

Due to the lack of surface water within Sheldon Refuge and current regulation, migratory bird hunting occurs primarily at the IXL managed wetlands, which were reconstructed in partnership with Ducks Unlimited specifically to provide waterfowl resting habitat and hunting opportunity. Additional opportunities are available at various small ponds, water developments, and wetland areas scattered throughout Sheldon Refuge (see Section 5.2.1 of the Draft Sheldon Refuge CCP/EIS for more details).

Hunting of upland game birds is largely controlled by state harvest limits. Hunting for upland birds (particularly chukar) often includes the use of dogs for pointing and retrieval of birds.

Hunting of Greater sage-grouse within Sheldon Refuge is allowed by permit issued from NDOW. The primary purpose for this hunt is to collect bird wings for use in estimating population productivity, reproduction, and sex and age ratios (see Section 4.2.2.1 of the Draft Sheldon Refuge CCP/EIS). A secondary benefit from this hunt is hunting opportunity provided for up to 75 hunters drawn by lottery from a pool of roughly 400 applicants each year. Hunting for sage-grouse within Sheldon Refuge is restricted to two separate two-day seasons in September. Seasons and harvest limits are coordinated by NDOW and Sheldon Refuge to maintain healthy populations and adequate data collection. Harvest levels are currently lower than in past years as a result of harvest and possession limits being reduced from three and six birds respectively and the number of annual permits reduced from 150 to 75 in 2007. From 2002 through 2010, a minimum of 1,296 Greater sage-grouse were harvested within Sheldon Refuge (based on the number of wings hunters

provided). Harvest ranged from 75 birds in 2007 to 230 in 2004 and averaged 144 birds per year (Collins 2010). The sage-grouse hunt is important for determining the success of reproduction for the year. Every hunter is required to deposit one wing from every grouse into a collection barrel before leaving Sheldon Refuge. Wings are then examined each year during the annual NDOW wing bee to estimate population productivity and nesting success. See Section 5.2.2 of the Draft Sheldon Refuge CCP/EIS for more details about upland bird hunting within the refuge.

Secondary uses of Sheldon Refuge that support hunting include hiking, backpacking, overnight camping at 13 designated campgrounds and by permit in backcountry areas, motorized and non-motorized boating, and vehicle use on designated access routes.

A more detailed description of secondary uses and supporting facilities is included in Section 5.3 of the Draft Sheldon Refuge CCP/EIS.

Availability of Resources:

Most administration and management of recreational hunting, including issuing of licenses, permits, and harvest tags is conducted by NDOW and ODFW. Maintenance of the IXL wetlands, campgrounds, access roads, and other supporting facilities and routine law enforcement patrols are conducted by Sheldon Refuge.

Category and Itemization	One-time	Annual
Administration and management (volunteer host site development, volunteer campground hosts, law enforcement patrols, fee collection and processing):	$15,000	$5,000
Maintenance:	$5,000	$500-$1,500
Monitoring:	$500	$500
Special equipment, facilities, or improvements (campgrounds, docks, and access roads):	$150,000	$500-$1,500
Offsetting revenues[3]:	$5,500	$5,500

[3] Anticipated campsite fee revenues for Catnip Reservoir, Big Spring Reservoir, and Virgin Valley campgrounds if fee structure adopted as proposed in the CCP based on $5/site/day for 1,100 site-use days.

Anticipated Impacts of the Use(s):

Hunting seasons and harvest levels are established in cooperation with both NDOW and ODFW. Both state and Federal wildlife biologists have determined the current levels of harvest are sustainable and would not have any significant long-term adverse impacts on wildlife populations (see also Section 6.1.2.2 of the Draft Sheldon Refuge CCP/EIS).

Sport hunting within Sheldon Refuge is supported by 13 primitive, semi-primitive, and developed campgrounds. The 13 campgrounds are located near water and partially within riparian habitats and several prehistoric cultural sites. While the majority of impacts occurred following the initial establishment of these campgrounds, some impacts continue due to ongoing soil disturbance and compaction within existing campsites, occasional use of previously unused areas adjacent to the campgrounds, and vehicle use outside designated areas. It is anticipated actions to relocate campgrounds to alternative sites, protect sensitive habitats at each of these campgrounds, and confine use to designated campsites in heavily used campgrounds will mitigate or avoid additional impacts altogether (see Section 6.1.2.3 of the Draft Sheldon Refuge CCP/EIS).

Access for sport hunting is provided by approximately 300 miles of motorized vehicle routes and several established routes and trails in the refuge backcountry. Roads and vehicle use can cause a number of impacts to soils, water, habitat, fish, and wildlife (see Section 6.1.2.3 of the Draft Sheldon Refuge CCP/EIS). Vehicle use is allowed on routes within the refuge where these impacts are anticipated to be minimal, or where planned management actions such as re-routing, realignment, and seasonal closures will acceptably minimize impacts. Route segments identified for re-routing, realignment, or other action were identified in the Draft Sheldon Refuge CCP preferred alternative.

Even though the hunting of Greater sage-grouse is conducted to collect data for management purposes, this activity is considered a wildlife-dependent recreation activity because the wings needed are collected from sport hunters. A number of studies suggest hunting of upland species, including sage-grouse, is compensatory to natural mortality and has little or no measurable effect on the population, but that some local, isolated populations may be vulnerable to hunting (Sage-grouse Conservation Team 2004). The validity of the idea that hunting is a form of compensatory mortality for upland game birds has been questioned in recent years (Connelly et al. 2005:660, 663; Reese and Connelly In Press:6).) cite many studies suggesting that hunting of upland game, including the Greater sage-grouse, is often not compensatory. Other studies have sought to determine whether hunting mortality in sage-grouse is compensatory or additive (USFWS 2010). Results of those studies have been contradictory. For example, Braun (1987:139) found that harvest levels of 7% to 11% had no effect on subsequent spring breeding populations based on lek counts in North Park, Colorado. Johnson and Braun (1999:83 as cited in USFWS 2010) determined that overwinter mortality correlated with harvest intensity in North Park, Colorado, and hypothesized that hunting mortalities may be additive. In general, hunting is not considered an additive mortality factor in areas where habitat is of sufficient quality and quantity. However, hunting may be additive where habitat is limited or degraded, or where other factors are limiting the population (e.g., West Nile virus outbreak) (Stiver et al. 2006).

In its 2010 finding, the Service evaluated the impact of hunting on sage-grouse throughout their current range and has determined that although the allowable harvest of sage-grouse through hunting was very high in past years, substantial reductions in harvest began during the 1990s and have continued to drop, and since approximately 2000, total mortality due to hunting has been lower than in the last 50 years. The present level of hunting mortality shows no sign of being a significant threat

to the species. However, in light of present and threatened habitat loss and other considerations (e.g., West Nile virus outbreaks in local populations), states and Tribes will need to continue to carefully manage hunting mortality, including adjusting seasons and harvest levels, and imposing emergency closures if needed. The Service concluded that the Greater sage-grouse is not threatened by overutilization for commercial, recreational, scientific, or educational purposes now or in the foreseeable future. The Western Association of Fish and Wildlife Agencies (WAFWA) recommends where populations are hunted, harvest rates should be 10% or less than the estimated fall population to minimize negative effects on the subsequent years breeding population (Armentrout et al. 2004).

In 2004 NDOW estimated the sage-grouse population within Sheldon Refuge was 2,896 to 3,475 birds and the minimum harvest was 230 birds (calculated from wings provided by hunters), or 7.9% to 6.6% of the population. In 2001, Sheldon Refuge fall population estimate was 3,652 birds and harvest was 180 birds, or 5% of the fall population. Based on the number of grouse wings provided by hunters, the minimum number of birds harvested from Sheldon Refuge from 2002 through 2010 was 1,296. Harvest ranged from 75 birds in 2007 to 230 in 2004 and averaged 144 birds per year (Collins 2010). Based upon these estimates, total harvest is likely less than 10% of the total sage-grouse population within Sheldon Refuge (which is the WAFWA guideline used by NDOW for Sheldon Refuge), and we anticipate continued hunting as proposed under all alternatives would not pose a threat that would lead to the likely endangerment of the species in the foreseeable future. Sage-grouse populations within Sheldon Refuge and population productivity estimates derived from wing analyses would continue to be evaluated and considered in future sage-grouse population management decisions and recovery efforts as appropriate under all alternatives to ensure overall harvest does not exceed 10% of the population and that wing data are appropriate and necessary for sage-grouse management within the refuge.

Impacts to wildlife populations and other public uses from sport hunting within the refuge, including both direct and indirect impacts, are considered minor (see Section 6.1.2.2 of the Draft Sheldon Refuge CCP/EIS). Actions proposed to manage public uses within the refuge, including sport hunting, are expected to reduce impacts to wildlife and wildlife habitat and to maintain opportunities for high-quality wildlife-dependent public uses. Currently refuge habitat conditions as a result of overgrazing by feral horses and burros, and past livestock and fire management practices have a greater impact on wildlife than hunting within the refuge. When considered with other existing and proposed public uses and proposed management actions at Sheldon Refuge, cumulative impacts from sport hunting would be minor, and cumulative impacts from management of supporting uses such as camping and vehicle access would be beneficial and minor to moderate. Continued monitoring of wildlife populations and coordination with NDOW and the Oregon Department of Fish and Wildlife will provide necessary information and management to ensure impacts to wildlife populations from sport hunting within the refuge remain minor. It is anticipated the overall amount of refuge visitation associated with sport hunting would remain relatively stable and would not interfere with or detract from the quality of other refuge public uses.

Public Review and Comment:

This and other compatibility determinations were prepared concurrently with the Draft Comprehensive Conservation Plan and Environmental Impact Statement for the Sheldon National Wildlife Refuge (in press). Open houses were held, multiple planning updates were mailed, and written comments were solicited from the public during development of the Draft CCP/EIS for the refuge. Appendix A of the Draft CCP/EIS further details public involvement during development of

the CCP. Additional public review and comment will be solicited during the Draft CCP/EIS comment period.

Determination: (check one below)

____ Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Management direction is provided in the Comprehensive Conservation Plan for Sheldon Refuge. This directs monitoring of wildlife-dependent recreational hunting activities. Findings from these monitoring efforts would be used in determining what additional management actions, if any, are needed to ensure all hunting activities remain compatible with refuge purposes. Additional stipulations that apply to all public uses within Sheldon Refuge are included in Exhibit D-1 and are incorporated into this compatibility determination by reference.

As a priority species for Sheldon Refuge and as a candidate species under the Endangered Species Act, Greater sage-grouse would be managed within Sheldon Refuge to ensure long-term population health and viability and to maintain or restore declining or extirpated populations (Draft Sheldon Refuge CCP Objective 6d). Sport hunting of these birds would be allowed to continue to the extent the activity does not interfere with the implementation of these primary objectives. Upon annual review, if Greater sage-grouse harvest data are determined insufficient to accurately and precisely measure identified population parameters, the activity would be found incompatible and the refuge closed to sport hunting for Greater sage-grouse.

Areas of the refuge including Dufurrena, lower Virgin Valley, and the area referred to as Little Sheldon (see Figure 5.1 of the Draft Sheldon Refuge CCP/EIS) would remain closed to all hunting. Catnip Reservoir and Big Spring Reservoir would remain closed to migratory bird hunting for public safety and to provide outstanding high quality opportunities for other wildlife-dependent public uses.

Hunting within the Refuge, consistent with state and Federal regulations, would continue to be allowed only for the following game animals: goose, duck, coot, quail, chukar, Greater sage-grouse, pronghorn, mule deer, and California bighorn sheep.

Special State of Nevada hunting regulations apply to recreational hunting on Sheldon Refuge. Sheldon Refuge staff would continue to work cooperatively with the State's regulatory process to maintain harvest regulations necessary and appropriate to minimize adverse impacts to wildlife resources. To minimize impacts on refuge lands and resources, law enforcement patrols would routinely be conducted in an effort to maximize compliance with applicable policies, rules, and/or regulations.

Justification:

The National Wildlife Refuge System Administration Act of 1966 (as amended) identifies recreational hunting as one of six priority public uses on national wildlife refuges. The law states that, when managed in accordance with principles of sound fish and wildlife management and

administration, hunting and the other priority wildlife-dependent recreational uses "have been and are expected to continue to be generally compatible uses." The Act further states that these priority public uses should receive enhanced consideration over other general public uses in refuge planning and management, and directs the U.S. Fish and Wildlife Service to provide increased opportunities for the public to safety engage in traditional outdoor activities such as fishing and hunting.

Sport hunting does result in harm to individual animals and can result in additional disturbance or displacement of wildlife. Based on the number of hunting tags issued, and the average size groups during hunting season, we estimate visitation associated with hunting is less than 4,000 people per year and the majority of visitors who engage hunting stay in designated campgrounds and they travel roads and motorized routes throughout the Refuge. By closing approximately 65 miles of routes that are duplicative, are not necessary for public access, and are causing adverse impacts to wildlife and wildlife habitat, we expect overall adverse impacts to wildlife from motorized vehicles and vehicle use during the hunting seasons will be reduced. In addition, there is a sufficient amount of undisturbed habitat available to refuge wildlife for escape and cover. Other requirements for the use of non-motorized boats, use of designated campgrounds, and requirement for backcountry camping permits will also minimize wildlife disturbance and displacement from important habitats while maintaining opportunities for solitude within proposed wilderness areas and wilderness study areas. Stipulations identified in this compatibility determination and included in Exhibit D-1 are expected to minimize impacts from hunting within Sheldon Refuge to fish, wildlife, plants, and their habitats.

Closure of the Virgin Valley and Little Sheldon areas to all hunting and the closure of Big Spring Reservoir and Catnip Reservoir to migratory bird hunting will continue to provide outstanding opportunities for other wildlife-dependent public uses and provide sanctuary for some big-game and game bird animals.

To reduce impacts to wildlife resources and to provide the continued opportunity for recreational uses of these species by the American public, Sheldon Refuge, NDOW and ODFW cooperatively conduct population surveys and studies and adopt regulations in response to wildlife population survey and study results and management needs. These regulations currently provide adequate protection for Sheldon Refuge's wildlife resources, continued recreation opportunities, and other refuge purposes.

Mandatory 10- or 15-Year Re-evaluation Date: (provide year for "allowed" uses only)

___2026___ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

____ Categorical Exclusion without Environmental Action Statement

____ Categorical Exclusion and Environmental Action Statement

____ Environmental Assessment and Finding of No Significant Impact

_X_ Environmental Impact Statement and Record of Decision

References Cited:

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USFWS. 2010. Proposed Rule for 12-month finding for petitions to list the Greater sage-grouse (*Centrocercus urophasianus*) as threatened or endangered. FWS-R6-ES-2010-0018. Federal Register Vol. 75, No. 55 published Tuesday, March 23, 2010.

Refuge Determination

Prepared by:	_____	_____
	(Signature)	(Date)
Refuge Manager/ Project Leader Approval:	_____	_____
	(Signature)	(Date)
Concurrence		
Refuge Supervisor:	_____	_____
	(Signature)	(Date)
Regional Chief, National Wildlife Refuge System:		
	_____	_____
	(Signature)	(Date)

D.4 Compatibility Determination for Guiding on Sheldon National Wildlife Refuge

Use(s): Guiding (big-game hunting, upland bird hunting, and migratory bird hunting)

Supporting Uses: Camping, boating, hiking, backpacking, horseback riding, and vehicle use

Refuge Name: Sheldon National Wildlife Refuge

City/County and State: Washoe County, Nevada; Humboldt County, Nevada; Lake County, Oregon

Establishing and Acquisition Authority(ies):

What is today known as the Sheldon National Wildlife Refuge was initially established by Executive Order 5540 dated January 26, 1931, and later enlarged by Executive Order 7364 dated May 6, 1936, and Executive Order 7522 dated December 21, 1936.

The authorities for nearly all Federal lands within Sheldon Refuge are the Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715r) and the National Wildlife Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee). A small portion of Sheldon Refuge was acquired under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1231-1544).

Refuge Purpose(s):

> "...as a refuge and breeding ground for wild animals and birds..." Executive Order 5540 dated January 26, 1931.
>
> "... 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 ..." Executive Order 7522 dated December 21, 1936.
>
> "... to conserve (A) 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)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):

Guiding and outfitting considered in this compatibility determination are limited to commercial and economic activities related to transporting, assisting, and accompanying hunters within Sheldon

Refuge. Sheldon Refuge issues approximately 10 Special Use Permits each year for guiding and outfitting hunters within Sheldon Refuge, nearly all of which are for guided big-game hunting.

Commercial outfitting and guiding generally occur throughout much of Sheldon Refuge and at the same times and locations as sport hunting. However, guides and outfitters often conduct trips within Sheldon Refuge prior to the hunting season to scout for and spot game and to transport equipment and supplies for temporary campsites.

Guides and outfitters typically use designated campgrounds for short periods of less than 14 days throughout the hunting seasons or travel into Sheldon Refuge for day-use hunting. Access to hunting areas typically includes both motorized vehicle use along designated roads and routes, as well as hiking. Few guides or outfitters provide pack or saddle stock for access to wilderness and other backcountry areas of Sheldon Refuge. Guides who provide opportunities for hunting migratory or upland game birds often use trained dogs for finding and retrieving birds as allowed by state hunting regulations.

Refuge policy allows commercial services within proposed wilderness to the extent they are necessary for activities that are proper for realizing the recreation or other wilderness purposes of the wilderness areas. Most big-game hunting opportunities are found within proposed wilderness areas, and it is assumed all commercial outfitters and guides will use portions of one or more proposed wilderness areas during any particular hunt. The types and amounts of commercial guiding and outfitting necessary for recreation opportunities within the eight proposed wilderness areas were evaluated in the Draft Sheldon Refuge CCP/EIS and are determined as part this compatibility determination.

Availability of Resources:

The primary cost to Sheldon Refuge of managing commercial guiding and outfitting is for the administration of Special Use Permits. Fees for permits and client days typically cover the costs associated with issuing and administering the permit. However, if demand exceeds the limit of 10 commercial permits available, the costs associated with reviewing and selecting permittees through a competitive bid process would not be offset or recovered through fees.

Most administration and management of recreational hunting, including issuing of licenses, permits, and harvest tags is conducted by the Nevada Department of Wildlife (NDOW) and Oregon Department of Fish and Wildlife (ODFW). Maintenance of the IXL wetlands, campgrounds, access roads, and other supporting facilities and routine law enforcement patrols are conducted by Sheldon Refuge primarily to provide quality wildlife-dependent public uses. The amount of use at these facilities by commercial guides and outfitters is considered negligible and does not represent and added cost for administration of this economic use.

Category and Itemization	One-time	Annual
Administration and management (issuance and administration of Special Use Permits):	$2,500	$2,500
Maintenance:		

Monitoring (law enforcement contacts and review of client-use reports):	$1,000	$1,000
Special equipment, facilities, or improvements (campgrounds, docks, and access roads):		
Offsetting revenues[4]:	$3,500	$3,500

Anticipated Impacts of the Use(s):

It is anticipated that commercial guiding and outfitting and associated public uses will have impacts similar to those described for sport hunting (refer to impacts discussed in sections 6.1.2.1, 6.1.2.2, and 6.1.2.3, the Draft Sheldon CCP/EIS, and to the sport hunting compatibility determination in this appendix), but conditions included in all Special Use Permits for guiding and outfitting within Sheldon Refuge (see Exhibit D-2) should reduce the effects of these impacts.

Proposed wilderness areas located within Sheldon Refuge provide remote isolated settings characterized by vast expanses of open sagebrush country, rugged terrain, highly variable weather and temperatures, and isolation. Safe travel and exploration of Sheldon Refuge demands visitors be prepared, knowledgeable, and experienced in wilderness and backcountry settings. Allowing a limited number of commercial outfitters and guides who possess adequate equipment, knowledge and skills to operate within Sheldon Refuge would provide wilderness recreation opportunities for many people who otherwise would be unable or unwilling to visit. Because visitation within much of Sheldon Refuge is characterized as low or very low, the presence of outfitters or guides with small groups of clients is not expected affect overall opportunities for wilderness solitude or natural character. Because most demand for outfitting and guiding is currently from a small proportion of the limited number of big-game hunting tag holders, there currently is no need to consider limits on the number of clients or client-use days to maintain wilderness character.

Issuing up to 10 permits for commercial outfitting and guiding would be consistent with past use within Sheldon Refuge and is expected to supply an adequate number of choices and variety of services for the visiting public while maintaining a level of competition sufficient to ensure quality services are provided.

Impacts to wildlife populations and other public uses from commercial outfitting and guiding within the refuge, including both direct and indirect impacts, are considered minor (refer to section 6.1.2 of the Draft Sheldon Refuge CCP/EIS). Actions proposed to manage commercial uses within the refuge,

[4] Anticipated Special Use Permit fees and revenues as proposed in the CCP are based on $250 annual fee and 10 client-use days per permit.

including big-game guiding and outfitting, are expected to have both adverse and beneficial impacts to wildlife and wildlife habitat and to increase opportunities for high-quality wildlife-dependent public uses. When considered with other existing and proposed public uses and proposed management actions at Sheldon Refuge, cumulative impacts from outfitting and guiding and cumulative impacts from management of supporting uses such as camping and vehicle access would be beneficial and minor to moderate. Continued monitoring of public uses and outfitter and guides operating within the refuge and special use permit conditions will provide necessary information and management to ensure the continued benefit of commercial services to the visiting public. It is anticipated the overall amount of refuge visitation associated with outfitting and guiding will remain relatively low and stable, and would not interfere with or detract from the quality of other refuge public uses.

Public Review and Comment:

This and other compatibility determinations were prepared concurrently with the Draft Comprehensive Conservation Plan and Environmental Impact Statement for the Sheldon National Wildlife Refuge (in press). Open houses were held, multiple planning updates were mailed, and written comments were solicited from the public during development of the Draft CCP/EIS for the refuge. Appendix A of the Draft CCP/EIS further details public involvement during development of the CCP. Additional public review and comment will be solicited during the Draft CCP/EIS comment period.

Determination: (check one below)

____ Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Any guide or outfitter using lands managed by the Service within Sheldon Refuge while conducting or in support of his or her business must obtain a Refuge Special Use Permit. In addition to standard conditions and requirements that apply to all National Wildlife Refuge Special Use Permits, additional conditions and requirements apply to Special Use Permits issued by Sheldon Refuge and for all commercial outfitting and guiding activities conducted within Sheldon National Wildlife Refuge. A list of these refuge-specific conditions and requirements are included in Exhibit D-2.

A maximum number of 10 commercial outfitters or guides would be issued Special Use Permit to conduct activities within Sheldon Refuge at any given time. Each Special Use Permit will be issued for a period of five years. Such permits would only be issued after applicants are selected by the Complex Project Leader through a competitive prospectus bid process. Exhibit D-3 provides an example prospectus and request for proposal.

Special state regulations apply to all licensed hunting guides operating within the states of Oregon and Nevada. Additional Refuge Special Use Permit conditions are intended to increase the quality of recreation opportunities for clients and other members of the visiting public. These permit conditions are included as stipulations of this determination to ensure compatibility (see Exhibit D-2). Law enforcement patrols would routinely be conducted in an effort to maximize compliance with applicable policies, rules, and/or regulations.

Additional stipulations that apply to all public uses (including big-game hunting, upland bird hunting, and migratory bird hunting) within Sheldon Refuge are included in Exhibit D-1 and are incorporated into this compatibility determination by reference.

Justification:

The National Wildlife Refuge System Administration Act of 1966 (as amended) identifies recreational hunting as one of six priority public uses on national wildlife refuges. The law states that, when managed in accordance with principles of sound fish and wildlife management and administration, hunting and the other priority wildlife-dependent recreational uses "have been and are expected to continue to be generally compatible uses." The Act further states that these priority public uses should receive enhanced consideration over other general public uses in refuge planning and management, and directs the U.S. Fish and Wildlife Service to provide increased opportunities for the public to safety engage in traditional outdoor activities such as fishing and hunting.

The services provided by outfitters and guides increase hunting quality and in some cases enable hunters to visit and experience Sheldon Refuge who would otherwise be unwilling or unable to do so. The remoteness, rugged terrain, and limited hunting seasons make experience, skill, and first-hand knowledge important for a safe, enjoyable, and productive hunt. In the case of bighorn sheep, hunters who are awarded a hunting tag must wait 10 years to reapply. For these rare and highly sought-after hunting opportunities, the services of an experience guide often ensure a successful hunting experience.

To reduce impacts to wildlife resources and to provide the continued opportunity for recreational uses of these species by the American public, Sheldon Refuge, NDOW, and ODFW cooperatively conduct population surveys and studies and adopt regulations in response to wildlife population survey and study results and management needs. These regulations currently provide adequate protection for Sheldon Refuge's wildlife resources, continued recreation opportunities, and other refuge purposes.

Allowing outfitting and guiding as a private economic use contributes to the quality of compatible wildlife-dependent uses within Sheldon Refuge. The competitive prospectus selection process in conjunction with numerous Special Use Permit stipulations would ensure commercial outfitters and guides conserve fish, wildlife, plants, and their habitats within Sheldon Refuge while providing high-quality service and recreation experiences to the visiting public.

Mandatory 10- or 15-Year Re-evaluation Date: (provide year for "allowed" uses only)

_____ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses)

___2021___ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

____ Categorical Exclusion without Environmental Action Statement

____ Categorical Exclusion and Environmental Action Statement

____ Environmental Assessment and Finding of No Significant Impact

_X_ Environmental Impact Statement and Record of Decision

Refuge Determination

Prepared by:	_____	_____
	(Signature)	(Date)
Refuge Manager/ Project Leader Approval:	_____	_____
	(Signature)	(Date)
Concurrence		
Refuge Supervisor:	_____	_____
	(Signature)	(Date)
Regional Chief, National Wildlife Refuge System:		
	_____	_____
	(Signature)	(Date)

D.5 Compatibility Determination for Rock Collecting on Sheldon National Wildlife Refuge

Use(s): Rock Collecting

Supporting Uses: Camping, hiking, backpacking, horseback riding, and off-highway vehicle use

Refuge Name: Sheldon National Wildlife Refuge

City/County and State: Washoe County, Nevada; Humboldt County, Nevada; Lake County, Oregon

Establishing and Acquisition Authority(ies):

What is today known as the Sheldon National Wildlife Refuge was initially established by Executive Order 5540 dated January 26, 1931, and later enlarged by Executive Order 7364 dated May 6, 1936, and Executive Order 7522 dated December 21, 1936.

The authorities for nearly all Federal lands within Sheldon Refuge are the Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715r) and the National Wildlife Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee). A small portion of Sheldon Refuge was acquired under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1231-1544).

Refuge Purpose(s):

> "...as a refuge and breeding ground for wild animals and birds..." Executive Order 5540 dated January 26, 1931.
>
> "... 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 ..." Executive Order 7522 dated December 21, 1936.
>
> "... to conserve (A) 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)

Consistent with Service Policy (601 FW 2), proposed wilderness areas are to be managed as designated wilderness. The Wilderness Act of 1964 creates additional purposes within and supplemental to other refuge purposes. Proposed wilderness areas are to be managed for the purposes of securing an enduring resource of wilderness, protecting and preserving wilderness character, and providing opportunities for public use and enjoyment and for "solitude or a primitive and unconfined type of recreation" in ways that will leave the wilderness unimpaired for future use and enjoyment as wilderness.

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the

fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):

Rock collecting is a non-priority public use that occurs throughout Sheldon Refuge, but it is concentrated within Virgin Valley, at abandoned mining claims and prospect pits, and other areas located primarily in the southern portion of Sheldon Refuge along improved roads, and unimproved vehicle routes.

Visitors seek primarily precious and semi-precious opals, petrified wood, and other common variety rocks and minerals. Currently each visitor is authorized to surface collect up to seven pounds of rock or mineral per day from public lands.

Rock collecting opportunities within Sheldon Refuge are widely known, and many visitors see the area as a destination for rock collecting both on public lands and on private mining claims within Sheldon Refuge. Visitation to the Virgin Valley portion of Sheldon Refuge occurs between May and August and constitutes the greatest amount of annual public use within Sheldon Refuge. Most visitors to Virgin Valley collect and dig for precious black opal on private mining claims, with an unknown number of visitors collecting from public lands. Other known locations are popular and consistently used throughout the summer months. Secondary uses of Sheldon Refuge that support rock collecting include hiking, horseback riding, motorized and non-motorized boating, and vehicle use on designated access routes. Overnight camping in support of the use occurs primarily at the Virgin Valley Campground, with much lesser amounts of use occurring at the eleven other designated campgrounds and by permit in backcountry areas. A more detailed discussion of supporting uses and facilities can be found in section 5.3 of the Draft Sheldon Refuge Comprehensive Conservation Plan and Environmental Impact Statement.

Availability of Resources:

Administration and management of rock collecting is very limited. Information kiosks at Sheldon Refuge entrances, Sheldon Refuge websites, brochures, and leaflets provide general information about Sheldon refuge. Private companies and individuals with mining claims provide additional signs, websites, brochures, and other information about rock collecting within Sheldon Refuge. Maintenance of the campgrounds, access roads, and other supporting facilities and routine law enforcement patrols are also conducted by Sheldon Refuge.

Category and Itemization	One-time	Annual
Administration and management (volunteer host site development, volunteer campground hosts, law enforcement patrols, backcountry use permits, fee collection and processing):	$15,000	$5,000
Maintenance:	$1,500	$500-$1,500
Monitoring:	$500	$500

Special equipment, facilities, or improvements (campgrounds and access roads):	$150,000	$500-$1,500
Offsetting revenues[5]:	$8,000	$8,000

As part of a 2001 Memorandum of Agreement with Sheldon Refuge, Humboldt County, Nevada provides approximately $2,500 per year to support volunteer staffing, maintenance, and administration of the Virgin Valley Campground and associated public facilities. When adjusted for inflation, the 2001 funding amount has the purchasing power of approximately $1,850 dollars today (2010). If inflation continues at this rate, the funding amount will have the purchasing power of about $1,370 in 2021. As a result, the continued maintenance of the Virgin Valley Campground and associated public facilities will require increased funding and support. Volunteer organizations provide additional support for the maintenance and administration of facilities that support rock collecting within Sheldon Refuge. We anticipate current funding and volunteer support when combined with campground use fees would be adequate for management of the Virgin Valley Campground over the next 10 to 15 years.

Anticipated Impacts of the Use(s):

Rock collecting is a non-priority public use which represents the majority of summer public use within Sheldon Refuge, and in particular the Virgin Valley area. However, the use does not currently conflict with priority public uses within Sheldon Refuge and is not anticipated to conflict with these uses within the 10-year timeframe of this compatibility determination. If the Refuge Manager determines such conflicts occur, the Refuge Manager may allocate rock colleting activities in time and/or space to reduce or eliminate conflicts among users of the refuge. If this cannot be done, the refuge manager may need to terminate or disallow rock collecting within Sheldon Refuge.

Rock collecting is supported by 13 designated campgrounds. The 13 campgrounds are located near water and partially within riparian habitats and several prehistoric cultural sites. While the majority of impacts occurred following the initial establishment of these campgrounds, some impacts continue due to continued soil disturbance and compaction within existing campsites, occasional use of previously unused areas adjacent to the campgrounds, and vehicle use outside designated areas. It is anticipated that actions to define each of these campgrounds and confine use to designated campsites will mitigate or avoid additional impacts altogether (refer to section 6.1.2.3 of the Draft Sheldon Refuge CCP/EIS).

[5] Anticipated campsite fee revenues as proposed in the CCP based on $5/site/day for 1,100 site-use days and $2,500 from Humboldt County, Nevada.

Access for wildlife observation and photography is provided by approximately 300 miles of motorized vehicle routes and several established routes and trails in the refuge backcountry. Roads and vehicle use can cause a number of impacts to soils, water, habitat, fish, and wildlife (refer to section 6.1.2.1 of the Draft Sheldon Refuge CCP/EIS). Vehicle use is allowed on routes within the refuge where these impacts are anticipated to be minimal, or where planned management actions such as rerouting, realignment, and seasonal closures will acceptably minimize impacts. Route segments identified for rerouting, realignment, or other action were identified in the Draft Sheldon Refuge CCP preferred alternative.

Rock collecting activities have both direct and indirect impacts on wildlife distribution, behavior, and habitats. The most frequent impacts are disturbance to large birds and mammals from people approaching too close and from vehicle presence. These impacts are most severe during periods of mating, nesting, lambing, and fawning. However, because the number of people participating in rock collecting is small and visitors generally do not venture far from roads and campgrounds, impacts from rock collectors are only a portion of the overall wildlife disturbance.

Rock collecting can cause impact through removal of interesting or unique specimens which could otherwise be enjoyed by future visitors. We expect these impacts are minor due to the likelihood that most valuable or unique specimens within the Virgin Valley have been or would be collected through mining activities and the common variety nature of most rocks collected outside the Virgin Valley area. Additional discussion of the impacts related to rock collecting and other public uses occurring within Sheldon Refuge can be found in section 6.3.6 of the Draft Sheldon Refuge Comprehensive Conservation Plan and Environmental Impact Statement.

Monitoring of public use and law enforcement at identified sensitive cultural resource sites, known fossil deposits, and areas with large specimens of petrified wood are conducted to determine if either intentional or unintentional illegal collection are impacting these resources. While violations associated with rock collecting are suspected to occur on Sheldon Refuge, it is unknown how many violations occur or if a sufficient number are inadvertent or unintentional that violations could effectively be reduced through additional regulation or permit. An adaptive management strategy would be used to more accurately document where and why violations occur and adjust refuge outreach efforts accordingly. If it is determined violations are inadvertent or unintentional and proposed outreach and education methods prove ineffective, compatibility of this use would be reevaluated.

Impacts to refuge resources and other public uses from rock collecting are suspected, but not well understood or documented. Actions proposed to manage rock collecting within the refuge, including development of targeted outreach and education programs, and additional rules and regulations for use of the Virgin Valley Campground are expected to minimize or reduce impacts. The majority of rock collecting occurs within the Virgin Valley. When considered with other existing and proposed public uses and proposed management actions, including management of mining claims within Virgin Valley, cumulative impacts from the surface collection of common variety rocks and minerals, when conducted according to applicable refuge rules and regulations, are negligible.

Public Review and Comment:

This and other compatibility determinations were prepared concurrently with the Draft Comprehensive Conservation Plan and Environmental Impact Statement for the Sheldon National Wildlife Refuge (in press). Open houses were held, multiple planning updates were mailed, and

written comments were solicited from the public during development of the Draft CCP/EIS for the refuge. Appendix A of the Draft CCP/EIS further details public involvement during development of the CCP. Additional public review and comment will be solicited during the Draft CCP/EIS comment period.

Determination: (check one below)

____ Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

The following stipulations are included in the management direction provided in the Sheldon Refuge Comprehensive Conservation Plan and are required to ensure rock collecting remains compatible with priority wildlife-dependent public uses and purposes for Sheldon Refuge. Additional stipulations that apply to all public uses within Sheldon Refuge are included in Exhibit D-1 and are incorporated into this compatibility determination by reference.

1. Surface disturbance or the use of any tool, equipment, or other device would not be allowed for the location or collection of rocks or minerals.
2. Each visitor would be authorized to collect no more than seven pounds of rock or minerals per day.
3. Sheldon Refuge will document all violations committed on refuge lands related to the collection of cultural resources (e.g., prehistoric stone tools and projectiles), vertebrate fossils, surface disturbance, or collection of more than seven pounds per person per day.
4. The number of violations in item three above committed by persons engaged in collection activities shall not exceed five violations per year in two years of any five-year period. If this compatibility threshold is exceeded, refuge compatibility for rock collecting would be reevaluated.
5. Sheldon Refuge would regulate occupancy and length-of-stay at the Virgin Valley Campground, and other designated campgrounds as necessary, to ensure adequate camping opportunities are available to support priority wildlife-dependent public uses and avoid conflict with such uses.
6. Fees would be collected for overnight use of Virgin Valley Campground to provide necessary funding for maintenance, rock collecting outreach and education programs, resident volunteers, and campground administration.

Justification:

Rock collecting is a long-standing and well-established public use within Sheldon Refuge. Rock collecting occurred within the area prior to establishment of the Refuge and has consistently been found compatible with the purposes for Sheldon Refuge and other priority wildlife-dependent public uses.

In finding rock collecting to be an appropriate use within Sheldon Refuge, the Refuge Manager determined the use does not conflict with priority wildlife-dependent public uses, that funding and

staffing are available to currently manage the use, and that the use increases public understanding and appreciation of the Refuge's natural resources.

Thresholds for campground use and the number of violations related to collection of cultural artifacts and vertebrate fossils, which are included as stipulations within this compatibility determination, would address the primary management concern related to the use and would ensure rock collection does not result in additional conflict with Sheldon Refuge purposes, management responsibilities, management goals and objectives, or with priority wildlife-dependent public uses. Targeted outreach and education would increase public understanding and appreciation of both natural and cultural resources within Sheldon Refuge. If it is determined violations are inadvertent or unintentional and proposed outreach and education methods prove ineffective, compatibility of this use would be reevaluated prior to the mandatory 10-year re-evaluation date.

