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Management Guidelines for Sage Grouse and Sagebrush Ecosystems in Nevada

Bureau of Land Management

MANAGEMENT GUIDELINES

for

SAGE GROUSE

and

SAGEBRUSH ECOSYSTEMS

in NEVADA

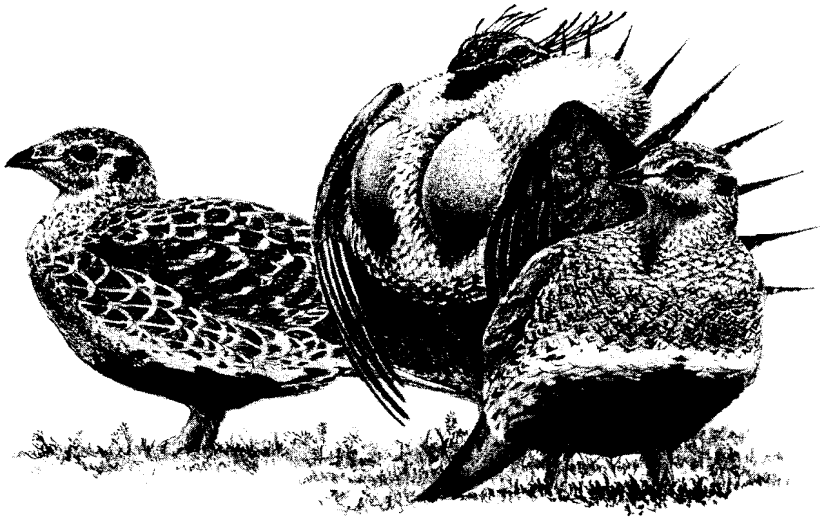

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Table of Contents

INTRODUCTION

These management guidelines and supportive background information promote the conservation of sage grouse (*Centrocercus urophasianus*) and their sagebrush (*Artemisia spp*) habitats on Nevada public lands administered by Bureau of Land Management (BLM). The guidelines are intended to provide interim guidance to field managers, without restricting options currently being explored for regional, state, and local sage grouse/sagebrush conservation planning.

The guidelines are a Nevada BLM, habitat-specific, adaptation of the recently updated, and soon to be finalized, Western Association of Wildlife Agencies (WAFWA) Draft Guidelines. The Nevada BLM guidelines apply the most current sage grouse science to BLM activities, within the context of a multiple use mandate.

Sage grouse populations have exhibited long-term declines throughout North America, declining by 33 percent over the past 30 to 40 years (Braun 1998). The species is extirpated in five states and one Canadian province, and is at risk in six other states and two Canadian provinces. Even in the five Western states where the species is considered to be secure, long-term population declines have averaged 30 percent (Connelly and Braun 1997, Crawford and Lutz 1985). No single causal factor has been identified for these declines. Rather, an accumulation of factors described herein are responsible.

Existing guidance with direct bearing on these guidelines include:

BLM National Special Status Species Policy (BLM 6840 Manual)
This policy states that BLM shall ensure that actions authorized, funded, or carried out do not contribute to the need to list a species under the provisions of the Endangered Species Act.

Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in the Sierra Front/Northwestern Great Basin RAC Area
Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in the Northeastern Great Basin RAC Area
Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in the Mojave/Southern Great Basin RAC Area

Western Association of Fish and Wildlife Agencies *Draft Guidelines for Management of Sage Grouse Populations and Habitats* (Appendix I). This document is a soon-to-be finalized update of a document which was first issued in 1977. The BLM, along with the Forest Service (FS) and the Fish and Wildlife Service (FWS) recently signed an agreement to consider the WAFWA guidelines in their respective planning efforts. The Nevada BLM guidelines have been developed to be consistent with the WAFWA guidelines, recognizing that generally lower moisture regimes prevail throughout the majority of Nevada's sagebrush ecosystem.

Matters related to falconry, predator control, and hunting are not the purview of the BLM but are instead administered by other federal or state agencies. These management guidelines are intended to apply only to BLM-administered activities on public lands.

Sage Grouse Life History

OVERVIEW

The sage grouse breeding season begins in mid-March when the males start to congregate on the leks. In Nevada, breeding activities typically occur from March through mid-May. Leks are the breeding or strutting grounds. Females come to the leks to mate. They generally nest in the vicinity. A high proportion of nests are located within 6.2 km (4 mi.) of the lek when suitable nesting habitat exists. However, some studies have shown that female sage grouse or hens nest as far as 20 km (12 mi.) away from the lek (Autenrieth 1981,Wakkinen et al. 1992). After hatching, the hen and her brood stay in the general vicinity of the nest for 1 or more weeks. For the first 3 to 4 weeks after hatching, chicks feed primarily on insects, which provide the high protein diet needed for rapid growth. As the season and plant phenology progress, hens will move their broods to higher elevation or more moist habitats, such as meadows, where higher quality foods are available.

Forbs, such as yarrow and dandelion, are an important food source to sage grouse. As forbs mature and dry out and insect availability declines with the advance of summer, the sage grouse diet includes more sagebrush leaves and buds. During late fall, sage grouse feed almost exclusively on sagebrush and continue to feed on sagebrush throughout the winter until forbs reappear the following spring. Because of their dependence on sagebrush, the birds are commonly referred to as sagebrush obligates. For this reason, there is much concern over the condition and distribution of sagebrush habitats.

REPRODUCTION

Sage grouse generally have lower reproductive rates and higher annual survival rates than other species of upland game birds such as quail and partridge (Connelly and Braun 1997). They also live longer than most upland gamebird species–individual birds 4 to 5 years old are common. Annual reproductive success varies throughout the species' range (Gregg 1991, Wallestad and Pyrah 1974).

NESTING RATES

Nesting rates vary from year to year and from area to area (Schroeder 1997, Connelly et al. 1993, Gregg 1991, Bergerud 1988, Coggins 1998). This variation is most likely a result of available nutrition quality and the general health of pre-laying females (Barnett and Crawford 1994). At least 70 percent of the females in a population will initiate a nest each year. Higher nest initiation rates were recorded during years of higher precipitation as compared to nest initiation rates during periods of drought (Coggins 1998). Renesting rates by females who have lost their first clutch are 10 to 40 percent--far lower than that of other upland game birds (Connelly et al. 1993, Patterson 1952, Eng 1963, Petersen 1980, Bergerud 1988). Renesting may do little to increase overall population numbers.

NEST SUCCESS

Nest success of sage grouse also varies by area and year. Of all the birds that nest, 10 to 86 percent produce chicks (Trueblood 1954, Gregg 1991, Connelly et al. 1993, Schroeder 1997). Adult females may experience higher success rates than yearling females (Wallestad and Pyrah 1974), a characteristic that may be related to past nesting experience.

CLUTCH SIZE

Clutch (a nest of eggs) size of sage grouse is variable and relatively low as compared to other species of game birds (Edminster 1954, Schroeder 1997). Clutch size per nest normally ranges from seven to ten eggs (Connelly unpublished data, Schroeder 1997, Wakkinen 1990). These differences may be related to habitat quality and overall condition of pre-laying females (Coggins 1998).

SURVIVAL RATES

Annual survival rates for yearling and adult female sage grouse vary from 35 percent to 85 percent; male survival rates vary from 38 percent to 54 percent (Wallestad 1975, Zablan 1993, Connelly et al. 1994). Lower survival rates for males may be related to higher predation rates on males during the lekking season (Swenson 1986).

A stable sage grouse population is largely dependent on the level of production of young, clutch size, nest success, chick survival, and adult survival. Among western states, long-term juvenile to hen ratios have varied from 1.40 to 2.96 juveniles per hen in the fall. In recent years, this ratio has declined to 1.21 to 2.19 juveniles per hen. Research suggests that at least 2.25 juveniles per hen should be present in the fall population to allow for stable to increasing sage grouse populations (Connelly and Braun 1997, Edelmann et al. 1998, Compton and Connelly unpub. data).

Sage Grouse Habitat Requirements

SEASONAL MOVEMENTS AND HOME RANGE

Sage grouse populations can be migratory or nonmigratory (resident) (Berry and Eng 1985, Connelly et al.1988, Wakkinen 1990, Fischer 1994, Beck 1975, Wallestad 1975), depending on location and associated land form. Where topographic relief allows, sage grouse will generally move up in elevation from spring through fall as snow melt and plant growth advance. Nonmigratory or "resident" populations may spend the entire year within an area 100 km^2 (38.61 $mi.^2$) or less in size. In migratory populations, seasonal movements may exceed 75 km (46.5 mi.) (Dalke et al. 1963, Connelly et al. 1988) and home ranges may exceed 1,500 km^2 (579 $mi.^2$) (Connelly unpub. data). There may be two or more seasonal ranges in such cases. For example, there may be a breeding range, a brood-rearing range, and a winter range, indicating that migratory sage grouse populations depend on large expanses of habitat.

To accommodate these habitat needs, sage grouse movement patterns and seasonal ranges must be identified before any management actions such as vegetation treatment projects are planned. Large expanses of suitable habitat are needed to allow for connectivity between the different resident populations. Connectivity promotes genetic exchange and reduces complications that may arise from inbreeding.

BREEDING HABITATS (March through May)

Sage grouse breed on sites called leks or strutting grounds. Generally, the lek sites are traditional, that is, the same lek sites are used year after year. They are established in open areas surrounded by sagebrush, which is used for escape and protection from predators (Patterson 1952, Gill 1965). Examples of lek sites include landing strips; old lake beds or playas; low sagebrush flats; openings on ridges, roads and crop land; and burned areas (Connelly et al. 1981, Gates 1985). As grouse populations decline, the number of males attending leks may decline, or the use of some leks may be discontinued. Likewise, as populations increase, male attendance on leks increases, new leks may be established, or old leks may be re-occupied. New leks may be established when natural or prescribed disturbances result in suitable lek habitat in sage grouse range. Annual counts of males on leks are used to assess population trends.