Mandatory 10- or 15-Year Re-evaluation Date: (provide year for "allowed" uses only)

_____ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses)

___2021___ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

____ Categorical Exclusion without Environmental Action Statement

____ Categorical Exclusion and Environmental Action Statement

____ Environmental Assessment and Finding of No Significant Impact

_X_ Environmental Impact Statement and Record of Decision

Refuge Determination

Prepared by:	_____	_____
	(Signature)	(Date)
Refuge Manager/ Project Leader Approval:	_____	_____
	(Signature)	(Date)
Concurrence		
Refuge Supervisor:	_____	_____
	(Signature)	(Date)
Regional Chief, National Wildlife Refuge System:	_____	_____
	(Signature)	(Date)

D.6 Compatibility Determination for Research on Sheldon National Wildlife Refuge

Use: Research, scientific collecting, and surveys

Supporting Uses: camping, boating, hiking, backpacking, horseback riding, off-highway vehicle use, and landing of aircraft

Refuge Name(s): Sheldon National Wildlife Refuge

County and State: Washoe County, Nevada; Humboldt County, Nevada; Lake County, Oregon

Establishing and Acquisition Authority(ies):

What is today known as the Sheldon National Wildlife Refuge was initially established by Executive Order 5540 dated January 26, 1931, and later enlarged by Executive Order 7364 dated May 6, 1936, and Executive Order 7522 dated December 21, 1936.

The authorities for nearly all Federal lands within Sheldon Refuge are the Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715r) and the National Wildlife Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee). A small portion of Sheldon Refuge was acquired under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1231-1544).

Refuge Purpose(s):

> "...as a refuge and breeding ground for wild animals and birds..." Executive Order 5540 dated January 26, 1931.
>
> "... 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 ..." Executive Order 7522 dated December 21, 1936.
>
> "... to conserve (A) 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)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee].

Description of Use(s):

Sheldon Refuge staff receives periodic requests (fewer than six per year) from non-Service entities (e.g., universities, state agencies, other federal agencies, and non-governmental organizations) to

conduct the planned, organized, and systematic investigation of a scientific nature (i.e., research); the gathering of refuge natural resources or cultural artifacts for scientific purposes (i.e., scientific collecting); and scientific inventory or monitoring (i.e., surveys) on refuge lands. These activities have previously been found appropriate and compatible with the purposes for Sheldon Refuge and are not considered to be wildlife-dependent public uses or economic refuge uses.

The activities can address a wide range of natural and cultural resources as well as public-use management issues including habitat use and life history requirements for specific species/species groups, practical methods for habitat restoration, extent and severity of environmental contaminants, techniques to control or eradicate pest species, effects of climate change on environmental conditions and associated habitat/wildlife response, identification and analyses of paleontological specimens, wilderness character, quality of wildlife-dependent recreation, modeling of wildlife populations, and assessing response of habitat/wildlife to disturbance from public uses. Projects may be species-specific, use-specific, or refuge-specific, or may evaluate the relative contribution of Sheldon Refuge to larger landscape (e.g., ecoregion, region, flyway, national, international) issues and trends.

Research, scientific collection, and surveys typically employ a wide variety of methodologies, techniques, and tools as dictated by specific information needs, research questions, and hypotheses. It is anticipated that research, scientific collecting, and surveys within Sheldon Refuge will continue to utilize direct observation of fish, wildlife, and their habitats; the temporary installation of facilities and specialized monitoring and measuring instruments; both non-lethal and lethal collection of fish, wildlife, and plant specimens; excavation of small areas, disturbance and/or removal of cultural artifacts and paleontological specimens; and interaction with refuge visitors.

Activities are expected to occur during all seasons and in all habitat types but would continue to occur primarily in sagebrush habitat types during the spring, summer, and fall seasons. Sheldon Refuge anticipates multiple requests to conduct research, scientific collection, or surveys would be authorized each year. Most activities would occur within Sheldon Refuge for short periods of time, but some temporary facilities or instruments may remain for several months and in rare instances, longer than one year.

Potential means of access and transportation include hiking, horseback, motorized vehicles, fixed-wing aircraft, helicopters, and non-motorized boats. Activities may also require short-term use of Sheldon Refuge campgrounds, use of temporary campsites in backcountry areas, or landing of helicopters.

Authorizations for all activities and forms of access included in this compatibility determination within proposed wilderness areas are subject to a minimum requirements analysis.

The Service's Research and Management Studies (4 RM 6) and Appropriate Refuge Uses policies (603 FW1.10D(4)) indicate priority for scientific investigatory studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitat as well as their natural diversity. Projects that contribute to refuge-specific and/or wilderness management, where applicable, would be given a higher priority over other requests.

Availability of Resources:

Refuge staff responsibilities for projects by non-Service entities will be primarily be limited to the following: review and approval of proposals, preparation of Special Use Permits and other

compliance documents (e.g., Section 7, Section 106 of the National Historic Preservation Act), monitoring of project implementation to ensure that impacts and conflicts remain within acceptable levels (compatibility) over time. Additional administrative support, logistical and operational support may also be provided depending on each specific request. Estimated costs for one-time (e.g., prepare Special Use Permits) and annually re-occurring tasks by refuge staffs and other Service employees will be determined for each project. Sufficient funding in the general operating budget of Sheldon Refuge must be available to cover expenses for these projects. The terms and conditions for funding necessary to administer each project on Sheldon Refuge will be clearly stated in the Special Use Permits.

The Service has the following staffing and funding to administratively support and monitor research that is currently taking place on refuge lands. Any substantial increase in the number of projects would create a need for additional resources to oversee the administration and monitoring of the investigators and their projects. Any substantial additional costs above those itemized below will result in finding a project not compatible unless expenses are offset by the investigator(s), sponsoring agency, or organization.

Category and Itemization	One-time	Annual
Administration and management		$5,000
Maintenance		$500
Monitoring		$2,000
Special equipment, facilities, or improvement		$100
Offsetting revenues[6]		N/A

Itemized costs in the previous table are current estimates calculated using estimated costs associated with processing and administering past research, scientific collecting, and survey activities within Sheldon Refuge.

Anticipated Impacts of the Use:

A number of factors such as target species or resources, timing and duration of activities, number of researchers, and modes and frequency of access will determine the extent of impacts within Sheldon

[6] Anticipated Special Use Permit fees and revenues as proposed in the CCP are based on $250 annual fee, which typically is waived for research, scientific collection, and surveys which further the purposes for the refuge and/or provide a benefit to the refuge.

Refuge. Impacts on fish and wildlife resources, other refuge resources (e.g., water quality, soil, vegetation), and other refuge users are expected to be project- and site-specific, but are not anticipated to be significant or unacceptable because of the limited scope, Special Use Permit and compatibility stipulations, and administrative oversight of activities proposed.

Data collection techniques will generally result in negligible animal mortality or disturbance, negligible habitat destruction, no introduction of contaminants, and no introduction of non-indigenous species. In contrast, projects involving the collection of biotic samples (plants or animals) or requiring intensive ground-based data or sample collection will have short-term impacts. Impacts will be reduced by authorizing collection of the minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) necessary for identification and/or experimentation and statistical analysis as identified in project proposals submitted.

Impacts from the spread or introduction of invasive species will be minimized or mitigated through monitoring for early detection and rapid response and conditions described in the stipulations section of this compatibility determination.

There could also be localized and temporary effects from vegetation trampling, collecting of soil and plant samples, or trapping and handling of wildlife. Some level of disturbance is expected with these projects, especially if investigator(s) enter areas closed to the public and collect samples or handle wildlife. However, wildlife disturbance (including altered behavior) would be localized and temporary in nature. Projects expected to result in unavoidable long-term or substantial cumulative adverse effects will not be authorized.

Public Review and Comment:

This and other compatibility determinations were prepared concurrently with the Draft Comprehensive Conservation Plan and Environmental Impact Statement for the Sheldon National Wildlife Refuge (in press). Open houses were held, multiple planning updates were mailed, and written comments were solicited from the public during development of the Draft CCP/EIS for the refuge. Appendix A of the Draft CCP/EIS further details public involvement during development of the CCP. Additional public review and comment will be solicited during the Draft CCP/EIS comment period.

Determination: (check one below)

____ Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Only requests that demonstrate scientific validity and/or benefit to Sheldon Refuge may be approved.

In order for refuge staff and others, as needed, to identify unacceptable impacts to refuge resources, all proposals and requests to conduct research, scientific collecting, or surveys must be submitted in writing to the Refuge Manager at least 90 days prior to project initiation. Continuation of existing projects would require approval by the Complex Project Leader and inclusion of the permit stipulations listed below.

Projects will adhere to scientifically defensible protocols for data collection, where available and applicable. A Special Use Permit or Cooperative Agreement will not be issued for any final project proposal or request that the Refuge Manager determines is likely to cause unacceptable impacts to refuge resources.

Unless specifically waived by the Project Leader, any project proposal that includes the capture and handling of wildlife within Sheldon Refuge must be accompanied by written review from an accredited Institutional Animal Care and Use Committee as defined by Section 13(b) of the Animal Welfare Act (7 U.S.C. 2143).

Unless otherwise stated in a valid Special Use Permit, all items collected on refuge lands are the property of the U.S. Fish and Wildlife Service even while in the possession of the investigator(s). Any future work with previously collected samples not clearly identified in the project proposal will require submission of a subsequent proposal for review and approval. In addition, a new Special Use Permit will be required for additional project work. For samples or specimens to be stored at other facilities (e.g., museums), a signed copy of the memorandum of understanding must be provided before the Special Use Permit will be issued (see Exhibit D-2).

For all projects proposed within a designated or proposed wilderness area, a minimum requirements analysis (MRA) will be submitted by the permittee for Refuge Manager approval and will be included as part of the decision process. An MRA is a two-step process to decide if a proposed activity is necessary in wilderness, and if so, to determine the minimum tool to accomplish the project. Although required for all administrative activities, including issuing Special Use Permits, an MRA cannot be used to authorize prohibited activities in designated wilderness by the public.

Each project will require a Special Use Permits or Cooperative Agreement, which would typically be issued for a period of one year or less. Some permits may be renewed annually or issued for longer periods if needed to allow completion of a project. However, no Special Use Permit or Cooperative Agreement would be issued or renewed for a period longer than five years.

Refuge staff will monitor all research, scientific collection, and surveys being conducted on Sheldon Refuge. Findings from these monitoring efforts will be used to determine what additional management actions, if any, are needed to ensure that research activities remain compatible with refuge purposes.

Monitoring of all authorized research, scientific collection, and survey activities will be continued to ensure compliance with specific terms and conditions tailored for each research project's permit as well stipulations incorporated into all research permits to minimize impacts on refuge lands and resources.

In addition to General Conditions and Requirements for Special Use Permits and Sheldon National Widlife Refuge Special Use Permit Conditions (see Exhibit D-2), the conditions listed below are to be included on all Sheldon Refuge Special Use Permits and Cooperative Agreements issued for scientific research, scientific collection, and surveys, most of which are intended to minimize impacts and ensure compatibility. Refuge permits may also include other special conditions as necessary or appropriate for the specific operations or activities that are proposed.

- Failure to abide by any part of this Special Use Permit; violation of any refuge-related provision in Titles 43 (Part 36) or 50(sub-chapters B and C), Code of Federal Regulations; or

violation of any pertinent state regulation (e.g., fish or game violation) will, with due process, be considered grounds for revocation of this permit and could result in denial of future permit requests for lands administered by the U.S. Fish and Wildlife Service. This provision applies to all persons working under the authority of this permit. Appeals of decisions relative to permits are handled in accordance with Title 50 Code of Federal Regulations Part 36.41.

- The permittee and all others conducting activities under this permit are required to follow all refuge-specific regulations unless specific exemptions are included in this SUP.
- A copy of this permit must be in the permittee's or field party chief's possession at all times while exercising the privileges of this permit. A copy of the permit must be shown to any U.S. Fish and Wildlife Service employee or Federal law enforcement officer upon request.
- The permitee is responsible for obtaining, possessing, and complying with all other appropriate State and Federal permits required for their projects, including appropriate collection permits from the State of Nevada and/or Oregon Department of Fish and Wildlife, for research involving fish and wildlife.
- For each instance, the permittee or party chief shall notify the Refuge Manager during refuge working hours before beginning and upon completion of activities allowed by this permit.
- Prior to beginning any activities allowed by this permit, the permittee shall provide the Refuge Manager with the following: (1) name and method of contact for the field party chief or supervisor; aircraft and other vehicle types to be used, identification information for these vehicles; and names of assistants (2) any changes in information provided in the original permit application.
- The Project Leader or appointed representative, upon request, shall be afforded the opportunity and logistical support to accompany the permittee for the purpose of inspection and monitoring permittee activities. A final inspection trip provided by the permittee of the areas of use may be required by the project leader to determine compliance with the terms of this permit.
- Unless otherwise stated in this Special Use Permit, all items collected on refuge lands remain the property of the U.S. Fish and Wildlife Service.
- Project progress reports will be submitted to the Refuge Manager annually for multiple-year projects. At a minimum, each report will include the required elements listed in Exhibit D-2.
- The permittee shall provide the Refuge Manager with a report of activities under this permit within 30 days of permit expiration, unless otherwise negotiated with the Project Leader.
- The Project Leader will be provided copies of all raw data in electronic database format (unless otherwise stipulated in this permit) and a final report within one year of completion of the project.
- The Project Leader will be given adequate opportunity to review draft manuscript(s) from the project before being submitted to a scientific journal(s) for consideration of publication.
- The Project Leader will be provided with at least three copies (reprints) of all publications resulting from activities authorized by this permit.
- Sheldon Refuge staff and other Service personnel will be appropriately cited and acknowledged in all written and oral presentations resulting from projects on refuge lands.

Justification:

Research, scientific collecting, and surveys on refuge lands are inherently valuable to the Service because they expand scientific information available for resource management decisions. In addition, only projects that directly or indirectly contribute to the enhancement, protection, use,

preservation, and management of refuge wildlife populations and their habitats generally will be authorized on refuge lands. Research, scientific collection, and surveys conducted by other agencies, universities, non-profit organizations, and individuals can provide information and data related to Sheldon Refuge, which would otherwise not be available. In many cases, the information and data provided address important management issues and improve the ability of Service to fulfill the purposes for Sheldon Refuge and the mission of the Refuge System. Furthermore, the uses contribute to the scientific and educational values of the eight proposed wilderness areas encompassing more than half of Sheldon Refuge. By allowing the use to occur under the stipulations included as part of this compatibility determination, it is anticipated the use would not result in any unacceptable or irreversible adverse impacts to fish, wildlife, plants, and their habitats or to wildlife-dependent public uses. As a result, these projects will not materially interfere with or detract from fulfilling refuge purpose(s); contributing to the mission of the National Wildlife Refuge System; and maintaining the biological integrity, diversity, and environmental health of Sheldon Refuge.

Mandatory 10- or 15-Year Re-evaluation Date: (provide year for "allowed" uses only)

_____ Mandatory 15-year re-evaluation date (wildlife-dependent public uses)

___2021___ Mandatory 10-year re-evaluation date (uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

____ Categorical Exclusion without Environmental Action Statement

____ Categorical Exclusion and Environmental Action Statement

____ Environmental Assessment and Finding of No Significant Impact

_X_ Environmental Impact Statement and Record of Decision

Refuge Determination

Prepared by:	_____	_____
	(Signature)	(Date)
Refuge Manager/ Project Leader Approval:	_____	_____
	(Signature)	(Date)
Concurrence		
Refuge Supervisor:	_____	_____
	(Signature)	(Date)
Regional Chief, National Wildlife Refuge System:	_____	_____
	(Signature)	(Date)

Exhibit D-1 Proposed Stipulations for Compatible Public Uses within Sheldon National Wildlife Refuge

Secondary uses that support several wildlife-dependent public uses have the potential to cause adverse impacts to one or more resources or compatible wildlife-dependent public uses within Sheldon Refuge. The following stipulations would minimize or avoid these potential adverse impacts and must be included as stipulations to ensure compatibility (50 CFR 26.41(a)(11), 603 FW 2(11)). The stipulations listed in this exhibit are incorporated by reference and are in addition to specific compatibility determination stipulations for all public uses within Sheldon Refuge, including the following:

- Hunting
- Fishing
- Wildlife observation
- Wildlife photography
- Environmental education
- Environmental interpretation
- Rock collecting
- Commercial guiding[9]
- Research, scientific collecting, and surveys[7]

Public Use Stipulations:

- All vehicles defined as an off-road vehicle under 42 U.S.C. Section 4321 use must be registered with the State of Nevada or Sheldon National Wildlife Refuge for use on lands administered by Sheldon Refuge.

- Vehicle use within Sheldon Refuge is allowed only on roads and routes that are designated for such use on maps included in the Final Record of Decision for the Sheldon National Wildlife Refuge Comprehensive Conservation Plan and associated Environmental Impact Statement and that are signed or otherwise marked for such use.

- Unless otherwise indicated by sign, permit, or regulation, the maximum number of consecutive nights any person or attended vehicle may remain at a designated refuge campground is 14 nights.

[7] Public use stipulations apply to commercial guiding, research, scientific collecting, and surveys unless otherwise stated in the Special Use Permit.

- Except for camping within campgrounds that are designated for such use on maps included in the Final Record of Decision for the Sheldon National Wildlife Refuge Comprehensive Conservation Plan and associated Environmental Impact Statement and that are signed or otherwise marked for such use, no overnight use is allowed on lands administered by Sheldon Refuge unless expressly authorized by a valid signed Special Use Permit.

- Non-motorized boats or boats with electric motors are allowed only in Big Spring Reservoir, Catnip Reservoir, and Dufurrena Ponds consistent with 50 CFR 32.47.

- Open fires are allowed only at designated campgrounds and within constructed fire rings, subject to additional seasonal fire restrictions and/or closures.

- Pets must be leashed, except dogs used for hunting migratory or upland birds. Hunting dogs must be under strict voice control at all times.

- Riding or packing with horses and mules is allowed in all areas open to public use. All horses and mules must be haltered, branded, tagged, or otherwise visibly marked as a domestic animal and must be tied, hobbled, high-lined, corralled, or otherwise under direct control at all times.

- Grazing of domestic animals within Sheldon Refuge is not allowed.

- We encourage the use of certified weed-free hay, pellets, straw, and other livestock feed within Sheldon Refuge. The use of certified weed-free feed will be required if monitoring of stock use areas indicates the spread or introduction of noxious weeds from uncertified feed.

Exhibit D-2 Special Use Permit Conditions and Requirements

General Conditions and Requirements (All Special Use Permits)

1. Responsibility of Permittee: The permittee by operating on the premises shall be considered to have accepted these premises with all facilities, fixtures, or improvements in their existing condition as of the date of this permit. At the end of the period specified or upon earlier termination, the permittee shall give up the premises in as good order and condition as when received except for reasonable wear, tear, or damage occurring without fault or negligence. The permittee will fully repay the Service for any and all damage directly or indirectly resulting from negligence or failure on his/her part, or the part of anyone of his/her associates, to use reasonable care.

2. Operating Rules and Laws: The permittee shall keep the premises in a neat and orderly condition at all times, and shall comply with all municipal, county, and State laws applicable to the operations under the permit as well as all Federal laws, rules, and regulations governing national wildlife refuges and the area described in this permit. The permittee shall comply with all instructions applicable to this permit issued by the refuge official in charge. The permittee shall take all reasonable precautions to prevent the escape of fires and to suppress fires and shall render all reasonable assistance in the suppression of refuge fires.

3. Use Limitations: The permittee's use of the described premises is limited to the purposed herein specified and does not, unless provided for in this permit, allow him/her to restrict other authorized entry on to his/her area; and permits the Service to carry on whatever activities are necessary for (1) protection and maintenance of the premises and adjacent lands administered by the Service; and (2) the management of wildlife and fish using the premises and other Service lands.

4. Transfer of Privileges: This permit is not transferable, and no privileges herein mentioned may be sublet or made available to any person or interest not mentioned in this permit. No interest hereunder may accrue through lien or be transferred to a third party without the approval of the Regional Director of the Service and the permit shall not be used for speculative purposes.

5. Compliance: The Service's failure to require strict compliance with any of this permit's terms, conditions, and requirements shall not constitute a waiver or be considered as a giving up of the Service's right to thereafter enforce any of the permit's terms or conditions.

6. Conditions of Permit not Fulfilled: If the permittee fails to fulfill any of the conditions and requirements set forth herein, all money paid under this permit shall be retained by the Government to be used to satisfy as much of the permittee's obligation as possible.

7. Payments: All payment shall be made on or before the due date to the local representative of the Service by a postal money order or check made payable to the U.S. Fish and Wildlife Service.

8. Termination Policy: At the termination of this permit the permittee shall immediately give up possession to the Service representative, reserving, however, the rights specified in paragraph 11. If he/she fails to do so, he/she will pay the Government, as liquidated damages, an amount double the rate specified in this permit for the entire time possession is withheld. Upon yielding possession, the permittee will still be allowed to re-enter as needed to remove his/her property as

stated in paragraph 11. The acceptance of any fee for liquidated damages or any other act of administration relating to the continued tenancy is not to be considered as an affirmation of the permittees' action nor shall it operate as a waiver of the Government's right to terminate or cancel the permit for the breach of any specified condition or requirement.

9. Revocation Policy: This permit may be revoked by the Regional Director of the Service without notice for noncompliance with the terms hereof or for violation of general and/or specific laws or regulations governing national wildlife refuges or for nonuse. It is at all times subject to discretionary revocation by the Director of the Service. Upon such revocation the Service, by and through any authorized representative, may take possession of the said premises for its own and sole use, or may enter and possess the premises as the agent of the permittee and for his/her account.

10. Damages: The United States shall not be responsible for any loss or damage to property including, but not limited to, growing crops, animals, and machinery or injury to the permittee or his/her relatives, or to the officers, agents, employees, or any other who are on the premises from instructions or by the sufferance of wildlife or employees or representatives of the Government carrying out their official responsibilities. The permittee agrees to save the United States or any of its agencies harmless from any and all claims for damages or losses that may arise to be incident to the flooding of the premises resulting from any associated Government river and harbor, flood control, reclamation, or Tennessee Valley Authority activity.

11. Removal of Permittee's Property: Upon the expiration or termination of this permit, if all rental charges and/or damage claims due to the Government have been paid, the permittee may, within a reasonable period as stated in the permit or as determined by the refuge official in charge but not to exceed 60 days, remove all structures, machinery, and/or other equipment, etc., from the premises for which he/she is responsible. Within this period the permittee must also remove any other of his/her property including his/her acknowledged share of products or crops grown, cut, harvested, stored, or stacked on the premises. Upon failure to remove any of the above items within the aforesaid period, they shall become the property of the United States.

12. Collected Specimens: You may use specimens collected under this permit, any components of any specimens (including natural organisms, enzymes, genetic materials or seeds), and research results derived from collected specimens for scientific or educational purposes only, and not for commercial purposes unless you have entered into a Cooperative Research and Development Agreement (CRADA) with us. We prohibit the sale of collected research specimens or other transfers to third parties. Breach of any of the terms of this permit will be grounds for revocation of this permit and denial of future permits. Furthermore, if you sell or otherwise transfer collected specimens or any components without a CRADA, you will pay us a royalty rate of 20% of gross revenue from such sales. In addition to such royalty, we may seek other damages and injunctive relief against you.

Sheldon National Wildlife Refuge Special Use Permit Conditions

1. A copy of this permit must be in the permittee's possession at all times while exercising the privileges of this permit.

2. All waste materials must be removed from the Refuge upon the permittee's and/or clients' departure. The permittee is responsible for removal of clients' garbage.

3. The landing of aircraft and use of helicopters is prohibited.

4. All guides operating under a refuge Special Use Permit must accompany each client a minimum of one use day in the field while hunting.

5. Management direction is provided in the Comprehensive Conservation Plan for Sheldon Refuge. This directs monitoring of wildlife-dependent recreation activities and other public uses. Findings from these monitoring efforts would be used in determining what additional management actions, if any, are needed to ensure public use activities remain compatible with refuge purposes. In addition to the stipulations listed here, all general public use stipulations included in Exhibit D-1, and all stipulations listed within compatibility determinations for all other public uses are hereby incorporated as stipulations of this compatibility determination and as special conditions of each commercial outfitter and guide SUPs unless otherwise specifically excluded by the Special Use Permit.

Additional Sheldon Refuge Special Use Permit Conditions for Commercial Guiding and Outfitting

1. Failure to abide by any part of this Special Use Permit; violation of any refuge related provision in Titles 43 (Part 36) or 50 (sub-chapters B and C) Code of Federal Regulations; or violation of any pertinent state regulation (e.g., fish or game violation) will, with due process, be considered grounds for immediate revocation of this permit and could result in denial of future permit requests for lands administered by the U.S. Fish and Wildlife Service. This provision applies to all persons working under the authority of this permit (e.g., assistants). Appeals of decisions relative to permits are handled in accordance with Title 50 Code of Federal Regulations Part 36.41.

2. The permittee is responsible for ensuring that all employees, party members, aircraft pilots, and any other persons working for the permittee and conducting activities allowed by this permit are familiar with and adhere to the conditions of this permit.

3. The permittee may not sublet any part of the authorized use area and is prohibited from subcontracting clients with any other guide.

4. The permittee and permittee's clients do not have the exclusive use of the site(s) or lands covered by this permit, except for authorized camp facilities.

5. This permit may be canceled or revised at any time by the refuge manager in case of emergency (e.g., high fire danger, flooding, unusual resource problems, etc.).

6. The permittee shall notify the Refuge Manager during refuge working hours in person or by telephone before beginning and upon completion of annual activities allowed by this permit.

7. Prior to beginning any activities allowed by this permit, the permittee shall provide the Refuge Manager with (1) proof of appropriate comprehensive general liability ($300,000 each occurrence, $500,000 aggregate), marine liability, and/or aviation passenger liability insurance covering all aspects of operations throughout the annual use period; (2) aircraft and other vehicle types to be used, with identification information, if different from the original permit or previous

year; (3) changes in names of assistant guides and other employees; and (4) any other changes in information provided in the original permit/proposed operations plan.

8. The permittee is responsible for accurate recordkeeping and will provide the Refuge Manager with a comprehensive summary report of the number of clients, and number of client days per activity type by December 31 for all uses during that calendar year unless stated otherwise in the permit. A legible copy of the State's "Hunt Record" for each client will be required in addition to the summary report.

9. Failure to report the actual number of client use days per type of authorized activity by December 31 of each calendar year and annually pay the Service's established fees (client-use day and reserved land site) within 30 days after receiving a bill for collection will be grounds for revocation of this permit.

10. In accordance with the Archaeological Resources Protection Act (16 U.S.C. 470aa), the removal or disturbance of archaeological or historic artifacts is prohibited. The excavation, disturbance, collection, or purchase of historical or archaeological specimens or artifacts on refuge lands are prohibited.

11. Permittees shall maintain their use areas in a neat and sanitary condition. Latrines, seepage pits, etc., associated with permitted use areas or campsites must be located at least 100 feet, measured horizontally, to the nearest edge of the mean annual high water level of lakes, rivers, streams, springs, sloughs, or other body of surface water. No privies are to be installed in areas subject (no less than 4 feet to maximum water table elevation) to flooding. All property of the permittee must be removed from refuge lands upon completion of permitted activities.

12. The use of off-road vehicles is prohibited unless specifically authorized in writing in this permit.

13. The operation of aircraft at altitudes and in flight paths resulting in the herding, harassment, hazing, or driving of wildlife is prohibited. It is recommended that all aircraft maintain a minimum altitude of 2,000 feet above ground level.

14. All aircraft being used in a commercial guiding operation must have 12-inch identification numbers in contrasting colors which are readily visible.

15. Construction of any permanent structure is prohibited.

16. Any action by a permittee or the permittee's employees that unduly interferes with or harasses other refuge visitors or impedes access to any site is strictly prohibited. Examples of prohibited acts include, but are not limited to, low flights over camps or persons at less than 500 feet.

17. The permittee's operations plan, as amended and accepted by the U.S. Fish and Wildlife Service, is hereby incorporated in its entirety as a special condition. All deviations from the operations plan must receive prior written approval by the Refuge Manager or his/her designee.

Exhibit D-3 Prospectus and Request for Proposals to Conduct Commercial Big Game Guide Services (Sample Document)

U.S. Department of the Interior
Fish and Wildlife Service
Sheldon-Hart Mountain National Wildlife Refuge Complex

Prospectus and Request for Proposal

INVITATION FOR PROPOSALS TO CONDUCT COMMERCIAL BIG GAME GUIDE SERVICES WITHIN AREAS OF SHELDON NATIONAL WILDLIFE REFUGE AND HART MOUNTAIN NATIONAL ANTELOPE REFUGE

Sample Document -- Not Valid for Use

Issued by: Project Leader
Sheldon-Hart Mountain NWR Complex

Date: Month numberday, four digit year

Location: Lakeview, OR

Submittal: Sealed proposals must be postmarked or hand delivered to the address indicated below by, time, Month numberday, four digit year.

U.S. Fish and Wildlife Service,
Attention: Complex Project Leader
Sheldon-Hart Mountain NWR Complex
PO Box 111
Lakeview, OR 97630.

For Information Contact:

Sheldon-Hart Mountain NWR Complex, P.O. Box 111, Lakeview, OR 97630 (541) 947-3315,

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Application Cover Sheet
Form A - Proposed Operations Plan
Form B - History of Violations
Form C - Safety Record, Training, Equipment and Plan
Form D - Demonstrated Experience and Knowledge of the Guide Area, and the Terrain, Climate, and Species to be Hunted
Form E - Ability to Provide a High Quality Hunt and Guiding Service to the Public
Form F - Evaluation of Client References

Appendix A - Form Continuation Sheet
Appendix B - Sample Special Use Permit
Appendix C - Map of Sheldon NWR Hunt Area
Appendix D - Map of Hart Mountain NAR Hunt Area[h]

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[h] These maps are not included as part of this CCP/EIS appendix, but would be included with the actual prospectus and request for proposals. Figure 5.1 of the Draft Sheldon CCP/EIS depicts areas of Sheldon Refuge open to all hunting, and would be the approximate area included in the Prospectus Appendix C.

PROSPECTUS FOR COMMERCIAL BIG GAME GUIDE SERVICES

SHELDON NATIONAL WILDLIFE REFUGE, NEVADA
AND
HART MOUNTAIN NATIONAL ANTELOPE REFUGE, OREGON

I. INTRODUCTION

The Sheldon-Hart Mountain NWR Complex (Sheldon NWR and Hart Mountain NAR) is offering opportunities for up to five (5) big game guides on each refuge, to provide commercial services on Refuge lands. The Refuge will award special use permits for big game guiding services on both refuges through a competitive selection process. Prospective applicants are advised to read this prospectus and the sample permit (see attachment).

The objective of allowing commercial big game guiding is to make a variety of quality services available in support of recreational hunting on the refuges, when such activities are compatible with the refuge's purposes, resources and management objectives. Both refuges encourage family-oriented sport hunting consistent with promoting positive hunting values, hunter ethics such as fair chase, and provide participants with reasonable harvest opportunities, less crowding, less competition, fewer conflicts between hunters, relatively undisturbed wildlife, greater hunter safety, less than average crippling loss, and less interference from or dependence on mechanized aspects of the sport. Commercial guiding activities authorized on refuge lands should contribute to these policies.

Permit holders cannot sublet any part of their permit and are prohibited from subcontracting clients with any other guide.

All applicants are responsible for making their own investigations as to the economic feasibility of any proposal, facts about the area, and estimates of potential business opportunity.

It will be the responsibility of all permit holders selected under this prospectus to adhere to all permit conditions and work diligently to minimize conflicts with other users.

For additional information contact Sheldon-Hart Mountain NWR Complex, P.O. Box 111, Lakeview, OR 97630 (541) 947-3315, Hart Mountain NAR (541) 947-2731, or Sheldon NWR (775) 941-0199, weekdays between 8:00 AM and 5:00 PM.

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II. AREA DESCRIPTION

Hart Mountain NAR

Hart Mountain NAR was established in 1936, with the help and support of local residents, as *"a range and breeding ground for pronghorn and other wildlife."* Hart Mountain NAR is located in east-central Lake County, Oregon, and is situated within the northwestern Great Basin. The total area encompassed within the executive borders of the refuge equals 275,173 acres. Including refuge lands outside these borders brings the total to 277,893 acres. Within the executive borders of the refuge, 11,998 acres remain as state inholdings, 14,600 acres remain as private and county inholdings, and the remaining 251,295 acres are refuge lands.

Sheldon NWR

Sheldon was set aside in the 1930s for the conservation and development of natural wildlife resources, primarily pronghorn, and for the protection and improvement of public grazing lands and natural forage resources. The refuge encompasses approximately 575,000 acres of sagebrush-steppe in the northwestern corner of Nevada. Topography of the area is characterized by large tablelands and several mountain ranges separated by stream valleys and, in some cases, steep gorges. Elevations range from over 7,000 feet on the tables and mountain tops to 4,000 feet in the lowlands in the northeast portion of the refuge. Surface water supplies are limited with annual precipitation averaging 7 inches at the lower elevations on the eastern end to 13 inches at the higher elevations on the western end.

Vegetation comprises shrub-steppe communities dominated by big sagebrush, low sagebrush, and bitterbrush. Stands of mountain mahogany are found on the higher elevations throughout the Refuge, western juniper is prevalent at higher elevations on the western end of the refuge, and greasewood and four-wing saltbush are common at lower elevations on the east end. Aspen and willow stands are limited to snow pockets and stringer meadows.

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III. DEFINITIONS

Fish and Wildlife Service (Service). U.S. Department of Interior, Fish and Wildlife Service, Sheldon-Hart Mountain National Wildlife Refuge Complex.

Guide. For purposes of this prospectus, "Guide" means to provide, for compensation or with the intent or with an agreement to receive compensation, services, equipment, or facilities to a big game hunter in the field by a person who accompanies or is present with the big game hunter in the field either personally or through an assistant; in this paragraph, “services” includes:

(A) contracting to guide or outfit big game guide hunts;

(B) stalking, pursuing, tracking, killing, or attempting to kill big game;

(C) packing, preparing, salvaging, or caring for meat, except that which is required to properly and safely load the meat on the mode of transportation being used by a transporter;

(D) field preparation of trophies, including skinning and caping;

(E) selling, leasing, or renting goods when the transaction occurs in the field;

(F) using guiding or outfitting equipment, including spotting scopes and firearms, for the benefit of a hunter; and

(G) providing camping or hunting equipment or supplies, which are already located in the field.

Operations Plan. A narrative description of the proposed commercial hunting operation, which contains all information required in Form A of this prospectus.

Party Size. The number of people (including guides, clients, pilots, and any other employees of the holder) who are authorized to be in a use area, by the terms of a special use permit.

Permit Holder or Permittee. An individual who is selected through this prospectus and who is issued a special use permit.

Special Use Permit (Permit). A U.S. Fish and Wildlife Service authorization required for all commercial uses of refuge lands and waters.

Use Area. An area designated by the Service and offered to a commercial operator to provide guided big game hunting services for the public.

Use Day. One calendar day (24 hours), or portion thereof, for each person using the refuge. Used as a measure of human use. Also called a visitor day. Includes use of the refuge by guides, clients, and any other individuals associated with the permit holder for any part of one day (24-hour period from midnight to midnight).

Example: One guide, one assistant guide, and four clients fly in to the refuge at 8:00 A.M, on September 1, spend three nights and leave at 2:00 P.M. on September 4. That equals 24 use days (6 people x 4 days = 24 use days); and 16 client use days (4 clients x 4 days = 16 client use days).

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Base Camp. Seasonal camps used as the primary base of guide operations in the field for the entire, or most of the hunting season, and usually used by most or all of the clients during some portion of their hunt.

Spike Camp. Smaller camps usually used only for short duration (e.g., portion of a client trip) while hunting outside the range of the base camp, and then disassembled and moved or removed when no longer in use for a particular hunt or season.

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IV. OFFERINGS

Sheldon-Hart Mountain NWR Complex is offering a maximum of five (5) and (10) Big Game Hunting Guide SUP's on Hart Mountain NAR and Sheldon NWR, respectively, as described below. Each individual can submit only one application per guide use area offered.

Offering:

Use area number (and location): Sheldon NWR and/or Hart Mountain

Term of permit(s): August 1, 2009–July 31, 2014

Offering Type: Single use – one permittee

Species available: Pronghorn antelope, mule deer, and/or bighorn sheep

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V. SPECIAL REQUIREMENTS AND CONSIDERATIONS

Minimum Requirements (**Applicant must submit copies of all documents with application in order to be evaluated, unless otherwise indicated**)

* Applicant must possess a current State:
  - guide license
  - certification with appropriate State agency

* Applicant shall provide proof of liability insurance (minimum $300,000 each occurrence, $500,000 aggregate), with the Fish and Wildlife Service named as coinsured prior to issuance of the refuge special use permit. Insurance does not have to be purchased prior to applying. The Service may, during the life of this permit, conduct a review of insurance requirements to assess adequacy of our current minimum requirements. Applicants should be aware that if a determination is made to increase minimum insurance requirements, permittees holding the current minimum coverage will be required to increase their insurance coverage to comply with the new requirements.

* Applicant and his/her assistant guides must possess current first aid and CPR cards prior to issuance of the permit and maintain currency through the authorized use period.

* Applicant shall submit an affidavit signed by the applicant that affirms the applicant's financial ability to perform according to the operations plan.

Use Records

The permit holder will be required to furnish the refuge manager a guide use report each year showing the numbers of clients and client use days for each species hunted, numbers of each species harvested, applicable dates, and other data required by special conditions of the special use permit, and provide a copy of the State's hunt report for each client. This report must be provided by December 31 for all uses during that calendar year unless the permit requires otherwise. This report shall be certified by the permit holder as being complete and accurate.

Performance Evaluations

Permit holders will be checked periodically to determine compliance with the permit conditions and operations plan. Evaluations will be based upon compliance inspections, discussions with clients, etc. The permit holder will be advised of deficiencies and any legal actions.

Fees

Fees are required for commercial use of refuge lands. Holders of special use permits awarded under this prospectus will be required to pay a $250 administrative fee for each permit, annual fees for use and occupancy of refuge lands (i.e., cabins, tent platforms, campsite structures, caches, etc.), and client use day fees in accordance with Service Regional Policy.

Total Allowable Use

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The Service anticipates the use allowed under the refuge permit will remain the same throughout the time period covered by the permit. However, it is not guaranteed. Use may be adjusted annually by the Service, if necessary due to regulation changes, environmental or resource concerns, or other management needs that may warrant adjustment.

General Terms

1. The government reserves the right to not award portions or all of some use areas being offered; extend the date for receiving the proposals; and reject any or all proposals.

2. Applications containing false or incomplete information may be rejected by the Service. If a permit has been issued based on false or incomplete information, it may be terminated at any time.

3. The Service will use the information submitted with the original applications to rank applicants and award permits. However, the Service also reserves the right to contact all applicants for any offering for additional information, or to evaluate other sources of information prior to award.

4. Economic uses on national wildlife refuges must be approved by an authorized officer (50 CFR 29.1). Successful applicants will be issued special use permits authorizing and governing use and occupancy of refuge lands under the National Refuge System Administration Act (16 U.S.C. 668dd-668ee) and the Refuge Recreation Act (16 U.S.C. 460k-3). Such uses are subject to fees established by the Service. Permits issued in response to this prospectus will only authorize commercial big game guiding activities allowed under a big game guide license by the States of Oregon or Nevada, and specified in the permit holder's approved plan of operations. Other commercial activities (e.g., incidental sport fish guiding or guiding for small game/migratory birds) will be prohibited without the prior written approval of the refuge manager.

5. The permit does not authorize use of other private or state lands.

6. Any oral statement by any representative of the government, modifying or changing any conditions of this prospectus is an expression of opinion only and confers no right upon any applicant.

7. In the event that a contradiction exists between conditions in the prospectus or sample permit and the conditions in the permit holder's special use permit, the conditions in the special use permit will govern.

8. The permit holder's operation plan, as amended and accepted by the Service, will be incorporated as a special condition of the holder's permit. By accepting the permit, the holder must conduct his/her commercial guiding operations in adherence with the plan of operations, as well as other permit conditions. Any deviation from the permit conditions or approved operations plan requires prior written approval from the Refuge Manager. In the event that a contradiction exists between the permit holder's proposal and the conditions in the holder's special use permit, the conditions in the special use permit will govern.

9. All costs incurred by the applicants for items submitted for this prospectus shall be the sole responsibility of the applicant.

Freedom of Information Act

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All proposals submitted in response to this prospectus will be disclosed by the Department of the Interior to any person upon request pursuant to the Freedom of Information Act, 5 U.S.C. § 552. The Service believes that it is not necessary for applicants to provide trade secrets or confidential commercial or financial information when completing their proposals. Therefore, inclusion of such information is highly discouraged. However, if the applicant chooses to include commercial or financial information in the application which the applicant believes to be exempt from disclosure under the Freedom of Information Act (5 U.S.C. 552), the cover page of each copy of the proposal shall include an attachment with the following statement:

> "The information specifically identified on pages __, __, __, etc., of this proposal constitutes confidential commercial and financial information which the applicant believes to be exempt from disclosure under the Freedom of Information Act. The applicant requests that this information not be disclosed to the public, except as may be required by law."

The applicant shall also specifically identify confidential commercial and financial information on the page of the proposal which it appears and shall mark each page with the following legend:

> "This page contains confidential commercial and financial information which the applicant believes to be exempt from disclosure under the Freedom of Information Act and which is subject to the legend contained on the cover page of this proposal."

In the event of a request for documents under the Freedom of Information Act, the burden will be on the applicant to establish that the information he/she requests to be withheld as privileged commercial or financial information, qualifies for nondisclosure under the Freedom of Information Act. Information included in the proposals relating to personal privacy such as social security numbers, home telephone numbers, certain items in law enforcement reports, etc. is protected from disclosure under the Freedom of Information Act and the Privacy Act [5 U.S.C. § 552(a)] and will be withheld.

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VI. SELECTION OF SUCCESSFUL APPLICANTS

A panel made up of Service employees will evaluate all properly completed applications or proposals for a refuge guide use area, using scoring factors and guidance developed by the Service for each of the criteria listed below. The average score assigned by panel members will determine the applicant's final score for each of the criteria. The sum of scores for all criteria will determine the applicant's total score. After scoring and ranking all applications for a guide use area, the ranking panel will recommend a list of the "best qualified applicants" to be considered for final selection for that area. The refuge managers for Sheldon NWR and Hart Mountain NAR will make the final selections for the guide use areas within the refuge that he/she manages. The refuge manager may either limit his/her selection to the list of best qualified applicants recommended by the ranking panel, or consider all applicants for the area that meet the minimum scores and qualifications. The refuge manager will base his/her final selection on the results of the ranking panel evaluations, the manager's own examination of the applications, interviews of the applicants, client references, and other records or sources of information (e.g., permit files) that can document the applicant's performance and qualifications.

Applicants must attain the minimum scores indicated below in all of the criteria to be considered for selection by the refuge manager. In the last criterion, any applicant whose point deductions for history of violations/convictions reach or exceed 90 points, will be ineligible for a permit.

1) Ability to provide a high quality hunt and guiding service to the public:
(Maximum 75 points; minimum 25 points).

2) Safety record, training, equipment and plan:
(Maximum 60 points; minimum 25 points).

3) Demonstrated experience and knowledge of the guide area, and the terrain, climate, and species to be hunted: (Maximum 110 points; minimum 20 points).

4) Impacts of the proposed operation on wildlife and other refuge resources such as water quality, vegetation disturbance, and soil disturbance:
(Maximum 110 points; minimum 55 points, 60 points for wilderness areas, proposed wilderness areas, or wilderness study areas).

5) Impacts of the proposed operation on other refuge users: (Maximum 45 points; minimum 20 points, 24 points for wilderness areas, proposed wilderness areas, or wilderness study areas).

6) History of compliance with state and federal laws, regulations, and permitting requirements associated with commercial guiding:
(points deducted for each offense; point deductions may not exceed 90 points).

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VII. INSTRUCTIONS: HOW TO SUBMIT PROPOSALS

All proposals must be submitted in writing to:

U.S. Fish and Wildlife Service
Attention: Complex Project Leader
Sheldon-Hart Mountain NWR Complex
PO Box 111
Lakeview, OR 97630.

All proposals must either be postmarked at the address indicated above, by [time, month numberday, four digit year]. **An original and two copies of the complete application package(s) must be submitted for each refuge.** Proposals must be submitted in sealed envelopes and must be signed by the individual submitting the proposal. Each sealed envelope shall be clearly marked **"**Sheldon NWR or Hart Mountain NAR Refuge Guiding Proposal**."** Each package should be marked with the name, address, and telephone number of the applicant. Applications that are mailed must be sent by certified or registered mail, return receipt requested.

Incomplete proposals will not be returned to the applicant for more information. Material submitted with the proposals will not be returned to the applicant. All proposals must be legible, either neatly printed in dark ink or typed. **Proposals received after the above deadline will be considered late and will be returned to the sender without evaluation.**

You may apply as a partnership; however, each partner must be individually qualified to receive the permit, and partnership applications will be ranked by the lowest scoring partner. Each partner must sign the permit and be responsible for complying with permit conditions.

The following instructions are provided to guide the applicant in completing the enclosed forms in Section VIII. **The Service will not accept any form of proposal except as specified in the format under Section VIII.** Elements of the proposal may be incorporated as conditions of the special use permit.

An applicant who knowingly provides false or incomplete information will be disqualified.

Proposals must include:

Cover Sheet. By signing this form the applicant attests that all information provided with the application is true and complete and authorizes the Service to verify any information provided.

Form A - Proposed Operations Plan. Information on this form should describe the full services you will offer to the public. The information you provide in your proposed operations plan will be used in evaluating impacts to fish and wildlife resources, other refuge resources, and other refuge users. It will also be considered in evaluating your ability to provide a quality hunt and guiding service to the public, and your knowledge of the area applied for. Instructions on the form indicate the information required.

Form B - History of Violations. You must report felony or misdemeanor convictions (including forfeiture of collateral and no contest pleas) for violations committed during the last 10 years by you, or any of your business partners, or employees, and any pending charges pursuant to the instructions on the form. You must also report convictions and pending charges for any violations committed by individuals who were being guided or accompanied by you or persons associated with your guiding

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business at the time of the violation. If a pending charge results in a conviction, the conviction could be cause to revoke a permit, depending on the nature and severity of such conviction. You must also provide copies of official law enforcement records or background reports of criminal history for you and your business partners, as explained on the form.

Form C - Safety Record, Training, Equipment and Plan. Information on this form will be used to evaluate your past safety record and ability to provide clients with a safe hunt.

Form D - Demonstrated Experience and Knowledge of the Guide Area, and the Terrain, Climate, and Species to be Hunted. Use this form to describe your experience and knowledge of the refuge being applied for, including the terrain, climate, and species to be hunted.

Form E - List and Description of Property, Equipment and Accessories. Applicants must describe how they will be able to meet all applicable federal, state, and local requirements pertinent to their full operation. Applicants must also be able to demonstrate that all the equipment and accessories proposed for use in their operations are safe and adequate for general public service.

Form F - Ability to Provide a High Quality Hunt and Guiding Service to the Public. Use this form to describe your ability to provide a high quality hunt and big game guiding service.

Form G - Evaluation of Client References. Applicants must supply a complete list of clients for the past three years. The clients may be contacted by the Service for references to evaluate the quality of your past services.

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VIII. INFORMATION REQUIRED

Please read the following forms carefully. Additional information relative to the questions found in these forms can be found in Section V. Be sure to provide in written form the information requested under each element in the format specified. **Additional pages should be used if extra space is needed (use copies of or the same format as the continuation sheet form provided in Appendix A).** Information beyond the minimum requested will be evaluated. All information is subject to verification by the Service and additional supporting data may be required. **Be sure to retain a copy of the application for your records.** The Service is under no obligation to return applications.

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SHELDON-HART MOUNTAIN NWR COMPLEX REFUGE GUIDING PROSPECTUS
APPLICATION COVER SHEET

GUIDE USE AREA (SHELDON NWR / HART MOUNTAIN NAR)
circle one

I certify that the information furnished herewith is true and complete to the best of my knowledge and belief. I authorize the Fish and Wildlife Service to verify the information furnished herewith.

BY _____
(Sign in ink as typed or printed below)

_____
(Type or print full name) (Social Security Number)

_____
(Doing business as)

PERMANENT MAILING ADDRESS

_____

_____

_____

ADDRESS DURING APPLICATION REVIEW PERIOD (IF DIFFERENT)

_____

_____

_____

TELEPHONE NUMBER: Daytime _____

Other _____

DATE _____

<u>The following information on Forms A through G must be submitted for your proposal to be evaluated.</u>

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FORM A

Proposed Operations Plan

Provide in narrative form a description of the services you propose to offer. Be sure to explain the services for each offering for which you are applying. This narrative should address at a minimum, the type and extent of services, including the following:

1. Dates of operations
2. Species to be hunted and type of hunt(s) provided for each (i.e., archery, muzzleloader)
3. Maximum number of clients for each species, and each type of hunt
4. Methods or strategies to reduce impacts on Refuge resources and other Refuge users
5. Camp site traditionally used and methods to alleviate effects on other campers
6. Methods to minimize interactions with other refuge hunters

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Applicant's Name _____ Form A - Page 1

FORM B

History of Violations

1. Within the past 10 years, have **you or any of your former, current or proposed business partners**, been convicted, forfeited collateral, pled nolo contendere, had a guiding license or privilege suspended, or been administratively penalized for violation of any federal, state, or local laws, regulations, or permit conditions, related to hunting, fishing (including commercial fishing), guiding, or for any DUI offense? Are you or any of your former, current, or proposed business partners under pending charges for any violation as indicated above? If the answer to either of these questions is yes, list each incident and give the name of the person, place of occurrence and name/address of the law enforcement agency and/or court involved (and provide explanation, if you desire).

1. Within the past 10 years, have any of your **employees** while in your employment, been convicted, forfeited collateral, pled nolo contendere, had a guiding license or privilege suspended, or been administratively penalized for violation of any federal, state, or local laws, regulations, or permit conditions, related to hunting, fishing and guiding? Are any current or proposed employees presently under pending charges for any violation as indicated above? If the answer to either of these questions is yes, list each incident and give the name of the person, place of occurrence and name/address of the law enforcement agency and/or court involved (and provide explanation, if you desire).

3. Within the past 10 years, has any **client** or other individual been convicted, forfeited collateral, pled nolo contendere, or is now under pending charges for any violation that occurred while being guided or accompanied by you or individuals associated with your guiding business? If yes, list each incident and give the name of the person, place of occurrence and name/address of the law enforcement agency and/or court involved (and provide explanation, if you desire).

Sample Document - Not valid for use

Applicant's Name _____ Form B - Page 1

FORM C

Safety Record, Training, Equipment and Plan

1. List all accidents, incidents, and safety related violations or enforcement actions involving you or your guiding operations that have occurred within the past 10 years.

2. List all safety related training that you, your partners, and your employees have taken (e.g., advanced first aid, ETT, EMT, arctic survival, wilderness first aid/medicine, cold water survival, etc.) Also describe any relevant experience/training in actual rescue or survival operations or programs, hunter safety programs, etc. Give dates of training or participation and indicate if certification is current (if applicable). Note: the successful applicant and assistant guides are required to submit current first aid and CPR certification prior to permit issuance.

3. Describe your emergency preparedness or safety plan. List emergency communications equipment and address your plans, if any, in the event of mechanical failures, or other types of accidents/incidents.

4. List all safety related equipment and supplies, in addition to the communications equipment listed above.

Sample Document-- Not Valid for Use

Applicant's Name _____ Form C - Page 1

FORM D

Demonstrated Experience and Knowledge of the Guide Area, and the Terrain, Climate, and Species to be Hunted

1. Describe and document the number of years of your guiding experience (noting the number of days spent in the field each year) On Sheldon NWR and/or Hart Mountain NAR, during the past 20 years.

2. Describe your guiding/outfitting experience during each of the last 10 years. For each year, list the number of clients, noting the number of days you spent in the field, identify the species hunted, number of each species taken, specific locations and type of terrain and climate where you guided or outfitted. Indicate the specific periods, if any, for which you were not serving as a registered big game guide. You should also indicate if you were the contracting guide. If you guided for activities other than big game guiding, describe the type of activities you guided, and the specific services you provided.

4. You may document experience other than guiding for the same period that you believe is relevant (e.g., personal sport hunting, or fishing, resource management activities, etc.) Describe the experience or activity, the specific location involved, noting the amount of time in the field and, if applicable, the number of clients served each year and the number of each species of animals harvested.

5. Describe any education and/or training you believe is relevant.

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Applicant's Name _____ Form D - Page 1

Form E

List and Description of Property, Equipment and Accessories

1. Describe how the property, equipment and accessories proposed for use in your operation are safe and adequate for general public service.

2. Describe how you will be able to meet all applicable federal, state, and local requirements pertinent to your proposed operation.

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Applicant's Name _____ Form E - Page 1

FORM F

Ability to Provide a High Quality Guiding Service to the Public

1. Describe your business practices including proposed client rates; payment options; promotional strategies or efforts; reservation, cancellation and refund policies; and acknowledgement of risk forms. Submit your current advertisement leaflets, client price lists, hunter contract forms, or other literature that reflects your business practices.

2. Describe provisions for clients with disabilities.

3. Describe educational and/or interpretive services or programs provided to clients.

4. Describe drinking water supplies and method of treatment if appropriate.

5. Describe your knowledge, abilities, and experience in caring for meat, capes, and hides from big game. List the number of years and estimated number of animals of each species that you and/or your employees have taken care of (e.g., field dressed, skinned, caped, boned, butchered, etc.) Also, document any training that you or your employees have received in care of meat or trophies (e.g., taxidermy, meat cutting, etc.)

6. Describe your plan, methods, provisions, and facilities to salvage, care, and provide opportunity for utilization of meat from harvested animals.

Sample Document-- Not Valid for Use

Applicant's Name _____ Form F - Page 1

FORM G

Evaluation of Client References

Provide a complete list of all big game hunting clients that you have contracted and/or personally guided since July 1, 2005. If you need to go back prior to this date in order to have a minimum of 10 clients, you may do so. Include full names; addresses; home telephone and other telephone numbers, if known; species hunted; year of hunt; whether you were the contracting guide; whether it was a guided or drop-off client; and whether the client was guided by you personally or by an assistant.

If you are a recently registered guide and are unable to provide the requested list for a minimum of 10 clients, simply indicate that on this form.

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Applicant's Name _____ Form G - Page 1

Sample Document-- Not Valid for Use

Applicant's Name_____ Form _____ Page _____

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Appendix E. Projects, Staff, and Facilities Needed to Implement the Alternatives

E.1 Overview

Implementation of the CCP alternatives would require changes in funding, which would be sought from a variety of sources. This plan would depend on additional congressional allocations, partnerships and grants, and adoption demand for horses and burros. There are no guarantees that additional Federal funds will be made available to implement any of these projects. Other sources of funds would need to be obtained (both public and private). Activities and projects identified would be implemented as funds become available.

The CCP proposes several projects to be implemented over the next 15 years. Differences in funding for each alternative are due primarily to differences in feral horse and burro population management objectives; differences in the location, development, and necessary staffing for visitor facilities; and staffing changes necessary to implement prescribed burning and control of encroaching sagebrush and western juniper. All of these projects are included in the Refuge Management Information System (Refuge Operational Needs System [RONS] or Maintenance Management System [MMS]), which are used to request funding from Congress. The RONS documents proposed new projects to implement the CCP to meet refuge goals and objectives and legal mandates.

Annual revenue sharing payments to Humboldt, Washoe, and Lake counties would continue. If the refuge expands through the purchase of inholdings (privately owned lands within the current approved boundary) or through an expanded refuge boundary, additional revenue sharing payments in lieu of tax payments will be made to the respective county. See Chapter 5 for a summary of the economic effects of the CCP's implementation.

Monitoring activities would be conducted on a percentage of all new and existing projects and activities to document wildlife populations and changes across time, habitat conditions, and responses to management practices.

E.2 Costs to Implement CCP

The following sections detail both one time and recurring costs for staffing and projects under each alternative that are high priority or that are anticipated to have substantial costs associated with them. Some biological staff positions at Sheldon Refuge have been vacant for several years. Under all alternatives, funding for these positions would continue to be necessary and has been included. Therefore, costs to implement the CCP will be greater than refuge management costs in past years. Costs for staffing and projects that are either assumed to be the same across all alternatives or that are not anticipated to be substantial are included under basic categories such as staffing, maintenance, and operations. One time costs reflect the initial costs associated with a project, such as the purchase of equipment, contracting services, construction, etc. Future operational and maintenance costs associated with the project are identified under recurring costs.

E.2.1 One-Time Costs

One time costs are project costs that have a start-up cost associated with them, such constructing a new building or relocating a campground. Some are full project costs for projects that can be

completed in three years or less. One time costs can include the cost of temporary or term salary associated with a short-term project. Salary for new positions and operational costs are reflected in operational or recurring costs.

Funds for one time costs will be sought through increases in refuge base funding, special project funds, grants, etc. Some projects also might require land acquisition funds, other special appropriations, or grants.

Projects listed in Table E.1 show high-priority and major one time costs for replacement of Catnip Reservoir Dam and replacement of the Sheldon Refuge Headquarters office and visitor information building, which would be included under all alternatives. The primary differences in one time costs between the three alternatives are for relocation of the existing campgrounds to reduce resource impacts and for upgrades to the three most heavily used and more developed campgrounds.

Table E.1 High-priority and Major One Time Costs

	Alt 1 (no action)	Alt 2 (preferred)	Alt 3 (natural processes)	Priority[1]
Reconstruction of the Catnip Reservoir Dam	$3,000,000	$3,000,000	$3,000,000	H
Construction of Park Ranger and Law Enforcement Officer Quarters at Sheldon Refuge Headquarters	$200,000	$200,000	$200,000	M
Replacement of Visitor Center and Headquarters	$2,700,000	$2,700,000	$2,700,000	H
Relocation of Campgrounds	$0	$450,000	$225,000	L
Upgrades to Virgin Valley, Big Spring, and Catnip Reservoir Campgrounds	$0	$110,000	$0	M
Total Fixed Costs	$5,900,000	$6,460,000	$6,125,000	

[1] H=High; M= Medium; L= Low

E.2.2. Operational (Recurring) Costs

Operational costs reflect refuge spending of base funds allocated each year. These are also known as recurring costs and are usually associated with day-to-day operations and projects that last longer than three years.

Table E.2 displays projected operating costs under the CCP. The CCP reflects increased funding needs for proposed feral horse and burro management; increases in public uses, facilities, and staffing; increased removal of encroaching western juniper and sagebrush, and new monitoring needs. This table includes salaries and operational expenditures such as travel, training, supplies, utilities, and annual maintenance costs.

For comparison purposes, the costs for feral horse and burro management have been calculated as an annual average over the 15-year life of the CCP even though the entire amount would be needed within five years under Alternative 2 and within 10 years under Alternative 3. Increased recurring costs for maintenance supplies and equipment are primarily for maintenance of the proposed Sheldon Refuge Headquarters office and visitor center, additional staff housing, and additional campground facilities, as well as for the removal of water developments and restoration work. Increased funds for fire fuels reduction supplies and equipment would be needed to fully complete fire breaks and for mechanical removal of encroaching western juniper and sagebrush.

Reductions to biological staff salaries under Alternative 2 reflect shorter-term needs for a feral horse and burro specialist. Changes to fire and habitat management staff salaries reflect less need for prescribed fire staff. Additional maintenance, law enforcement, and public use staff would be needed to adequately administer refuge lands as visitation increases and to maintain and operate additional public use facilities. Under Alternative 3, additional maintenance staff would be needed to complete removal of water control structures and associated restoration work.

Table E.2 includes costs for permanent and seasonal staff needed year after year. It does not include staff costs associated with special projects; these are summarized in Table E.1.

Table E.2 Operational (Recurring) Costs

	Alt 1 (no action)	Alt 2 (preferred)	Alt 3 (natural processes)	Priority[1]
Feral Horse and Burro Management	$675,000	$333,000	$523,000	H
Maintenance Supplies and Equipment	$100,000	$170,000	$100,000	H
Fire Fuels Reduction and Habitat Management Supplies and Equipment	$47,000	$87,000	$47,000	H
Administrative and Refuge Management Staff Salaries	$278,000	$278,000	$278,000	H
Biological Staff Salaries	$206,000	$191,000	$206,000	H
Fire and Habitat Management Staff Salaries	$266,000	$257,000	$164,000	H
Maintenance Staff Salaries	$148,000	$164,000	$164,000	H
Public Use and Law Enforcement Staff Salaries	$83,000	$174,000	$83,000	M
Total Operational (Recurring) Costs	$1,803,000	$1,654,000	$1,565,000	

[1]H=High; M= Medium; L= Low

Appendix F. Sheldon National Wildlife Refuge Wilderness Inventory and Review Summary

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F.1 Introduction

Sheldon National Wildlife Refuge was initially established by Executive Order in 1931 as a refuge and breeding ground for wild animals and birds. Additional lands were acquired later, and the refuge's purpose was broadened to include the conservation and development of natural wildlife resources and the protection and improvement of public grazing lands and natural forage resources.

After a comprehensive inventory and evaluation of the wilderness character and value of the entire Sheldon Refuge with public input and involvement, the Service prepared an environmental impact statement and recommended portions of Sheldon Refuge for designation as wilderness under the Wilderness Act of 1964. This recommendation was later expanded, and a proposal was submitted to Congress by the President in 1974. At that time, the President requested Congress not act on his proposal until a mineral survey for Sheldon Refuge could be completed. The mineral survey was completed by the U.S. Geological Survey in 1975, but since that time Congress has taken no action to designate any portion of Sheldon Refuge as wilderness.

F.1.1 Wilderness Review Process

The purpose of a wilderness review is to identify and recommend for congressional designation National Wildlife Refuge System (System) lands and waters that merit inclusion in the National Wilderness Preservation System. Wilderness reviews are a required element of CCPs and are conducted in accordance with the Service's wilderness review and evaluation policy outlined in 610 FW 4 and in accordance with the refuge planning process outlined in 602 FW 1 and 3, including public involvement and National Environmental Policy Act (NEPA) compliance.

There are three phases to a wilderness review: 1) inventory, 2) study, and 3) recommendation.

1) Wilderness Inventory. The wilderness inventory identifies those lands within the refuge that might have wilderness character and satisfy the definition of wilderness as stated in the Wilderness Act and in Service Policy. The inventory preliminarily classifies each unit of land that meets these requirements as a wilderness study area (WSA).

2) Wilderness Study. The wilderness study further evaluates each WSA for values, resources, and uses to determine if each one merits recommendation from the Service to the Secretary of the Interior as wilderness.

3) Wilderness Recommendation. The recommendation phase consists of forwarding or reporting recommendations for wilderness designation from the Director of the U.S. Fish and Wildlife Service, through the Secretary of the Interior, and the President to Congress in a wilderness study report.

This appendix summarizes the wilderness inventory, study, and recommendations for the preferred alternative included in the Sheldon Refuge CCP. The complete 2010 Sheldon Refuge Wilderness Review is available and can be found on the Sheldon Refuge planning website.

F.1.1.1 Inventory Criteria

The wilderness inventory is a broad look at the planning area to identify WSAs. These are roadless areas that meet the minimum criteria for wilderness identified in Section 2(c) of the Wilderness Act:

> A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions, and which: (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological or other features of scientific, educational, scenic, or historical value.

A WSA must appear natural, provide outstanding opportunities for solitude or primitive recreation, meet the size criteria, and may provide other supplemental values. The process for identification of roadless areas in the Sheldon NWR and application of the wilderness criteria are described in the following sections.

Identification of Roadless Areas

Identification of roadless areas required gathering and evaluating land status maps, land uses, road inventory data, and aerial photographs for Sheldon Refuge. By definition, a "roadless area" is a reasonably compact area of undeveloped Federal land that has the general characteristics of a wilderness and within which there is no improved road suitable for public travel by means of four-wheeled, motorized vehicles intended primarily for highway use. A route maintained solely by the passage of vehicles does not constitute a road (610 FW 1.5 Z).

Using the Service's definition of a road, there are six roaded areas within Sheldon Refuge. These areas include Highway 140, County Roads 34 and 34A, County Road 8A, Summit Lake Road, Bog Hot Road, and the Duffurena/Virgin Valley Road. All other routes within Sheldon Refuge are maintained solely by the passage of vehicles and do not constitute roads for the purposes of the Sheldon Refuge Wilderness Inventory completed in 2010.

Evaluation of the Naturalness Criteria

In addition to being roadless, a WSA must meet the naturalness criteria. Section 2(c) defines wilderness as an area that "generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable." An area is apparently natural if it looks natural to the average visitor who is not familiar with historic conditions or human influences in a given area. Areas that have been or are in the process of being restored to a substantially natural appearance following previous significant disturbances such as grazing or agriculture may still be found suitable.

An area may also meet the naturalness criteria if human impacts are relatively minor and substantially unnoticeable in the unit as a whole. Minor impacts may include trails, fire towers, fire breaks, pit toilets, fire rings, hitching posts, snow gauges, research monitoring devices, wildlife enhancement facilities (e.g., guzzlers or exclosures), fencing, spring developments, and small reservoirs.

Established or proposed refuge management activities or refuge uses that require the use of temporary roads, motor vehicles, motorized equipment, mechanical transport, landing of aircraft, structures, and installations generally prohibited within designated wilderness or "sights and sounds" of human impacts and activities outside the boundary of the unit do not disqualify an area from meeting the wilderness naturalness criteria. The physical impacts of these practices within the unit should be the focus of the naturalness evaluation. We evaluate existing and proposed refuge management activities and refuge uses in the study phase of the wilderness review.

Evaluation of Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation

In addition to meeting the size and naturalness criteria, a WSA must provide outstanding opportunities for solitude or primitive recreation. An area does not have to possess outstanding opportunities for both solitude and primitive and unconfined recreation and does not need to have outstanding opportunities on every acre. Further, an area does not have to be open to public use and access to qualify under this criteria; Congress has designated a number of wilderness areas in the Refuge System that are closed to public access to protect resource values.

Opportunities for solitude refer to the ability of a visitor to be alone and secluded from other visitors in the area. Primitive and unconfined recreation means non-motorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport. These primitive recreation activities may provide opportunities to experience challenge, risk, self-reliance, and adventure.

An outstanding opportunity for solitude may be present in an area offering only limited primitive recreation potential. Conversely, an area may be so attractive for primitive and unconfined recreational use that it would be difficult to maintain opportunities for solitude (e.g., around water).

Opportunities are evaluated for each area on its own merits independent from other areas. When an area is contiguous to proposed wilderness, recommended wilderness, a WSA, or other Federal lands that a land management agency has already determined to have wilderness character (i.e., Service, Bureau of Land Management [BLM], National Park Service, or U.S. Forest Service lands), an additional evaluation of outstanding opportunities is not required.

Evaluation of the Size Criteria

Roadless areas or roadless islands meet the size criteria if any one of the following standards apply:

- An area with over 5,000 contiguous acres. State and private lands are not included in making this acreage determination.
- A roadless island of any size. A roadless island is defined as an area surrounded by permanent waters or that is markedly distinguished from the surrounding lands by topographical or ecological features.
- An area of less than 5,000 contiguous Federal acres that is of sufficient size as to make practicable its preservation and use in an unimpaired condition and of a size suitable for wilderness management.
- An area of less than 5,000 contiguous federal acres that is contiguous with a designated wilderness, recommended wilderness, or area under wilderness review by another Federal managing agency such as the U.S. Forest Service, National Park Service, or BLM.

Evaluation of Supplemental Values

Supplemental values are defined by the Wilderness Act as "ecological, geological, or other features of scientific, educational, scenic, or historic value." These values are not required for wilderness, but their presence should be documented.

F.1.1.2 Inventory Process

Refuge staff assessed several factors during the inventory process: the location of the existing 1974 proposed wilderness area boundaries[1], improved roads, well-used and long-standing unimproved roads determined necessary for vehicle access, natural features such as cliffs, canyons, and mountain ranges, and the location of disconnected Refuge lands. From this assessment, refuge staff identified 34 discrete wilderness inventory units (see Figure F.1 for an overview of all Sheldon Refuge Wilderness Inventory Units).

F.1.1.3 Wilderness Inventory Summary

Thirty-four Wilderness Inventory Units were identified during the inventory process. Thirteen Wilderness Inventory Units represent the eight areas proposed for wilderness designation in 1974. Five of the eight proposed wilderness areas (Rye Creek, Round Mountain, Catnip Mountain, Big Mountain, and Sage Hen Hills WSAs) are determined to still meet the criteria for wilderness study throughout their boundaries. As a result the boundaries for these WSAs remain unchanged from the 1974 Wilderness Proposal. For the remaining three proposed wilderness areas (Big Spring, Gooch Table, and Alkali Peak), natural conditions, opportunities for solitude or a primitive and unconfined type of recreation, or size/contiguous status (through acquisition) have changed to the extent that portions either no longer meet the criteria and have been removed from wilderness study or now do meet criteria and have been added for wilderness study. As a result, the recommended boundaries for these three areas have been adjusted (see Figure F.1 for general location). An explanation for these adjustments is included in Table F.1.

Of the 21 Wilderness Inventory Units that have not been previously proposed for designation, 10 are determined to meet the criteria for further wilderness study and have been identified as WSAs. Of the 11 remaining units not identified as WSAs, all but one (Badger Mountain) were determined to not meet the criteria for wilderness study in both the 1973 and 2009 wilderness inventories and for largely the same reasons.

Table F.1 summarizes results of the wilderness inventory for Sheldon Refuge. A detailed description of the wilderness character for each of the 34 wilderness inventory units based upon the wilderness inventory criteria discussed previously is included in the Sheldon Refuge Wilderness Review (USFWS 2010).

[1] The Proposed Wilderness Area boundaries have been corrected and adjusted slightly from earlier refuge planning documents based upon a detailed review of the final 1974 Sheldon Refuge Wilderness Proposal submitted to Congress and updated digital land status and refuge boundary data.

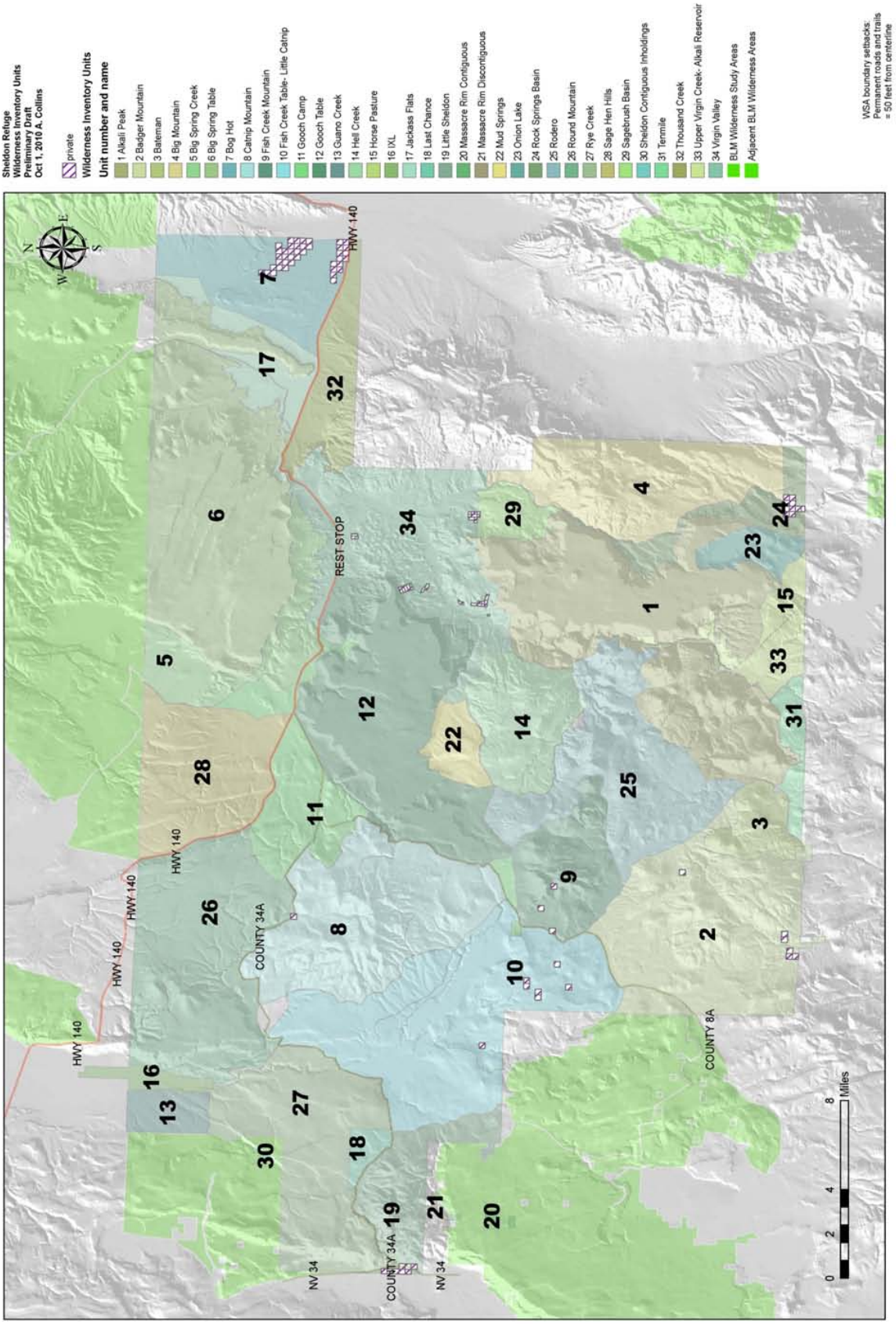

Figure F.1 Sheldon Refuge Wilderness Inventory Units.