The lek is considered to be the center of year-round activity for resident sage grouse populations (Eng and Schladweiler 1972, Wallestad and Pyrah 1974, Wallestad and Schladweiler 1974). However, habitats that are located long distances from the leks are used by migratory populations of sage grouse and are essential to their survival (Connelly et al.1988, Wakkinen et al.1992). On the average, most nests are located within 6.2 km (4 miles) of the lek; however, some females or hens may nest more

than 20 km (12 mi.) away from the lek (Autenrieth 1981, Wakkinen et al.1992, Fischer 1994, Hanf et al. 1994).

Habitats used by pre-laying hens are also part of the general breeding habitat. These areas provide forbs that are high in calcium, phosphorus, and protein, all of which are necessary for egg production. The condition and availability of these areas are thought to have noticeable effects on reproductive success (Barnett and Crawford 1994, Crawford pers. comm.).

Most sage grouse nests are located under sagebrush plants (Patterson 1952, Gill 1965, Gray 1967, Schroeder et al. 1999, Wallestad and Pyrah 1974); however, nests have been found under other plant species (Connelly et al. 1991, Gregg 1991). Sage grouse that nest under sagebrush experience higher nest success (53 percent) than those nesting under other plant species (22 percent) (Connelly et al. 1991). Studies on sage grouse nesting habitat have found that sage grouse tend to select nest sites under sagebrush plants that have large canopies. The canopies provide overhead cover and often correlate with an herbaceous (primarily tall grasses) understory, which provides lateral cover and assists birds in hiding from predators (Patterson 1952, Gray 1967, Klebenow 1969, Wallestad and Pyrah 1974, Wakkinen 1990, Fischer 1994, Gregg 1991, Gregg et al. 1994, Delong et al. 1995). Hens nesting in these cover conditions experience higher nest success rates than those nesting under inferior cover conditions (Wallestad and Pyrah 1974, Gregg et al.1994, Delong et al. 1995).

When considered on a range-wide basis, optimum sage grouse nesting habitat generally consists of sagebrush plants 40 to 80 cm (16 to 32 in.) tall with a canopy cover ranging from 15 percent to 25 percent in the stand, and an herbaceous understory of at least 15 percent grass canopy cover and 10 percent forb canopy cover that is at least 18 cm (7 in.) tall. Ideally, these vegetative conditions should be on 80 percent of the breeding habitat for any given population of sage grouse, although optimum canopy cover may vary with the specific vegetation type. Winward (1991) found that herbaceous cover associated with potential nest sites, and sage grouse habitat in general, could be limited by excessive shrub canopy cover. Winward's results indicate when shrub canopy cover exceeded 15 percent in Wyoming big sagebrush vegetation type, and 20 percent in basin/mountain big sagebrush vegetation type, that grass and forb cover could decrease because of competition with shrubs. So, it is important to note the general range-wide cover descriptions may not be attainable or provide optimal sage grouse nesting habitat in all sagebrush vegetation types.

BROOD-REARING HABITATS (April through August)

Early brood-rearing generally occurs close to nest sites; however, movements of individual broods may be highly variable (Connelly 1982, Gates 1983). When considered on a range-wide basis, optimum brood-rearing habitat consists of sagebrush stands that are 40 to 80 cm (16 to 32 in.) tall with a canopy cover of 10 percent to 25 percent and an herbaceous understory of 15 percent grass canopy and 10 percent forb canopy. Ideally, this type of habitat will be found on at least 40 percent of the area that is considered brood-rearing habitat. Hens with broods will use sagebrush habitats that have less canopy cover (about 14 percent) than that provided in optimum nesting habitat (Martin 1970, Wallestad 1971), but need a canopy cover of at least 15 percent of grasses and forbs (Sveum et al. 1998). Optimum canopy cover within brood-rearing habitat is specific to each vegetation type and range-site potential. Chick diets include forbs and invertebrates (Drut et al.. 1994). Insects, especially ants and beetles, are an important component of early brood-rearing habitat (Drut et al. 1994, Fischer et al.1996a). Brood-rearing habitats having a wide variety of plant species tend to provide an equivalent variety of insects that are important chick foods. Hens with broods tend to select these types of areas.

In June and July, as sagebrush habitats dry up and herbaceous plants mature, hens usually move their broods to moister sites where more succulent vegetation is available (Gill 1965, Klebenow 1969,

Savage 1969, Gates 1983, Connelly and Markham 1983, Connelly et al. 1988, Fischer et al. 1996b). Examples of such habitats include black sagebrush and low sagebrush (*A. nova and A. arbuscula*) and wet meadows (Savage 1969, Martin 1970, Connelly and Markham 1983, Gates 1983, Connelly et al. 1988). Where available, alfalfa fields and other farmlands or irrigated areas adjacent to sagebrush habitats are often used by sage grouse. However, these habitat types are not uniformly distributed throughout the range of sage grouse in Nevada. Sage grouse broods use a variety of habitats from summer though fall. Generally, these habitats are characterized by relatively moist conditions and many succulent forbs in or adjacent to sagebrush cover. These habitats include sagebrush, meadows and riparian areas, and agricultural lands. Optimum habitat contains a mosaic of these land types that includes at least 40 percent of the area in sagebrush stands that are 40-80 cm (16 to 32 in.) tall with a canopy cover of 10 to 20 percent (less than 25 percent total shrub cover) and an herbaceous understory of 15 percent grass canopy cover and 10 percent forb canopy cover (Gregg et al., 1994).

WINTER HABITATS (October through March)

As fall progresses toward winter, sage grouse move toward their winter ranges, at which time their diet shifts primarily to sagebrush leaves and buds (Patterson 1952, Connelly and Markham 1983, Connelly et al. 1988, Wallestad 1975). Exact timing of this movement varies depending on the sage grouse population, geographic area, overall weather conditions, and snow depth.

Sage grouse winter habitats are relatively similar throughout most of their range. Winter habitats must provide adequate amounts of sagebrush because their winter diet consists almost exclusively of sagebrush. Sagebrush canopy can be highly variable (Patterson 1952, Eng and Schladweiler 1972, Wallestad et al. 1975, Beck 1977, Robertson 1991). Sage grouse tend to select areas with both high canopy and taller Wyoming big sagebrush (*A. t. wyomingensis*), and they will feed on plants which are highest in protein content (Remington and Braun 1985, Robertson 1991). It is crucial that sagebrush be exposed at least 25 to 30 cm (10 to 12 in.) above snow level as this provides both food and cover for wintering sage grouse (Hupp and Braun 1989). If snow covers the sagebrush, the birds will move to areas where sagebrush is exposed. Therefore, good winter habitat consists of sagebrush with 10 to 30 percent canopy cover on 80 percent of the wintering area.

Current Sage Grouse Situation

STATUS

Approximately 220 million acres of sagebrush vegetation types existed in North America (McArthur and Ott 1996), making it one of the most widespread habitats in the country. Much of this habitat, has been lost or degraded over the last 100 years.

According to Connelly and Braun (1997) and Crawford and Lutz (1985), sage grouse populations have exhibited long-term declines throughout North America, declining by 33 percent over the past 30 to 40 years. Sage grouse are extirpated in Arizona, New Mexico, Oklahoma, Kansas, Nebraska, and British Columbia and are at risk in Washington, California, Utah, Colorado, North Dakota, South Dakota, and in the Canadian provinces of Alberta and Saskatchewan. In Oregon, Nevada, Idaho, Wyoming, and Montana, long-term population declines have averaged 30 percent since 1950.

THREATS TO THE SPECIES

Numerous activities have adversely impacted, and continue to have the potential to adversely impact, the distribution and quality of sage grouse and their habitat. Additionally, natural events and human response to these events may have a direct impact on sage grouse and their habitat. A table which lists possible statewide threats to the species is located in Appendix III.

Rangeland conversion – Mechanical treatments (mowing, plowing, chaining) of sagebrush have generally been more local in nature, but are known to adversely impact sage grouse habitat if done on a broad scale (Swensen et al. 1987). Even small-scale projects to reduce sagebrush can be damaging if conducted in the wrong location, such as winter habitat.

Livestock management – Various livestock management practices have altered sage grouse habitat over the past century. Livestock facilities such as spring developments, water pipelines, and fencing distribute livestock use over areas that were sporadically or lightly used in the past. In many areas, grazing has contributed to long-term changes in plant communities and has reduced certain habitat components, such as biological crusts, which contribute to the health of sagebrush habitat (Mack and Thompson1982, Quigley and Arbelbide 1997, Wisdom et al. in press). Heavy, excessive grazing too soon after disturbances such as fire, may lead to permanent reductions in food plants and nesting cover. Current BLM policy provides for a minimum of two growing seasons for rest following fire. Temporary non-renewable use can result in excessive removal of grass and herbaceous nesting cover. Land treatments have included seedings which did not include sagebrush, native forbs, and grasses. This kind of seeding activity contributes to an increased dominance of non-native species, which are detrimental to sage grouse habitat.

Drought can lead to increased competition between livestock and sage grouse for food and cover. Drought will exacerbate the adverse effects of heavy, excessive livestock grazing on vegetation and soils (Valentine 1990). In some instances, the failure to make timely adjustments in livestock use during drought has resulted in limited plant regrowth, overuse in wet meadows and riparian areas, and has negated gains in rangeland conditions made during higher-precipitation years (Thurow and Taylor 1999).

Wildfire and prescribed fire – Fire has altered sage grouse habitat on the landscape in Nevada. Wyoming big sagebrush is very vulnerable to fire. Wildfires have reduced sagebrush acreage by greater than 50 percent in some areas of Idaho and Nevada (Sather-Blair pers. comm., Pulliam pers. comm.).

Repeated wildfires and the disturbance by livestock grazing has favored invasion by cheatgrass (*Bromus tectorum*) and other exotic species (Valentine 1990, Pellant 1990). Conversion to cheatgrass alters the fire frequency from the historic 32 to 70 years in sagebrush-steppe ecosystems to 5 years or less (Wright and others 1979). This scenario is referred to by Pellant (1996) as the cheatgrass-wildfire cycle. Risk from wildfire is very high and fire suppression efforts are challenged by very high spread rates. Therefore, the potential for large fires has increased, threatening adjacent areas not yet dominated by cheatgrass.

Prescribed fire has contributed to the decrease of Wyoming big sagebrush habitat, reducing sage grouse brood-rearing habitat (Connelly et al. 1994, Fischer et al. 1996a). With the cessation of herbicide use in the early 1980s, the use of fire to reduce sagebrush has increased. The *Federal Wildland Fire Management Policy and Program Review* (USDI and USDA 1995) indicates that, consistent with land and resource management plans, fire must be reintroduced into the ecosystem. In 1998, Congress established a budget for fuels management, enabling the increased use of prescribed fire and other fuel management practices to restore and maintain ecosystem health and reduce wildfire risk and losses.

Mountain big sagebrush (*A. t. vaseyana*) is highly susceptible to fire. Plants are readily killed in all seasons by even light intensity fires (Blaisdell et al. 1982). Moderately moist, or mesic, site conditions and patchy fuels may result in unharmed mountain big sagebrush plants or groups of plants within light and moderately severe burn areas. Whereas the normal mesic site conditions often preclude severe burns, severe wildfires are more likely to occur on steep, south slopes during hot, dry summers,

and on days with high wind. Such severe fires leave few, if any, unburned plants and consume most of the seed stored in the litter and upper soil. Mountain big sagebrush does not resprout. Regeneration following fire is from seed. Seedlings often re-establish readily and grow rapidly on light to moderate burns, and reproductive maturity may occur within 3 to 5 years. Preburn density and cover may be achieved in 15 to 20 years under favorable conditions (Hironaka et al. 1983).

Fire rehabilitation – The lack of prompt and appropriate fire rehabilitation following a wildfire can present additional threats to sage grouse habitat. The seed supply of native species is generally limited during extreme fire years when large areas burn. Although planting brush species is more common now than in the past, sagebrush may not always be included in fire rehabilitation seeding mixtures. Crested wheatgrass is often planted in lieu of native species, or as a mixture with native species because it can successfully compete with cheatgrass and help protect resources. If cheatgrass or any of a number of other exotic plant species are present before a fire, they are likely to become more dominant afterwards if the area is not properly rehabilitated.

Structures – Power lines, fences, roads, and urban development have an adverse impact on sage grouse habitat and their populations (Braun 1998). Power lines and fences provide perches for birds of prey and may actually cause direct mortality when sage grouse fly into them (Connelly pers. comm.). Urban development results in direct loss of sage grouse habitat due to habitat fragmentation.

Pinyon-Juniper expansion – Expansion of pinyon-juniper northward into the Great Basin occurred during the early-late Holocene (5,500 to 4,500 years BP) (Tausch 1999). Before settlement by Euro-Americans, pinyon pine (*Pinus monophylla*) and Utah Juniper (*Juniperus osteosperma*) existed in open, savannah-like woodlands that were maintained by relatively frequent fires, or were confined to rocky surfaces or ridges. These woodlands had an understory that included various sagebrush species. Increased livestock grazing in the late 1800s and early 1900s contributed to a reduction in fuels that could carry fire, thereby decreasing fire frequency (Eddleman et al.1994). Past fire suppression activities have also contributed to decreasing fire frequencies in all Great Basin ecosystems. In Nevada, pinyon-juniper woodlands are found over a wide range extending from upper fringes of the Mojave Desert to lower fringes of high mountain ranges.

The encroachment of pinyon-juniper on sagebrush communities may deteriorate existing habitat for sage grouse. Vegetation treatments improve habitat for sage grouse and other obligate species, such as the sage sparrow (*Amphispiza belli*) and brewer's sparrow (*Spizella breweri*). It is likely that the largest expansion of pinyon-juniper occured during the past 100 to 150 years, and the expansion continues today (Tausch et al. 1981, Tausch and West 1988).

The *Federal Wildland Fire Management Policy and Program Review* (USDI and USDA 1995) determined that wildland fire would be reintroduced into the ecosystem, allowing fire to function as nearly as possible as an ecological process on BLM lands in Nevada. This would allow for a balance between pinyon-juniper communities and other Great Basin vegetative types, benefitting sagebrush obligate species.

Non-native invasive plants – While cheatgrass proliferation has been widespread, increases in other exotic species such as medusahead (*Taeniatherum caput-medusae*), knapweed (*Centaurea* spp.) and yellow starthistle (*Centaurea solstitialis*) are also adversely impacting sagebrush habitat (Quigley and Arbelbide 1997). Many exotic plants are adapted to the Great Basin climate (Trewartha 1981 *in* Mack 1986, Young and others 1972 *in* Mack 1986). The rapid rate of expansion is partly attributable to the life history of exotic plants. Exotic plants are often opportunists, and many are pioneer, colonizing species. They are frequently one of the first species to arrive and colonize areas that have experienced soil-surface disturbance or areas that lack plant cover. Their establishment and spread are aided by disturbance to the soil surface (Baker 1986, Bazzaz 1986). Spotted knapweed (*C. maculosa*), yellow

starthistle, and leafy spurge (*Euphorbia esula*) have exhibited the ability to invade relatively undisturbed sites, including wilderness areas (Asher 1994, Tyser and Key 1988).

Wild horses and burros – Grazing has altered sage grouse habitat over the last century. In many areas, grazing contributed to long-term changes in plant communities and reduced certain habitat components such as biological crusts, which contribute to the health of sagebrush habitat (Mack and Thompson1982, Quigley and Arbelbide 1997, Wisdom et al. in press). Wild horses in Nevada are managed in 103 herd management areas (HMAs) that include approximately 15 million acres of public lands. As of July 2000, an estimated 24,000 wild horses and burros existed within the HMAs. The appropriate management level (AML) for horse/burro numbers in these areas is estimated to be approximately 14,000 animals.

The management goals for wild horses and burros are to manage them as components of the public lands and to manage them in a manner that preserves and maintains a thriving natural ecological balance in a multiple use relationship.

Sage Grouse/Sagebrush Ecosystem Management Guidelines

These management guidelines and supportive background information establish interim policy for the Bureau of Land Management in Nevada. The guidelines have been developed to be consistent with the WAFWA Guidelines within the inherent constraint of generally lower moisture regimes throughout the majority of Nevada's sagebrush ecosystem. Many Nevada sagebrush range sites may not have the potential to achieve the optimum sage grouse habitat conditions described in the WAFWA Guidelines. These guidelines will be incorporated, as appropriate to site specific conditions, into the long-term Sage Grouse/Sagebrush Ecosystem Conservation Assessment and Strategy Plan(s).

Throughout this document the terms *known habitat* and *potential habitat* are used. *Known habitats* are those habitats that are known to be currently occupied and used by sage grouse for breeding, nesting, brood-rearing or wintering. Knowledge of sage grouse occupancy is unknown for large expanses of sagebrush areas. *Potential habitat* refers to the kinds of land, land forms, and plant communities that may support or potentially support sage grouse during breeding, nesting, brood-rearing, or wintering. These habitats may be vitally important to sage grouse, but we lack information about sage grouse occupancy. BLM will treat all historical habitats (leks, breeding, brood-rearing and winter) as potential habitat unless BLM, in cooperation with the Nevada Division of Wildlife, determines that they no longer can function as sage grouse habitat and cannot be reasonably rehabilitated. It is important to maintain the historical baseline of sagebrush ecosystems.

Management guidelines described herein (concerning size of buffers, time frames, etc.) may be modified based on monitoring, site-specific local knowledge, professional judgement, or the need to protect/accommodate other resources.

GOAL

The goal of these management guidelines is to initiate actions that effectively promote the conservation of sagebrush habitats on BLM-administered public lands in Nevada. While these guidelines focus on conservation of sage grouse and their sagebrush habitats, conservation of sagebrush habitats needed by sage grouse will benefit a multitude of other sagebrush habitat species of concern (Wisdom et al. in press). Sage grouse are considered to be an umbrella species, so management of sagebrush ecosystems to meet the life cycle needs of sage grouse is expected to achieve sagebrush ecosystem health and sustainability and provide for the needs of other sagebrush obligate and associated species.

These guidelines will be implemented in concert with Nevada's allotment evaluation and multiple-use decision process established to implement the BLM Nevada standards and guidelines for rangeland health and other applicable laws, regulations, and policies. The guidelines represent the interpretation of the standards and guidelines as they apply to the management of uses affecting sage grouse habitats and sagebrush ecosystems.

These goals will also be implemented in concert with reclamation standards as described in *Final Guidelines for Successful Mine and Exploration Revegetation in Nevada.*

OBJECTIVES

The following objectives are intended as guidance for implementation of existing land-use plan activities and development of long-term conservation management plans. The objectives are applicable to sagebrush habitats in Nevada managed by BLM. Neither these objectives nor the guidelines derived from these objectives are intended to supercede the National Environmental Policy Act (NEPA) or any other applicable laws or regulations.

1. Identify and map, in cooperation with the Nevada Division of Wildlife, known sage grouse habitats.

2. Maintain and enhance known sage grouse habitats, paying particular attention to areas of high ecological integrity.

3. Minimize net loss of sage grouse habitat as a result of new actions authorized by BLM; minimize habitat losses resulting from natural disturbances (wildland fire, insects, disease, etc.).