Table F.1 Summary of Wilderness Inventory on Sheldon NWR by Unit

Refuge Unit	Proposed Wilderness Area (1974)	Acres	Criteria 1: Naturalness	Criteria 2: Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation (at least one of three required)			Criteria 3: Size	Criteria 4: Supplemental Values	Unit qualifies as WSA[1]
				2a (2a) has outstanding opportunities for solitude	2b (2b) has outstanding opportunities for a primitive and unconfined type of recreation	2c (2c) is contiguous to proposed wilderness, recommended wilderness, or WSA			
Alkali Peak Unit 1	PWA	51,414	Yes			Yes	Yes	Yes: Scenic canyons and prehistoric cultural sites	Yes
Badger Mountain Unit 2		37,252	No: The number and density of primitive vehicle routes and impacts from past wildfire suppression activities detract from the overall natural appearance of the unit	No: Ongoing refuge management activities and relatively high amounts of visitation during summer and fall hunting seasons reduce opportunities for solitude	No: Recreation activities within this unit are supported by motorized vehicles and a network of primitive motorized routes		Yes	Yes: Mountain mahogany habitat	No
Bateman Unit 3		5,772	Yes		Yes		Yes	Yes: Mountain mahogany habitat	Yes
Big Mountain Unit 4	PWA	23,361	Yes			Yes	Yes	Yes: Scenic views	Yes

Refuge Unit	Proposed Wilderness Area (1974)	Acres	Criteria 1: Naturalness	Criteria 2: Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation (at least one of three required)			Criteria 3: Size	Criteria 4: Supplemental Values	Unit qualifies as WSA[1]
				2a	2b	2c			
Big Spring Creek 5 Unit	PWA	13,191	No: A large number of mining disturbances, including disturbance unnoticed during 1974 inventory or which have occurred after the 1974 wilderness proposal are readily apparent from areas within the unit and detract from the natural appearance of the unit as a whole			Yes	Yes		No
Big Spring Table Unit 6	PWA	52,200	Yes			Yes	Yes	Yes: Antelope research, rare habitats, geologic feature	Yes
Bog Hot Unit 7		16,662	No: The unit does not appear natural as a whole due to the presence of permanent roads and additional developments on private lands	No: Activities and uses associated with private inholdings reduce opportunities for solitude or a primitive type of recreation			Yes		No
Catnip Mountain Unit 8	PWA	33,227	Yes			Yes	Yes		Yes
Fish Creek Mountain Unit 9	PWA	13,786	Yes			Yes	Yes		Yes

Refuge Unit	Proposed Wilderness Area (1974)	Acres	Criteria 1: Naturalness	Criteria 2: Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation (at least one of three required)			Criteria 3: Size	Criteria 4: Supplemental Values	Unit qualifies as WSA[1]
				2a	2b	2c			
Fish Creek Table—Little Catnip Unit 10		43,609	Yes: One of the most pristine and undeveloped portions of Sheldon Refuge; Swan Lake Reservoir is noticeable, but does not detract from the natural appearance of the unit as a whole	Yes: Few visitors, very rugged remote terrain, which provides outstanding opportunities for solitude and primitive recreation in an unconfined setting	Yes		Yes		Yes
Gooch Camp Unit 11		16,957	No: Density of roads and other developments give the appearance of unnatural conditions throughout the unit as a whole	No: The presence of major access roads, highways, developed campgrounds, and management facilities provide little or no opportunities for solitude or primitive recreation			Yes		No
Gooch Table Unit 12	PWA	40,038	Yes			Yes	Yes		Yes
Guano Creek Unit 13		4,133	Yes			Yes	Yes		Yes
Hell Creek Unit 14		13,969	Yes			Yes	Yes		Yes
Horse Pasture Unit 15		2,651	Yes	No	No	No	No		No
IXL Unit 16		2,506	No: Developments, structures, and manipulations from water control and farming are readily apparent throughout the majority of the unit			Yes	Yes	Yes: Historic structures	No

Refuge Unit	Proposed Wilderness Area (1974)	Acres	Criteria 1: Naturalness	Criteria 2: Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation (at least one of three required)			Criteria 3: Size	Criteria 4: Supplemental Values	Unit qualifies as WSA[1]
				2a	2b	2c			
Jackass Flats Unit 17		7,815	Yes			Yes	Yes		Yes
Last Chance Unit 18		1,886	No: Density and size of roads and historic livestock developments give the appearance of unnatural conditions throughout the unit as a whole			Yes	Yes	Yes: Historic structures	No
Little Sheldon Unit 19		11,722	No: Density of roads and other developments give the appearance of unnatural conditions throughout the unit as a whole			Yes	Yes	Yes: Scenery and wildlife viewing opportunities	No
Massacre Rim Contiguous Unit 20		334	Yes: Some historic livestock developments and nearby roads and/or motorized trails, but parcels appear natural, especially when considered in context of the contiguous BLM WSA			Yes	Yes		Yes
Massacre Rim Discontiguous Unit 21		142	No: Surrounded by lands found not suitable for wilderness study by BLM and that contain various historic developments for livestock management	No: Opportunities for solitude or primitive recreation greatly affected by proximity (less than 0.25 mile) to motorized vehicle routes and other mechanized and motorized uses			No	No	No

Refuge Unit	Proposed Wilderness Area (1974)	Acres	Criteria 1: Naturalness	Criteria 2: Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation (at least one of three required)			Criteria 3: Size	Criteria 4: Supplemental Values	Unit qualifies as WSA[1]
				2a	2b	2c			
Mud Springs Unit 22	PWA	4,641	No: A number of developments in this portion of the unit have been enlarged, improved, or added since the 1974 proposal; the size and density of these developments now detract from the substantially natural appearance of the unit as a whole			Yes	Yes		No
Onion Lake Unit 23	PWA	4,252	No: Density of historic livestock developments, existing trails, and Onion Reservoir are readily apparent and detract from the overall natural appearance of the unit as a whole			Yes	Yes		No
Rock Springs Basin Unit 24		7,220	No			Yes	Yes		No
Rodero Unit 25	PWA	28,321	No: Density of historic livestock developments, camping, and existing trails are readily apparent and detract from the overall natural appearance of the unit as a whole			Yes	Yes		No
Round Mountain Unit 26	PWA	36,148	Yes			Yes	Yes		Yes
Rye Creek Unit 27	PWA	28,151	Yes			Yes	Yes	Yes: Scenic views, prehistoric rock art/ petroglyphs, wildlife viewing opportunities	Yes

Refuge Unit	Proposed Wilderness Area (1974)	Acres	Criteria 1: Naturalness	Criteria 2: Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation (at least one of three required)			Criteria 3: Size	Criteria 4: Supplemental Values	Unit qualifies as WSA[1]
				2a	2b	2c			
Sage Hen Hills Unit 28	PWA	21,068	Yes			Yes	Yes		Yes
Sagebrush Basin Unit 29		4,241	Yes: Some disturbance from past mineral prospecting and mining, which are gradually returning to a more natural appearance and do not detract from the natural appearance of the unit as a whole			Yes	Yes		Yes
Sheldon Contiguous WSA Inholding Unit 30		119	Yes: Parcels are remote, undeveloped areas within an existing recommended BLM WSA			Yes	Yes		Yes
Tenmile Unit 31		3,702	Yes		Yes	Yes	Yes	Yes: Mountain mahogany habitat	Yes
Thousand Creek Unit 32		10,766	No: The unit does not appear natural as a whole due to the presence of permanent roads and additional developments on private lands	No: Activities and uses associated existing roads and private lands reduce opportunities for solitude or a primitive type of recreation			Yes		No
Upper Virgin Creek/Alkali Reservoir Unit 33		5,715	Yes			Yes	Yes		Yes

Refuge Unit	Proposed Wilderness Area (1974)	Acres	Criteria 1: Naturalness	Criteria 2: Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation (at least one of three required)			Criteria 3: Size	Criteria 4: Supplemental Values	Unit qualifies as WSA[1]
				2a	2b	2c			
Virgin Valley Unit 34		31,220	No: The number, size, and, density of developments and disturbances resulting from mining, ranching, and refuge management activities make this the least naturally appearing unit within Sheldon Refuge; it is unlikely this unit would appear natural even with extensive restoration and rehabilitation or a substantial amount of time to naturally recover	No: Constant commercial mining activities, pubic use, motorized vehicle use, and other activities eliminate nearly all opportunities for solitude or a primitive type of recreation	No: Recreation activities and uses within the unit are highly mechanized, supported by modern development, and controlled through rules and regulation		Yes	Yes: Geology and opals	No

[1] Unit qualifies as WSA if it meets criteria 1, 2a or 2b or 2c, and 3.

F.2 Wilderness Study Areas

Based upon the wilderness review for Sheldon Refuge, 15 of the 34 wilderness inventory units totaling 189,389 acres were determined not suitable for wilderness study because they do not meet the minimum criteria for wilderness character. The remaining 19 of the 34 distinct and separate units totaling 388,802 acres were identified as meeting the definition of wilderness and meeting the criteria for wilderness study. This total area constitutes 67% of the entire 578,191acres within Sheldon Refuge. These 19 units make up the following 17 wilderness study areas (WSAs):

- Big Mountain WSA
- Sage Hen Hills WSA
- Gooch Table WSA
- Fish Creek Mountain WSA
- Rye Creek WSA
- Round Mountain WSA
- Catnip Mountain WSA
- Big Spring Table WSA (includes portions of the Big Spring Table and Jackass Flats units)
- Railroad Point WSA (includes portions of the Big Spring Table and Jackass Flats units)
- Alkali Peak WSA (includes Alkali Peak and Upper Virgin Creek/ Alkali Reservoir units)
- Hell Creek WSA
- Guano Creek WSA
- Massacre Rim Contiguous WSA
- Sheldon Contiguous Inholdings WSA
- Fish Creek Table-Little Catnip WSA
- Bateman WSA
- Tenmile WSA

F.3 Refuge Recommendations for WSAs

In total, Sheldon Refuge recommends 341,598 acres or 88% of the 388,802 acres found suitable for wilderness study be designated by Congress as wilderness as defined by the Wilderness Act of 1964.

Nearly all of Sheldon Refuge possesses wilderness character but also has been influenced by human activities. Several WSAs determined to meet the definition of wilderness for the purposes of this review include lands previously proposed for wilderness designation. These WSAs continue to contain valuable wilderness resources and, with the exception of vehicle trespass, have been effectively managed to meet the mission of the Service, the purposes for Sheldon Refuge, and the purposes of the Wilderness Act for the past 36 years. Upon further review, Sheldon Refuge has determined the existing situation is not substantially different so as to preclude the effective and continued management of these lands as wilderness. Sheldon Refuge has also determined that lands within certain WSAs acquired subsequent to the initial 1974 wilderness recommendation are substantially similar to surrounding proposed wilderness areas both in terms of resource values and management requirements. Therefore, Sheldon Refuge makes the following recommendations for these WSAs.

F.3.1 Big Mountain WSA

The entire 23,361-acre Big Mountain WSA is recommended for wilderness designation. This recommendation is consistent with the original 1974 recommendation and proposal. Today there are six additional permanent structures (i.e., guzzlers) within the WSA. No routes provide access to any of the six guzzlers and use of a helicopter would likely be necessary to conduct major maintenance or replacement, similar to initial construction. However, these guzzlers and the use of aircraft for their maintenance would not preclude the designation or management of this area as wilderness. Other developments and disturbances noted during the 1974 wilderness inventory are less visible today and no other management manipulation or intrusion has been identified as necessary for the management of the Big Mountain WSA, which would be inconsistent with wilderness purposes.

F.3.2 Sage Hen Hills WSA

The entire 21,068-acre Sage Hen Hills WSA is recommended for designation as wilderness. This is not consistent with the original 1974 recommendation. No specific reason was given as to why this unit was not recommended for wilderness designation in 1974, but Map 6 of the Wilderness Study Report (USFWS 1974) indicated "range rehabilitation" was planned for nearly the entire unit. Presumably, activities would have included additional fencing and intensive artificial water development listed as recommended management activities in Step 1 of the Management Framework Plan for the Catnip Mountain grazing allotment (BLM 1972). These planned activities did not occur, and today the Sage Hen Hills WSA remains some of the most undeveloped, pristine, and productive habitat for pronghorn and Greater sage grouse within Sheldon Refuge. Other than maintenance of fences along the Sheldon Refuge boundary, no specific actions have been determined necessary for the continued management of lands within this WSA which would be inconsistent with wilderness purposes.

F.3.3 Gooch Table WSA

The entire 40,038-acre Gooch Table WSA is recommended for wilderness designation. This is consistent with the original 1974 wilderness recommendation and proposal. The Gooch Table WSA retains the same wilderness character as in 1974.

The majority of the WSA was previously proposed for wilderness designation, but also includes 3,000 acres near Highway 140. which has not been proposed. Most of the 3,000-acre area near Highway 140 is open to the location of mining claims, but little prospecting has occurred, no claims have been established, and there is little or no need for management activities within the unit which conflict with wilderness designation. Therefore, the recommendation would protect and preserve wilderness character of the WSA but would not interfere or hinder any ongoing or planned mining activities.

With the exception of a few historic vehicle routes and disturbances that are gradually recovering to a more natural appearance, the WSA remains unchanged from its natural condition and there is no need for active management to remove developments or conduct habitat restoration work. The isolation of the table topography and abundance of low sagebrush habitat create conditions such that the likelihood and need for aggressive wildfire suppression is low, but the importance and value to pronghorn and other sagebrush-dependent wildlife is high.

F.3.4 Fish Creek Mountain WSA

The entire 13,786-acre Fish Creek Mountain WSA is recommended for wilderness designation. This is consistent with the original 1974 recommendation and proposal. There are two parcels of private land within the WSA, but motorized access has not been documented and is not likely necessary for their use or development. Currently the Service is in negotiations to acquire one of these parcels from a willing seller. It is expected that some management intrusion and use of motorized equipment would be necessary to remove abandoned water troughs and restore three developed springs within the unit. Otherwise, no specific management actions have been determined necessary for the continued management of the WSA that would be inconsistent with wilderness purposes.

F.3.5 Rye Creek WSA

An area 17,453 acres in size within the eastern portion of the Rye Creek WSA is recommended for wilderness designation. The remaining 10,698 acres are not recommended primarily to allow the use of mechanical thinning of encroaching western juniper and prescribed burning to restore natural habitat and fire regime conditions to this portion of Sheldon Refuge. It is anticipated these activities would require repeated use of motorized and mechanized equipment and vehicles along previous established routes which would substantially affect opportunities for solitude and would reduce the natural appearance of the area. The cutting, thinning, and burning of native vegetation on the lands that are not recommended is also not consistent with the principles of wilderness management and would reduce the untrammeled natural character within this portion of the unit.

F.3.6 Round Mountain WSA

Sheldon Refuge recommends this WSA be divided into two separate proposed wilderness areas allowing a former primitive route corridor to be reopened to public vehicle access. The eastern portion of the Round Mountain WSA (15,548 acres) would be separated from the western portion of the Round Mountain WSA (20,600 acres) by a designated route corridor 100 feet wide consisting of approximately 172 acres extending from the northern Sheldon Refuge boundary to County Road 34A and including a 3-mile dead-end route extending to the west. This would be consistent with the original 1974 wilderness review and study, which recommended allowing this north-south route to remain in place. These routes are necessary for the removal, rehabilitation, and monitoring of several abandoned livestock developments located in the western portion of the Round Mountain WSA.

Despite the fact both routes have officially been closed since the 1974 wilderness proposal, recreation users continually use OHVs and other vehicles on these popular routes, making rehabilitation ineffective. Sheldon Refuge anticipates regular vehicle use of these routes to support future management activities and continued use by the public. Once re-established, these routes would provide legal access to an existing BLM vehicle route connecting to Highway 140 in Oregon.

F.3.7 Catnip Mountain WSA

An area 11,737 acres in size, which includes the southern portion of the Catnip Mountain WSA, is recommended for wilderness designation. The remaining 21,490 acres, which include the northern portion of the WSA, are not recommended. Disturbances from past vehicle use in the northern portion of the WSA have altered the natural appearance and are not recovering naturally. Sheldon Refuge is seeking to increase the range of wildlife-dependent recreation opportunities available, and recommending the entire WSA would conflict with this management direction. Currently there are

few remote areas within Sheldon Refuge that provide vehicle access and opportunities for high-quality wildlife viewing and hunting. Recommending the southern portion of the WSA would preserve wilderness character in the most undisturbed and naturally appearing portion of the WSA and enhance other remote recreation opportunities by allowing vehicle use along exiting routes in the remaining portion of the WSA.

F.3.8 Big Spring Table WSA

Sheldon Refuge recommends those portions of the Big Spring Table Unit and the Jackass Flats Unit, which are west of the identified primitive route be combined to form the approximately 48,915-acre Big Spring Table WSA and that this WSA be designated as wilderness. Despite the fact most lands within the Jackass Flats Unit have been open to location of mining claims, little prospecting has occurred, no claims have been established, and there is little or no need for management activities within the unit that conflict with wilderness designation. The only portion of the Big Spring Table and Jackass Flats units not recommended for designation is a 100-foot-wide corridor extending 8.3 miles from Highway 140 to the northern boundary of Sheldon Refuge consisting of approximately 100 acres. This corridor would continue to provide administrative vehicle access through the Jackass Flats portion of the WSA and would re-establish administrative vehicle access through the current proposed wilderness area to Oregon for maintenance of fence lines and wildlife water guzzlers within Sheldon Refuge. This recommendation would effectively split the proposed wilderness area leaving the portion containing Railroad Point as a separate area approximately 11,000 acres in size.

Recommending the Big Spring Table WSA for wilderness designation would protect and preserve one of the most pristine and ecologically intact portions of Sheldon Refuge. When considered in combination with the adjacent Hawk Mountain and Sage Hen Hills WSAs managed by BLM, this recommendation would protect and preserve wilderness character of a continuous area approximately 102,600 acres in size.

F.3.9 Railroad Point WSA

Sheldon Refuge recommends those portions of the Big Spring Table Unit and Jackass Flats Unit east of the identified route (refer to unit maps) be combined to form the approximately 11,000-acre Railroad Point WSA and designated as wilderness.

Despite the fact most lands within the Jackass Flats Unit have been open to location of mining claims, little prospecting has occurred, no claims have been established, and there is little or no need for management activities within the unit that conflict with wilderness designation. The only portion of the Big Spring Table and Jackass Flats units not recommended for designation is a 100-foot-wide corridor extending 8.3 miles from Highway 140 to the northern boundary of Sheldon Refuge consisting of approximately 100 acres. This corridor would continue to provide administrative vehicle access through the Jackass Flats portion of the WSA and would re-establish administrative vehicle access through the current proposed wilderness area to Oregon for maintenance of fence lines and wildlife water guzzlers within Sheldon Refuge. This recommendation would effectively split the proposed wilderness area leaving the portion containing Railroad Point as a separate area approximately 11,000 acres in size.

F.3.10 Alkali Peak WSA

Sheldon Refuge recommends nearly the entire 61,370-acre Alkali Peak WSA for designation as wilderness. The WSA includes the Alkali Peak Unit (51,414 acres) which was previously proposed for wilderness designation, the Upper Virgin Creek/Alkali Reservoir Unit (5,715 acres) which was acquired by the Service through purchase, and the Sagebrush Basin Unit (4,241 acres). The only portion of the WSA not recommended for designation is a corridor that is 100 feet wide and 4.25 miles in length consisting of approximately 51.5 acres. This corridor extends downstream along Virgin Creek from Alkali Reservoir and contains an administrative vehicle access route and several historic ranching structures. Management efforts for preservation of these permanent structures and regular vehicle use for administrative purposes are not be consistent with wilderness values.

The Sagebrush Basin Unit was not recommended for wilderness designation in 1974 primarily due to anticipated mining and planned restoration activities that were inconsistent with wilderness management and necessary to meet the purposes for Sheldon Refuge. The area was subsequently withdrawn from mineral entry, which precluded additional mining activities, and the remaining management restoration activities (primarily the construction of erosion control structures and removal of sagebrush) have either been completed or are no longer considered necessary.

The reaches of Virgin Creek within the WSA are relatively undisturbed and intact. Preservation and protection of wilderness characteristics would benefit the various nesting raptors and other wildlife sensitive to human activities and disturbances. Protecting and preserving the undeveloped low sagebrush habitats of Rock Spring Table in their natural conditions are important for the conservation of pronghorn, Greater sage grouse, and other sagebrush-dependent wildlife.

Overall the Alkali Peak WSA contains truly remarkable scenery characterized by the broad high expanses of Rock Spring Table and the high vertical cliffs that form the canyon along Virgin Creek. The canyon affords isolation and remoteness to create outstanding opportunities for wilderness solitude.

F.3.11 Hell Creek WSA

Sheldon Refuge recommends the entire 13,969-acre Hell Creek WSA for designation as wilderness. The WSA includes a small portion of land previously proposed for wilderness designation, but primarily consists of that portion of Sheldon Refuge used to support the reintroduction of California bighorn sheep. This area was previously not recommended for wilderness designation due to the need for a large fence exclosure, water developments, and associated vehicle use and access routes. The reintroduction was successful, and the developments and access routes are no longer necessary for management purposes.

The Hell Creek WSA possesses a diversity of habitats, remarkable scenery, and nationally important prehistoric resources in a remote and undeveloped setting. These characteristics provide outstanding opportunities for wilderness solitude and primitive and unconfined types of recreation.

F.3.12 Guano Creek WSA

Sheldon Refuge recommends the entire 4,133-acre Guano Creek WSA for designation as wilderness. This area was not found suitable during the 1973 wilderness review due to historic cultivation for agriculture. Subsequent management by Sheldon Refuge has substantially restored the natural

appearance and ecological function of these lands, which has made them suitable for wilderness designation. When combined with the recommended Rye Creek WSA and Sheldon Contiguous WSA managed by BLM, this recommendation would protect and preserve wilderness character on a continuous area approximately 45,183 acres in size.

F.3.13 Massacre Rim Contiguous WSA

Sheldon Refuge does not recommend the 334-acre Massacre Rim Contiguous WSA for designation as wilderness. This recommendation is consistent with the current BLM recommendation for adjacent lands in the Massacre Rim WSA.

F.3.14 Sheldon Contiguous Inholdings WSA

Sheldon Refuge recommends the entire 119-acre Sheldon Contiguous Inholdings WSA for designation as wilderness. This recommendation is consistent with the current BLM recommendation for adjacent lands in the Sheldon Contiguous WSA.

F.3.15 Fish Creek Table-Little Catnip WSA

Sheldon Refuge recommends two separate portions of WSA be designated as wilderness. The recommendation would include an area approximately 8,755 acres in size west of Little Catnip Spring Road and another area approximately 20,371 acres in size north of County Road 8A. These lands represent some of the most intact natural habitats on Sheldon Refuge. The vast expanses of intact undeveloped sagebrush habitat, which are only occasionally visited by people, provide a sense of complete isolation and outstanding opportunity for wilderness solitude. Natural conditions are untrammeled, and ecological function is largely intact requiring few management activities.

The remaining 14,483 acres of the Fish Creek Table-Little Catnip WSA is not recommended for wilderness designation to allow continued and planned activities to restore and manage wildlife habitats. These management activities include prescribed burning along Andy's Place Road, maintenance of Swan Lake Reservoir and the earthen dam, and mechanical thinning of shrubs and trees on and around Bitner Butte. All of these activities are anticipated to require repeated long-term use of large vehicles and associated access routes, motorized and mechanized equipment, and other tools to manipulate the structure and function of habitats within portions of Sheldon Refuge. These tools and activities are considered necessary to fulfill the purposes for Sheldon Refuge but are generally not consistent with the principles of wilderness management.

F.3.16 Bateman WSA

Sheldon Refuge recommends the entire 5,772-acre Bateman WSA for designation as wilderness. This recommendation would protect and preserve relatively pristine and intact mountain mahogany habitats in their natural condition. These habitats are considered essential for fulfilling the purposes of Sheldon Refuge and for maintaining biological health, integrity, and natural diversity.

F.3.17 Tenmile WSA

Sheldon Refuge recommends the entire 3,702-acre Tenmile WSA for designation as wilderness. This recommendation would be consistent with the 2009 BLM findings and conclusion for the Ten Mile Spring WSA and would protect and preserve relatively pristine and intact mountain mahogany

habitats in their natural condition. These habitats are considered essential for fulfilling the purposes of Sheldon Refuge and for maintaining biological health, integrity, and natural diversity.

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Appendix G. Minimum Requirements Decisions and Analyses

G.1 Draft Minimum Requirements Decision and Analysis for Removal of Feral Horses and Burros

Step 1: Determine if any administrative action is necessary**.** (Refer to the Sheldon Refuge Draft CCP/EIS and preferred alternative).

Management direction for feral horse and burro populations was evaluated through a range of alternatives included in the Sheldon Refuge Draft CCP/EIS. The CCP/EIS preferred alternative for removal of feral horse and burros has been determined necessary for management of Sheldon Refuge and the proposed wilderness areas.

Step 2: Determine the minimum activity/minimum tool.

Description of Alternatives

Activities considered as part of this minimum requirements and decision analysis do not include the use of vehicles for law enforcement purposes. Such uses have not been necessary in the past, but could occur during horse and burros gathers to ensure the health and safety of contractors, employees, and the general public. Uses of motorized vehicles and equipment, mechanical transport, or aircraft within the proposed wilderness may be authorized in emergency situations and are not subject to a minimum requirements and decision analysis (610 FW 1).

Alternative A

Description

Gathers of feral horses and burros would be conducted on horseback, using temporary corrals or bait-traps, and other non-mechanized and non-motorized tools and techniques within proposed wilderness not otherwise prohibited by the Wilderness Act and Service wilderness policy. Gathers would be conducted much as they were prior to the availability of high clearance four-wheel drive vehicles, stock trailers, and portable metal fencing panels commonly used today. Trap sites would consist of exiting canyons or stone corrals and could include sections of lightweight fence, which could be transported on foot or by horseback and erected for temporary use. If trap sites within the proposed wilderness areas are used, a number of herders would then be needed drive animals to additional holding pens located along nearby roads where they could then be loaded and transported by truck and trailer.

Effects

Wilderness Character

"Untrammeled"
The use of horseback riders and temporary corrals would not alter natural processes. Because horses presently occur throughout Sheldon Refuge, the presence of horseback riders would have a temporarily but negligible effect on the behavior and movements of wildlife, particularly large

mammals such as bighorn sheep, mule deer, and antelope. Feral horses and burros are by definition the descendants of escaped domesticated livestock and are not part of the native ecology or natural processes within Sheldon Refuge. The removal of these animals would result in less trammeling of wilderness character over the long term.

"Undeveloped"
This alternative would not require further development of any temporary roads or permanent facilities within the proposed wilderness areas and would have little or no effect on the undeveloped character of the proposed wilderness areas.

"Natural"
The use of horseback riders to conduct gathers would protect and preserve natural conditions within the proposed wilderness areas.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
In areas where gathers take place, the presence of several horseback riders would reduce opportunities for solitude for up to two weeks during the summer months. These activities would not impact opportunities for primitive or unconfined types of recreation.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
The primitive and traditional skills required for horseback gathers and roundups are used less often and may become lost altogether as both government agencies and rancher increasingly rely on motorized equipment such as helicopters and OHVs. This alternative would result in the continued practice and teaching of these primitive skills, but only for a relatively short period of time until removal is complete.

Special Provisions
N/A

Economic and Time Constraints
It is doubtful any amount of time or money would result in the removal of all horses and burros from Sheldon Refuge with gathers conducted only by horseback. Even if this method could be effective, it is likely dozens of skilled riders would be required to conduct gather operations for several weeks to months each year. The costs for such gathers would likely be greater than those required to implement Alternative B or C and would likely be prohibitive.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

The terrain of Sheldon Refuge is very rugged, rocky, and difficult to traverse by foot or on horseback. Feral horses living within Sheldon Refuge develop strong hooves and the stamina needed to run long distances over rugged, broken, and uneven rocky terrain. Riding a domestic horse, even shod with steel horseshoes, at similar speed over this terrain to conduct gathers would almost

certainly result in injury to some horses and probably riders as well. Proper training, riding skill, and conditioning could reduce the potential for such injuries, but safety risks would remain high.

Alternative B

Description

Gathers of feral horses and burros would be conducted using helicopters to herd animals into temporary corrals located adjacent to, or within, proposed wilderness and along existing trails and routes. Transportation of temporary corrals and captured animals would be accomplished using trucks and trailers travelling on existing routes. Gathers would typically take place once or twice per year over a period of four to six days per gather.

Prior to the location of corral sites within wilderness, the existing access route and corral site would be photographed and monitored and the condition documented in conjunction with a cultural resource inventory. No maintenance or surface disturbance would be allowed to improve the access route or the corral site. The corral site would be located the minimum distance from the proposed wilderness boundary necessary and would be the minimum size necessary to safely and humanely hold the animals for transport.

Prior to motorized vehicle access, truck and trailer drivers would be provided maps indicating the exact route and corral location. Vehicle use would be authorized only for the minimum number of trips necessary to transport corral materials and animals. All other access would be on foot or by horseback.

Upon completion of the gather operations, all materials and structures would be removed. Once the management objective has been achieved, the corral site and route would be restored to their condition prior to use using standard wilderness route rehabilitation and restoration methods and primitive tools. Access routes and corral sites would be photographed and monitored following the first full growing season to document impacts from use and the effectiveness of restoration efforts, as well as to detect any newly introduced noxious weeds or other non-native species. Subsequent monitoring would be conducted as needed to document vehicle trespass and route recovery.

Effects

Wilderness Character

<u>"Untrammeled"</u>
Impacts from gather operations would be greater than those described for Alternative A or C. Impacts would likely affect a larger number of wildlife over the majority of Sheldon Refuge due to the noise and movement of helicopters conducting operations over large areas each day during gather operations.

<u>"Undeveloped"</u>
The use of temporary routes and erection of temporary corrals within proposed wilderness areas under this alternative would result in a more developed appearance during gathers when compared with Alternative A or C. All structures would be removed following each gather and impacts to the undeveloped character of the proposed wilderness areas would be short-term.

"Natural"
The crushing and disturbance of vegetation and soils from the use of motorized vehicles and temporary corral sites would adversely impact the natural appearance within portions of the proposed wilderness areas. The removal of temporary structures after each gather and rehabilitation of routes and corral sites following completion of horse and burro removal efforts would mostly restore natural conditions and leave little long-term evidence of past use and development. It is anticipated for some routes, restoration efforts would not be effective and evidence of vehicle use would remain visible for several years. Because some routes would remain visible, it is also anticipated public vehicle trespass within the proposed wilderness areas would occur along these routes, causing further adverse impact to wilderness character.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Where gathers are conducted, very few opportunities for solitude would be available for the anticipated four to six days per gather. Opportunities within a larger area would be impacted than under Alternative A or due to the distances over which helicopters would be seen and heard, and these impacts would occur more frequently than under Alternative C. Impacts to opportunities for solitude would not last as long as those described for Alternative A due to the shorter amount of time necessary to conduct gathers using helicopters. However, few people visit the proposed wilderness areas during summer, and gather operations under all alternatives would impact a relatively small number of recreation users.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
This alternative would not maintain traditional skills.

Special Provisions
N/A

Economic and Time Constraints
Despite the high costs associated with helicopters, the cost of this alternative would be considerably less than cost associated with potentially dozens of horses and riders needed to conduct gathers under Alternative A. In addition, the use of helicopters results in far less time than that required to conduct horseback gathers in a similarly sized area.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

The use of helicopters at low elevation to gather horses and burros does increase the level of risk when compared with standard point-to-point helicopter use. Gathers are planned based on the identification and avoidance of hazards such as terrain, fence lines, and power lines to minimize risk to the extent possible. Risks associated with horseback gathers under Alternative A do not necessarily differ from those under this alternative, but the greater number of people and animals

involved with horseback gathers does increase the probability for injury or accident when compared with the use of a single helicopter and pilot under this alternative.

Alternative C

Description

Gathers of feral horses and burros would be conducted using a combination of tools and techniques included in Alternatives A and B.

Under this alternative the majority of burros would be gathered by horseback or using bait-traps located outside proposed wilderness, and the majority of horses would typically be gathered using helicopters or other aircraft to herd animals to temporary corrals located adjacent to roads outside proposed wilderness areas. Landing of helicopters would be conducted within wilderness only when determined necessary for pilot, crew, or animal safety.

The placement of temporary corrals for the gathering of horses and burros is critical for safe and effective removal. Recent gather operations have successfully used roads and temporary corral sites outside proposed wilderness, but it is anticipated at least some sites within one or more proposed wilderness areas will be necessary to fully implement the minimum administrative action necessary. Corral site selection criteria include visibility (of the corral site by horses and burros; for horseback riders on the ground; and for safe low-level aircraft operations), terrain and obstacles (as related to effective sight distance, confinement, or interference with the movement of horse and burros being gathered; for horseback riders; and as hazards to low-flying aircraft), other hazards (such as overhead power lines or cliffs), and animal transport time (as a function of weather, safe vehicle speed, and overall distance from the corral site to the holding facility) are all determining factors in corral site selection to ensure a safe and effective gather operation.

The minimum number of temporary corral sites in support of gather operations would be located within proposed wilderness only upon the written determination by the Sheldon Refuge Project Leader that no safe and effective corral site could be located outside proposed wilderness which meets the above stated criteria. In the future, it is most likely two or three temporary corral sites would be located within the Alkali Peak and Big Spring Table proposed wilderness areas due to the number of horses present, the ruggedness of the terrain limiting the distance horses can be moved to trap locations, the relatively larger size of these two areas, and the distance from portions of these areas to adjacent roads. Sites would likely be used once or twice per year for up to five years in order to implement the Sheldon Refuge CCP/EIS preferred alternative.

Effects

Wilderness Character

<u>"Untrammeled"</u>
Impacts to untrammeled wilderness character would likely be between those described for Alternatives A and B.

"Undeveloped"
The types of impacts to untrammeled wilderness character would be similar to those described for Alternative B, but the lower number of temporary corrals proposed under this alternative would impact fewer proposed wilderness areas less often than anticipated under Alternative B.

"Natural"
The types of impacts to natural wilderness character would be similar to those described for Alternative B, but would occur less often and would impact fewer proposed wilderness areas due to the smaller number of temporary corrals located within proposed wilderness under this alternative.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Horses are found throughout Sheldon Refuge, and impacts to opportunities for solitude from gathers using helicopters would occur in all proposed wilderness areas as described under Alternative B.

Feral burros are commonly observed in and around the southern portion of the Big Spring Table proposed wilderness area and in the northern portion of the Gooch Table Proposed Wilderness Area. Impacts to opportunities for solitude in these areas would be as described under both Alternative A and B.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
This alternative would maintain traditional skills as described under Alternative A.

Special Provisions
N/A

Economic and Time Constraints
Gathers of both horses and burros are conducted by qualified private contractors. By allowing the use of either horseback riders or helicopters to conduct gathers, Sheldon Refuge would be able to accept the least expensive and most efficient method proposed for each particular gather. In certain areas and under certain conditions it is expected horseback gathers would be both less expensive and less time-consuming than helicopter gathers and vice versa.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

Typically horseback gathers are most practicable for feral burros in the lower elevation greasewood and salt scrub flats of the Virgin Valley and Thousand Creek drainages. Terrain in these locations is much gentler and domestic horses can more easily and safely be ridden than in other portions of Sheldon Refuge. The use of helicopters in other portions of Sheldon Refuge is generally accepted to be the safest method for the animals and people involved.

Comparison of Alternatives

It may be useful to compare each alternative's relative positive and negative effects to each of the criteria in tabular form, keeping in mind the law's mandate to "preserve wilderness character."

	Alternative A	Alternative B	Alternative C
Untrammeled	+	-	+/-
Undeveloped	+	-	-
Natural	+	-	-
Solitude or Primitive Recreation	+	-	+/-
Unique Components			
Wilderness Character	+	-	-

	Alternative A	Alternative B	Alternative C
Heritage and Cultural Resources			
Maintaining Traditional Skills	+	-	+
Special Provisions			
Economics & Time	-	+	+
Additional Wilderness Criteria			
Other Criteria Summary	+/-	+/-	+

	Alternative A	Alternative B	Alternative C
Safety	-	+	+

Safety Criteria

The selection criteria for each horse and burro corral site are primary to ensure safety for both people and animals. Sites will be located within proposed wilderness **only** after it has been determined a safe and effective corral site cannot be found outside proposed wilderness that meets the stated selection criteria. This determination will be documented in writing on a site-by-site basis during the gather planning phase.

Step 2 Decision: What is the <u>Minimum</u> Activity/Minimum Tool?

Selected Alternative

Alternative C

<u>Rationale</u> for Selecting this Alternative (Including Documentation of Safety Criterion, If Appropriate)

Gathering of horses and burros by horseback as described under Alternative A would be the least intrusive method within the proposed wilderness areas, but is unlikely to meet the management objective of the Sheldon Refuge CCP preferred alternative. Temporary corrals baited with feed or feed-traps are effective for gathering small numbers of feral burros and the use of horseback riders to herd feral burros has been successful for some gathers on Sheldon Refuge. Gathers conducted from horseback would likely be successful in areas of Sheldon Refuge with high concentrations of feral horses and ideal sites for temporary corrals. However, in areas with lower population density and as the population in other areas are reduced, horseback gathers would become increasingly difficult, time-consuming, and costly. Even with large numbers of riders and sufficient funding, gathers

conducted only from horseback are unlikely to be successful in gathering all feral horses and burros from Sheldon Refuge, which is required to fully implement the minimum administrative action necessary. As a result, horses and burros would continue to cause adverse impacts to Sheldon Refuge and wilderness character discussed under the No Action alternative of the Sheldon Refuge CCP/EIS.

In contrast, Alternative B would likely accomplish the minimum administrative action necessary as discussed under the preferred alternative of the Sheldon Refuge CCP/EIS, but would also result in the greater impact to wilderness character than the other options considered and would result in considerable cost.

Alternative C would minimize impacts to wilderness character to the extent practicable while providing a high probability for full implementation of the minimum administrative action necessary. Alternative C is also determined to be the safest and most cost effective alternative evaluated.

Monitoring and Reporting Requirements

No use of motorized vehicles would occur without a prior written determination by the Sheldon-Hart Mountain Refuge Complex Project Leader based upon a written evaluation using the corral trap site selection criteria listed in Alternative C. All areas where use of mechanized or motorized equipment occurs and where temporary structures are erected would be monitored and degradation of natural conditions reported.

Check Any Wilderness Act Section 4(c) Uses Approved in this Alternative

- ☐ mechanical transport
- ☐ motorized equipment
- ☒ motor vehicles
- ☐ motorboats
- ☐ landing of aircraft
- ☒ temporary road
- ☐ structure or installation

Record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:				
Recommended:				
Approved:				

G.2 Draft Minimum Requirements Decision and Analysis for Reduction and Thinning of Western Juniper within Sheldon Refuge Proposed Wilderness Areas

Step 1: Determine if any administrative action is necessary. (Refer to the Sheldon Refuge Draft CCP/EIS and preferred alternative).

Management direction for management of encroaching western juniper was evaluated through a range of alternatives included in the Sheldon Refuge Draft CCP/EIS. The CCP/EIS preferred alternative for the reduction and thinning of western juniper has been determined necessary for management of Sheldon Refuge and the proposed wilderness areas.

Step 2: Determine the minimum activity/minimum tool.

Description of Alternatives

Western juniper is a native species, but its expansion into sagebrush-steppe habitats as a result of continued long-term fire suppression and overgrazing for more than 100 years has severely degraded these habitats and as a result has adversely impacted priority wildlife species and the purposes for Sheldon Refuge. Areas of juniper expansion have been identified at various locations, primarily in the westernmost portion of Sheldon Refuge. While juniper expansion has been identified with proposed wilderness areas, we anticipate project areas would be located almost entirely within the Rye Creek Proposed Wilderness Area in the western portion of Sheldon Refuge, where approximately 5,000 acres have been identified for treatment. Terrain within the Rye Creek Proposed Wilderness Area is rugged and particularly steep along the westernmost edge. The entire unit is within 2 miles of established roads, and two access routes are located in the western half of the Rye Creek Area, where the majority of the 5,000 acres identified are located.

Average tree density and size within the Rye Creek Proposed Wilderness Area are highly variable. Densities range from only a few trees per acre to more than 150 trees per acre. Tree sizes range from less than two inches to more than 12 inches diameter breast height (dbh). These larger trees often have lower branches 4 inches or more in diameter, and near ground level below these lowest branches, trunk diameters can be more than 20 inches. While size and age structures have not been determined for juniper stands within Sheldon Refuge, sampling of western juniper stands in Eastern Oregon reveal juniper less than 5 inches dbh are typically less than70 years old, and represent about 7% of the total juniper trees within the stand. This same study reported 75% of juniper five inches dbh and larger were 70 to 130 years in age, and most were between 90 and 109 years in age (Gedney et al. 1999). These percentages are consistent with estimated areas of juniper expansion within the Rye Creek Proposed Wilderness Area. Using these estimates, approximately 350 acres of juniper within the Rye Creek Proposed Wilderness Area would be categorized as less than 5 inches dbh. Throughout the remaining 4,650 acres, we assume average density is 50 trees per acre.

Removal of western juniper has been focused on accessible non-wilderness areas throughout the region where the use of motorized tools and mechanized equipment are standard practice. Primitive tools and non-motorized methods have rarely been used for large-scale juniper reduction and thinning projects. The alternatives presented in this minimum requirements decision and analysis are considered a reasonable basis for initiating juniper treatments based upon knowledge of these tools and techniques when used for other tree species and in dissimilar environments.

Western juniper grows with branches close to the ground and has a dense, hard wood. Juniper is killed by cutting only when the cut is made below the lowest live branch. These characteristics make effective control of expanding juniper with hand tools more difficult and labor intensive than for other western tree species. Herbicides have been shown to effectively kill only smaller juniper less than 6 feet in height (Lile et al. 2004). For the purposes of this minimum requirements decision and analysis we assume one person using hand tools (e.g., pruning saw, pruning shears, axe, single-person crosscut saw, brush axe) would be able to cut 40 trees with an average dbh of 5 inches or less during a 10-hour workday, or less than 10 trees 5 to 12 inches dbh in the same amount of time. We also assume a one person using power tools (e.g., chainsaw, power pruning saw, power brush cutter) would be able to cut twice the number of trees in the same amount of time when compared to a person using primitive tools. While tree diameter is not the best indicator of tree age, we expect trees larger than 12 inches dbh would usually be considered mature old-growth trees (i.e., >120 years old) and would not be cut as part of juniper reduction and thinning. We anticipate these assumptions and consequently the minimum management action and tools necessary will be adjusted as additional inventory data and experience are obtained.

Alternative A

Description

Control of expanding western juniper on an average of 1,500 acres per year would be completed using a combination of chemical herbicides and cutting with primitive hand tools. Access and transport of tools and equipment would be by foot, horseback, pack stock, or other non-mechanized and non-motorized means.

Chemical control would be single tree application of approved herbicides as liquid concentrate through an applicator gun, dry pellets placed under the drip line, or as a spray applied to the foliage with a backpack sprayer. We anticipate these methods would be used most often where juniper are sufficiently small and occur at low density (less than 10 trees per acre) where carrying hand tools would be more cumbersome and cutting through small fine branches and more flexible stems would be more difficult and time consuming.

Cutting, felling, limbing, piling, and burning of western juniper would be conducted using non-motorized tools and equipment. Work crews using crosscut saws, axes, pruning saws, limbing shears, drip torches, and other primitive hand tools would remove or thin juniper. Burning of felled trees and limb piles would take place during typically cooler and wetter winter months.

Based upon the assumptions for this minimum requirements decision and analysis, accomplishment of the management objectives under the CCP preferred alternative of 1,500 acres per year would require two 20-person crews working for the entire year. In areas furthest from road access and with the highest density of juniper, it is expected seasonal tent camps would be used with regular resupply of food, water, tools, and equipment.

Temporary work crew campsites and latrine sites would be selected in advance. Sites would be capable of supporting one or more potential juniper thinning efforts. Access routes for seasonal camps or campsites anticipated to be used for multiple seasons would also be identified in advance. Both access routes and campsites would be photographed and inventoried prior to use in conjunction with a cultural resource inventory to document wildlife present, measure vegetative cover, and to identify noxious weeds and other invasive non-native plants. No maintenance or surface disturbance

would be allowed to improve access routes. Rocks and other obstacles could be temporarily moved to provide suitable tent sites. Temporary latrines for burial of waste would be excavated to the minimum depth and size necessary.

Upon completion of juniper reduction and thinning operations, all materials and structures would be removed. Once the management objective has been achieved, campsites would be restored to their prior appearance using standard wilderness rehabilitation and restoration methods and primitive tools. Access routes and campsites would be photographed and monitored following the first full growing season to document impacts from use and the effectiveness of restoration efforts, as well as to detect any newly introduced noxious weeds or other non-native species. Subsequent monitoring would be conducted as needed to document wildlife use and campsite recovery.

Effects

Wilderness Character

"Untrammeled"
The presence of 20-person work crews for the entire year within the same general location is expected to alter wildlife behavior and habitat use. These impacts would be expected to last for several years after treatment of the entire 5,000 acres is completed. Over the long term as native perennial grasses, forbs, and shrubs become re-established, we would expect several wildlife species absent from these areas over the past several decades to return. Long-term trammeling of wilderness character from cutting and burning of juniper was evaluated in the Sheldon Refuge Draft CCP/EIS.

"Undeveloped"
Year-long work camps consisting of small and large tents would affect the undeveloped character of small portions of the Rye Creek Proposed Wilderness Area. Following campsite removal and restoration, little or no noticeable evidence of temporary developments would remain. Use along identified access routes would be noticeable but would appear as undeveloped and unmaintained trails.

"Natural"
Where juniper is treated using herbicide, the few trees killed would be left standing and would appear to have died naturally. Higher amounts of herbicide needed to kill larger trees can also kill nearby shrubs, which would create a somewhat less natural appearance.

Natural conditions would be affected for many years by the presence of cut stumps throughout the Rye Creek Proposed Wilderness Area, reminding visitors of past use and human activities. Use of access routes and campsites would result in damage to vegetation, including shrubs and other perennials, and these impacts would be noticeable for several years. Following campsite removal and restoration, impacts would remain readily visible for several years due to the contrast between work camp locations lacking shrubs and other longer-lived plants and the surrounding undisturbed areas where these plants would remain. It is anticipated these impacts would occur at as many as six campsites, each less than 1 acre in size located primarily along the northern portion of the Rye Creek Proposed Wilderness Area. Long-term impacts to the natural conditions from the thinning and reduction of juniper were evaluated in the Sheldon Refuge Draft CCP/EIS.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Opportunities for solitude would be difficult to find due to the presence of two 20-person work crews within the area for the entire year. Generally, effects would occur within the project area and near campsite locations. The use of hand tools would have little or no impact on opportunities for primitive recreation. However, the appearance of thousands of cut stumps across 5,000 acres would serve as a reminder of human activity and intrusion and would adversely impact opportunities for solitude over the long term. Most of the project area is within a portion of Sheldon Refuge closed to hunting, and recreation use is estimated to be very low. As a result, impacts to solitude would affect few people.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
Under this alternative dozens of people with little or no prior experience would learn to use, and teach others to use, specialized primitive tools and skills (i.e., crosscut saws and saw maintenance) necessary for future wilderness preservation and management.

Special Provisions
N/A

Time Constraints
To achieve the objectives of the administrative action would require two 20-person crews working throughout the entire year over the next three to four years. Working throughout the year is not practical given the availability of large work crews, the required logistical support to sustain such large crews in a wilderness work environment, and inclement winter weather, which would periodically stop work. The training, tools, equipment, support, and other costs associated with such large numbers of people would require substantially more time to meet management objectives than that required for other alternatives.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

The use of hand tools required to implement this alternative results in fewer accidents and less severe injuries than motorized tools designed to accomplish the same tasks. The use of herbicides as proposed under this alternative presents little risk to health or safety when handled and applied properly and according to product labels. Other risks and potential safety issues encountered within proposed wilderness are generally no greater than those encountered in other remote areas of Sheldon Refuge.

Alternative B

Description

Cutting, felling, limbing, piling, and burning of western juniper within proposed wilderness would be conducted using both motorized and non-motorized tools and equipment. Transport of tools and

equipment would be by motorized vehicle along two existing routes located in the western portion of the Rye Creek Proposed Wilderness Area. Access for work crews to project areas would be by foot or horseback.

Work crews using chainsaws, motorized pruning saws, limbing shears, drip torches, and other hand tools would remove or thin juniper as described in Alternative A.

Under the assumptions described for this analysis, we expect motorized tools would be twice as effective as hand tools for cutting juniper. As a result, only half as many people (one 20-person crew) or half as much time (two 20-person crews for six months) would be required to accomplish the management objective of treating 1,500 acres as proposed under the CCP preferred alternative when compared with Alternative A. In areas farthest from road access and with the highest density of juniper, it is expected short-term tent camps would be used for periods up to four days. All supplies for temporary camps would be transported with tools and other equipment required for juniper thinning and removal.

Access routes would be photographed and inventoried prior to use to measure vegetative cover, and to identify noxious weeds and other invasive non-native plants. No maintenance or surface disturbance would be allowed to improve access routes. Transport of tools, equipment, and materials would be accomplished using one vehicle making a single trip to the project and/or campsite within the Rye Creek Proposed Wilderness Area, and a single trip out each week.

Upon completion of juniper reduction and thinning operations, all waste, materials, and structures would be removed. Once the management objective has been achieved, campsites would be restored to their prior condition using standard wilderness rehabilitation and restoration methods. Access routes and campsites would be photographed and monitored following the first full growing season to document impacts from use and the effectiveness of restoration efforts, as well as to detect any newly introduced noxious weeds or other non-native species. Subsequent monitoring would be conducted as needed to document route and campsite recovery and document future vehicle trespass into proposed wilderness areas.

Effects

Wilderness Character

<u>"Untrammeled"</u>
The presence of work crews for multiple four-day periods within the same general location is expected to alter wildlife behavior and habitat use until thinning and burning efforts are completed. Because activities would occur less often and for a shorter amount of time than under Alternative A, we anticipate these impacts would not persist for several years after juniper reduction is completed. Long-term trammeling of wilderness character from cutting and burning of juniper was evaluated in the Sheldon Refuge Draft CCP/EIS.

<u>"Undeveloped"</u>
Short-term work camps consisting of small tents would have less temporary impact on the undeveloped character of proposed wilderness than Alternative A. Following campsite removal and restoration, little or no noticeable evidence of temporary developments would remain. Access by motor vehicle would occur less frequently than foot or horseback access described under Alternative A. However, previously established routes would continue to be easily identified as primitive two-

track vehicle routes in contrast to the more naturally appearing undeveloped trails anticipated under Alternative A.

"Natural"
The use of chainsaws and other motorized tools to conduct juniper thinning would result in a less natural appearance of stumps and unburned logs when compared with Alternative A. Use of access routes and campsites would also result in damage to vegetation, including shrubs and other perennials. The use of smaller short-term camps would also avoid impacts from Alternative A of digging latrines to bury waste. When compared with Alternative A these impacts would be less severe, would affect smaller areas, and would be noticeable for a shorter amount of time due to smaller work crews, smaller campsites, and less use of routes with no camp resupplies needed. It is anticipated these impacts would be only somewhat noticeable for many years at as many as three campsites, each less than 0.3 acre in size, located primarily in the most remote northwest portion of the Rye Creek Proposed Wilderness Area where juniper density is highest. Long-term impacts to natural conditions from thinning and removal of juniper were evaluated in the Sheldon Refuge Draft CCP/EIS.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Opportunities for solitude would be directly affected by the presence of work crews as large as eight people and the sounds of chainsaws and other motorized equipment. Noise from a single vehicle trip for transport of tools, equipment, and supplies would have only a slight short-term impact on wilderness solitude. Overall, noise impacts to wilderness solitude under this alternative would be more intense and would affect a larger area than larger work crews using hand tools as proposed in Alternative A, but these impacts would last for a shorter length of time.

The use of motorized tools and equipment would detract from opportunities for primitive recreation. Impacts to solitude from the long-term presence of cut stumps would be the same as described for Alternative A. Most of the Rye Creek Proposed Wilderness Area is closed to hunting, and recreation use is estimated to be very low. As a result, impacts to solitude and primitive recreation would affect few people.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
This alternative would not maintain traditional skills.

Special Provisions
N/A

Time Constraints
The need for fewer work crews or less amount of time and only small short-term tent camps under this alternative would require considerably less logistical support than crews and camps proposed under Alternative A. In areas with higher tree density or larger diameter trees, we assume crews working with chainsaws and other motorized equipment would be able to remove and thin juniper twice as fast as similar sized crews working with crosscut saws, axes, and other primitive tools. However, where juniper density is low and most time and effort is spent walking and carrying tools

and equipment from one tree to the next, case studies have demonstrated crews using motorized equipment do not save time or accomplish the same amount of cutting faster than crews using primitive tools (Arthur Carhart Wilderness Training Center 2006). It is anticipated this alternative would save time compared with Alternative A only in those areas furthest from roads and with the highest juniper density.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

The use of motorized tools required to implement this alternative has been shown to result in a higher accident rate and result in more severe injuries than those from primitive tools designed to accomplish the same tasks (Arthur Carhart Wilderness Training Center 2006). However, the vehicle used to transport tools, equipment, and supplies under this alternative would remain in the project area to provide emergency evacuation to roads or suitable helispots. Improved emergency response time with the use of a motorized vehicle would mitigate some of the injury severity risks associated with the use of motorized equipment under this alternative. Other risks and potential safety issues encountered within proposed wilderness are generally no greater than those encountered in other remote areas of Sheldon Refuge.

Alternative C

Description

This alternative would combine the tools and methods described in Alternatives A and B. In areas with very low density of small trees (less than 10 trees per acre and less than 67 feet in height), herbicide would likely be used. In low juniper density areas (average less than 30 trees per acre) and in areas of small juniper size (average less than 5 inches dbh), thinning and removal would be conducted as described under Alternative A. For areas with juniper density greater than 30 trees per acre and in treatment areas where average juniper dbh is greater than 5 inches, thinning and removal would be conducted as described under Alternative B.

Effects

Wilderness Character

"Untrammeled"
Impacts to untrammeled wilderness character would likely be between those described for Alternatives A and B.

"Undeveloped"
Impacts to undeveloped wilderness character would be as described for Alternative B with the use temporary structures (i.e., tents) at some sites for periods of approximately four days at a time.

"Natural"
The types of impacts to natural wilderness character would include those described for Alternatives A and B. Areas with low juniper density would have a more natural appearance than those with higher juniper density where motorized equipment would be used. However, the use of motorized

equipment in higher density areas would not result in the impacts to natural condition from larger work crews and seasonal work camps described under Alternative A.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Impacts to untrammeled wilderness character would likely be between those described for Alternatives A and B. In low juniper density areas or areas with smaller juniper where herbicides or primitive tools would be used, opportunities for solitude and primitive recreation would be least impacted from the presence of work crews. In high juniper density areas or areas with larger juniper, opportunities for solitude and primitive recreation would be more intensely impacted, but these impacts would last for less than a week at a time and would end upon completion of cutting, felling, and limbing work. Impacts from piling and burning work would be as described under Alternative B.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
This alternative would maintain traditional skills as described under Alternative A.

Special Provisions
N/A

Time Constraints
It is more likely Sheldon Refuge would utilize assistance from volunteers and/or other organizations to assist thinning efforts using primitive hand tools in areas of lower juniper density and areas with smaller trees. Work projects in these lower density areas and areas with smaller juniper would also require smaller work crews and less training than would longer-term work projects using motorized equipment. Overall we anticipate the amount of time or number of people required to accomplish the management objective under this alternative would be slightly more than under Alternative B, but much less than required under Alternative A.

Additional Wilderness-specific Comparison Criteria

Safety of Visitors, Personnel, and Contractors

The level of safety involved with this alternative would fall between that described for Alternatives A and B.

Comparison of Alternatives

It may be useful to compare each alternative's positive and negative effects to each of the criteria in tabular form, keeping in mind the law's mandate to "preserve wilderness character."

	Alternative A	Alternative B	Alternative C
Untrammeled	--	-	+/-
Undeveloped	--	-	-
Natural	--	-	-
Solitude or Primitive Recreation	-	--	-

Unique Components			
Wilderness Character	--	--	-

	Alternative A	Alternative B	Alternative C
Heritage and Cultural Resources	N/A	N/A	N/A
Maintaining Traditional Skills	+	-	+
Special Provisions	N/A	N/A	N/A
Time	-	+	+
Additional Wilderness Criteria	N/A	N/A	N/A
Other Criteria Summary	+/-	+/-	+

	Alternative A	Alternative B	Alternative C
Safety	+	-	+/-

Safety Criteria

The use of chainsaws, motorized brush cutters, and other power equipment for the cutting juniper is inherently more dangerous than the use of crosscut saws, pruning shears, and other hand tools. The use of motorized equipment is not being proposed as the necessary minimum tool for safety reasons.

Documentation

Arthur Carhart Wilderness Training Center. 2006. Traditional tools and skills. PowerPoint presentation. Available at: http://www.wilderness.net/index.cfm?fuse=toolboxes&sec=awareness. Accessed September 7, 2010.

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Lile D.F., D.L. Lancaster, and R.G. Wilson. 2004. Control of cut juniper stumps and small trees in northeastern California. University of California Cooperative Extension, Lassen and Modoc Counties. In: 2004 Proceedings of the California Weed Science Society. Vol. 56. Pp. 88-93.

Step 2 Decision: What is the Minimum Activity/Minimum Tool?

Selected Alternative

Alternative C

Rationale for Selecting this Alternative (Including Documentation of Safety Criterion, If Appropriate)

Alternative C would use the tools and techniques least intrusive to opportunities for solitude and primitive recreation where they would be most efficient and would result in the least impact to natural conditions. Tools and techniques more intrusive to opportunities for solitude and primitive recreation would be used where they would be most efficient and would require the least impact to natural conditions from work crew campsites and resupply. Alternative C is also determined to have an acceptable level of safety and would be cost effective when compared with the other alternatives.

Monitoring and Reporting Requirements

Except as specifically described in alternative selected, no use of motorized vehicles or equipment may occur without prior written determination by the Sheldon-Hart Mountain Refuge Complex Project Leader. All areas where the use of motorized vehicles and temporary structures is to occur will be specifically identified, monitored, and degradation of natural conditions reported.

Check Any Wilderness Act Section 4(c) Uses Approved in this Alternative

- ☐ mechanical transport
- ☒ motorized equipment
- ☒ motor vehicles
- ☐ motorboats
- ☐ landing of aircraft
- ☒ temporary road
- ☐ structure or installation

Record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:				
Recommended:				
Approved:				

G.3. Draft Minimum Requirements Decision and Analysis for Treatment, Removal, and Eradication of Invasive Non-native Plants

Step 1: Determine if any administrative action is necessary. (Refer to the Sheldon Refuge Draft CCP/EIS and preferred alternative).

Management direction for invasive non-native plans was evaluated through a range of alternatives included in the Sheldon Refuge Draft CCP/EIS. The CCP/EIS preferred alternative for the treatment, removal, and eradication of invasive non-native plants has been determined necessary for management of Sheldon Refuge and the proposed wilderness areas.

Step 2: Determine the minimum activity/minimum tool.

Description of Alternatives

As described in the Sheldon Refuge Draft CCP/EIS, several invasive non-native plants (weeds) are currently found within Sheldon Refuge, or occur immediately adjacent to Sheldon Refuge and are expected to spread to areas within Sheldon Refuge in the near future. These non-native invasive plants include several noxious weeds and have a persistent and growing adverse impact on the natural character of the eight proposed wilderness areas within Sheldon Refuge, and/or threaten the natural character of adjacent contiguous Wilderness Study Areas managed by the Bureau of Land Management.

Based upon analysis of the impacts from the Service's preferred alternative in the Sheldon Refuge Draft CCP/EIS, it has been determined treatment of up to 1,000 acres per year using a variety of weed control techniques through an integrated pest management approach, including herbicides where appropriate and effective, would be the minimum administrative action necessary to fulfill the purposes for Sheldon Refuge and the mission of the Refuge System, and to protect and preserve wilderness character. The alternatives presented here evaluate the least intrusive methods and tools necessary to apply various integrated pest management techniques as necessary to accomplish the objective and strategies of the preferred alternative.

Management strategies of the preferred alternative that would affect the proposed wilderness areas include treatment of invasive non-native plants on as many as 1,000 acres per year primarily along road corridors throughout Sheldon Refuge, and control of non-native species as part of emergency stabilization and rehabilitation efforts following catastrophic fires. Proposed wilderness boundaries within Sheldon Refuge are set back 50 feet or more from the centerline of all roads, and these corridor areas are the locations where weeds most likely occur due to disturbances caused by vehicle use and maintenance activities. Based upon the size of the current road system within Sheldon Refuge, there would be approximately 5,800 non-wilderness acres targeted for repeated weed treatments. We anticipate very few acres associated with weed treatments along road corridors would occur within the proposed wilderness areas. Therefore, the actions evaluated in the alternatives presented would be primarily for weed treatments following catastrophic fires.

Invasion of grasslands and shrub-steppe habitats below 6,800 feet by cheatgrass (*Bromus tectorum*) following fire is the most likely large-scale threat to the natural character of the proposed wilderness areas. Portions of each proposed wilderness area are below 6,800 feet in elevation, and we anticipate treatment of cheatgrass across several hundred, and possibly several thousand acres, within one or more proposed wilderness areas would be necessary in the future. However, such large-scale

treatment efforts are complex and could require a variety of treatment tools and methods. Such large-scale treatments within wilderness would be evaluated on a case-by-case basis through a separate minimum requirements and decision analysis, including a minimum tool analysis.

Other weeds that threaten the ecological integrity of Sheldon Refuge and the natural character of the proposed wilderness areas occupy much smaller areas, ranging from widely scattered individual plants to areas a few acres in size. We anticipate treatment of these weeds would occur repeatedly within each proposed wilderness area, and in many instances at the same or very close to the same locations over the next 10 to 15 years. Due to the fact these types of situations are expected to be the most common, this minimum tool analysis will focus on determining the minimum tools necessary to implement weed treatment of individual plants or patches of weeds within portions of the proposed wilderness areas 10 acres in size or smaller.

Alternative A

Description

Under Alternative A, all weed treatments would be completed using non-mechanized and non-motorized means and other methods not otherwise prohibited by the Wilderness Act. In addition, weed treatment under this alternative would not allow the use of herbicides for treatment of areas 10 acres in size or smaller. Treatments would be completed using hand tools to cut or dig weeds from the ground.

We anticipate removing scattered individual plants and small patches of plants from an area 10 acres in size would require one to four people working for one to four days. Plant parts would either be left on the ground or removed from Sheldon Refuge for disposal, depending upon the type of weed and growth stage.

For treatment of larger areas infested with several acres of weeds, the number of people and/or the amount of time needed would be considerably longer. In areas where native shrubs and other woody plants are common, hand-pulling and grubbing would be the only practicable option. However, we anticipate many weeds would be overlooked under such conditions and treatment would not be very effective.

Because weed control would be limited to hand tools, retreatment of most areas is likely under this alternative.

Effects

Wilderness Character

<u>"Untrammeled"</u>
The presence of work crews for up to four days within the same general area is expected to alter wildlife behavior and habitat use until efforts are completed. Long-term trammeling of wilderness character from the control of non-native plants was evaluated in the Sheldon Refuge Draft CCP/EIS.

"Undeveloped"
Short-term temporary camps consisting of small tents would have a slight effect on the undeveloped character within small portions of the proposed wilderness areas. Following campsite removal and restoration, little or no noticeable evidence of temporary developments would remain.

"Natural"
We do not anticipate hand-pulling, cutting, or digging of scattered weeds or of individual weeds within areas a few acres in size would noticeably affect the natural appearance or condition of the proposed wilderness areas. Digging and grubbing to control numerous large patches of deep-rooted perennial weeds would likely cause substantial soil disturbance and could increase soil erosion from the site. Control of certain deep tap-rooted weeds and large woody plants using only hand-cutting, pulling, or grubbing is simply not effective and will only slow or delay plant growth.

Disturbance from hand tools to control large patches of weeds would make sites more susceptible to future invasion from weeds. Sites would be re-seeded to mitigate these impacts, but a number of efforts to reseed areas within Sheldon Refuge have had mixed results depending on weather, soil type, and other subsequent disturbances such as windstorms and wildlife use. The combination of digging and reseeding would slightly alter the natural appearance of the treated areas, but if successful these effects would not be noticeable after one or two growing seasons.

In areas of dense native vegetation and shrubs, the effectiveness of hand treatment would be limited, and many weeds would likely be overlooked, requiring several subsequent retreatments.

More general long-term impacts to natural conditions from control and removal of non-native invasive plants were evaluated in the Sheldon Refuge Draft CCP/EIS.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Opportunities for solitude and unconfined types of recreation would be directly affected by the presence of work crews for up to four days. The use of hand tools would have little or no impact on opportunities for primitive recreation. Most weed control activities would occur during the spring before seeds develop and would not coincide with the fall hunting seasons when most visitation to the wilderness areas occurs. As a result impacts to opportunities solitude and primitive and unconfined recreation would affect few people.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
The use of hand tools under this alternative could include grubbing and digging of individual plants and could result in damage or destruction of artifacts and minor disturbance of cultural and historic sites.

Maintaining Traditional Skills
The use of simple primitive tools such as hoes and grubbing adzes under this alternative would have little effect on maintaining traditional skills.

Special Provisions
N/A

Time Constraints
Removal of weeds with the use of hand tools would be the most time consuming when compared with Alternative B or C.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

Hand tools required to implement this alternative are commonly used. Safety issues and concerns can be mitigated through proper job training and protective equipment.

Alternative B

Description

Under this alternative the control and removal of scattered individual plants and treatment of areas 10 acres in size or less would be completed using tools under Alternative A and hand-operated 5-gallon backpack herbicide and/or slightly larger capacity pack stock sprayers over a period of one to four days per treatment. To protect public health and safety, areas treated with herbicides would be closed to public access for a period of time determined from product label recommendations and restrictions.

For herbicide treatment of very large patches or multiple large patches of weeds, we anticipate 10 or more trips per person would be required to refill portable backpack sprayers.

Effects

Wilderness Character

"Untrammeled"
The presence of work crews for periods up to four days per treatment is expected to alter wildlife behavior during treatment and to alter habitat use for several years until natural plant communities are restored. Long-term trammeling of wilderness character from control of invasive non-native plants was evaluated in the Sheldon Refuge Draft CCP/EIS.

"Undeveloped"
Short-term work camps consisting of small tents would have a lesser temporary impact on the undeveloped character of proposed wilderness than Alternative A. Following campsite removal and restoration, little or no noticeable evidence of temporary developments would remain.

"Natural"
Hand tools would be used under this alternative primarily to remove scattered individual weeds, or small patches of weeds. Herbicides would more commonly be used to treat large patches and areas with numerous patches of weeds. While some herbicides that would be used for treatment are plant specific and kill only the target weed (grasses, broadleaf plants, woody plants), some of the most effective herbicides are not specific to only the target weed and would kill native plants as well.

Where herbicides are applied over areas of a few acres or more, vegetation composition would not appear natural, at least until the following growing season. Depending upon the type of herbicide(s)

used, either the grass component of the habitat type or the forb component of the habitat type could be largely absent. A discussion of additional impacts to refuge and habitat biological health, diversity, and integrity from the use of herbicides is included in (Kilbride 2010). However, when compared to the often less-effective methods under Alternative A, this alternative would require fewer retreatments and would avoid ground disturbance to remove large patches of deep-rooted perennial weeds.

Long-term impacts to natural conditions from control and treatment of non-native plants were evaluated in the Sheldon Refuge Draft CCP/EIS.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Opportunities for solitude and unconfined types of recreation would be directly affected by the presence of work crews for up to four days and temporary closures in areas up to 10 acres in size where herbicides are used. The use of hand tools would have little or no impact on opportunities for primitive recreation. Most weed control activities would occur during the spring before seeds develop and would not coincide with the fall hunting seasons when most visitation to the wilderness areas occurs. As a result, impacts to opportunities solitude and primitive and unconfined recreation would affect few people.

Opportunities for solitude would be directly affected by the presence of small crews for several days. Opportunities for unconfined types of recreation would be directly impacted by temporary closures in areas up to 10 acres in size where herbicides are used. Because only herbicides would be used, we anticipate these impacts would last a few days longer than the herbicide application period. Overall, impacts to unconfined recreation would impact larger areas than under Alternative A due to public access closures. Noise impacts to wilderness solitude under this alternative would be more intense and affect a larger area than under Alternative A, but would be less intense than under Alternative C, which proposes the use of motorized vehicles.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
Impacts from the use of hand tools would be as described under Alternative A. However, in areas where herbicides are used, the potential for these impacts would be eliminated and as a result impacts to cultural resources are lower under this alternative when compared to Alternative A or C.

Maintaining Traditional Skills
This alternative would maintain only basic skills for using hand tools.

Special Provisions
N/A

Time Constraints
This alternative would require fewer people and less time over the long term when compared with multiple retreatments anticipated under Alternative A. For areas of moderate to gentle terrain, this alternative would require more time than under Alternative C, which would utilize larger-capacity motorized spray equipment and vehicles. In areas of steep, rough, and rocky terrain inaccessible to vehicles, this alternative would require about the same amount of time as Alternative C.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

The hand tools, hand-powered spray equipment, and livestock required to implement this alternative are commonly used. Backpack sprayers are notorious for developing small leaks and would likely need to be regularly fixed or replaced to avoid contamination. Safety issues and concerns can be mitigated through proper job training and project planning.

Alternative C

Description

As with Alternative A and B, the control and removal of scattered individual plants and treatment of areas a few acres in size would be completed with the use of hand tools and hand-powered backpack and/or pack stock sprayers by one to four people working over a period of one to four days per treatment.

In addition, motorized vehicles equipped with low-pressure tires and flail mowers or large-volume herbicide sprayers with electric pumps, handheld spray wands, and/or spray booms capable of spraying an area at least 40 feet in width would be used for the treatment of very large weed patches or multiple large patches over areas up to 10 acres in size. Using such equipment we anticipate one person could treat 10 acres within one day under ideal conditions and terrain, but treatments could require as many as two days depending on terrain, weed density, and the number of herbicide refilling trips needed. However, due to the steep rugged terrain within many portions of the proposed wilderness areas, motorized vehicles may not be capable of mowing or spraying all weeds within the treatment areas. The use of hand tools, backpack, or stock pack spray equipment would likely be necessary for treatment of these remaining areas. To protect public health and safety, areas treated with herbicides would be closed to public access for a period of time determined from product label recommendations and restrictions.

Vehicle use would occur off-road within the treatment areas. Vehicle access would occur along previously existing routes and would require a single trip to the treatment area. All fuel, herbicide, tools, equipment, and work crews necessary to complete the treatment would be transported with the vehicle to the treatment area, on foot, or by pack stock.

Effects

Wilderness Character

<u>"Untrammeled"</u>
The presence of work crews and motorized vehicles for periods up to two days per treatment is expected to alter wildlife behavior during treatment and to alter habitat use for several years until natural plant communities are restored. Long-term trammeling of wilderness character from control of invasive non-native plants was evaluated in the Sheldon Refuge Draft CCP/EIS.

<u>"Undeveloped"</u>
Impacts from work crews treating scattered individual plants or areas only a few acres in size would be as described for those activities under Alternatives A and B. Access by motor vehicle would occur less frequently than foot or horseback access described under Alternative A or B. However, previously established routes would continue to be easily identified as primitive two-track vehicle

routes in contrast to the more naturally appearing undeveloped trails anticipated under Alternative A. In addition, the use of vehicles off-road to conduct mowing or spraying would create new vehicle tracks, which would likely encourage trespass into these areas and the pioneering of new routes.

"Natural"
Effects from herbicide use would be as described under Alternative B, and we anticipate natural conditions would be affected for many years after treatment.

In areas where flail mowers would be used to cut weeds prior to seed production, vegetation would not appear natural within areas several acres or more in size and effects would be readily apparent to even a casual observer. In grassland habitats, these effects would be noticeable until the following spring or perhaps the end of the next growing season. In shrub-steppe habitats these effects would be noticeable for decades. However, unlike hand-pulling or herbicide use, mowers or flailers can effectively treat large patches of annual or biannual weeds by eliminating most seed production but still allow native plant communities to remain. The combination of followed by herbicide treatment or hand removal of remaining weeds can be effective. These remaining native plants are then able to continue growing and produce seed in following years to revegetate the treated areas and maintain natural conditions over the long term.

The presence of vehicle tracks throughout the treatment areas would appear unnatural and the use of access routes would result in damage to vegetation, including shrubs and other perennials. When compared with short-term campsite use, stock use, and backpacking under Alternatives A and B, these impacts would be more severe, would affect larger areas, and would be noticeable for a longer amount of time due to more intensive trampling from vehicle tires, and access travel concentrated along existing vehicles routes.

Long-term impacts to natural conditions from control and treatment of non-native plants were evaluated in the Sheldon Refuge Draft CCP/EIS.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Opportunities for solitude would be directly affected by the presence of small hand crews and the sights and sounds of concentrated use of motorized vehicles conducting treatments for one or two days. Opportunities for unconfined types of recreation would be directly impacted by temporary closures in areas ranging from two acres up to 10 acres in size where herbicides are used. Because only herbicides would be used, we anticipate these impacts would last a few days longer than the herbicide application period. Overall, impacts to unconfined recreation would impact larger areas than under Alternative A due to public access closures. Noise impacts to wilderness solitude under this alternative would be more intense and would affect a large area, but would last for a shorter period of time than under Alternative A or B.

The use of motorized vehicles would detract from opportunities for primitive recreation. Most treatments would occur during the spring when recreation use is estimated to be very low. As a result, impacts to solitude and primitive recreation would affect few people.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
Impacts from the use of hand tools would be as described under Alternative A. The use of vehicles off-road under this alternative has the potential to disturb unidentified artifacts or other historic and

cultural resources. The use of low-pressure tire vehicles would reduce the potential for breaking or otherwise destroying these artifacts.

Maintaining Traditional Skills
This alternative would maintain only basic skills for using hand tools.