4. Provide sage grouse habitats that are secure from direct human disturbance during the winter and breeding seasons (when birds are concentrated and susceptible to harassment).

5. Restore sage grouse habitats.

Management Actions

SPECIFIC GOALS

- Where possible, manage all historical habitat so that these habitats may one day be used again by sage grouse.

- Provide secure sage grouse breeding habitat with minimal disturbance and harassment.

- Maintain and improve existing leks or create sites suitable for additional leks.

- Manage sagebrush communities, based on best available science, to achieve optimal nesting habitat conditions within site potential to insure nesting and early brood-rearing success.

- Manage vascular and non-vascular plant communities and macrobiotic crusts to provide a diversity of high quality plant and insect food sources.

- Promote habitat conditions that support growth and survival of young sage grouse in late brood-rearing habitat.

- Maintain or improve known winter sage grouse habitat.

PROGRAM SPECIFIC GUIDELINES
Grazing – livestock, horses and burros, and wildlife

- Coordinate with livestock permittees to locate the placement of salt or mineral supplements appropriate distances from leks to avoid livestock concentrations and reduce the potential for harassment and displacement of birds during the breeding season.

- Designate livestock trailing routes, turnout locations, sheep bedding grounds/camp/sheep sheering facilities, and corral locations to ensure attainment of objectives for known sage grouse habitat. Evaluate existing livestock trailing routes and sheep bedding ground locations and make appropriate adjustments where such uses are precluding attainment of habitat objectives.

- Apply livestock grazing management to accomplish the four fundamentals of rangeland health, as described in the standards and guidelines: (1) watersheds are properly functioning, (2) ecological processes are in order, (3) water quality complies with state standards, and (4) habitats of protected species are in order, and to attain desired future condition objectives where applicable.

- Where grazing use by wildlife (e.g. elk, deer, antelope, etc.) is determined to be adversely affecting sage grouse populations or habitat, suggest appropriate adjustments to the Nevada Division of Wildlife.

- If it is determined through assessment/monitoring/observation that sage grouse habitat quality conditions (as described in the WAFWA guidelines and in relation to the specific site potential) are not being met, and livestock is determined to be a significant contributing factor, institute appropriate changes in grazing management prior to the next grazing year to ensure significant progress toward attainment of appropriate habitat objectives and the standards for rangeland health.

- During drought periods (i.e., a specified period of time in which the precipitation received is less than 75 percent of average) of two or more years, reduce stocking rates or change management practices for livestock if nesting cover and brood-rearing habitat requirements are not being met.

- Grazing in non-riparian sage grouse habitats should not exceed moderate use (see Appendix II, excerpted from Nevada Rangeland Monitoring Handbook, 1984, for a description of utilization levels) at the end of the growing season and throughout the dormant period. This applies to regularly authorized use, temporary non-renewable use (TNR), and grazing use during periods of drought and may be adjusted to lower levels as necessary to optimize nesting, brood rearing and winter habitat characteristics relative to site potential.

- Coordinate livestock use on wetland-riparian and streambank-riparian habitat to ensure known late season brood-rearing habitats are in optimal condition.

- Determine grazing use levels on that portion of the pasture which is known habitat. Grazing use levels should not be determined by "average use" throughout the entire pasture or grazing unit.

- Avoid supplemental winter feeding of livestock in known winter sage grouse habitat.

- Where wild horse and burro populations are adversely affecting the sage grouse population or habitat, evaluate herd populations and adjust numbers as necessary.

- Locate wild horse and burro capture facilities at appropriate distances from known sage grouse habitat to avoid adverse impacts to the habitat.

Range Improvement Projects

- Ensure that existing spring developments maintain, and new spring developments are designed and constructed to maintain, their free-flowing nature and wet meadow characteristics.

- Where necessary, modify existing water developments in cooperation with livestock permittees and other cooperators to restore natural ecological functions and processes at the source.

- Where necessary, modify, reconstruct, or relocate existing livestock facilities, in cooperation with livestock permittees, or other cooperators, to mitigate any adverse impacts to known sage grouse habitats.

- Install wildlife escape ramps in new water troughs. Retrofit existing troughs with wildlife escape ramps as needed.

- Construct new livestock facilities (livestock troughs, fences, corrals, handling facilities, "dusting bags", etc.) at appropriate distances from known sage grouse habitats based on WAFWA sage grouse management guidelines, and on site-specific conditions, to avoid concentration of livestock, collision hazards to flying birds, or avian predator hunting perches.

- Construct new livestock water developments outside of known sage grouse habitat unless it can be demonstrated that the development will not adversely affect the habitat.

- Consider off-site mitigation on a case-by-case basis in evaluating construction activities.

Vegetation Treatment

- Consider the habitat needs of sage grouse when planning vegetation treatments and maintenance projects.

- On all vegetation treatments, manage livestock for the long-term health of the vegetation community and the attainment of the treatment objectives.

- Vegetation treatments in areas highly susceptible to, or currently dominated by, cheatgrass should be accompanied by rehabilitation. Rehabilitation should include site preparation techniques and seed mixtures appropriate for the soils, climate, and landform of the area.

- Use appropriate vegetation treatment techniques to remove junipers/conifers that have invaded sage grouse habitat. Whenever possible employ vegetal control techniques that are least disruptive to the stand of sagebrush.

- Take appropriate precautions to minimize the possibility that noxious weed eradication activities directly impact sage grouse populations or affect sagebrush stands.

- Implement effective monitoring plans to determine the effectiveness of vegetation treatments.

- Develop and maintain cumulative records for all vegetation treatment projects to determine and evaluate site specific and cumulative impacts to sage grouse habitats and identify best management practices for successful vegetation treatments.

- Evaluate recent prescribed burns and wildfires to determine if rehabilitation is necessary to achieve habitat management objectives.

- Create sites suitable for leks where current leks are compromised by roads and other facilities.

- Use vegetation treatments to maintain or improve known habitats. Avoid vegetation treatments in known habitats when birds are present.

- When native plant species adapted to the site are available in sufficient quantities, and it is economically and biologically feasible to establish or increase them to meet management objectives, emphasize them over non-native species.

Recreational Use

- Identify conflict areas, assess the significance of impacts, and implement appropriate actions (e.g. emergency seasonal or area closures, educational programs to increase public awareness, etc.) as necessary to protect known sage grouse habitat.

- Construct new facilities (i.e., kiosks, toilets, signs, etc.) appropriate distances from known sage grouse habitats, based upon site-specific conditions and evaluation, to minimize disturbance to and displacement of birds and habitat loss and/or fragmentation.

- Limit development of new roads and trails to minimize impacts to known sage grouse habitat.

- Select sites, routes, and times for motor vehicle, OHV, competitive/commercial recreational events, etc., which minimize impacts to known breeding, nesting, brood-rearing and/or wintering habitat.

- Avoid the use of temporary horse corrals in riparian areas and meadows, and in known sage grouse habitat. Encourage use of pelleted feed or certified weed-free hay for horses to discourage the spread of noxious and invasive weeds.

- Plan and design the development of new recreational facilities to control recreational impacts to known sage grouse habitats and to riparian and wet meadow areas.

Lands and Realty

- Implement appropriate time-of-day and/or time-of year restrictions for future construction and/or maintenance activities in known sage grouse habitat to avoid adverse impacts.

- Wherever possible, locate new utility corridors a minimum 3.3 km (2 miles) from known sage grouse habitat, or appropriate distance based on site-specific conditions. Aerial structures should be modified to prevent avian predator perching or nesting.

- In evaluating land and realty actions, consider off-site mitigation on a case-by-case basis.

- In land exchanges or property transfer actions, consider such factors as: 1) loss or fragmentation of known or potential habitat 2) acquisition of equal or better quality habitat 3) consolidation of public lands for secure populations 4) direct impacts to sage grouse populations.

- Avoid authorizing rights-of-way that would result in significant habitat loss, habitat fragmentation, or population disturbance.

- Reseed all areas requiring reclamation with a seed mixture appropriate for the soils, climate, and landform of the area to ensure recovery of the ecological processes and habitat features of the potential natural vegetation, and to prevent the invasion of noxious weeds or other exotic invasive species.

- Work with existing rights-of-way holders in an attempt to install perch guards on all poles where existing utility poles are located within 3.3 km (2 miles) of known leks, where necessary. Stipulate these requirements at grant renewal.

- Authorize new rights-of-way at least 3.3 km (2 miles) or other appropriate distance (based on features such as type of project, topography, etc.) from leks.

- Use existing utility corridors and consolidate rights-of-way to reduce habitat loss, degradation, and fragmentation. Whenever possible, install new power lines within existing utility corridors. Otherwise, power lines should be located at least 3.3 km (2 miles) from breeding, nesting, brood-rearing and winter habitat.

- Allow land disposals in sage grouse habitats only if the land is identified as containing no known breeding, nesting, brood-rearing or winter habitat or where determined that those lands are not manageable as sage grouse habitat.

Energy and Minerals – locatable, leasable, salable
(*Leasable is oil, gas, and geothermal; salable is sand and gravel or common rock; and locatable is gold and silver.)*

- Avoid permitting or leasing energy or mineral-associated facilities or activities in known sage grouse habitat, as practicable (e.g. modifying location, implementing time-of-year and/or time-of-day restrictions, etc.)

- Reseed all areas requiring reclamation with a seed mixture appropriate for the soils, climate, and land form. Attempt to restore the ecological processes and potential natural vegetation, and prevent the invasion of noxious weeds or other invasive species.

- Consider the habitat needs of sage grouse when developing reclamation plans, as appropriate.