Special Provisions
N/A

Time Constraints
The need for fewer people and ability to treat areas within one or two days using vehicles would ensure treatment is conducted within the time period most likely to be effective, and herbicide application would require less time with fewer refilling trips required when compared with small-capacity backpack sprayers. However, when compared with Alternative B, this alternative's use of motorized vehicles would not be effective in treating 100% of project areas, which include steep rocky terrain. As a result, effective treatment under this alternative of all potential sites would require the methods and tools considered under Alternative B.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

The use of motorized vehicles to haul and apply herbicides off-road in uneven terrain is less safe than application on foot using a portable backpack sprayer. Using motorized vehicles presents a rollover hazard and in the event of an accident, the amount of herbicide that could be spilled is also greater than with a 5-gallon backpack sprayer.

Comparison of Alternatives

	Alternative A	Alternative B	Alternative C
Untrammeled	-	-	-
Undeveloped	-	+	+
Natural	-	+	+/-
Solitude or Primitive Recreation	+/-	+/-	-
Unique Components			
Wilderness Character	-	+	-

	Alternative A	Alternative B	Alternative C
Heritage and Cultural Resources	-	+/-	-
Maintaining Traditional Skills	+	-	-
Special Provisions	NA	NA	NA
Time	-	+/-	+
Additional Wilderness Criteria	NA	NA	NA
Other Criteria Summary	-	-	-

	Alternative A	Alternative B	Alternative C
Safety	+	+	-

Safety Criteria

Safety risks from hand tools for cutting and digging, from herbicide use, and off-road use of motorized vehicles can be mitigated by proper protective equipment and training. However, Alternative C is the least safe of the three alternatives due to the combined safety risk from the use of all three tools.

Documentation

Kilbride, K. 2010. Integrated pest management (IPM) management direction for National Wildlife Refuges in Region 1. U.S. Department of the Interior, Fish and Wildlife Service. Portland OR.

Step 2 Decision: What is the Minimum Activity/Minimum Tool?

Selected Alternative

Alternative B

Rationale for Selecting this Alternative (Including Documentation of Safety Criterion, If Appropriate)

The combination of hand-pulling, hand-cutting, and herbicide use proposed under Alternative B was identified as the minimum set of tools and techniques necessary to effectively maintain and/or restore natural habitat conditions within areas of Sheldon Refuge and the proposed wilderness areas identified. This alternative does not require activities otherwise prohibited by the Wilderness Act and would protect and preserve wilderness character.

Each of these techniques has been shown through experience to be well-suited to the control of certain weeds, while at the same time minimizing soil disturbance, seed germination, and the need for follow-up treatments when compared to more restrictive approaches, which utilize only one method of treatment, or more intensive methods, which utilize motorized equipment and vehicles. Mowing large areas to control weeds is typically combined with other treatment methods over areas larger than 10 acres in size. At this time no specific weeds or areas have been identified where the use of flail mowers would be necessary or effective.

The combination of tools and techniques under Alternative B would avoid activities and uses otherwise prohibited within proposed wilderness areas, and are expected to be effective. Grubbing, digging, and cutting with hand tools under Alternative A could actually aggravate the problem of invasive plants through ground disturbance. The use of herbicides under Alternative B would be effective for some weeds, but would also kill native plants when used for large patches. For such large patches, hand-cutting would eliminate seed production from biannual or annual plants, while only moderately impacting native perennial plants and natural appearance.

Alternative C would allow use of the widest range of tools and techniques, but not all tools and techniques are necessary to efficiently accomplish habitat management objective within relatively small areas of Sheldon Refuge. When combined with added impacts to natural condition from off-road vehicle use, Alternative C would cause the greatest damage to habitats and natural conditions when compared with Alternatives A and B. Treatment of larger areas

within wilderness areas will be considered on a case-by-case basis, and each evaluation would consider the use of effective large-scale non-motorized and non-mechanized tools and techniques such as biological control, grazing, or aerial herbicide application.

Monitoring and Reporting Requirements

Except as specifically described in alternative selected, no use of motorized vehicles or equipment may occur without prior written determination by the Sheldon-Hart Mountain Refuge Complex Project Leader.

Check Any Wilderness Act Section 4(c) Uses Approved in this Alternative

- ☐ mechanical transport
- ☐ motorized equipment
- ☐ motor vehicles
- ☐ motorboats
- ☐ landing of aircraft
- ☐ temporary road
- ☐ structure or installation

Record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:				
Recommended:				
Approved:				

G.4 Draft Minimum Requirements Decision and Analysis for Removal and Restoration for Abandoned Livestock Developments

Step 1: Determine if any administrative action is necessary. (Refer to the Sheldon Refuge Draft CCP/EIS and preferred alternative).

Management direction for abandoned livestock developments was evaluated through a range of alternatives included in the Sheldon Refuge Draft CCP/EIS. The CCP/EIS preferred alternative for removal and restoration of abandoned livestock developments has been determined necessary for management of Sheldon Refuge and the proposed wilderness areas.

Step 2: Determine the minimum activity/minimum tool.

Description of Alternatives

In order to achieve the minimum administrative action determined necessary as described in the Sheldon Refuge CCP/EIS preferred alternative, the minimum tools, equipment, and techniques for use within wilderness must be capable of removing and restoring structures and disturbances associated with at least 20 springs and 20% or more of playas located in the Sheldon Refuge proposed wilderness areas within the next 15 years.

Early pioneers in the Sheldon area quickly recognized that successful agriculture required irrigation during the summer months. These settlers built most of the region's large reservoirs to help ensure water was available through July, August, and September. Early management activities on Sheldon Refuge focused on additional development of water resources to increase year-round water for livestock and, to a lesser degree, wildlife. Ponds were dug in seeps, spring flow diverted to watering troughs, and stock ponds built. Fences were constructed to keep livestock out of riparian areas and directed to troughs. Although these activities have been common since the 1930s there is debate about how effective these activities are for wildlife (Broyles 1995).

In 1994, grazing privileges within Sheldon Refuge were transferred back to Sheldon Refuge by the permittee(s) and permanently retired by the Service. This eliminated all commercial livestock grazing within the Refuge and the need for all associated livestock water developments. These abandoned developments remain throughout Sheldon Refuge including all eight proposed wilderness areas.

There are currently 183 water improvements identified on Sheldon Refuge. Of primary concern for this wilderness minimum requirements decision and analysis are the 77 developed springs and 22 developed playas within Sheldon Refuge, which include the following developments and disturbances:

> a) Spring box or head box: A spring box or head box is a structure installed at or near the spring source to collect water for diversion to a water trough, tank, or dug-out using a pipe. Spring boxes or head boxes are typically constructed of concrete or steel to isolate water from contamination and are surrounded with gravel to filter coarse materials. Excavation to install these structures varied from spring to spring, up to about 20 feet in depth.

Figure 1. Typical spring box within Sheldon Refuge (photo Gail H. Collins).

b) Pipeline: Pipelines associated with developed springs connect a spring box to a water trough or tank, connect the spring source and a spring box, or connect directly from a spring source to a water trough or tank. Pipelines usually are constructed of steel or plastic pipe generally 2 inches or less in diameter. Pipelines are commonly buried below the frost line (usually 24-36 inches below ground) or placed on the surface and protected from trampling by a covering of rocks.

c) Troughs and Tanks: Water troughs that remain within Sheldon Refuge vary from 6-foot-long light-gauge galvanized steel "sheep" troughs to converted heavy-gauge steel military surplus aircraft engine containers weighing 300 pounds or more. In some cases a number of troughs are used together at the same spring to store additional water.

Figure 2. Abandoned converted aircraft engine container water troughs in Sheldon Refuge; these two troughs weigh several hundred pounds combined.

d) Stock Ponds and Dug-outs: Stock ponds are created by constructing earthen dams built across ephemeral drainages or depressions and are intended to capture snowmelt runoff and create a watering place that will persist into the summer months. Stock ponds differ from larger reservoirs in that there is no outlet structure such as a canal or headgate to release water. Dug-outs are artificially constructed depressions that collect and store water. Dug-outs differ from reservoirs and stock ponds in that a dam is not relied upon to impound water. Dug-outs within Sheldon Refuge are generally located below water troughs and are 30 feet in diameter or less, but occasionally larger. Seventy water improvements within Sheldon Refuge have been identified as spring dug-outs or stock ponds and 22 water developments have been identified as playa dug-outs. These dug-outs are not associated with springs or water troughs, are typically larger than spring dug-outs, and were constructed using backhoes, bulldozers, and sometimes explosives.

Figure 3. Typical stock pond; note the small earth dam at the right to impound water.

Figure 4. Moderately sized dug-out within the Round Mountain proposed wilderness area.

e) Fence Exclosures: Fences were constructed at some, but not all, springs to protect the spring source, spring box, water pipeline, and riparian vegetation. Exclosures were traditionally constructed using barbed wire and wood or metal posts to protect areas smaller than 1 acre and nearly all have been removed or are in various stages of disrepair.

Figure 5. Typical wire fence spring exclosure within Sheldon Refuge.

The primary concerns related to abandoned spring and playa water developments with Sheldon Refuge and the proposed wilderness areas are the long-term impacts to wetland and riparian ecological health from permanent changes to the distribution and timing of water and the visual impacts to the undeveloped and natural character of the proposed wilderness areas from the continued presence of permanent structures.

A secondary concern is the protection of springs and riparian habitats in either their current or restored condition from the impacts of feral horses and burros.

Alternative A

Description

Under Alternative A, primitive techniques, tools, and skills including non-mechanized and non-motorized tools and equipment would be used to remove abandoned debris and restore the natural character and function of developed springs throughout the proposed wilderness areas.

The majority of work under this alternative would be completed using small hand tools such as hand wire rollers, pliers, jacks, picks, shovels, snatch blocks, hand-powered winches, cables, ropes, etc. Transport of all tools, materials, supplies, debris, and people would be by foot or pack stock. Larger debris such as troughs and metal tanks would be dragged or skidded out along

existing routes using stock teams, or cut into smaller pieces with gas cutting torches, which could then be packed out.

To protect springs from further damage by feral animals and to ensure successful restoration, spring fence exclosures would either be fully repaired or completely replaced with new fence. Where feasible, replacement fences would be constructed using wood rail or metal pipe, which blend with the surroundings, do not present a tangle hazard to animals, require less maintenance, do not require ground disturbance, and are easily dismantled and removed. However, due to the remote location of many springs within the proposed wilderness areas, and the size, weight, and amount of fence material needed, construction using wood rail or metal pipe fence would be prohibitive (particularly at locations furthest from roads). Instead, we anticipate most exclosures would continue to be constructed using traditional wire and metal t-posts, which can more easily be hauled using pack stock and can be constructed over most terrain.

For deeply buried spring boxes and water pipelines where removal would create substantial surface disturbance, sites would be assessed to determine whether the development should be left intact to allow the continued flow of water or whether the pipe and/or spring box should be severed, plugged, and/or filled in. Most smaller stock ponds and dug-outs would not be refilled or recontoured with soil due to the impacts this would cause to invertebrates, existing riparian vegetation, and increased erosion rates and water turbidity. Instead these sites would be allowed to refill naturally over time or would be filled with coarse rocks and small boulders to create a more natural appearance and restore a more natural timing and amount of water flow by reducing water storage capacity of the structures. For restoration of larger dug-outs and catchments associated with playas and some springs, work crews with highline buckets and shovels and/or horse-drawn dredges and draglines would be used to refill excavated areas.

We anticipate the amount of time and effort required to removal and restore springs and playas under this alternative would vary considerably depending upon location and degree of development. For springs with minimal development (e.g., a few feet of plastic pipe and a single rusted-out light-gauge metal trough) and near roads for motorized access, we estimate complete removal and restoration could be completed by four people in a single day. In the case of springs with extensive developments and ground disturbance (i.e., a steel culvert spring box, 100 feet or more of 2-inch steel pipe, one or two converted aircraft engine container troughs, and a dug-out catchment 4 feet deep and 40 feet in diameter) or playas with large excavations (i.e., 8-12 feet deep and over 100 feet in length), removal and restoration could require seasonal work camps and pack stock resupply to support crews of eight or more people working with stock teams for several weeks.

Temporary work crew campsites and latrine sites would be selected in advance. Sites would be capable of supporting one or more restoration efforts. Access routes for seasonal camps or campsites anticipated to be used for multiple seasons would also be identified in advance. Both access routes and campsites would be photographed and inventoried prior to use in conjunction with a cultural resource inventory to document wildlife present, measure vegetative cover, and identify noxious weeds and other invasive non-native plants. No maintenance or surface disturbance would be allowed to improve access routes. Rocks and other obstacles could be temporarily moved to provide suitable campsites. Temporary latrines for burial of waste would be excavated to the minimum depth and size necessary.

Upon completion of restoration work, all materials and structures would be removed. Once the management objective has been achieved, campsites would be restored to their prior appearance using standard wilderness rehabilitation and restoration methods and primitive tools. Access routes and campsites would be photographed and monitored following the first full growing season to document impacts from use and the effectiveness of restoration efforts, as well as to detect any newly introduced noxious weeds or other non-native plants. Subsequent monitoring would be conducted as needed to document wildlife use and campsite recovery.

Effects

Wilderness Character

"Untrammeled"
The presence of work crews for periods of a month or possibly longer within the same general location is expected to alter wildlife behavior and habitat use until restoration efforts are completed. Long-term trammeling of wilderness character from management efforts to rehabilitate and restore natural condition to these sites within proposed wilderness was evaluated in the Sheldon Refuge Draft CCP/EIS.

"Undeveloped"
The removal of permanent structures and debris from the proposed wilderness areas would improve the undeveloped character of specific sites and areas within all eight proposed wilderness areas. For specific areas (such as the Alkali Peak Proposed Wilderness Area) where a number of abandoned developments are concentrated, the removal and restoration of these multiple sites would improve the overall undeveloped character of the proposed wilderness as a whole. Temporary short-term seasonal work camps consisting of small and large tents would affect the undeveloped character of small portions of the proposed wilderness areas. Following campsite removal and restoration, little or no noticeable evidence of temporary developments would remain. Use along identified access routes would be noticeable, but would appear as undeveloped and unmaintained single-track trails

"Natural"
Water pipelines, troughs, and playa dug-outs have altered the natural flow and location of water, which in turn have altered the natural ecology of associated riparian and wetland habitats. Actions under this alternative would restore natural ecological function to a number of springs within all eight proposed wilderness areas. However, the ecology of playa habitats is poorly understood and we can only speculate what impacts restoration efforts would have on playa function and ecology.

Water development has altered the natural appearance of the proposed wilderness areas through the placement of water troughs and the construction of dug-outs. Natural erosion and regrowth of vegetation have made a number of dug-outs substantially unnoticeable to the casual observer, particularly at sites with Wyoming big sagebrush and Great Basin wild rye. At other sites, particularly dug-outs in alkaline playa basins, excavation work completed more than 60 years ago remains readily visible and noticeable to most people. Even if work at these sites is unable to restore natural ecological function, efforts would be successful at restoring the natural appearance of these sites. Restoration work itself would result in some short-term soil disturbance and vegetation removal, but we anticipate these impacts would not be readily apparent within one or two growing seasons. Restoration sites would be monitored to determine if reseeding with native plants is needed to stabilize soils or prevent the establishment of invasive non-native plants.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Opportunities for solitude would be directly affected by the presence of work crews as large as eight people, and effects would primarily occur within the project area and near campsite locations. The use of hand tools would have little or no impact on opportunities for primitive recreation. Recreation use is estimated to be very low during the summer months, but use increases during the fall hunting seasons within most proposed wilderness areas. As a result, impacts to solitude would affect few people if restoration efforts were conducted during the spring and summer months and would affect sport hunters if conducted during the fall.

Once evidence of past developments has been removed, opportunities for primitive types of recreation would be improved over the long term within all eight proposed wilderness areas.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
Each site proposed for restoration has been previously disturbed by construction activities, and any cultural and historic resources were likely disturbed or destroyed at that time. Areas surrounding these sites would be inventoried for sensitive cultural and historic resources that could be damaged by restoration work; activities would be conducted to avoid these areas. However, the risk of disturbing or destroying artifacts and resources not identified during these inventories is greatest under this alternative, which proposes to use large teams of horses or mules, draglines, and dredges to refill large spring and playa dug-outs. Risk to cultural and historic resources from other restoration efforts would be negligible under this alternative.

Maintaining Traditional Skills
The primitive and traditional skills required for handling pack stock and stock teams to pull loads or specialized equipment such as dredges and draglines are used rarely and may become lost altogether as both government agencies and ranchers increasingly rely on motorized equipment such as backhoes and excavators. This alternative would result in the continued practice and teaching of these primitive skills, but only for a relatively short period of time until large-scale restoration efforts are completed.

Special Provisions
N/A

Time Constraints
It is estimated there are a dozen or more extensively developed playas and springs within the proposed wilderness areas. Even if the substantial amount of funding necessary were available, a number of highly skilled team drivers, specially trained horse and mule teams, and specialized equipment would be needed to complete restoration of these sites. It is uncertain if employees and/or contractors meeting these requirements could be hired to complete the work within the 10- to 15-year timeframe of the Sheldon Refuge CCP/EIS preferred alternative.

Additional Wilderness-specific Comparison Criteria
The continued use of traditional four-strand wildlife-friendly fence when reconstructing or replacing protective spring exclosures under this alternative would have a number of drawbacks. While effective, wire fence poses a tangle hazard to wildlife if not properly maintained, requires posts be placed into the ground, is not easily removed, and is more difficult to reuse at other locations when compared to wood rail or metal pipe fence exclosures as proposed under Alternatives B and C.

Safety of Visitors, Personnel, and Contractors

The use of hand tools and equipment required under this alternative would be relatively safe, but even with trained and experienced teamsters the use of horse or mule teams and dredges or draglines to refill large excavations would increase the level of risk and safety hazards. Consequently, this alternative would be less safe than the use of specialized excavators and other modern motorized equipment specifically designed to operate safely in such situations.

Alternative B

Description

Under this alternative the majority of spring and playa rehabilitation and restoration work would be completed using a combination of hand tools as discussed under Alternative A, non-motorized vehicles, and motorized vehicles and equipment. All vehicle use would be at restoration sites and along existing routes within the proposed wilderness areas.

Hand tools and non-motorized vehicles such as wheeled carts, wheelbarrows, or horse-drawn wagons would be used to transport tools, equipment, and debris, and to refill dug-out water catchments at the majority of sites within the proposed wilderness areas. At the most extensively developed springs and playas (refer to Alternative A Description section), removal and restoration work would be completed using a backhoe or small excavator. At a few locations where complete restoration would require removing large amounts of debris, refilling a dug-out, and constructing a protective fence exclosure around the spring itself, a truck and trailer would be used to transport both the backhoe or excavator and all fence materials to the site and haul out all debris and equipment in a single round trip. Any additional trips to transport supplies, materials, or people would be on foot or by horseback.

Figure 6. Free-standing metal pipe fence exclosure effectively protecting riparian habitat from feral horse and burro impacts (photo Gail H. Collins).

With the use of either mechanized or motorized vehicles under this alternative, we anticipate most protective fence exclosures would be constructed using the less intrusive but heavier wood rail or metal pipe fence. Exclosures would be constructed using traditional wire and metal t-posts only where terrain would make the use of freestanding rail or pipe fence impractical and ineffective.

Access routes would be photographed and inventoried prior to use to measure vegetative cover and to identify noxious weeds and other invasive non-native plants. Only the minimum maintenance or surface disturbance necessary would be conducted along routes at specific sites for the safe transport of vehicles and heavy equipment.

We anticipate the amount of time and effort to remove materials and complete restoration work under this alternative would not vary greatly due to location or degree of development. For springs with minimal development and near access roads, work could likely be completed by four people in a single day, similar to Alternative A. For springs and playas with extensive development and disturbance, we anticipate the use of mechanized vehicles and/or motorized equipment would enable crews of four to eight people to complete the necessary work within five days. Work crews would access sites each day on foot or by horseback, or would use short-term temporary campsites near the restoration sites.

Effects

Wilderness Character

"Untrammeled"
The presence of work crews for periods up to five days within the same general location is expected to alter wildlife behavior and habitat use until restoration efforts are completed. We anticipate these effects would be somewhat less than under Alternative A or C. Long-term trammeling of wilderness character from management efforts to rehabilitate and restore natural condition to these sites within proposed wilderness was evaluated in the Sheldon Refuge Draft CCP/EIS.

"Undeveloped"
As described under Alternative A, the removal of permanent structures and debris would improve the undeveloped character of all eight proposed wilderness areas. Impacts from short-term temporary crew campsites would be less than those described for longer-term campsites proposed under Alternatives A and C.

"Natural"
Similar to effects identified under Alternative A, restoration work under Alternative B would restore both natural ecological conditions and natural appearance to springs and playas within each of the eight proposed wilderness areas. For sites with extensive development and past disturbance, the use of a backhoe or small excavator would likely cause less disturbance to vegetation and soils than would teams of horses or mules as described under Alternative A. The bucket of a backhoe can be used effectively to a distance of 24 feet without moving the backhoe itself and could completely refill a 40-foot-diameter dug-out by repositioning only a few times. To refill a dug-out this size using teams of horses with a dredge or dragline would take many dozens of passes, and the amount of area required to turn the teams would disturb a much larger area than a backhoe. Similarly, when refilling long deep trenches in playa dug-outs, a backhoe with a front-end loader or small excavator with a blade would be able to move much more soil each pass than a team of horses or mules pulling a dredge or dragline. As with spring dug-outs, stock teams would disturb surrounding portions of the playa when turning around while motorized equipment is capable of backing over the freshly disturbed soil to make subsequent passes.

Vehicle access to restoration sites would occur along existing routes. For access routes to the most disturbed sites, one trip with a single truck and trailer or piece of equipment is expected to cause less damage to vegetation and soils than would the multiple trips on foot or by pack stock required to support long-term temporary camps under Alternative A. However, if the same access route would be used to access other developed springs and playas, impacts would likely be similar to those described under Alternative A.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Opportunities for solitude would be directly affected by the presence of work crews as large as eight people and the sounds of motorized vehicles. Noise from a single vehicle trip for transport of tools, equipment, and supplies would be expected to have a slight short-term impact on wilderness solitude. Overall, noise impacts to wilderness solitude under this alternative would be more intense and would affect a larger area, but would last for a shorter length of time than would those from larger work crews using hand tools as proposed in Alternative A. In contrast, impacts to wilderness solitude would be less intense, would affect a smaller area, and would last longer than those from the use of helicopters as proposed in Alternative C.

The use of both motorized and non-motorized vehicles would detract from opportunities for primitive recreation. As discussed under Alternative A, impacts would be greatest if restoration efforts are conducted during the fall hunting seasons when recreation use is greatest within the proposed wilderness areas.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
Inventories would be conducted as described under Alternative A. Because backhoes or small excavators would be used to refill spring or playa dug-outs with materials previously excavated to construct those structures and would need to reposition only a few times at each site and would be hauled along existing routes, the risk to unidentified artifacts or resources at restoration sites would be less under this alternative when compared to Alternative A, and only slightly greater than under Alternative C.

Maintaining Traditional Skills
This alternative would not maintain traditional skills.

Special Provisions
N/A

Time Constraints
The specialized tools and equipment needed to complete restoration of springs and playas under this alternative are readily available and with necessary funding, work could be completed within the 10- to 15-year timeframe of the Sheldon Refuge Draft CCP/EIS preferred alternative. Once fence materials are at the restoration site, construction of wood rail or metal pipe exclosures can be completed in a much shorter amount of time than a traditional wire and t-post fence exclosure of the same size.

Additional Wilderness-specific Comparison Criteria
Increased use of wood rail or metal pipe rail fence for protective spring exclosures under this alternative would have a number of added benefits when compared with Alternative A. Both wood and pipe rail are more durable than wire and as a result require less maintenance and last longer when properly maintained. Unlike wire fence, if wood or metal fencing does fail or collapse, the materials do not become an entanglement hazard for wildlife. Even though materials are more bulky than wire and metal t-posts, the natural color of wood and rusted metal blend surprisingly well into the surrounding landscape, which is covered with sagebrush, grass, and rock. Construction does not require posts be placed into the ground, and materials are easily dismantled, removed, and reassembled for reuse at other locations.

Safety of Visitors, Personnel, and Contractors

Backhoes and small excavators are specifically designed to allow a single skilled operator to safely and efficiently move large amounts of material in a relatively short amount of time. When compared to the increased risks associated with working around teams of horses and mules, the greater number of skilled people needed, and the longer amount of time necessary to move the same amount of material, this alternative would be considerably safer than Alternative A.

Transporting large amounts of debris and fence materials by vehicle under this alternative would be safer than transport by helicopter as proposed under Alternative C.

Alternative C

Description

Under this alternative developed springs and playas would be restored and rehabilitated using a combination of hand tools as described under Alternative A and helicopter transport of debris and fence materials when removal with primitive tools is not practicable. The use of a helicopter to remove debris from some springs would also make the use of metal pipe or wooden rail fence materials possible.

Access for work crews and transport of most tools, equipment, supplies, and debris to and from restoration sites would be on foot or horseback.

Helicopters would be used to transport suspended loads of fence materials for protective spring exclosures and to haul out large heavy debris such as converted aircraft engine container water troughs. At each site where fence materials are to be flown in, a load of debris would be prepared in advance to be hauled out on the return trip. Where it is determined a helicopter would be necessary for restoration of several springs in the same general vicinity, debris and materials would be prepared in advance and transported to/from all sites consecutively. In this way the length of time and amount of helicopter use within wilderness would be minimized, and the number of people and amount of time required to conduct restoration work would be minimized. Except in the case of emergency or for pilot safety, this alternative would not require the landing of aircraft within the proposed wilderness areas.

Filling and recontouring dug-outs, stock ponds, and small reservoirs for complete site restoration would not be conducted within the proposed wilderness areas under this alternative. We expect most dug-outs would continue to function for the foreseeable future but eventually will refill and revegetate through the natural processes of erosion, sedimentation, and plant community succession. Stock ponds are expected to recover more quickly than dug-outs as loose material used for constructing the impoundment berms is eroded away, allowing water to flow unimpeded. In many cases this has already occurred. A separate minimum tool analysis would be conducted on a case-by-case basis for playa restoration if results from proposed restoration efforts conducted outside wilderness indicate refilling and recontouring is necessary to restore biological health, diversity, and integrity to these habitats.

We anticipate the amount of time to remove materials and complete restoration of springs with minimal development and near access roads would likely be completed by four people in a single day similar to Alternatives A and B. Where helicopters are determined necessary, we anticipate a crew of two people could prepare debris and materials for transport in less than one day and transport with the helicopter could be completed in less than one hour. Construction of temporary fence exclosures around spring sources would be accomplished within one day by a crew of four to six people using hand tools. Under this alternative debris would be removed from springs and playas, but dug-outs, stock ponds, and small reservoirs at these sites would not be refilled as under Alternatives A and B. Instead, dug-outs would be allowed to naturally refill with sediment, or would be breached to prevent catastrophic failure and allow the flow of water back to riparian habitats where feasible. We expect this alternative would meet the Sheldon

Refuge CCP/EIS preferred alternative objective to restore at least 20% of playas and 20 springs over the next 15 years.

Effects

Wilderness Character

"Untrammeled"
Under this alternative, the number of people and amount of time required to complete restoration work would be less than under Alternative A or B. Consequently the impacts to untrammeled wilderness condition would also less than those under Alternatives A and B. Long-term trammeling of wilderness character from management efforts to rehabilitate and restore natural condition to these sites within proposed wilderness was evaluated in the Sheldon Refuge Draft CCP/EIS.

"Undeveloped"
The removal of permanent structures and debris would improve the undeveloped character of all eight proposed wilderness areas, similar to Alternatives A and B. Under this alternative debris and other abandoned items would be removed from springs and playas, but we would not refill areas excavated for stock ponds, dug-outs, or small reservoirs. As a result, some playas may continue to appear developed, but with debris removed, we anticipate remaining disturbances would be substantially unnoticeable to the casual observer due to natural filling through erosion and regrowth of vegetation. Impacts from temporary crew campsites anticipated under Alternatives A and B would not occur under this alternative.

"Natural"
Stock ponds, dug-outs, and small reservoirs would appear more natural in the short term when compared with more visible impacts of restoration under Alternatives A and B. In addition, the risk of spreading invasive weeds under this alternative is avoided due to the absences of soil disturbance, temporary work camps, and the need for repeated stock use. Over the long term, we anticipate natural hydrology and habitat composition would be restored under this alternative, but would occur at a much slower rate than under Alternatives A and B. Because the ecology of playa habitats is poorly understood we cannot determine if allowing natural erosion and recovery processes would restore natural playa function and ecology under this alternative. Results from playa restoration efforts planned for sites outside the proposed wilderness areas will provide the information needed to determine if such actions are the minimum necessary to restore wilderness character in the future.

Many existing routes within the proposed wilderness areas have naturally grown in with vegetation over time. Minimal access either on foot or horseback to restoration sites under this alternative would result in little or no noticeable impact to the current condition of existing routes compared with the repeated use of these routes for access either on foot or by horseback as proposed under Alternative A or by motorized vehicles as proposed under Alternative B. This alternative would leave routes looking more natural than under Alternative A or B and would not make these routes more visible and more susceptible to trespass vehicle use in the future.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Opportunities for solitude would be directly affected by the presence of work crews as large as six people and the sights and sounds of helicopters within the proposed wilderness area where work is conducted, and possibly within other nearby proposed wilderness areas. We anticipate noise from a single helicopter flight to drop off and pick up a load of materials or debris would impact wilderness

solitude for less than one hour. Overall, noise impacts to wilderness solitude under this alternative would be more intense and would affect a larger area than larger work crews using hand tools as proposed in Alternative A, or motorized vehicles as proposed under Alternative B, but these impacts would last for a shorter length of time.

As discussed under Alternative A, impacts would be greatest if restoration efforts are conducted during the fall hunting seasons when recreation use is greatest within the proposed wilderness areas.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
Because no soil disturbance would occur under this alternative, we expect no adverse impact to cultural or historic resources.

Maintaining Traditional Skills
This alternative would maintain some traditional skills, but not to the degree of Alternative A.

Special Provisions
N/A

Time Constraints
The specialized tools and equipment needed to implement this alternative are readily available and necessary funding is available. The less intensive restoration efforts under this alternative would require less time and funding than either Alternative A or B, and work could be completed within the 10- to 15-year timeframe of the Sheldon Refuge Draft CCP/EIS preferred alternative.

Additional Wilderness-specific Comparison Criteria
The benefits of constructing protective fence exclosures with wood rails or metal pipe at some springs where helicopters are used would be as described under Alternative B.

Safety of Visitors, Personnel, and Contractors

Using helicopters to transport large, irregular shaped, bulky loads of fence materials or debris would increase risks to safety. Because only two people are typically associated with such operations, this alternative is expected to be somewhat less safe than using motorized excavation equipment under Alternative B, but somewhat safer than using teams of horses or mules to pull excavation equipment under Alternative A.

Comparison of Alternatives

	Alternative A	Alternative B	Alternative C
Untrammeled	+	+	+
Undeveloped	+	+	-
Natural	+/-	+/-	+
Solitude or Primitive Recreation	++	--	+/-
Unique Components			
Wilderness Character	+	+/-	+/-

	Alternative A	Alternative B	Alternative C
Heritage and Cultural Resources	-	+/-	+
Maintaining Traditional Skills	+	-	-
Special Provisions	N/A	N/A	N/A
Time	-	+	+
Additional Wilderness Criteria	-	+	+
Other Criteria Summary	-	+	+

	Alternative A	Alternative B	Alternative C
Safety	-	+/-	+

Safety Criteria

Aircraft present a unique set of safety hazards which can be mitigated through the use of proper protective equipment, specialized training, and the use of qualified and experienced pilots and flight crews.

Documentation

Broyles, B. 1995. Desert wildlife water developments: Questioning use in the southwest. Wildlife Society Bulletin. 23(4):663-675.

Step 2 Decision: What is the Minimum Activity/Minimum Tool?

Selected Alternative

Alternative C

Rationale for Selecting this Alternative (Including Documentation of Safety Criterion, If Appropriate)

Alternative C would accomplish removal of permanent developments from all eight proposed wilderness areas with the least amount of short-term impacts to natural conditions, the least risk for introduction and spread of invasive non-native plants, the least risk for additional impact to cultural resources, and the shortest duration of impacts to opportunities for wilderness solitude and primitive recreation.

Alternative C would restore natural appearance and function to springs and other areas developed for livestock over a longer period of time, but with much less trammeling of wilderness character when compared with Alternative A or B.

It is our determination the impact to wilderness solitude from the short-term low-altitude use of helicopters is outweighed by avoiding other longer-term adverse impacts but achieving the beneficial impacts of restoring natural appearance, condition, and opportunities for solitude free from evidence of people and their activities.

Monitoring and reporting requirements:

Check Any Wilderness Act Section 4(c) Uses Approved in this Alternative

- ☐ mechanical transport
- ☐ motorized equipment
- ☐ motor vehicles
- ☐ motorboats
- ☐ landing of aircraft
- ☐ temporary road
- ☐ structure or installation

Record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:				
Recommended:				
Approved:				

G.5 Draft Minimum Requirements Decision and Analysis for Maintenance of Wildlife Guzzlers

Step 1: Determine if any administrative action is necessary**.** (Refer to the Sheldon Refuge Draft CCP/EIS and preferred alternative.)

Management direction for wildlife guzzlers was evaluated through a range of alternatives included in the Sheldon Refuge Draft CCP/EIS. The CCP/EIS preferred alternative for guzzler maintenance has been determined necessary for management of Sheldon Refuge and the proposed wilderness areas.

Step 2: Determine the minimum activity/minimum tool.

Description of Alternatives

Permanent water developments for wildlife (a.k.a. guzzlers) were previously constructed and are located within the Round Mountain (bighorn sheep guzzler), Big Mountain (three bighorn sheep guzzlers, and three small game guzzlers), and Big Spring Table (one bighorn sheep guzzler and four small game guzzlers) Proposed Wilderness Areas.

The preferred alternative identified in the Sheldon Refuge Draft CCP/EIS would retain all guzzlers, including those within the proposed wilderness areas. This analysis evaluates the minimum activity necessary within the proposed wilderness areas to accomplish the management direction of the preferred alternative.

To ensure guzzlers remain functional, periodic monitoring and maintenance are required. Materials needed for maintenance include small items such as fence wire, fence posts, and plastic gutter, as well as very large and heavy items such as sheet metal, fiberglass water catchments, and storage tanks.

Alternative A

Description

All maintenance of guzzlers within proposed wilderness would be conducted using non-mechanized and non-motorized tools and equipment. Access and transport of tools, equipment, and materials would be by foot, horseback, pack stock, or other non-mechanized and non-motorized means.

Under this alternative, periodic monitoring and minor maintenance could be completed by a single person or small crews of four to six people within a single day. Large items such as catchment basins and water tanks would be repaired on-site.

For major repairs requiring replacement, teams of horses or mules could be used to pack sheet metal or drag catchment basins used for small game guzzlers, and we anticipate crews could complete replacement within two days. Due to their size and weight, we do not expect replacement of large water storage tanks used for bighorn sheep guzzlers would be possible using non-mechanized means as proposed under this alternative.

Materials used for maintenance and replacement would be selected and/or modified to blend with the surrounding terrain. The most noticeable element of guzzlers are their metal roofs. Replacement roofing would be painted camouflage colors to better blend with the ground.

Effects

Wilderness Character

"Untrammeled"
The presence of work crews for one or two days within the same general location is expected to alter wildlife behavior and habitat use until maintenance efforts are completed. Continued long-term trammeling of wilderness character from altered numbers, movements, and distribution of wildlife populations due to the construction of artificial sources of water was evaluated in the Sheldon Refuge Draft CCP/EIS.

"Undeveloped"
Maintenance under this alternative would retain permanent structures within the three proposed wilderness areas. Over the long term, most bighorn sheep guzzlers could not be fully maintained and would likely be removed.

"Natural"
Maintenance of guzzlers using materials that blend with the surrounding landscape would somewhat reduce the unnatural appearance of guzzlers.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
The presence of small work crew for one or two days would have little or no impact on opportunities for solitude or unconfined types of recreation. Reduced visibility of guzzlers should improve opportunities for primitive recreation.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
The routine use of hand tools and the occasional use of horse or mule teams to transport materials would maintain traditional skills.

Special Provisions
N/A

Time Constraints
The use of non-mechanized and non-motorized tools and equipment for minor repairs and maintenance under this alternative would not substantially increase the amount of time to complete similar maintenance when compared with the other alternatives. For most guzzlers, initial construction was completed using helicopters to transport tools and materials, and completing major maintenance or repairs using stock for transport of tools and equipment would not be feasible.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

The use of hand tools and horse or mule teams to drag materials under this alternative does not present a great deal of risk. Other risks and potential safety issues encountered wiithin proposed wilderness are generally no greater than those encountered in other remote areas of Sheldon Refuge.

Alternative B

Description

Under this alternative, routine site visits for monitoring and minor maintenance would be completed using non-motorized tools and equipment as under Alternative A.