- Consider, on a case-by-case basis, off-site mitigation when evaluating energy and mineral activities.

- Avoid permitting or leasing mineral and energy-related activities within 3.3 km (2 miles)or other appropriate distance based on site-specific conditions, of leks, or within 1 km. (0.6 mi.) of known nesting, brood-rearing and winter habitat.

- For notices acknowledged under 43 CFR § 3809, inform the operator if the proposed exploration is within 3.3 km (2 miles) of known sage grouse habitat and make recommendations to avoid or mitigate potential impacts.

Fire Management

- Review district fire management plans annually, incorporate new sage grouse habitat information, and distribute to fire dispatchers for initial attack planning.

- Where practical, locate fire camps, staging areas, and helibases at least 1 km. (0.6 mile) away from known sage grouse habitat. Also, as part of any preparedness planning process, identify the possible location of these temporary facilities on a map.

- Ensure known sage grouse habitat information is incorporated into each Wildfire Situation Analysis to assist in determining appropriate suppression plans and prioritizing fires during multiple ignition episodes.

- Minimize the amount of sage grouse habitat burned:

    - Give wildfire suppression in sage grouse habitat appropriate consideration within the framework of the Federal Wildland Fire Policy (human life and safety as the first priority, with property and natural resources as equal second priorities) (USDI and USDA 1995).

    - Use direct attack when it is safe and effective.

    - Retain, if possible, unburned areas (including interior islands and patches between roads and the fire perimeter) of sage grouse habitat.

- When modifying water sources for the temporary purpose of fire suppression, ensure that all impacts are reclaimed as soon as practicable following fire suppression activities.

Emergency Fire Rehabilitation

- Evaluate all wildfires as soon as possible to determine if reseeding is necessary to recover ecological processes and achieve habitat objectives appropriate for the biological needs of sage grouse and prevent the invasion of noxious weeds or other exotic invasive species.

- Assure that long-term wildfire rehabilitation objectives are consistent with the potential natural vegetation community.

- Align long-term objectives for seedings with the habitat needs of sage grouse. Seedings should include an appropriate mix of grasses, forbs, and shrubs, including sagebrush, that will recover the ecological processes and habitat features of the potential natural vegetation. Emphasize native plant species when these species are adapted to the site, are available in sufficient quantities, and are economically and biologically feasible.

- Reseed all burned lands occurring in sage grouse habitat within 1 year unless natural recovery of the native plant community is expected.

Implementation Monitoring

Critical to BLM's success in meeting responsibilities and implementing these guidelines for the management of sage grouse habitat is the ability to measure and report on-the-ground results. Pursuant to this end, field offices, in cooperation with the Nevada Division of Wildlife, will maintain annual records of the following:

Baseline Information

- Total district acreage (# of acres)
- Known sage grouse habitat (acres)
- Total number of leks

Sage Grouse Monitoring

- Total number of leks (#)
- Number of leks surveyed (#)
- Estimated sage grouse population (#)

Grazing Monitoring (livestock, wild horses and burros, and wildlife)

- Number of allotments assessed for rangeland health (annual and cumulative #)
- Acres assessed for rangeland health (annual and cumulative # acres)
- Number of allotments meeting wildlife standard for sage grouse habitat
- Acres which meet wildlife standard for sage grouse habitat (annual and cumulative # acres)
- Number of allotments not meeting wildlife standard for sage grouse habitat - due to livestock (annual and cumulative #)

- Acres which do not meet wildlife standard for sage grouse habitat - due to livestock (annual and cumulative (# acres)
- Number of allotments not meeting wildlife standard for sage grouse habitat - other causes (annual and cumulative #)
- Acres which do not meet wildlife standard for sage grouse habitat - other causes (annual and cumulative # acres)
- Number of allotments where corrective action was taken (annual and cumulative #)
- Number of acres where corrective action was taken (annual and cumulative #)

Recreational Use

- Road or area closures required in known sage grouse habitat (# of roads and acres)
- New roads and trails restricted in known sage grouse habitat (# of roads and acres)
- Recreational permits that include restrictions for sage grouse habitat (# of permits)

Lands and Realty

- Land tenure adjustments involving sage grouse habitat (#)
- Net gain/loss of sage grouse habitat (# acres)
- Rights-of-ways authorized in known sage grouse habitat (#)
- Rights-of-ways authorized in known sage grouse habitat with restrictions (#)

Energy and Minerals

- Management actions taken relative to energy/minerals with respect to sage grouse habitat (#)
- Description

Range Improvements

- Range improvements constructed in sage grouse habitat (#)
- Range improvements constructed which incorporate sage grouse guidelines (#)
- Modification of existing range improvements to meet sage grouse guidelines (type and #)

Wildfire

- Sage grouse habitat burned (acres)
- Known sage grouse habitat burned (acres)
- Sage grouse habitat requiring reseeding (acres)
- Sage grouse habitat rehabilitated and reseeded (acres)

Vegetation Treatment
Vegetation Treatments in sage grouse habitat (#, type, acres)

Literature Cited

Asher, J. 1994. Crushing the wilderness spirit: Alien plant invasions. Unpublished report on file with U.S. Department of the Interior, Bureau of Land Management, Oregon State Office, P.O. Box 2965, Portland, Oregon 97201.

Autenrieth, R. E. 1981. Sage grouse management in Idaho Wildlife Bulletin Number 9. Idaho Department of Fish and Game. Boise. 239 pp.

Baker, H.G. 1986. Patterns of plant invasion in North America. Pages 44-57 in: Mooney, H.A. and J.A. Drake, editors, Ecology of biological invasions of North America and Hawaii. Springer-Verlag, New York.

Barnett, J. F., and J. A. Crawford. 1994. Pre-laying nutrition of sage grouse hens in Oregon. Journal of Range Management. 47:114-118.

Barney, M.A.; Frischknecht, N.C. 1974. Vegetation changes following fire in the pinyon-juniper type of west-central Utah. J. of Range Management 27:91-96.

Bazzaz, F.A. 1986. Life history of colonizing plants: Some demographic, genetic, and physiological features. Pages 96-110 in: Mooney, H.A. and J.A. Drake, editors, Ecology of biological invasions of North America and Hawaii. Springer-Verlag, New York.

Beck, T. D. I. 1977. Sage grouse flock characteristics and habitat selection during winter. Journal of Wildlife Management 41:18-26.

Beck, T. D. I. 1975. Attributes of a wintering population of sage grouse, North Park, Colorado. M.S. thesis. Colorado State University, Fort Collins. 49 pp.

Bergerud, A. T. 1988. "Population ecology of North American grouse." Pages 578-648 *in* A.T. Bergerud and M. W. Gratson, eds. Adaptive strategies and population ecology of northern grouse. University of Minnesota Press, Minneapolis. 809 pp.

Berry, J. D., and R. L. Eng. 1985. Interseasonal movements and fidelity to seasonal use areas by female sage grouse. Journal of Wildlife Management 49:237-240.

Blaisdell, James P., Robert B. Murray, Durant E. McArthur 1982. Managing Intermountain rangelands - sagebrush-grass ranges. General Technical Report. INT-134. Ogden, UT: U. S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 41p p.

Blus, L. J., C. S. Staley, C. J. Henny, G. W. Pendleton, T. H. Craig, E. H. Craig,, and D. K. Halford. 1989. Effects of organophosphorus insecticides on sage grouse in southeastern Idaho. Journal of Wildlife Management 53:1139-1146.

Braun, C. E. 1987. Current issues in sage grouse management. Proceedings of the Western Association of Fish and Wildlife Agencies 67:134-144.

Braun, C. E. 1998. Sage grouse declines in western North America: what are the problems? Proceedings of the Western Association of State Fish and Wildlife Agencies. 78:139-156.

Braun C. E., T. Britt, and R. O. Wallestad. 1977. Guidelines for maintenance of sage grouse habitats. Wildlife Society Bulletin 5:99-106.

Coggins, K. A. 1998. Sage grouse habitat use during the breeding season on Hart Mountain National Antelope Refuge. M.S. thesis, Oregon State University, Corvallis. 61 pp.

Connelly, J. W., Jr. 1982. An ecological study of sage grouse in southeastern Idaho. Ph.D. dissertation, Washington State University, Pullman. 84 pp.

Connelly, J. W., and C. E. Braun. 1997. Long-term changes in sage grouse Centrocercus urophasianus populations in western North America. Wildlife Biology 3:123-128.

Connelly, J. W., and O. D. Markham. 1983. Movements and radio nuclide concentrations of sage grouse in southeastern Idaho. Journal of Wildlife Management 47:169-177.

Connelly, J. W., W. J. Arthur, and O. D. Markham. 1981. Sage grouse leks on recently disturbed sites. Journal of Range Management 52:153-154.

Connelly, J. W., H. W. Browers, and R. J. Gates. 1988. Seasonal movements of sage grouse in southeastern Idaho. Journal of Wildlife Management 52:116-122.

Connelly, J. W., W. L. Wakkinen, A. D. Apa, and K. P. Reese. 1991. Sage grouse use of nest sites in southeastern Idaho. Journal of Wildlife Management 55:521-524.

Connelly, J. W., R. A. Fischer, A. D. Apa, K. P. Reese, and W. L. Wakkinen. 1993. Renesting of sage grouse in southeastern Idaho. Condor 95:1041-1043.

Connelly, J. W., K. P. Reese, W. L. Wakkinen, M. D. Robertson, and R. A. Fischer. 1994. Sage grouse ecology report. Idaho Department of Fish and Game Job Completion Report. W-160-R-19. Subproject 9. 91 pp.

Connelly, J. W, M. A. Schroeder, A. R. Sands, C. E. Braun. Guidelines for management of sage grouse populations and habitats. Wildlife Society Bulletin in press.