The transport of sheet metal, catchments, and water tanks for major maintenance and repairs would be conducted using non-motorized vehicles such as wagons and carts along existing routes. Water tanks used at bighorn sheep guzzlers are typically buried and would need to be excavated for replacement. Under this alternative we anticipate a single trip using a non-motorized vehicle would occur at each guzzler no more than once every 10 years.

In order to accomplish management objectives for guzzler maintenance it is likely multiple crews of four to eight people would work up to six days depending upon terrain, the size of guzzler, and the maintenance needed. Most guzzlers are located in very rocky steep terrain, and tools and materials were transported for initial construction to most sites by helicopter. It is unlikely major maintenance could be completed at all guzzlers using stock or non-motorized vehicles as proposed under this alternative and Alternative A. At bighorn sheep guzzlers farthest from road access, it is expected short-term tent camps for as many as eight people would be used for periods up to five days. All supplies for temporary camps would be transported with tools, equipment, and materials required for major maintenance.

Access routes would be photographed and inventoried prior to use to measure vegetative cover, and to identify noxious weeds and other invasive non-native plants. No maintenance or surface disturbance would be allowed to improve access routes. Transport of tools, equipment, and materials would be accomplished using one vehicle making a single trip to the project and/or campsite within the Rye Creek Area, and a single trip out.

Upon completion of maintenance operations, all waste, materials, and structures would be removed. Once the management objective has been achieved, campsites would be restored to their prior condition using standard wilderness rehabilitation and restoration methods. Access routes and campsites would be photographed and monitored following the first full growing season to document impacts from use and the effectiveness of restoration efforts, as well as to detect any newly introduced noxious weeds or other non-native species. Subsequent monitoring would be conducted as needed to document route and campsite recovery and document new vehicle trespass into proposed wilderness areas.

Effects

Wilderness Character

"Untrammeled"
The presence of crews working up to six days within the same general location is expected to alter wildlife behavior and habitat use until maintenance is completed. Continued long-term trammeling of wilderness character from altered numbers, movements, and distribution of wildlife populations due to the construction of artificial sources of water was evaluated in the Sheldon Refuge Draft CCP/EIS.

"Undeveloped"
Maintenance under this alternative would retain permanent structures within the three proposed wilderness areas. The presence of tents and other temporary structures at work camps would affect the undeveloped character of the three areas for up to six days.

"Natural"
Maintenance of guzzlers using materials that blend with the surrounding landscape would somewhat reduce the unnatural appearance of guzzlers. The use of vehicles would trample vegetation and make existing routes more visible and more susceptible to unauthorized vehicle use in the future.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
The presence of small work crew for up to six days would have minor impacts on opportunities for solitude or unconfined types of recreation. Reduced visibility of guzzlers should improve opportunities for primitive recreation.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
This alternative would not maintain traditional skills.

Special Provisions
N/A

Time Constraints
For guzzlers that were initially constructed using vehicles, use of non-mechanized and non-motorized tools and equipment for minor repairs and maintenance under this alternative would not substantially increase the amount of time to complete similar maintenance when compared with the other alternatives. For most guzzlers, initial construction was completed using helicopters to transport tools and materials, and completing major maintenance or repairs using non-motorized vehicles for transport of tools and equipment would not be feasible.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

The use of hand tools, horse or mule teams, and non-motorized vehilces under this alternative does not present a great deal of risk. Other risks and potential safety issues encountered within proposed wilderness are generally no greater than those encountered in other remote areas of Sheldon Refuge.

Alternative C

Description

Under this alternative, routine site visits for monitoring and minor maintenance would be completed using non-motorized tools and equipment as under Alternative A.

The transport of sheet metal, catchments, and water tanks for major maintenance and repairs would be conducted by helicopter. Helicopters would be used to transport suspended loads of large materials such as catchments and tanks. At each site where materials are to be flown in, the items being replaced would be prepared in advance to be hauled out on the return trip. In this way, the use of helicopters would be maximized, and the number of people and amount of time required for maintenance would be minimized. Except in the case of emergency or for pilot safety, this alternative would not require the landing of aircraft within the proposed wilderness areas; personnel would not be transported by helicopter.

Tools and smaller items could be combined with other loads of materials and for transport by helicopter. Under this alternative, we anticipate a single trip using a helicopter would occur at each guzzler no more than once every 10 years.

Similar to Alternative B, water tanks used at bighorn sheep guzzlers are typically buried and would need to be excavated for replacement.

Effects

Wilderness Character

<u>"Untrammeled"</u>
We expect impacts to untrammeled wilderness character would be similar to Alternative B.

<u>"Undeveloped"</u>
Impacts to undeveloped wilderness character would be as described for Alternative B with the use temporary structures (i.e., tents) at some sites for periods up to six days.

<u>"Natural"</u>
Impacts to natural conditions would be similar to those under Alternative A.

<u>"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"</u>
The use of a helicopter under this alternative would have a direct impact on opportunities for wilderness solitude. Due to the noise and visibility of helicopters, these impacts would occur over a larger area than those anticipated under either Alternative A or B.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
This alternative would not maintain traditional skills.

Special Provisions
N/A

Time Constraints
The use of non-mechanized and non-motorized tools and equipment for minor repairs and maintenance under this alternative would not substantially increase the amount of time to complete similar maintenance when compared with the other alternatives. This alternative is likely the only one that could feasibly complete all necessary maintenance and repairs to all guzzlers within the proposed wilderness areas.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

Using helicopters to transport large, irregular shaped, bulky loads would increase risks to safety. Because only two people are typically associated with such operations, this alternative is expected to be only somewhat less safe than using horse or mule teams and non-motorized equipment as under Alternative B.

Comparison of Alternatives

It may be useful to compare each alternative's positive and negative effects to each of the criteria in tabular form, keeping in mind the law's mandate to "preserve wilderness character."

	Alternative A	Alternative B	Alternative C
Untrammeled	-	-	-
Undeveloped	+/-	-	-
Natural	+	-	+
Solitude or Primitive Recreation	+	+	-
Unique Components	N/A	N/A	N/A
Wilderness Character	+	-	-

	Alternative A	Alternative B	Alternative C
Heritage and Cultural Resources	N/A	N/A	N/A
Maintaining Traditional Skills	+	-	-
Special Provisions	N/A	N/A	N/A
Time	-	-	+
Additional Wilderness Criteria	N/A	N/A	N/A
Other Criteria Summary	+/-	-	+/-

	Alternative A	Alternative B	Alternative C
Safety	+	+	-

Safety Criteria

Aircraft present a unique set of safety hazards which can be mitigated through the use of proper protective equipment, specialized training, and the use of qualified and experienced pilots and flight crews.

Step 2 Decision: What is the Minimum Activity/Minimum Tool?

Selected Alternative

Alternative C

Rationale for Selecting this Alternative (Including Documentation of Safety Criterion, If Appropriate)

Alternative C would utilize the tools and techniques having the least impact to natural conditions. Impacts to wilderness solitude are greatest under Alternative C due to the use of helicopters approximately once every 10 years at each guzzler, but landing would not be required and impacts to solitude would be short-term and would be less intrusive over the long-term than the use of wheeled vehicles as proposed under Alternative B.

Alternative A would be less intrusive than either Alternative B or C, but due to the steep, rough, and rocky terrain where most guzzlers are located, neither Alternative A or B would be able to transport large materials required for major maintenance or repairs in order to accomplish maintenance of all guzzlers, including replacement of large water tanks or sheet metal at bighorn sheep guzzlers—which has been determined the minimum administrative action necessary.

Monitoring and Reporting Requirements

Except as specifically described in alternative selected, no use of motorized vehicles or equipment may occur without prior written determination by the Sheldon-Hart Mountain Refuge Complex Project Leader. All areas where the use of motorized vehicles and temporary structures occur will be monitored and degradation of natural conditions reported.

Check Any Wilderness Act Section 4(c) Uses Approved in this Alternative

- ☐ mechanical transport
- ☐ motorized equipment
- ☐ motor vehicles
- ☐ motorboats
- ☐ landing of aircraft
- ☐ temporary road
- ☐ structure or installation

Record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	**Signature**	**Name**	**Position**	**Date**
Prepared by:				
Recommended:				
Approved:				

G.6 Draft Minimum Requirements Decision and Analysis for Refuge Studies, Inventory, Monitoring, and Research

Step 1: Determine if any administrative action is necessary. (Refer to the Sheldon Refuge Draft CCP/EIS and preferred alternative).

Management direction for inventory and monitoring was evaluated through a range of alternatives included in the Sheldon Refuge Draft CCP/EIS. The CCP/EIS preferred alternative for the use of studies, inventory, monitoring and research has been determined necessary for management of Sheldon Refuge and the proposed wilderness areas.

Step 2: Determine the minimum activity/minimum tool.

Description of Alternatives

Fulfilling the purposes for Sheldon National Wildlife Refuge and implementation of Sheldon Refuge Draft CCP/EIS preferred alternative would require continued inventory, monitoring, research, and other studies related to both biological resources and social issues within all eight of the proposed wilderness areas. The majority of studies, inventory, monitoring, and research conducted within Sheldon Refuge and identified through the Sheldon Refuge CCP/EIS would be conducted using methods and tools not otherwise prohibited by the Wilderness Act or Service policy for management of proposed wilderness areas.

The majority of inventory, monitoring, and research conducted within Sheldon Refuge require observation, collection of small samples, or basic measurements and could be accomplished by staff, volunteers, and partners using primitive tools and would not require access by motorized vehicle or aircraft. However, due to concerns for animal welfare, accepted study protocols, and limited times of day, season, or year when activities can be accomplished, some prohibited uses, such as the use of helicopters to capture and/or transport animals, need to be evaluated for use within the proposed wilderness areas.

The study, inventory, monitoring, and research of large animals within Sheldon Refuge and the proposed wilderness, particularly to inventory populations, population trends, animal movements, and migration patterns of large mammals, could be completed using a variety of tools and methods including the use of helicopters. Helicopters have traditionally been used for such activities and are evaluated through this minimum tool analysis as one alternative. Alternatives to using helicopters include a variety of non-motorized and non-mechanized ground-based capture methods, which are also evaluated as part of this minimum tool analysis.

Alternative A

Description

All inventory, monitoring, and research would be conducted on foot or by horseback using non-motorized equipment and traditional primitive tools.

With the exception of basic monitoring efforts, most projects would require the establishment of temporary field camps to support crews of two to eight people for a period of one to 12 weeks

depending upon the type of project and specific inventory, monitoring, and research protocols. We anticipate no more than two temporary seasonal field camps would be used at any given time.

Temporary field camps and latrine sites would be selected in advance. Sites would be capable of supporting one or more projects. Access routes for seasonal camps or campsites anticipated to be used for multiple seasons would also be identified in advance. Both access routes and campsites would be photographed and inventoried prior to use in conjunction with a cultural resource inventory to document wildlife present, measure vegetative cover, and identify noxious weeds and other invasive non-native plants. No maintenance or surface disturbance would be allowed to improve access routes. Rocks and other obstacles could be temporarily moved to provide suitable tent sites. Temporary latrines for burial of waste would be excavated to the minimum depth and size necessary.

Upon project completion, all materials and structures would be removed and campsites would be restored to their prior appearance using standard wilderness rehabilitation and restoration methods and primitive tools. Access routes and campsites would be photographed and monitored following the first full growing season to document impacts from use and the effectiveness of restoration efforts, as well as to detect any newly introduced noxious weeds or other non-native species. Subsequent monitoring would be conducted as needed to document wildlife use and campsite recovery.

Capture of large animals for fitting with radio or GPS collars and the collection of blood or tissue samples would be conducted using a wide variety of methods dictated by a variety of factors including project objectives; species of animal; terrain and distance; and time of year. Methods designed to capture individual animals could include baiting or attracting animals into temporary box traps, temporary corrals, or leg-hold snares. These methods require nearby temporary field camps to allow repeated visits to the trap site to release non-target animals and to minimize the length of time animals are in captivity.

Other methods designed to capture multiple animals involve the use of herders either on foot or horseback to drive animals into large nets, temporary traps or corrals, or other confined areas where target animals can be selected and then sedated or captured by hand. These methods reduce the potential for capturing non-target species but increase the number of non-target individuals captured and increase the length of time animals are kept in captivity when compared with other capture methods. The length of time from when animals are initially herded until the time they are release is highly variable using these techniques, but can be up to 12 hours.

For construction of some temporary traps, holes would be dug to place post or anchors. Monitoring populations and locating animals in preparation of capture operations would include aircraft overflights to count and record locations, but no landing of aircraft within the proposed wilderness areas would occur.

Effects

Wilderness Character

<u>"Untrammeled"</u>
The presence of temporary traps, field camps, and crews for periods of several weeks or months within the same general location is expected to alter wildlife behavior and habitat use until projects are completed.

Herding animals for a single capture operation is not likely to result in long-term changes to animal behavior, migration, or habitat use. If repeated capture efforts are necessary, the use of the methods and techniques under this alternative would likely affect both animal behavior and habitat use as animals become conditioned to the activity (either by avoiding capture areas or by becoming habituated to the activity). Using herders to capture live animals typically requires moving entire groups of animals into the net, trap, or confined area where individuals are then selected. As a result, impacts are likely to affect entire groups within the larger wildlife population.

The most common types of injuries that occur during live animal captures include falling, tripping, being trampled by other animals, or suffering from shock. Injuries typically occur when slower, smaller animals are trampled by faster, larger animals as they are driven or herded, when animals are tripped and tangled in nets during captures at running speeds, while trying to escape from traps or other confined spaces as people try to restrain and remove a single animal from the group; or from adverse reaction to immobilization drugs used for capture, or from a physiological response to being captured, referred to as "capture myopathy."

When compared with the use of use of helicopters, the herding or driving of groups of animals into nets or traps increases the risk of injury to non-target individuals both because of the greater number of animals captured and the longer amount of time required both for completing the capture and processing, and the length of time animals are kept in captivity.

Long-term trammeling of wilderness character from inventory, monitoring, and research was evaluated in the Sheldon Refuge Draft CCP/EIS.

"Undeveloped"
Temporary field camps consisting of small and large tents would affect the undeveloped character of small portions of the proposed wilderness areas. Following campsite removal and restoration, little or no noticeable evidence of temporary developments would remain. Use along identified access routes would be noticeable but would appear as undeveloped and unmaintained trails.

"Natural"
Use of access routes and campsites would result in damage to vegetation, including shrubs and other perennials, and these impacts would be noticeable for several years. In areas where longer-term temporary field camps are constructed and used, vegetation would be trampled and some areas of bare ground would occur. It is anticipated these impacts would affect areas less than 1 acre in size in and around field camp locations.

Live animal captures would temporarily affect the natural behavior and movements of animals. The placement of tracking devices such as radio and GPS collars would temporarily affect the natural appearance of these animals.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Opportunities for solitude would be directly impacted by seasonal field camps consisting of several tents and groups of up to eight people for periods lasting several weeks or months. Management objectives, weather, and availability of staff, contractors, and equipment influence the time of year large animal captures are conducted. While capture efforts would be conducted during periods of low public use when possible, it is likely some projects would be conducted when public use of the proposed wilderness areas is greatest (i.e., during the fall hunting seasons).

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
In today's increasingly modern technical work environment, the basic skills necessary for conducting extended inventory, monitoring, and research within large wilderness areas have become increasingly rare. The primitive and traditional skills required for living daily life in a remote field camp setting would be maintained under this alternative.

Special Provisions
A purpose for all wilderness areas is to administer such areas for the gathering and dissemination of information regarding their use and enjoyment as wilderness. Most proposed wilderness areas within Sheldon Refuge contain ecological features of scientific and educational value. The study, inventory, monitoring, and research of large animals and other ecological features are necessary both for the preservation and protection of natural and untrammeled wilderness character and for the long-term conservation of fish, wildlife, plants, and their habitats within Sheldon Refuge.

Time Constraints
Completion of some inventory, monitoring, and research activities considered as part of this alternative may require multiple field crews, multiple seasons, or multiple years. All else being equal, the use of methods under this alternative to inventory, monitor, and research certain species of large mammals would take considerably longer to achieve project and management objectives when compared with the use of helicopters described under Alternative B. Due to the rugged terrain of Sheldon Refuge and the difficulty of herding large wildlife from horseback or on foot, we anticipate these methods would not result in the capture of a sufficient number of animals to meet project objectives in some instances.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

The terrain of Sheldon Refuge is very rugged, rocky, and difficult to traverse by foot or on horseback. Capture of live animals using the tools and techniques under this alternative would include safety risks for staff or contractors conducting the work. People could be injured during live animal captures by falling or tripping, or by being kicked, trampled, or gored by animals.

Alternative B

Description

The appropriate methods for live capture of large mammals are most often determined by project objectives, species of animal, animal density, time of year, terrain, and a variety of other factors. In many cases, the methods described for Alternative A are the most efficient and result in the least amount of risk to wildlife and would be used. We anticipate inventory, monitoring, and research requiring live capture of animals, including certain capture of large mammals, within Sheldon Refuge

would be conducted as described under Alternative A. This alternative considers the use of helicopters in addition to other methods considered under Alternative A.

In certain cases, live capture of large animals can be conducted with fewer people, in less time, and with less impact to fewer animals with the use of a helicopter. Under this alternative, helicopters could be used for live capture of large animals. Helicopter captures typically require spotting animals from the air and then using the aircraft to isolate a single target animal, which can then be quickly immobilized using a tranquilizing dart gun or net gun. Once the animal has been immobilized, the helicopter lands nearby so that information and samples can be collected and any marking or collaring completed before the animal is released. The length of time between initial spotting of the animal and release of the animal is typically less than 30 minutes.

Effects

Wilderness Character

"Untrammeled"
When compared with herding or driving of groups of animals into nets or traps as described under Alternative A, the use of helicopters under this alternative would reduce the risk of injury to non-target individuals because target animals can more quickly and easily be singled out for capture, the amount of time required for completing the capture is less, and the length of time animals are kept in captivity is shorter.

"Undeveloped"
The use of helicopters under this alternative when compared with other methods would eliminate the need for field camps and the need for temporary traps or corrals.

"Natural"
The use of helicopters under this alternative when compared with other methods would reduce the amount of ground disturbance and impacts to vegetation from temporary field camps and use of access routes.

Impacts to the natural appearance of animals from marking or collaring would be as described under Alternative A.

"Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"
Helicopter activities would limit opportunities for solitude for periods of less than one week in areas where activities are conducted. When compared with the use of temporary field camps, traps, and corrals for several weeks as proposed under Alternative A, the use of helicopters would impact opportunities within a larger area due to the distances over which helicopters would be seen and heard. Impacts to opportunities for solitude would not last as long as those described for Alternative A due to the shorter amount of time necessary to conduct live animal captures using helicopters. We anticipate helicopters would be used at various times of the year, including during fall hunting seasons depending upon project objectives and impacts could affect the majority of visitors within any particular proposed wilderness area.

Other Unique Components that Reflect the Character of this Wilderness

Heritage and Cultural Resources
N/A

Maintaining Traditional Skills
The use of helicopters under this alternative would not maintain traditional skills.

Special Provisions
N/A

Time Constraints
When compared with the herding or driving of animals described under Alternative A, we anticipate the use of helicopters would result in the capture of a sufficient number of animals to accomplish objectives for most or all types of possible projects.

Additional Wilderness-specific Comparison Criteria
N/A

Safety of Visitors, Personnel, and Contractors

The use of helicopters at low altitudes to conduct live animal captures does increase the level of risk when compared with standard point-to-point helicopter use. Captures are planned based on the identification and avoidance of hazards such as terrain, fencelines, and powerlines to minimize risk to the extent possible. Risks associated with capture activies under Alternative A do not necessarily differ from those under this alternative, but the greater number of people and animals involved does increase the probablity for injury or accident when compared with the use of a single helicopter pilot and two-person crew under this alternative.

Comparison of Alternatives

It may be useful to compare each alternative's relative positive and negative effects to each of the criteria in tabular form, keeping in mind the law's mandate to "preserve wilderness character."

	Alternative A	Alternative B
Untrammeled	-	-
Undeveloped	-	+
Natural	-	+
Solitude or Primitive Recreation	--	-
Unique Components		
Wilderness Character	-	-

	Alternative A	Alternative B
Heritage and Cultural Resources	N/A	N/A
Maintaining Traditional Skills	+	-
Special Provisions	+	+
Time	-	+
Additional Wilderness Criteria	N/A	N/A
Other Criteria Summary	+	+

	Alternative A	Alternative B
Safety	-	+

Safety Criteria

Capture of large wild animals by herding and driving in rough terrain and in confined spaces is inherently dangerous and has a high risk for injury both to the animals and the handlers and herders. The most common potential injuries include broken bones, fractures, contusions, punctures, lacerations, and head injuries from falling, being trampled, kicked, or gored. These risks can be reduced but not eliminated by using protective equipment such as chest protectors, eye protection, and helmets. The number of people required to implement these methods as proposed under Alternative A and the number of animals involved would increase the overall potential for injury.

Capture of large animals with the use of helicopters at low levels is also inherently dangerous. The use of proper aircraft for the specific type of flight operations, the use of experienced pilots and crews, use of specialized fire-resistant clothing and helmets, and proper pre-flight briefings to identify and avoid hazards and obstacles can minimize but not eliminate the potential for accidents and injuries. While injuries sustained from low-level helicopter accidents are typically more severe than would be expected from herding and driving animals on foot or by horseback, the shorter amount of time, fewer people required, and the smaller number of animals to be captured as proposed under Alternative B would decrease the overall potential for injury.

Step 2 Decision: What is the Minimum Activity/Minimum Tool?

Selected Alternative

Alternative B

Rationale for Selecting this Alternative (Including Documentation of Safety Criterion, If Appropriate)

Capture of large animals by driving and herding on foot or by horseback as described under Alternative A would avoid the landing of aircraft, which is otherwise prohibited within the proposed wilderness areas, but would not necessarily be the least intrusive method. The use of field camps for periods of several weeks, disturbance and stress caused to more animals than is otherwise necessary, and the greater risk to both employee and staff safety and to the health of animals being captured would have greater impact on wilderness character than would Alternative B. The use and landing of helicopters as proposed under Alternative B would occasionally diminish opportunities for wilderness solitude for short periods of time, but when compared with seasonal field crews living in longer-term temporary wilderness camps as proposed under Alternative A, helicopter impacts are expected to be less intrusive overall.

Helicopters have proven to be an efficient and effective tool for the quick capture and release of a number of species for the purposes of wildlife research and management. In contrast, herding and driving under Alternative A would not only pose more safety risks, but due to terrain and logistical difficulties, we anticipate some efforts would be unsuccessful and would therefore not meet management objectives.

Alternative B would minimize impacts to wilderness character to the extent practicable while providing a high probability for full implementation of the minimum administrative action necessary. Alternative B is also determined to be the safest and most efficient alternative evaluated.

Check Any Wilderness Act Section 4(c) Uses Approved in this Alternative

- ☐ mechanical transport
- ☐ motorized equipment
- ☐ motor vehicles
- ☐ motorboats
- ☒ landing of aircraft
- ☐ temporary road
- ☐ structure or installation

Record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:				
Recommended:				
Approved:				

Appendix H. Standard Operating Procedures for Horse and Burro Population Control Methods

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 (corral) 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 (corral) 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 (corral).
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 (corral).
4. Bait Trapping (corralling). This capture method involves utilizing bait (water or feed) to lure primarily burros into a temporary trap (corral) (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 (corral) 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 (corral) locations as determined by the RM. All traps (corrals) 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 (corrals), 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 (corrals) 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 (corrals) 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 (corral) 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 (corrals), 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 (corrals) 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 (corrals) 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 (corrals) 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 (corral) 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 (corral). 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 (corrals) 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 (corral). If the contractor selects this method, the following applies:

    a. A minimum of two saddle-horses shall be immediately available at the trap (corral) 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 (corral) 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 (corral) 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 (corral) 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
Lakeview Office - Deputy Project Leader
Sheldon Refuge – Refuge Manager

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, issued a stop work order, or other appropriate measures.

Appendix I. Sheldon Refuge Establishing and Acquisition Authorities

Establishment Authorities

Sheldon National Wildlife Refuge was established by Executive Order (EO). The key source for the Refuge establishment authorities is as follows:

With **EO 5141 (20 June 1929)** President Hoover temporarily withdrew 31,399 acres of present-day Little Sheldon from "settlement, location, sale or entry, subject to prior valid claims, for classification as to their suitability for game refuge purposes" on recommendation by the Department of Agriculture and Department of the Interior.

In 1931 President Hoover signed the EO officially establishing the Charles Sheldon Wildlife Refuge. **EO 5540 (26 January 1931)** "reserved and set apart for use of the Dept. of Agriculture" the same area as described in EO 5141 "as a refuge and breeding ground for wild animals and birds, subject to existing valid rights." EO 5540 declared that "It is unlawful within this reservation (a) to hunt, trap, capture, willfully disturb, or kill any wild animal or bird of any kind whatever, to take or destroy the nests or eggs of any wild bird, to occupy or use any part of the reservation, or to enter thereon for any purpose, except under such rules and regulation as may be prescribed by the Secretary of Agriculture; (b) to cut, burn, or destroy any timber, underbrush, grass, or other natural growth; (c) willfully to leave fire or to suffer it to burn unattended near any forest, timber, or other inflammable material; (d) after building a fire in or near any forest, timber, or other inflammable material, to leave it without totally extinguishing it; and (e) willfully to injure, molest, or destroy any property of the United States." The EO designated the name of this land as the "Charles Sheldon Wild Life Refuge."

EO 6910 (26 November 1934) withdrew 3,840 acres for "classification and other purposes all vacant, unreserved, and unappropriated public lands in the states of Nevada and Oregon and certain other states." (Currently we do not have a copy of EO 6910 but will continue the research.)

EO 7178 (6 September 1935) set aside the lands for the Hart Mountain Game Range, which included the present-day Hart Mountain National Antelope Range and Big Sheldon: "it is ordered that the following described lands, insofar as title thereto is in the United States, be, and they are hereby withdrawn from settlement, location, sale, or entry and reserved and set apart for the conservation and development of natural wildlife resources.…for wild-life conservation purposes such lands shall become part of the preserve, but the grazing rights thereon shall accrue primarily to the use of wild-life, and such lands shall not be homesteaded, sold, exchanged, or patented under any law or regulation relating to public lands or the establishment of wild-life refuges."

EO 7364 (6 May 1936) states that "in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 stat. 1222), it is ordered that, subject to valid existing rights, all the public lands of the United States in the following-described area be, and they are hereby, withdrawn from settlement, location, sale, entry, or other form of appropriation and reserved and set apart for the use of the Department of Agriculture as an addition to the existing Charles Sheldon Wildlife Refuge, established by" EO 5540. It further states that "The reservation made by this order supersedes as to the above-described lands the temporary withdrawl [sic] for classification and other purposes made by EO 6910 of November 26, 1934, as amended." This land was added so the area could be fenced

effectively, according to Rudolf Dieffenbach, Chief of the Division of Land Acquisition, in a letter to Doren Woodward dated 10 October 1935.

EO 7522 (21 December 1936) revoked the lands in Nevada established as the Hart Mountain Game Range under EO 7178 and established them as the Charles Sheldon Antelope Range.

> Section 1: "Executive Order No. 7178 of September 6, 1935, which reserved and set apart certain lands in Oregon and Nevada as the Hart Mountain Game Range, is Hereby revoked as to the following lands in Nevada:"
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> Section 2: "Subject to the condition expressed in the above-mentioned acts and to all existing valid rights, the lands described in section 1 of this order are hereby withdrawn from settlement, location, sale, or entry and reserved and 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; Provided, That nothing herein contained shall restrict prospecting, locating, developing, mining, entering, leasing, or patenting the mineral resources of the lands under the applicable laws: Provided further, That any lands within the described area that are otherwise withdrawn or reserved will be affected hereby only so far as may be consistent with the uses and purposes for which such prior withdrawal or reservation was made: And provided further, That upon the termination of any private right to, or appropriation of, any public lands within the exterior limits of the area included in this order, or upon the revocation of prior withdrawals unless expressly otherwise provided in the order of revocation, the lands involved shall become part of this preserve."
>
> Section 3: "This range or preserve, so far as it relates to conservation and development of wildlife, shall be under the joint jurisdiction of the Secretaries of the Interior and Agriculture, and they shall have power jointly to make such rules and regulation for its protection, administration, regulation, and improvement, and for the removal and disposition of surplus game animals, as they may deem necessary to accomplish its purposes, and the range or preserve, being within a grazing district duly established pursuant to the provisions of the act of June 28, 1934 (ch. 865, 48 stat. 1269) , as amended by the act of June 26, 1936 (Public No. 827, 74th Congress), shall under the exclusive jurisdiction of the Secretary of the Interior so far as it relates to the public grazing lands and natural forage resources thereof; Provided, however, That the natural forage resources therein shall be first utilized for the purpose of sustaining in a healthy condition a maximum of three thousand five hundred (3500) antelope, the primary species, and such nonpredatory secondary species in such numbers as may be necessary to maintain a balanced wildlife population, but in no case shall the consumption of forage by the combined population of the wildlife species be allowed to increase the burden of the range dedicated to the primary species: Provided further, That all the forage resources within this range or preserve shall be available, except as herein otherwise provided with respect to wildlife, for domestic livestock under rules and regulation promulgated by the Secretary of the Interior under the authority of the aforesaid act of June 28, 1934, as amended: And provided further, That land within the exterior limits of the area herein described, acquired and to be acquired by the United States for the use of the Department of Agriculture for conservation of migratory birds and other wildlife, shall be and remain under the exclusive administration of the Secretary of Agriculture and may be utilized for public grazing purposes only to such extent as may be determined by the said Secretary to be compatible with the utilization of said lands for the purposes for which they were acquired as aforesaid under regulations prescribed by him."

Section 4: "This preserve shall be known as the Charles Sheldon Antelope Range."

Proclamation 2416 (30 July 1940) changed the name of Charles Sheldon Wildlife Refuge to Sheldon National Antelope Refuge.

On December 4, 1974, the President transmitted the Sheldon Wilderness proposal to the U.S. Congress (**House Document No. 93-403**). The initial proposal at that time (prior to the August 1974 modifications) encompassed 277,200 acres in 11 areas. The President recommended designating 20,100 acres at that time and remanding the remainder to study under a mineral survey. Public hearings and further review modified (August 1974) the wilderness proposal to include 341,500 acres in nine areas on Sheldon Refuge, which was included in the 1974 transmittal to Congress. Further action on the wilderness proposal was suspended until a mineral survey was completed and the mineral estate was withdrawn on areas considered for wilderness designation. The mineral survey was completed by the U.S. Geological Survey and published in 1984 (Geological Survey Bulletin 1538). The Service completed an environmental assessment on the proposed mineral withdrawal, with a Finding of No Significant Impact issued in February 1984. The action culminated with a Public Land Order (PLO) for the withdrawal of 445,766 acres of the mineral estate for Sheldon Refuge from claims under the 1872 Mining Law (see PLO 6849 below). We found no further action on the Sheldon Wilderness Proposal, neither Record of Decision nor Final Environmental Impact Statement nor congressional action.

PLO 5497 (25 April 1975) transferred management of the Charles Sheldon Antelope Range "to the sole jurisdiction of the Bureau of Land Management".

The **Game Range Act (Public Law 94-223, February 27, 1976)** amended the Refuge System Administration Act of 1966 to give sole jurisdiction for management of refuges to the Secretary of Interior through the Fish and Wildlife Service. The Act states: "For the purpose of consolidating the authorities relating to the various categories of areas that are administered by the Secretary of the Interior for the conservation of fish and wildlife, including species that are threatened with extinction, all lands, waters, and interests therein administered by the Secretary as wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas are hereby designated as the 'National Wildlife Refuge System' which shall be subject to the provisions of this section and shall be administered by the Secretary through the United States Fish and Wildlife Service."

The Congressional reports that define each branch's intent for the law (**House Report No. 94-334; Senate Report No. 94-593**) emphasize the priority for wildlife (over grazing or other uses) and specifically name several species as the purpose of the game ranges. For example, House Report 94-334 states: "During the 1930's President Franklin D. Roosevelt established four wildlife ranges as part of the National Wildlife Refuge System in order to protect species such as the desert big-horn sheep, the pronghorn antelope, the bald eagle, the peregrine falcon and the prairie falcon." The report then names Cabeza Prieta, Charles M. Russell, Charles Sheldon, and Kofa Game Range refuges. Pronghorn were named as the primary species for management at Sheldon Refuge in its establishing executive order, and it is the only refuge of the four listed where prairie falcons are common.

PLO 5634 (25 April 1978) 1(a) revoked PLO 5497 and transferred sole jurisdiction of the Charles Sheldon Antelope Range to the USFWS: (b) "the operation and administration of the Charles

Sheldon Antelope Range, including grazing, was to be administered, and is now being administered, in accordance with the National Wildlife Refuge System Administration Act…" (NWRSAA), "except that, those holding grazing privileges validly issued by the BLM and in effect on February 27, 1976, are permitted to continue such privileges under term and conditions imposed by the Taylor Grazing Act, and implementing regulations, until those privileges expire. The renewal or initiation of grazing privileges subsequent to February 27, 1976, is in accordance with the NWRSAA and implementing regulations"; (c) EO 7522 ....[was] modified to the extent necessary for it to conform to the provisions of (a) and (b) above."

PLO 6849 (22 April 1991) withdrew approximately 445,766 acres of the Sheldon National Wildlife Refuge from mining location in order for the USFWS to protect the wildlife habitat and unique resource values of the refuge lands.

> 1. "Subject to valid existing rights, the following described Sheldon National Wildlife refuge lands are hereby withdrawn from location under the United States mining code (30 U.S.C. Chapter 2), but not from leasing under the mineral leasing laws, to protect the wildlife habitat and unique resource values."
>
> 2. The PLO describes private lands of "3145.7 acres" that are within Sheldon Refuge, that if the United States "subsequently acquires the private lands with the mineral interests through purchase, exchange, or donation, the mineral estate will be subject" to the withdrawal specified in the PLO.
>
> 3. "This withdrawal will expire 20 years from the effective date of this order unless, as a result of a review conducted before the expiration date pursuant to section 204(f) of the Federal Land Policy and Management Act of 1976, U.S.C. 1714 (f), the Secretary determines that the withdrawal shall be extended, except that the withdrawal on any land in this order that Congress does not designate as wilderness will expire 1 year after Congress has completed action on the Sheldon National Wildlife Refuge wilderness proposal."

Land Exchange (3 August 1994) finalized the Harry Wilson Land Exchange adding 2,240 acres to Sheldon Refuge. The Acquisition Authority was the Endangered Species Act.

The 2006 Fiscal Year Summary states that Sheldon Refuge encompasses 572,876.15 acres (Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service as of September 30, 2006).

Summary of Land Acquisition for Sheldon National Wildlife Refuge as of 9/30/2006

Reserved From Public Domain	Device or Gift	Purchased	Total
514,356.82	4,775.66	25,745.67	572,876.15

Refuge Establishment and Purposes

The following are establishment and purpose excerpts from statutes, executive orders, public land orders, and other supporting documents:

EO 5141 (20 June 1929): "under and pursuant to the provisions of the act of Congress approved June 25, 1910 (36 Stat. 847), as amended by the act of August 24, 1912 (37 Stat. 497), hereby ordered that the public lands within the following described area [Sheldon Refuge] in Nevada be, and

they are hereby, temporarily withdrawn from settlement, location, sale or entry, subject to prior valid clams, for classification as to their suitability for game refuge purposes."

EO 5540 (26 January 1931): "It is hereby ordered that the following described area [Sheldon Refuge] be ….reserved and set apart for the use ….as a refuge and breeding ground for wild animals and birds, subject to existing valid rights. It is unlawful within this reservation (a) to hunt, trap, capture, willfully disturb, or kill any wild animal or bird of any kind whatever, to take or destroy the nests or eggs of any wild bird, to occupy or use any part of the reservation, or to enter thereon for any purpose, except under such rules and regulation as may be prescribed by the Secretary of Agriculture; (b) to cut, burn, or destroy any timber, underbrush, grass, or other natural growth; (c) willfully to leave fire or to suffer it to burn unattended near any forest, timber, or other inflammable material; (d) after building a fire in or near any forest, timber, or other inflammable material, to leave it without totally extinguishing it; and (e) willfully to injure, molest, or destroy any property of the United States."

The Refuge shall be known as the Charles Sheldon Wildlife Refuge.

EO 7178 (6 September 1935), which reserved and set apart certain lands in Nevada [Sheldon Refuge]: "Subject to the conditions expressed and to all existing valid rights, it is ordered that the following described lands, insofar as title thereto is in the United States, be, and they are hereby withdrawn from settlement, location, sale, or entry and reserved and 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; Provided, That upon the termination of any private right to, or appropriation of, any public lands within the exterior limits of the area included in this order, such lands shall become part of this preserve: And provided further, That upon the acquisition by the United States of title to any private lands within such limits for wild-life conservation purposes such lands shall become part of the preserve, but the grazing rights thereon shall accrue primarily to the use of wild-life, and such lands shall not be homesteaded, sold, exchanged, or patented under any law or regulation relating to public lands or the establishment of wild-life refuges or grazing districts."