Crawford, J. A. and R. S. Lutz. 1985, Sage grouse populations in Oregon, 1941-1983. Murrelet 66:69-74.

Cottam, W. P. and G. Stewart. 1940. Plant succession as a result of grazing and of meadow desiccation by erosion since settlement in 1892. J. Forestry 38: 613-626.

Dalke, P. D., D. B. Pyrah, D. C. Stanton, J. E. Crawford, and E.F. Schlatterer. 1963. Ecology, productivity, and management of sage grouse in Idaho. Journal of Wildlife Management 27:810-841.

Delong, A. K., J. A. Crawford, and D. C. Delong, Jr. 1995. Relationships between vegetational structure and predation of artificial sage grouse nests. Journal of Wildlife Management 59:88-92.

Drut, M. S., W. H. Pyle, and J. A. Crawford.1994. Diets and food selection of sage grouse chicks in Oregon. Journal of Range Management 47:90-93.

Edelmann, F. B., M. J. Ulliman, M. J. Wisdom, K. P. Reese, and J. W. Connelly. 1998. Assessing habitat quality using population fitness parameters: a remote sensing/GIS-based habitat-explicit

population model for sage grouse (*Centrocercus urophasianus*). Technical Report 25. Idaho Forest, Wildlife and Range Experiment Station, Moscow. 33 pp.

Edminster, F. C. 1954. American game birds of field and forest. Charles Scribner's Sons, NY. 490 pp.

Eng, R. L. 1963. Observations on the breeding biology of male sage grouse. Journal of Wildlife Management 27:841-846.

Eng, R. L., and P. Schladweiler. 1972. Sage grouse winter movements and habitat use in central Montana. Journal of Wildlife Management 36:141-146.

Enyeart, G. 1956. Responses of sage grouse to grass reseeding in the Pines area, Garfield County, Utah. M.S. thesis, Utah State Agricultural College, Logan. 55 pp.

Fischer, R. A. 1994. The effects of prescribed fire on the ecology of migratory sage grouse in southeastern Idaho.

Fischer, R. A., K. P. Reese, and J. W. Connelly. 1996*a*. An investigation on fire effects within xeric sage grouse brood habitat. Journal of Range Management 49:194-198.

Fischer, R. A., K. P. Reese, and J. W. Connelly. 1996*b*. Influence of vegetal moisture content and nest fate on timing of female sage grouse migration. Condor 98:868-872.

Gates, R. J. 1983. Sage grouse, lagomorph, and pronghorn use of a sagebrush grassland burn site on the Idaho National Engineering Laboratory. M. S. thesis, Montana State University, Bozeman. 135 pp.

Gates, R. J. 1985. Observations of the formation of a sage grouse lek. Wilson Bulletin 97:219-221.

Gill, R. B. 1965. Distribution and abundance of a population of sage grouse in North Park, Colorado. M. S. thesis, Colorado State University, Fort Collins. 187 pp.

Gray, G. M. 1967. An ecological study of sage grouse broods with reference to nesting movements, food habits and sagebrush strip spraying in the Medicine Lodge drainage, Clark County, Idaho. M.S. thesis, University of Idaho, Moscow. 200 pp.

Gregg, M. A. 1991. Use and selection of nesting habitat by sage grouse in Oregon. M.S. thesis, Oregon State University Corvallis. 46 pp.

Gregg, M. A., J. A. Crawford, M. S. Drut, and A. K. DeLong. 1994. Vegetational cover and predation of sage grouse nests in Oregon. Journal of Wildlife Management 58:162-166.

Hanf, J. M., P. A. Schmidt, and E. B. Groshens. 1994. Sage grouse in the high desert of central Oregon: results of a study, 1988-1993. U. S. Department of Interior, Bureau of Land Management Series P-SG-01, Prineville, OR. 56 pp.

Hann, W. J., J. L. Jones, M. G. Karl, P. F. Hessburg, R. E. Kean, D. G. Long, J. P. Menakis, C. H. McNicoll, S. G. Leonard, R. A. Gravenmier, and B. G. Smith. 1997. An assessment of ecosystem components in the Interior Columbia Basin and portions of the Klamath and Great Basins, Vol. II. Landscape dynamics of the basin. U.S. Dept. Agric., Pacific Northwest Res. Stat., For. Serv. Gen. Tech. Rep. PNW-GTR-405, Portland, OR.

Higby, L. W. 1969. A summary of the Longs Creek sagebrush control project. Proceedings Biennial Western States Sage Grouse Workshop. 6:164-168.

Hironaka, M., M. A. Fosberg, A. H. Winward. 1983. Sagebrush-grass habitat types of southern Idaho. Bull 35. Univ. Idaho, Forest, Wildl. and Range Exp. Stn. Moscow, ID. 44 pp.

Hupp, J. W. and C. E. Braun. 1989. Topographic distribution of sage grouse foraging in winter. Journal of Wildlife Management 53:823-829.

Interagency Technical Reference. 1996. Utilization studies and residual measurements. Cooperative Extension Service, Bureau of Land Management, U. S. Forest Service, and Natural Resource Conservation Service. 176 pp.

Klebenow, D. A. 1969. Sage grouse nesting and brood habitat in Idaho. Journal of Wildlife Management 33:649-661.

Mack, R.N. 1986. Alien plant invasion into the Intermountain West: A case history. Pages 191-213 in: Mooney, H.A. and J.A. Drake, editors, Ecology of biological invasions of North America and Hawaii. Springer-Verlag, New York.

Mack, R. N. and J. N. Thompson 1982. Evolution in steppe with few large, hoofed mammals. American Naturalist 119:757-773.

Martin, N. S. 1970. Sagebrush control related to habitat and sage grouse occurrence. Journal of Wildlife Management 34:313-320.

McArthur, E. D. and J. E. Ott. 1996. Potential natural vegetation in the 17 conterminous western United States. pp. 16-28 *in* Proceedings: Shrub land ecosystem dynamics in a changing environment, J. R. Barrow, E. D. McArthur, R. E. Sosebee and R. J. Tausch, compilers. USDA Forest Service Gen. Tech. Rep. INT-GTR-338. Ogden, UT, USA.

Miller, R.F., Tausch, R.J. and Waichler, W. 1999. Old-growth juniper and pinyon woodlands. USDA Forest Service Proceedings RMRS-P-9.

Nevada Rangeland Monitoring Handbook. 1984. Bureau of Land Management, Reno, NV. 49 pp.

Patterson, R. L. 1952. The sage grouse in Wyoming. Sage Books, Inc. Denver, CO. 341pp.

Pellant, Mike. 1990. The cheatgrass-wildfire cycle--are there any solutions? In: McArthur, E. Durant; Romney, Evan M.; Smith, Stanley D; Tueller, Paul T. , comps. Proceedings --symposium on cheatgrass invasion, shrub die-off, and other aspects of shrub biology and management: 1989 April 5-7; Las Vegas, NV. Gen. Tech. Rep. INT-276. Ogden, UT: US Department of Agriculture, Forest Service, Intermountain Research Station: 11-17.

Pellant, M. 1996. Use of indicators to qualitatively assess rangeland health. *Rangelands in a Sustainable Biosphere.* (Ed. N.E. West), pp434-435. Proc. Vth International Rangeland Congress. Society for Range Management. Denver, CO.

Petersen, B. E. 1980. Breeding and nesting ecology of female sage grouse in North Park, Colorado. M.S. thesis, Colorado State University, Fort Collins. 86pp.

Peterson, J. G. 1970. The food habits and summer distribution of juvenile sage grouse in central Montana. Journal of Wildlife Management 34:147-155.

Quigley, T.M., and S.J. Arbelbide, technical editors. 1997. Volume II of: An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins. General Technical Report PNW-GTR-405. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, Oregon.

Remington, T. E., and C. E. Braun. 1985. Sage grouse food selection in winter, North Park, Colorado. Journal of Wildlife Management 49:1055-1061.

Robertson, M. D. 1991. Winter ecology of migratory sage grouse and associated effects of prescribed fire in southeastern Idaho. M.S. thesis, University of Idaho, Moscow. 88pp.

Savage, D. E. 1969. Relation of sage grouse to upland meadows in Nevada. Nevada Fish and Game Commission Job Completion Report, Project W-39-R-9. Job 12. Reno. 101pp.

Schroeder, M. A. 1997. Unusually high reproductive effort by sage grouse in a fragmented habitat in north-central Washington. Condor 99:933-941.

Schroeder, M. A., J. R. Young and C. E. Braun. 1999. Sage Grouse (*Centrocercus urophasianus*). *In* The Birds of North America, No. 425 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Sveum, C. M., J. A. Crawford, and W. D. Edge. 1998. Use and selection of brood-rearing habitat by sage grouse in south central Washington. Great Basin Naturalist 58:344-351.

Swenson, J. E., C. A. Simmons, and C. D. Eustace. 1987. Decrease of sage grouse *Centrocercus urophasianus* after ploughing of sagebrush steppe. Biological Conservation 41:125-132.

Swenson, J. E. 1986. Differential survival by sex in juvenile sage grouse and gray partridge. Ornis Scandinavica 17:14-17.

Tausch, R.J., West, N.E., and Nabi, A.A. 1981. Tree age and dominance patterns in the Great Basin pinyon-juniper woodlands. Journal of Range Management 34:259-264.

Tausch, R.J. and N.E. West. 1988. Differential establishment of pinyon-juniper following fire. American Midland Naturalist. 119:174-184.

Thurow, T. L., and C. A. Taylor. 1999. The role of drought in range management. Journal of Range Management 52:413-419.

Trueblood, R. W. 1954. The effect of grass reseeding in sagebrush lands on sage grouse populations. M.S. thesis, Utah State Agricultural College, Logan.

Tyser, R.W., and C.H. Known. 1988. Spotted knapweed in natural area fescue grasslands: An ecological assessment. Northwest Science 62:151-160.

U.S.D.I. and U.S.D.A. 1995. Federal Wildland Fire Management Policy and Program Review. 45 pp.

Valentine, J. F. 1990. Grazing management. Academic Press, Incorporated. San Diego, CA. 553pp.

Wakkinen, W. L. 1990. Nest site characteristics and spring-summer movements of migratory sage grouse in southeastern Idaho. M. S. thesis, University of Idaho, Moscow. 57pp.

Wakkinen, W. L., K. P. Reese, and J. W. Connelly. 1992. Sage grouse nest locations in relation to leks. Journal of Wildlife Management 56:381-383.

Wallestad, R. O. 1971. Summer movements and habitat use by sage grouse broods in central Montana. Journal of Wildlife Management 35:129-136.

Wallestad, R. O. 1975. Life history and habitat requirements of sage grouse in central Montana. Montana Fish and Game Department Technical Bulletin. 66pp.

Wallestad, R. O., and D. B. Pyrah. 1974. Movement and nesting of sage grouse hens in central Montana. Journal of Wildlife Management 38:630-633.

Wallestad, R. O., and P. Schladweiller. 1974. Breeding season movements and habitat selection of male sage grouse. Journal of Wildlife Management 38:634-637.

Wallestad, R. O., J. G. Peterson, and R. L. Eng. 1975. Foods of adult sage grouse in central Montana. Journal of Wildlife Management 39:628-630.

Winward, A. H. 1991. A renewed commitment to management of sagebrush grasslands. Pages 2-7 *In* Miller, R.F., ed., Management in the sagebrush steppe. Oregon State Univ., Agricultural Experimental Station Special Report 880. Corvallis OR. 48pp.

Wisdom, M.J., R.S. Holthausen, B.C. Wales, D.C. Lee, C.D. Hargis, V.A. Saab, W.J. Hann, T.D. Rich, M.M. Rowland, W.J. Murphy, and M.R. Eames. [in press]. Source habitats for terrestrial vertebrates of focus in the interior Columbia Basin: Broad-scale trends and management implications. General Technical Report PNW-GTR-XXX. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR.

Wright, H.A., L.F. Neuenschwander, and C.M. Britton. 1979. The role and use of fire in sagebrush-grass and pinyon-juniper plant communities: A state-of-the-art review. General Technical Report INT-GTR-58. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Ogden, Utah.

Zablan, M. A. 1993. Evaluation of sage grouse banding program in North Park, Colorado. M.S. thesis, Colorado State University, Fort Collins. 59pp.

Appendix I

Draft
Western Association of Fish And Wildlife Agencies
Guidelines for Management of Sage Grouse Populations and Habitats

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RECOMMENDED GUIDELINES

Sage grouse populations occupy relatively large areas on a year-round basis (Berry and Eng 1985, Connelly et al. 1988, 1994, Wakkinen 1990), invariably involving a mix of ownerships and jurisdictions. Thus, state and federal natural resource agencies and private landowners must coordinate efforts over at least an entire seasonal range to successfully implement these guidelines. Based on current knowledge of sage grouse population and habitat trends, these guidelines have been developed to help agencies and landowners effectively monitor populations, protect and manage remaining habitats, and restore damaged habitat. Because of gaps in our knowledge and regional variation in habitat characteristics, the judgment of local biologists and quantitative data from population and habitat monitoring are necessary to implement the guidelines correctly. Further, we urge agencies to employ an adaptive management approach (Macnab 1983, Gratson et al. 1993), using monitoring and evaluation to assess the success of implementing these guidelines to manage sage grouse populations.

Activities responsible for the loss or degradation of sagebrush habitats may also be used to restore these habitats. These activities include prescribed fire, grazing, herbicides, and mechanical treatments. Decisions on land treatments using these tools should be based on quantitative knowledge of vegetative conditions over an entire population's seasonal range. Generally, the treatment selected should be that which is least disruptive to the vegetation community and has the most rapid recovery time. This selection should not solely be based on economic cost.

For the purpose of these guidelines, we define an occupied lek as a traditional display area in or adjacent to sagebrush-dominated habitats that has been attended by $\geq$ 2 male sage grouse in $\geq$ 2 of the previous 5 years. We define a breeding population as a group of birds associated with 1 or more occupied leks in the same geographic area separated from other leks by >20 km. This definition is somewhat arbitrary but generally based on maximum distances females move to nest.

General Habitat Management

The following guidelines pertain to all seasonal habitats used by sage grouse.

1. Monitor habitat conditions and only propose treatments if warranted by range condition (i.e., the area no longer supports habitat conditions described in the following guidelines under habitat protection). Do not base land treatments on schedules, targets, or quotas.

2. Use appropriate vegetation treatment techniques (e.g., mechanical methods, fire) to remove junipers and other conifers that have invaded sage grouse habitat (Commons et al. 1999). Whenever possible, employ vegetation control techniques that are least disruptive to the stand of sagebrush, if this stand meets the needs of sage grouse (Table I).

3. Increase the visibility of fences and other structures occurring within 1 km of seasonal ranges by flagging or similar means if these structures appear hazardous to flying grouse (e.g., birds have been observed hitting or narrowly missing these structures or grouse remains have been found next to these structures).

4. Avoid building power lines and other tall structures providing perch sites for raptors within 3 km of seasonal habitats. If these structures must be built, or presently exist, the lines should be buried or poles modified to prevent their use as raptor perch sites.

Breeding Habitat Management

For both migratory and non-migratory populations, lek attendance, nesting, and early brood-rearing occur in breeding habitats. These habitats are sagebrush-dominated rangelands with a healthy herbaceous understory and are critical for survival of sage grouse populations. Mechanical disturbance, prescribed fire, and herbicides can be used to restore sage grouse habitats to those conditions identified as appropriate in the following sections on habitat protection. Local biologists and range ecologists should select the appropriate technique on a case-by-case basis. Generally, fire should not be used in breeding habitats dominated by Wyoming big sagebrush if these areas support sage grouse. Fire can be difficult to control and tends to burn the best remaining nesting and early brood-rearing habitats (i.e., those areas with the best remaining understory) while leaving areas with poor understory. Further, we recommend against using fire in habitats dominated by xeric mountain big sagebrush (*A. t. vaseyana* var. *xericensis*) because annual grasses commonly invade these habitats and much of the original habitat has been altered by fire (Bunting et al. 1987).

Although mining and energy development are common activities throughout the range of sage grouse, quantitative data on the long-term effects of these activities on sage grouse are limited. However, some negative impacts have been documented (Braun 1998). Thus, these activities should be discouraged in breeding habitats, but when unavoidable, restoration efforts should follow procedures outlined in these guidelines.

Habitat Protection

1. Manage breeding habitats to support 15-25% canopy cover of sagebrush, perennial herbaceous cover averaging $\geq$18 cm in height with $\geq$15% canopy cover for grasses and $\geq$10% for forbs and a diversity of forbs (Barnett and Crawford 1994, Drut et al. 1994*a*, Apa 1998) during spring (Table I). Habitats meeting these conditions should have a high priority for wildfire suppression and should not be considered for sagebrush control programs. Sagebrush and herbaceous cover should provide overhead and lateral concealment from predators. If average sagebrush height is >75 cm, herbaceous cover may need to be substantially greater than 18 cm to provide this protection. The herbaceous height requirement may not be possible in habitats dominated by grasses that are relatively short when mature. In these cases, local biologists and range ecologists should develop height requirements that are reasonable and ecologically defensible. Cover on leks does not have to meet the above requirements.

2. For non-migratory grouse occupying habitats that are uniformly distributed (i.e., habitats have the characteristics described in guideline 1 and are generally distributed around the leks), protect (i.e., do not manipulate) sagebrush and herbaceous understory within 3.2 km of all occupied leks. For non-migratory populations, consider leks the center of year-round activity and use them as focal points for management efforts (Braun et al. 1977).

3. For non-migratory populations where sagebrush is not uniformly distributed (i.e., habitats have the characteristics described in guideline 1 but irregularly distributed with respect to leks), protect suitable habitats for $\leq$5km from all occupied leks. Use radio-telemetry, repeated surveys for grouse use, or habitat mapping to identify nesting and early brood-rearing habitats.

4. For migratory populations, identify and protect breeding habitats $\leq$18 km of leks in a manner similar to that described for non-migratory sage grouse. For migratory sage grouse, leks generally are associated with nesting habitats but migratory birds may move >18 km from leks to nest sites. Thus, protection of habitat within 3.2 km of leks may not protect most of the important nesting areas (Wakkinen et al. 1992).

5. In areas of large-scale habitat loss ($\geq$40% of original breeding habitat), protect all remaining habitats from additional loss or degradation. If remaining habitats are degraded, follow guidelines for habitat restoration listed below.

6. During drought periods ($\geq$2 consecutive years), reduce stocking rates or change management practices for livestock, wild horses and wild ungulates if cover requirements during the nesting and brood-rearing periods are not met. Grazing pressure from domestic livestock and wild ungulates should be managed in a manner that, at all times, addresses the possibility of drought.

7. Suppress wildfires in all breeding habitats. In the event of multiple fires, land management agencies should have all breeding habitats identified and prioritized for suppression, giving the highest priority to breeding habitats that have become fragmented or reduced by >40% in the last 30 years.

8. Adjust timing of energy exploration, development, and construction activity to minimize disturbance of sage grouse breeding activities. Energy-related facilities should be located >3.2 km from active leks whenever possible. Human activities within view of or <0.05 km from leks should be minimized during the early morning and late evening when birds are near or on leks.