EO 7522 (21 December 1936): "This range or preserve, so far as it relates to conservation and development of wildlife" and "so far as it relates to the public grazing lands and natural forage resources thereof; Provided, however, That the natural forage 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 non-predatory secondary species in such numbers as may be necessary to maintain a balanced wildlife population, but in no case shall the consumption of forage by the combined population of the wildlife species be allowed to increase the burden of the range dedicated to the primary species: Provided, further, That all the forage resources within this range or preserve shall be available, except as herein otherwise provided with respect to wildlife, for domestic livestock under rules and regulations promulgated by the Secretary of the Interior under the authority of the aforesaid act of June 28, 1934. Land within the exterior limits of the area herein described, acquired and to be acquired by the United States for the use of the Department of Agriculture for conservation of migratory birds and other wildlife, shall be and remain under the exclusive administration of the Secretary of Agriculture for conservation of migratory birds and other wildlife …and may be utilized for public grazing purposes only to such extent as may be determined by the said Secretary to be compatible with the utilization of said lands for the purposes for which they were acquired as aforesaid under regulations prescribed by him."

The following **EO 7364** is recorded in The National Archives Federal Register, Volume I, Number 41, dated May 6, 1936: "By virtue of and pursuant to the authority vested in me by the Act of June 25, 1910, c. 421, 36 Stat. 847, as amended by the Act of August 24, 1912, c. 369, 37 Stat. 497, and as President of the United States, and in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1222) , it is ordered that, subject to valid existing rights, all the public lands of the United States in the following-described area [Sheldon Refuge] be, and they are hereby, withdrawn from settlement, location, sale, entry, or other form of appropriation and reserved and set apart for the use of the Department of Agriculture as an addition to the existing Charles Sheldon Wildlife Refuge, established by Executive Order No. 5540 of January 26,1931."

An early memorandum **(Memorandum Number 9, ca. 1937)** stated: "The Charles Sheldon Antelope Refuge was established in September 1936 as an addition to the already existing Charles Sheldon Wildlife Refuge. The primary purpose of this area is the conservation of antelope. An excellent opportunity is also afforded, however, for the restoration in suitable numbers of native deer, sage grouse, and fur-bearing animals, and for the development of desirable feeding and nesting places for migratory waterfowl."

Another early memorandum **(Memorandum No. 14, January 12, 1937)** stated: "The Charles Sheldon Wildlife Refuge as originally established [EO 5540, 26 January 1931] embraced 31,399 acres of public land. Through Executive Order [thought to be EO 7364 May 6, 1936] in September 1936 the Charles Sheldon Antelope Range was established under joint jurisdiction of the Secretaries of Agriculture and Interior.

"The purchase of the alienated lands within these antelope ranges is to control the water and hay producing areas essential to the perpetuation of the antelope and other wildlife. While these areas are primarily for the conservation of antelope, they also offer great opportunity to restore in suitable numbers the native deer, prairie chickens, sage grouse, and fur animals. There is also excellent opportunity to develop extensive waterfowl nesting and feeding places."

In **Memorandum Number 9 (ca. 1937)** it states: "At the January 1937 meeting one ownership (Dufurrena) involving 17,984 acres was approved for purchase. An 80 acre tract in the same ownership, which was overlooked when the other lands were optioned, is now being presented for consideration."

Proclamation No. 2416 by President Franklin D. Roosevelt on 30 July 1940 in the Federal Register states: "Whereas certain areas of land and water in the United States, [Sheldon Refuge] have been reserved and set aside from time to time as refuges and breeding grounds for native birds, migratory waterfowl, wild animals, and other forms of wildlife, on which it is unlawful for any person to hunt, trap, capture, willfully disturb or kill any bird or wild animal of any kind whatsoever to take or destroy the nests or eggs of any wild bird, or to occupy or use any part of such reservations or to enter thereon for any purpose except as permitted by law or by rules and regulations of the Secretary of the Interior in order that the conservation and development of the natural wildlife resources may contribute to the economic welfare of the Nation and provide opportunities for wholesome recreation to the citizens of the United States."

March 25, 1941: Sheldon National Antelope Refuge and Range was enlarged by a gift of 2,495.66 acres from the Audubon Society, and the Migratory Bird Conservation Commission approved purchase of 23,328.76 acres. Executive orders have set aside for refuge purposes a total of 556,399.48 acres of public domain.

The Game Range Act (Public Law 94-223, February 27, 1976) amended the Refuge System Administration Act of 1966 to give sole jurisdiction for management of refuges to the Secretary of Interior through the Fish and Wildlife Service. The Act states: "For the purpose of consolidating the authorities relating to the various categories of areas that are administered by the Secretary of the Interior for the conservation of fish and wildlife, including species that are threatened with extinction, all lands, waters, and interests therein administered by the Secretary as wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas are hereby designated as the 'National Wildlife Refuge System' which shall be subject to the provisions of this section and shall be administered by the Secretary through the United States Fish and Wildlife Service."

The Congressional reports that define each branch's intent for the law **(House Report No. 94-334; Senate Report No. 94-593)** emphasize the priority for wildlife (over grazing or other uses) and specifically name several species as the purpose of the game ranges. For example, House Report 94-334 states: "During the 1930's President Franklin D. Roosevelt established four wildlife ranges as part of the National Wildlife Refuge System in order to protect species such as the desert big-horn sheep, the pronghorn antelope, the bald eagle, the peregrine falcon and the prairie falcon." The report then names Cabeza Prieta, Charles M. Russell, Charles Sheldon and Kofa Game Range refuges. Pronghorn were named as the primary species for management at Sheldon Refuge in its establishing executive order, and it is the only refuge of the four where prairie falcons are common.

On December 4, 1974, the President transmitted the Sheldon Wilderness proposal to Congress **(House Document No. 93-403)**. The initial proposal (prior to the August 1974 modifications) encompassed 277,200 acres in 11 areas. The President recommended designating 20,100 acres at that time and remanding the remainder to study under a mineral survey. Public hearings and further review modified (August 1974) the wilderness proposal to include 341,500 acres in nine areas on Sheldon Refuge, which was included in the 1974 transmittal to Congress. Further action on the wilderness proposal was suspended until a mineral survey was completed and the mineral estate was withdrawn on areas considered for wilderness designation.

CFR Public Land Order 6849 (22 April 1991) Mineral Withdrawal of a Portion of the Sheldon National Wildlife Refuge; Nevada: This order withdraws approximately 445,766 acres of the Sheldon Refuge from mining location for the Fish and Wildlife Service to protect the wildlife habitat and unique resource values of the refuge lands. The lands have been and remain open to mineral leasing.

March 8, 1994: The Harry Wilson Land Exchange encompassing 2,240 acres was purchased by the Conservation Fund. The Acquisition Authority was the Endangered Species Act. Service personnel inspected the lands offered and desired in the exchange and determined the exchange would be biologically beneficial to Sheldon Refuge. With this land in refuge status, the Service would have the authority needed to exercise the control deemed necessary over migratory bird, wildlife, and land management objectives relative to this area. The Service would receive the water and water rights appurtenant to the Wilson lands. These lands are ecologically unique on Sheldon Refuge and have been proposed for classification as a wilderness area. One primitive road leads partway into the area, which provides vistas and other wilderness qualities that are extraordinary. The area has abundant wildlife with representative examples such as birds, bighorn sheep, mountain lions, mule deer, and native fishes and amphibians. Archaeologically, the area is rich; one site alone contains the greatest lithic scatter of all sites on Sheldon Tefuge. With the above acres in refuge status or in combined

refuge-wilderness status, the longstanding problem of the Service's inability to exert any control over migratory bird, wildlife, and land management objectives relative to this area was resolved.

Appendix J. Legal and Policy Guidance

International Treaties

The international treaties that affect Sheldon Refuge are migratory bird treaties with Canada, Mexico, Japan, and Russia, and the Convention on Nature Protection and Wildlife Conservation in the Western Hemisphere. These treaties differ in emphasis and species of primary concern, but collectively provide clear mandates for identifying and protecting important habitats and ecosystems, and protecting and managing certain species.

Treaties for migratory bird protection include management provisions such as:

- Prohibiting disturbance of nesting colonies
- Directing each nation to undertake, to the maximum extent possible, measures necessary to protect and enhance migratory bird environments and prevent and abate pollution or detrimental alteration of their habitats
- Requiring each nation to provide immediate notification to the other when pollution or destruction of habitats occurs or is expected
- Stipulation that each nation shall, to the extent possible, establish preserves, refuges, protected areas, and facilities for migratory birds and their habitats and manage them to preserve and restore natural ecosystems
- Stipulating that special habitats outside the jurisdictional boundaries (territorial limits) may be designated in which, to the maximum extent, persons under each nation's jurisdiction shall act in accordance with the principles of the treaty (for instance, this stipulation might require U.S. oil tankers to avoid or prevent pollution of special seabird areas on the high seas)
- Providing that protective measures under the treaty may be applied to species and subspecies not listed in the specific convention, but which belong to one of the families containing listed species. Of the migratory bird species of concern in the treaties, those that use the Sheldon Refuge include swans, geese, ducks, hawks, eagles, harriers, falcons, cranes, plovers, sandpipers, gulls, owls, and passerines.

Laws and Acts

National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd-668ee; Refuge Administration Act)

Of all the laws governing activities on National Wildlife Refuges, the National Wildlife Refuge System Improvement Act (Improvement Act) undoubtedly exerts the greatest influence. The Improvement Act amended the Refuge System Administration Act of 1966, by including a unifying mission for all National Wildlife Refuges to be managed as a System, a new process for determining compatible uses on refuges, and a requirement that each refuge will be managed under a comprehensive conservation plan, developed in an open public process.

The Improvement Act states that the Secretary of the Interior shall provide for the conservation of fish, wildlife and plants, and their habitats within the Refuge System as well as ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained. House Report 105–106 accompanying the Improvement Act 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. As later explained in the Biological Integrity, Diversity and Environmental Health Policy (see section 1.5B), "the highest measure of biological integrity, diversity, and environmental health is viewed as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions."

Under the Improvement Act, each refuge must be managed to fulfill the Refuge System mission as well as the specific purposes for which it was established. The Act requires the Service to monitor the status and trends of fish, wildlife, and plants in each refuge.

Additionally, the Act identifies six priority wildlife dependent recreational uses ("Big Six"). These uses are hunting, fishing, wildlife observation and photography, environmental education, and interpretation. Through the Improvement Act, the U.S. Congress directed the Service to grant these six wildlife-dependent public uses special consideration in the planning for, management of, and establishment and expansion of units of the Refuge System. In addition, when determined compatible on a refuge-specific basis, these six uses assume priority status over any other uses proposed or occurring on a refuge. The Service is to make extra efforts to facilitate priority wildlife-dependent public use opportunities.

When preparing a CCP, Refuge Managers must re-evaluate the compatibility of all general public, recreational, and economic uses (even those occurring to further refuge habitat management goals) proposed or occurring on a refuge. No activity may be allowed or continued unless it is determined to be an appropriate refuge use and compatible with the mission of the National Wildlife Refuge System and the purposes for the refuge. A compatible use is one that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge. The authority to make the determination is delegated to the Refuge Manager. Updated compatibility determinations for existing and proposed uses for Sheldon Refuge are in Appendix D of this Draft CCP/EIS.

The Improvement Act also required that, in addition to formally established guidance, the CCP must be developed with the participation of the public. Issues and concerns articulated by the public play a role in guiding alternatives considered during the development of the CCP, and with the formal guidance, can play a role in selection of the preferred alternative.

The Endangered Species Act of 1973 as amended (16 U.S.C. 1231-1544)

The Endangered Species Act provides for the conservation of threatened and endangered species of fish, wildlife, plants, and their critical habitats by Federal action and by encouraging the establishment of state programs. Although not specifically addressing the System, it does directly affect management activities on national wildlife refuges. It directs Federal agencies to take actions that would further the purposes of the act and to ensure that actions they carry out, authorize, or fund do not jeopardize endangered species or their critical habitat (Section 7).

The Refuge Recreation Act of 1998 (16 U.S.C. 460k-460k-4, as amended)

This act requires that any recreational use on areas of the National Wildlife Refuge System be compatible with the primary purpose(s) for which the area was acquired or established. This act also

requires that sufficient funding be available for the development, operation, and maintenance of recreational uses that are not directly related to the area's primary purpose(s).

National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321-4347), and the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508)

NEPA is the basic national charter for protection of the environment. The procedural provisions in CEQ regulations require Federal agencies to integrate the NEPA process with other planning at the earliest possible time whenever taking a major Federal action that may significantly affect the human environment in order to provide a systematic interdisciplinary approach; identify and analyze the environmental effects of their actions; describe appropriate alternatives to the proposal; involve the affected state and Federal agencies, tribal governments, and the affected public in the planning and decision-making process; and fully integrate all refuge proposals that may have an impact on the environment with the provisions of NEPA (40 CFR 1501.2). Implementation of any one of the alternatives in this CCP for managing Sheldon Refuge is such an action. Therefore, this planning process is subject to NEPA requirements.

Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act of 1977, (Public Law [P.L.] 95-217; 33 U.S.C. 1251-1387, et seq., as amended; 33 CFR 320 ff; 40 CFR 15, 100-400, 220-233, 400-471)

This act regulates the discharge of pollutants into waters of the United States. The act protects fish and wildlife, establishes operation permits for all major sources of water pollution, and limits the discharge of pollutants or toxins into water. The act makes it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit is obtained under the Clean Water Act.

Clean Air Act of 1990 as amended (42 USC 7401-7661)

This act established Federal standards for various pollutants from both stationary and mobile sources and to provide for the regulation of polluting emissions via state implementation plans. In addition, the amendments are designed to prevent significant deterioration in certain areas where air quality exceeds national standards, and to provide for improved air quality in areas which do not meet Federal standards ("nonattainment" areas).

This act also requires Federal agencies to prevent significant deterioration of air quality and, in particular, to preserve air quality in national parks, national wilderness areas, national monuments, and national seashores (42 U.S.C. 7470).

Antiquities Act (16 U.S.C. 431-433); Archaeological Resources Protection Act of 1979 (P.L. 96-95; 16 U.S.C. 470as, et seq., as amended; 43 CFR 50-58); and the National Historic Preservation Act of 1966 (P.L. 89-665; 16 U.S.C. 470 et seq., as amended)

These laws make reference to cultural resources or govern the management of cultural resources on Federal lands. The various historic preservation laws, in general, do the following:

- Vest ownership of historic and prehistoric properties and of materials collected from such sites with the state and Federal governments.

- Protect archeological and historic sites from unauthorized disturbance and prescribe penalties for individual who damage (or collect from) such sites.
- Provide for issuing of permits to qualified individuals and institutions to conduct scientific research.
- Mandate the inventory and evaluation of all sites on government-owned and managed lands. Inventory is the responsibility of the individual Federal agency involved.
- Require that all projects with state or Federal involvement be conducted in such a way as to protect any significant cultural resources that may be present. This includes, but is not limited to, the performance of archeological surveys, site evaluations, and, if necessary, mitigation of adverse impacts on such resources.

Native American Graves Protection and Repatriation Act (P.L. 101-601; 25 U.S.C. 3001-13; 104 Stat. 3042)

- Establishes requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal land.
- Requires Federal agencies to provide notice to affected Tribes of any such item is found that can be associated with a specific Tribe or groups of Tribes.
- Requires that such items be returned upon request to an associated Tribe or Tribes.

General Mining Act of 1872, as amended (30 U.S.C. 21 et seq.)

- Commonly known as the Mining Law of 1872, this Act the foundation of the existing system for acquiring rights in public mineral lands, and is solely applicable to "locatable" minerals.
- Provides for locating and patenting mining claims where a discovery has been made for locatable minerals on public lands.

Mineral Lands Leasing Act of 1920 as amended (30 U.S.C. 181 et seq.)

- Also known as the Mineral Leasing Act of 1920, this Act is solely applicable to "leasable" minerals. Among the laws affecting the exploration and development of leasable minerals are the Act of July 31, 1947, as amended (30 U.S.C. 601 et seq.); the Mineral Leasing Act for Acquired Lands, as amended (30 U.S.C. 351 et seq.); the Geothermal Steam Act of 1970, as amended (30 U.S.C. 1001-1027); and the Surface Mining Control and Reclamation Act of 1977, as amended (30 U.S.C. 1201 et seq.).

Many other laws govern the U.S. Fish and Wildlife Service and Refuge System lands. A list and brief description of each can be found at http://laws.fws.gov.

Executive Orders

Executive Order 11644 as amended (42 U.S.C. Sec 4321 et seq.)

Section 1. Purpose. It is the purpose of this order to establish policies and provide for procedures that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.

Sec. 3. Zones of Use. (a) Each respective agency head shall develop and issue regulations and administrative instructions, within six months of the date of this order, to provide for administrative designation of the specific areas and trails on public lands on which the use of off-road vehicles may be permitted, and areas in which the use of off-road vehicles may not be permitted, and set a date by which such designation of all public lands shall be completed. Those regulations shall direct that the designation of such areas and trails will be based upon the protection of the resources of the public lands, promotion of the safety of all users of those lands, and minimization of conflicts among the various uses of those lands. The regulations shall further require that the designation of such areas and trails shall be in accordance with the following –

> (1) Areas and trails shall be located to minimize damage to soil, watershed, vegetation, or other resources of the public lands.
>
> (2) Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats.
>
> (3) Areas and trails shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors.
>
> (4) Areas and trails shall not be located in officially designated Wilderness Areas or Primitive Areas. Areas and trails shall be located in areas of the National Park system, Natural Areas, or National Wildlife Refuges and Game Ranges only if the respective agency head determines that off-road vehicle use in such locations will not adversely affect their natural, aesthetic, or scenic values.

Regulation

50 CFR Sec. 27.31 General provisions regarding vehicles

Travel in or use of any motorized or other vehicles, including those used on air, water, ice, snow, is prohibited on national wildlife refuges except on designated routes of travel, as indicated by the appropriate traffic control signs or signals and in designated areas posted or delineated on maps by the refuge manager and subject to the following requirements and limitations…

> (f) The operation of a vehicle which does not bear valid license plates and is not properly certified, registered, or inspected in accordance with applicable State laws is prohibited.
>
> (g) Driving or permitting another person to drive a vehicle without valid license is prohibited. A valid driver's or operator's license must be displayed upon the request of any authorized official…
>
> (l) A motor vehicle shall not be operated at anytime without proper brakes and brake lights, or from sunset to sunrise without working headlights and taillights which comply with the regulations for operation on the roads of the State within whose boundaries the refuge is located.

Policy

U.S. Fish and Wildlife Service management direction for all national wildlife refuges is contained in the Refuge Manual chapters, Director's orders, national policy issuances, handbooks, Director's memoranda, and Regional directives. Some of the Refuge Manual chapters relevant to the CCP include feral horse and burro management (7 RM 6); off-road vehicle management (8 RM 7); and management of non-wildlife-dependent public uses (8 RM 9). Over the last few years, the Service has developed or revised numerous policies and Director's Orders to reflect the mandates and intent of the Improvement Act. Some of these key policies include the Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3); the Compatibility Policy; the Refuge Planning Policy; Mission, Goals, and Purposes (601 FW 1), Appropriate Refuge Uses (603 FW 1); Wildlife-Dependent Public Uses (605 FW 1); Wilderness Stewardship Policy (610 FW 1); and the Director's Order for Coordination and Cooperative Work with State Fish and Wildlife Agency Representatives on Management of the National Wildlife Refuge System. These policies and others in draft or under development can be found at http://refuges.fws.gov/policymakers/nwrpolicies.html.

In developing a CCP, a refuge must consider these broader laws and policies as well as Refuge System and ecosystem goals and visions. The CCP must be consistent with these and also with the refuge purpose.

Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3)

Section 4(a)(4)(B) of the Refuge Improvement Act states, "in administering the [NWRS], the Secretary shall…ensure that the biological integrity, diversity, and environmental health of the [NWRS] are maintained for the benefit of present and future generations of Americans." This legislative mandate represents an additional directive to be followed while achieving refuge purposes and the NWRS mission. The Act requires the consideration and protection of a broad spectrum of fish, wildlife, plant, and habitat resources found on a refuge. Service policy guiding implementation of this statutory requirement provides a refuge manager with an evaluation process to analyze his/her refuge and recommend the best management direction to prevent further degradation of environmental conditions and, where appropriate, and in concert with refuge purposes and NWRS mission, to restore lost or severely degraded resource components. Within the Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3[3.7B]), the relationships among biological integrity, diversity, and environmental health; NWRS mission; and refuge purposes are explained as follows: "each refuge will be managed to fulfill refuge purpose(s) as well as to help fulfill the [NWRS] mission, and we will accomplish the purpose(s) and our mission by ensuring that the biological integrity, diversity, and environmental health of each refuge are maintained and where appropriate, restored."

When evaluating the appropriate management direction for refuges, refuge managers will use sound professional judgment to determine their refuge's contribution to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, an understanding of the refuge's role within an ecosystem, and the knowledge of refuge resources, applicable laws, and best available science, including consultation with resource experts both inside and outside the Service.

The priority public uses of the NWRS are not in conflict with this policy when they have been determined to be compatible. The directives of this policy do not envision or necessitate the exclusion of visitors or the elimination of visitor use structures from refuges; however, maintenance

and/or restoration of biological integrity, diversity, and environmental health may require spatial or temporal zoning of visitor use programs and associated infrastructures. General success in maintaining or restoring biological integrity, diversity, and environmental health will produce higher-quality opportunities for providing wildlife-dependent recreational uses.

Feral Horse and Burro Policy (7 RM 6)

6.2 Policy. It is the policy of the Service that feral horse and burro populations will not be maintained on Sheldon, Hart Mountain, and Kofa National Wildlife Refuges. Feral horses and burros on these refuges will be removed in accordance with the provision of 50 CFR 30.12 and Section 6.9, below.

6.9 On Sheldon, Hart Mountain, and Kofa National Wildlife Refuges, the preferred methods of control are biological control or live capture. If neither is feasible, surplus animals may be destroyed, provided the methods are approved by the regional director. All control activities will be conducted as humanely as possible.

Exotic Species Policy (7 RM 8)

8.1 Policy. The National Wildlife Refuge System exists for the protection and management of plants and animals native to the United States. The policy of the Service is to prevent further introduction of exotic species on national wildlife refuges except where and exotic species would have value as a biological control agent and would be compatible with the objectives of the refuge. The continued existence, or management of exotic plants and animals on refuge lands will be permitted only if:

> A. An exotic species has become established and its elimination, while desirable, is no longer practicable, or
>
> B. An exotic species has become established and maintained on a non-augmented basis for at least 25 years and does not conflict with refuge objectives.

Wilderness Stewardship Policy (610 FW 1)

This policy provides guidance on administrative and public activities on wilderness areas, proposed wilderness areas, and wilderness study areas within the NWRS. The purpose of the policy is to provide "an overview and foundation for implementing the Wilderness Act and the National Wildlife Refuge System Administration Act of 1966, as amended (Administration Act)" (610 FW 1 1.1A). The policy states that we will manage proposed wilderness areas as if they were designated wilderness (610 FW 1 1.5T).

1.4 What are the priorities in implementing this policy? We will consider three main priorities in the following order when administering refuge wilderness areas: The Administration Act, the Endangered Species Act, and the Wilderness Act. We initially determine what needs to be accomplished to meet refuge purposes, then ensure that these activities comply with the Endangered Species Act, and then ensure that these activities comply with the Wilderness Act.

1.14 What are the principles for administering wilderness? We observe five key principles in administering wilderness:

A. Accomplish Administration Act purposes, refuge purposes, including Wilderness Act purposes, and the Refuge System mission. The Administration Act, refuge purposes, and Wilderness Act purposes tell us what to accomplish on a refuge. The Wilderness Act, however, may affect how we accomplish these purposes and the Refuge System mission.

B. Secure "an enduring resource of wilderness" by maintaining and, where appropriate, restoring, a wilderness area's biological integrity, diversity, environmental health, and wilderness character.

C. Administer wilderness areas to provide a wide variety of public benefits "for the use and enjoyment of the American people" (Wilderness Act, section 2(a)) in a manner that is appropriate and compatible with the Administration Act, refuge purposes, including Wilderness Act purposes, and the Refuge System mission; retains wilderness character; is consistent with the nondegradation principle; and leaves the areas "unimpaired for future use and enjoyment as wilderness."

D. Use restraint in our administration of wilderness. As a place "where the earth and its community of life are untrammeled by man," we minimize actions for administration of wilderness areas. We may allow exceptions to the generally prohibited uses if the uses are the minimum requirement for administering the area as wilderness and are necessary to accomplish the purposes of the refuge, including Wilderness Act purposes. We may limit even nonmotorized refuge management activities to protect wildness.

E. Provide opportunities for primitive recreation, giving priority to compatible wildlife-dependent activities that are enhanced by a wilderness setting. Provide physical, social, and administrative settings that are conducive to experiencing opportunities for solitude, adventure, challenge, inspiration, and other aspects of wilderness character that the American people can use and enjoy.

1.16 What activities does the Service prohibit in wilderness?

A. Section 4(c) of the Wilderness Act prohibits commercial enterprises and permanent roads within wilderness, except as specifically provided by legislation and subject to existing private rights. Section 4(d)(6) of the Wilderness Act, however, allows commercial services in wilderness, but only when they are "necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas." We may allow commercial services, such as outfitter and guide services, in wilderness where they are necessary to accomplish the purposes of the refuge, including Wilderness Act purposes. (See 610 FW 2 for more information about what we allow and prohibit in wilderness.)

B. Section 4(c) of the Wilderness Act also lists a number of generally prohibited uses in wilderness, subject to existing private rights:

(1) "[E]xcept as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area."

(2) We may allow exceptions to the generally prohibited uses for refuge management activities if the prohibited uses are the minimum requirement for administering the area as wilderness and are necessary to accomplish the purposes of the refuge, including Wilderness Act purposes. (See section 1.18.)

C. Area-specific wilderness legislation may permit uses that the Wilderness Act generally prohibits, and we comply with the provisions of those laws.

1.18 How does the Service determine if a proposed refuge management activity is the minimum requirement for administering the area as wilderness and necessary to accomplish the purposes of the refuge, including Wilderness Act purposes? We conduct and document a minimum requirement analysis (MRA) for all proposed refuge management activities that involve a generally prohibited use (also see section 1.19). The MRA clarifies the need for and impacts of a proposed action. We authorize an activity only if we demonstrate that it is necessary to meet the minimum requirement for administering the area as wilderness and necessary to accomplish the purposes of the refuge, including Wilderness Act purposes.

A. We identify and analyze alternative ways to accomplish refuge purposes, including Wilderness Act purposes, in order to determine whether the proposed refuge management activity is necessary and to identify the techniques that will minimize impacts to the wilderness resource. At a minimum, we evaluate the impacts of:

(1) An alternative where we take no management action,

(2) An alternative allowing no generally prohibited uses, and

(3) Alternative(s) to conduct the activities inside the wilderness and outside the wilderness.

B. We consider the full range of wilderness values and character when evaluating the alternatives. These values include the undeveloped and untrammeled natural condition of wilderness, cultural resources, outstanding opportunities for solitude, the potential for the public to have a primitive and unconfined type of recreational experience, and other components of wilderness character.

C. We consider the direct impacts of the proposed refuge management activity under each of the alternatives. We also consider the indirect impacts associated with the action and the cumulative impacts of the action when it is conducted in conjunction with other existing or planned uses or actions within or adjacent to and affecting the wilderness areas. Under the nondegradation principle, the conditions prevailing in an area at the time of wilderness designation establish a benchmark for assessing the significance of a proposed action's beneficial and adverse impacts on wilderness character.

D. Our refuge management activities preserve wilderness character and only rarely involve generally prohibited uses. The alternative that has the least impact on the area's wilderness character, including intangible aspects of wilderness character, and accomplishes refuges purposes, including wilderness purposes, constitutes the minimum requirement. We do not use cost or convenience as a factor in determining the minimum requirement or minimum tool. We use primitive tools when possible.

Appropriate Use Policy (603 FW 1)

1.4 What are the objectives of this chapter?

A. Refuges are first and foremost national treasures for the conservation of wildlife. Through careful planning, consistent Refuge Systemwide application of regulations and policies, diligent monitoring of the impacts of uses on wildlife resources, and preventing or eliminating uses not appropriate to the Refuge System, we can achieve the Refuge System conservation mission while also providing the public with lasting opportunities to enjoy quality, compatible, wildlife-dependent recreation.

B. Through consistent application of this policy and these procedures, we will establish an administrative record and build public understanding and consensus on the types of public uses that are legitimate and appropriate within the Refuge System.

A. Appropriate Use.
A proposed or existing use on a refuge that meets at least one of the following four conditions.

(1) The use is a wildlife-dependent recreational use as identified in the Improvement Act.

(2) The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.

(3) The use involves the take of fish and wildlife under State regulations.

(4) The use has been found to be appropriate as specified in section 1.11.

1.8 What is the relationship between appropriateness and compatibility? This policy describes the initial decision process the refuge manager follows when first considering whether or not to allow a proposed use on a refuge. The refuge manager must find a use is appropriate before undertaking a compatibility review of the use. This policy clarifies and expands on the compatibility policy (603 FW 2.10D(1)), which describes when refuge managers should deny a proposed use without determining compatibility. If we find a proposed use is not appropriate, we will not allow the use and will not prepare a compatibility determination. By screening out proposed uses not appropriate to the refuge, the refuge manager avoids unnecessary compatibility reviews. By following the process for finding the appropriateness of a use, we strengthen and fulfill the Refuge System mission. Section 1.11 describes the appropriateness finding process. Although a refuge use may be both appropriate and compatible, the refuge manager retains the authority to not allow the use or modify the use. For example, on some occasions, two appropriate and compatible uses may be in conflict with each other. In these situations, even though both uses are appropriate and compatible, the refuge manager may need to limit or entirely curtail one of the uses in order to provide the greatest benefit to refuge resources and the public. See the compatibility policy (603 FW 2.11G) for information concerning resolution of these conflicts.

Compatibility Policy (603 FW 2)

Lands within the NWRS are different from other multiple-use public lands in that they are closed to all public uses unless specifically and legally opened. The Refuge Improvement Act states that “the Secretary shall not initiate or permit a new use of a Refuge or expand, renew, or extend an existing use of a [refuge], unless the Secretary has determined that the use is a compatible use and that the use

is not inconsistent with public safety." The Refuge Improvement Act also states that "compatible wildlife-dependent recreational uses [hunting, fishing, wildlife observation and photography, or environmental education and interpretation] are the priority general public uses of the [NWRS] and shall receive priority consideration in [refuge] planning and management."

In accordance with the Refuge Improvement Act, the Service has adopted a Compatibility Policy (603 FW 2) that includes guidelines for determining if a use proposed on a national wildlife refuge is compatible with the purposes for which the refuge was established. A compatible use is defined in the policy as a proposed or existing wildlife-dependent recreational use or any other use of an national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the NWRS mission or the purposes for which the refuge was established and contributes to the maintenance of biological integrity, diversity, and environmental health. The policy also includes procedures for documentation and periodic review of existing refuge uses.

The Compatibility Policy does not apply to overflights above a refuge or to activities authorized, funded, or conducted by a Federal agency (other than the Service) that has primary jurisdiction over a refuge or portion of a refuge, if the management of those activities is in accordance with a Memorandum of Understanding between the Secretary or the Director and the head of the Federal agency with primary jurisdiction over the refuge governing the use of the refuge.

The first step in determining if a use is compatible is to determine if the use is appropriate (refer to previous discussion of 603 FW 1). If a use is not appropriate, the use is not further considered, and a compatibility determination is not required. If a use is determined to be appropriate, the Service must prepare a compatibility determination. When a determination is made as to whether a proposed use is compatible or not, this determination is provided in writing and is referred to as a compatibility determination.

An opportunity for public review and comment is required for all compatibility determinations. For compatibility determinations prepared concurrently with a CCP or step-down management plan, the opportunity for public review and comment is provided during the public review period for the draft plan and associated NEPA document. Appropriateness findings and the compatibility determinations prepared in association with this CCP/EIS are provided in Appendices C and D.

Appendix K. Planning Team Members and Work Experience

Name	Position (USFWS Start and End Dates)	CCP Roles and Responsibilities	Education	Experience
Gail Collins	Complex Supervisory Wildlife Biologist (April 2007-present)	Affected environment for wildlife, water resources; environmental consequences; Wilderness Minimum Tool Analysis review	M.S. Wildlife Biology	Wildlife biology 15 years
Aaron Collins	Complex Park Ranger (July 2009-present)	Lead planner; affected environment for public uses; environmental consequences for public uses, cultural resources; wilderness review; Wilderness Minimum Tool Analysis	B.S. Natural Resource Science	Conservation planning 10 years, outdoor recreation management 8 years, wilderness management 5 years, botany 2 years
Brian Day	Sheldon Refuge Manager (September 2006-present)	Facilities, public use, fish and wildlife, habitat, compatibility determinations, wilderness inventory and study, environmental consequences	B.S. Wildlife Biology	Wildlife biology 6 years, refuge management 14 years
Andy Goheen	Complex Fire Management Officer (September 2006-September 2009)	Fire management, fire ecology, cultural resources	B.S. Environmental Management	Fire management 13 years, fire ecology 10 years, cultural resource management 8 years
Sue Goheen	Complex Natural Resource Planner (September 2006-July 2009)	CCP team lead, wilderness inventory and study, soils, geology	B.S. Natural Resource Management, B.S. Soil Science	Soil science 21 years, biological and physical sciences 6 years, natural resource planning 3 years, recreation management 1 year
Damien Miller	Deputy Project Leader, Project Leader (acting) (January 2010-present)	Refuge management alternatives	M.S. Wildlife Science, B.S. Wildlife Management	Supervision 12 years, project management 12 years, habitat management 6 years, wildlife research 6 years, Endangered Species Act 5 years, National Environmental Policy Act 1 year

Name	Position (USFWS Start and End Dates)	CCP Roles and Responsibilities	Education	Experience
Betsy Schenk	Complex Fire Management Officer (March 2010-present)	Fire management, fire ecology, Wilderness Minimum Tool Analysis review	B.S. Supervision, B.S. Wildlife and Forest Management	Wildland fire 18 years, fuels management 9 years
Paul Steblein	Complex Project Leader (September 2006-October 2010)	Management alternatives, feral horses and burros	M.S. Biology, B.S. Wildlife Science	Refuge Management 7 years, wildlife biology 3 years, wildlife research 9 years

Appendix L. Recreation Opportunity Spectrum Setting Criteria

Adapted from the U.S. Forest Service 1982 ROS Users Guide

Remoteness Criteria*

Primitive	Semi-Primitive Non-Motorized	Semi-Primitive Motorized	Roaded Natural	Rural	Urban
At least 3 miles from all roads or trails with motorized use	½-3 miles from all roads or trails with motorized use	Within ½ mile of primitive roads or trails with motorized use	Within ½ mile of improved roads	No distance criteria	No distance criteria

*Natural barriers, screening, and other features can be used to modify these criteria.

Evidence of Humans

Primitive	Semi-Primitive Non-Motorized	Semi-Primitive Motorized	Roaded Natural	Rural	Urban
Setting is essentially an unmodified natural environment; evidence of humans is not noticeable to the casual observer or visitor	Setting may have subtle modifications that are noticeable but do not draw the attention of the casual observer	Setting may be moderately altered, but alterations would not draw the attention of motorized observers	Modifications to the environment range from easily noticeable to dominating the setting, but are generally not noticeable from more primitive setting areas	Human modifications dominate the setting, but most are primarily modifications to land use and appearance rather than constructed buildings and features	Setting is dominated by the influence of human use and activity and is almost entirely altered from its natural condition through development and construction
Structures are extremely rare	Structures are rare and isolated	Structures are rare and isolated	Structures are generally scattered, remaining visually subordinate or unnoticed to the casual observer; structures may include power lines, cell phone towers, etc.	Structures are readily apparent and may range from scattered to small, dominant clusters including power lines, cell phone towers, ski areas, and recreation sites	Structures dominate the setting and include major building complexes, towns, industrial sites, and large resort developments

Social Setting*

Primitive	Semi-Primitive Non-Motorized	Semi-Primitive Motorized	Roaded Natural	Rural	Urban
Usually less than 6 parties per day encountered on trails and less than 3 parties visible from campsites	Usually 6-15 parties per day encountered on trails and 6 or fewer parties visible from campsites	Frequency of contact with other visitors low to moderate	Frequency of contact with other visitors moderate to high on roads, but low to moderate on trails and away from roads	Frequency of contact with other visitors moderate to high in and around developed sites, but moderate away from developed sites	Frequent contact with other visitors; large number of users on-site and in nearby areas

*Criteria apply during the typical use season. Peak use days or seasons may exceed these limits.

Managerial Setting

Primitive	Semi-Primitive Non-Motorized	Semi-Primitive Motorized	Roaded Natural	Rural	Urban
Control* and regulation of visitor use is primarily off-site; few or no on-site controls apparent	On-site control of visitor use present but subtle	On-site control of visitor use present but subtle	On-site control of visitor use noticeable but in harmony with the natural environment	On-site control of visitor use obvious and numerous but largely in harmony with the constructed environment	On-site control of visitor use obvious and numerous

*Controls may be physical (i.e., barriers) or regulatory (i.e., permits).

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Pronghorn antelope
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