Habitat Restoration

1. Before initiating vegetation treatments, quantitatively evaluate the area proposed for treatment to ensure that it does not have sagebrush and herbaceous cover suitable for breeding habitat (Table I). Treatments should not be undertaken within sage grouse habitats until the limiting vegetation factor(s) has been identified, the proposed treatment is known to provide the desired vegetation response, and land use activities can be managed after treatment to ensure that vegetation objectives are met.

2. Restore degraded rangelands to a condition that again provides suitable breeding habitat for sage grouse by including sagebrush, native forbs (especially legumes), and native grasses in reseeding efforts (Apa 1998). If native forbs and grasses are unavailable, use species that are functional equivalents and provide habitat characteristics similar to those of native species.

3. Where the sagebrush overstory is intact but the understory has been severely degraded and quality of nesting habitat has declined (Table I), use appropriate techniques (e.g., brush beating in strips or patches and interseed with native grasses and forbs) that retain some sagebrush but open shrub canopy to encourage forb and grass growth.

4. Do not use fire in sage grouse habitats prone to invasion by cheatgrass and other invasive weed species unless adequate measures are included in restoration plans to replace the cheatgrass understory with perennial species using approved reseeding strategies. These strategies could include, but are not limited to use of pre-emergent herbicides (e.g., Oust®, Plateau®) to retard cheatgrass germination until perennial herbaceous species become established.

5. When restoring habitats dominated by Wyoming big sagebrush, regardless of the techniques used (e.g., prescribed fire, herbicides), do not treat >20% of the breeding habitat (including areas burned by wildfire) within a 30-year period (Bunting et al. 1987). The 30-year period represents the approximate recovery time for a stand of Wyoming big sagebrush. Additional treatments should be deferred until the previously treated area again provides suitable breeding habitat (Table I). In some cases, this may take <30 years and in other cases >30 years. If 2,4-D or similar herbicides are used, they should be applied in strips in a manner that minimizes their effect on forbs. Because fire generally burns the best remaining sage grouse habitats (i.e., those with the best understory) and leaves areas with sparse understory, use fire for habitat restoration only when it can be convincingly demonstrated to be in the best interest of sage grouse.

6. When restoring habitats dominated by mountain big sagebrush, regardless of the techniques used (e.g., fire, herbicides), treat ≤20% of the breeding habitat (including areas burned by wildfire) within a 20-year period (Bunting et al. 1987). The 20-year period represents the approximate recovery time for a stand of mountain big sagebrush. Additional treatments should be deferred until the previously treated area again provides suitable breeding habitat (Table I). In some cases, this may take <20 years and in other cases >20 years. If 2,4-D or similar herbicides are used, they should be applied in strips in a manner that minimizes their effect on forbs.

7. All wildfires and prescribed burns should be evaluated as soon as possible to determine if reseeding is necessary to achieve habitat management objectives. If needed, reseed with sagebrush, native bunchgrasses, and forbs whenever possible.

8. Until research unequivocally demonstrates that use of tebuthiuron and similar acting herbicides to control sagebrush has no long-lasting negative impacts on sage grouse habitat, use these herbicides only on an experimental basis and over a sufficiently small area that any long-term negative impacts are negligible. Because these herbicides have the potential of reducing but not eliminating sagebrush cover within grouse breeding habitats, thus stimulating herbaceous development, their use as sage grouse habitat management tools should be closely examined.

Summer/Late Brood-rearing Habitat Management

Sage grouse may use a variety of habitats including meadows, farmland, dry lakebeds, sagebrush, and riparian zones from late June to early November (Patterson 1952, Wallestad 1975, Connelly 1982, Hanf et al. 1994). Generally, these habitats are characterized by relatively moist conditions and many succulent forbs in or adjacent to sagebrush cover.

Habitat Protection

1. Avoid land use practices that reduce soil moisture effectiveness, increase erosion, cause invasion of exotic plants, and reduce abundance and diversity of forbs.

2. Avoid removing sagebrush within 300 m of sage grouse foraging areas along riparian zones, meadows, lakebeds, and farmland, unless such removal is necessary to achieve habitat management objectives (e.g., meadow restoration).

3. Discourage use of highly toxic organophosphorus and carbamate insecticides in sage grouse brood-rearing habitats. Sage grouse using agricultural areas may be adversely affected by pesticide applications (Blus et al. 1989). Less toxic agri-chemicals or biological control may provide suitable alternatives in these areas.

4. Avoid developing springs for livestock water, but if water from a spring will be used in a pipeline or trough, design the project to maintain free water and wet meadows at the spring. Capturing water from springs using pipelines and troughs may adversely affect wet meadows used by grouse for foraging.

Habitat Restoration

1. Use brush beating or other mechanical treatments in strips 4-8 m wide in areas with relatively high shrub canopy cover ($\geq$35% total shrub cover) to improve late brood-rearing habitats. Brush beating can be used to effectively create different age classes of sagebrush in large areas with little age diversity.

2. If brush beating is impractical, use fire or herbicides to create a mosaic of openings in mountain big sagebrush and mixed shrub communities used as late brood-rearing habitats where total shrub cover is $\geq$35%. Generally, 10-20% canopy cover of sagebrush and $\leq$25% total shrub cover will provide adequate habitat for sage grouse during summer.

3. Only construct water developments for sage grouse in or adjacent to known summer use areas and provide escape ramps suitable for all avian species and other small animals. Water developments and "guzzlers" may improve sage grouse summer habitats (Autenrieth et al. 1982, Hanf et al. 1994). However, sage grouse used these developments infrequently in southeastern Idaho because most were constructed in sage grouse winter and breeding habitat, rather than summer range (Connelly and Doughty 1989).

4. Whenever possible, modify developed springs and other water sources to restore natural free-flowing water and wet meadow habitats.

Winter Habitat Management

Sagebrush is the essential component of winter habitat. Sage grouse select winter use sites based on snow depth and topography and snowfall can affect the amount and height of sagebrush available to grouse (Connelly 1982, Hupp and Braun 1989, Robertson 1991). Thus, on a landscape scale, sage grouse winter habitats should allow grouse access to sagebrush under all snow conditions (Table I).

Habitat Protection

1. Maintain sagebrush communities on a landscape scale, allowing sage grouse access to sagebrush stands with canopy cover of 10-30% and heights of at least 25-35 cm regardless of snow cover. These areas should be high priority for wildfire suppression and sagebrush control should be avoided.

2. Protect patches of sagebrush within burned areas from disturbance and manipulation. These areas may provide the only winter habitat for sage grouse and their loss could result in the extirpation of the grouse population. They are also important seed sources for sagebrush re-establishment in the burned areas. During fire suppression activities do not remove or burn any remaining patches of sagebrush within the fire perimeter.

3. In areas of large-scale habitat loss ($\geq$40% of original winter habitat), protect all remaining habitats.

Habitat Restoration

1. Reseed former winter range with the appropriate subspecies of sagebrush and herbaceous species unless the species are re-colonizing the area in a density that would allow recovery (Table I) within 15 years.

2. Discourage prescribed burns >50 ha and do not burn >20% of an area used by sage grouse during winter within any 20–30 year interval (depending on estimated recovery time for the sagebrush habitat).

Table I. Characteristics of sagebrush rangeland needed for productive sage grouse habitat.

	Breeding		Brood-rearing		Winter[d]	
	Height(cm)	Canopy(%)	Height(cm)	canopy(%)	Height(cm)	Canopy(%)
Sagebrush	40-80	15-25	40-80	10-25	25-35	10-30
Grass/forb	>18[b]	≥25[c]	variable	>15	N/A	N/A
Area[a]	>80		>40		>80	

[a] Percent of seasonal habitat needed with indicated conditions.

[b] Measured as "droop height"; the highest naturally growing portion of the plant.

[c] Cover should exceed 15% for perennial grasses and 10% for forbs; values should be substantially higher if most sagebrush has a growth form that provides little lateral cover (Schroeder 1995)

[d] Values for height and canopy cover are for shrubs exposed above snow.

Appendix II

Herbaceous Utilization Classes

1. No Use (0-5 percent). The rangeland shows no evidence of grazing use or the rangeland has the appearance of negligible grazing.

2. Slight (6-20 percent). The rangeland has the appearance of very light grazing. The known herbaceous forage plants may be topped or slightly used. Current seeds stalks and young plants of known herbaceous species are little disturbed.

3. Light (21 - 40 percent). The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed and 60 to 80 percent of the number of current seeds stalks of known herbaceous plants remain intact. Most young plants are undamaged.

4. Moderate (41-60 percent). The rangeland appears entirely covered as uniformly as natural features and facilities will allow. Fifteen to 25 percent of the number of current seeds stalks of known herbaceous species remain intact. No more than 10 percent of the number of low value herbaceous forage plants are utilized. (Moderate use does not imply proper use.)

5. Heavy (61-80 percent). The rangeland has the appearance of complete search. Known herbaceous species are almost completely utilized with less than 10 percent of the current seeds stalks remaining. Shoots of rhizomatous grasses are missing. More than 10 percent of the number of low value herbaceous forage plants have been utilized.

6. Severe (81 -100 percent). The rangeland has a mown appearance and there are indications of repeated coverage. There is no evidence of reproduction or current seeds stalks of known herbaceous species. Known herbaceous forage species are completely utilized. The remaining stubble of preferred grasses is grazed to the soil surface.

Appendix III
Factors Potentially Contributing to Risk

Program/Project	Population or Habitat Feature *	Factor
Grazing (includes livestock, wild horses and burros, and wildlife) general management practices	all known habitats	• grazing of an intensity, frequency, season-of-use, or distribution that results in: - vegetation composition, density, and structure that do not meet canopy and cover needs for sage grouse -non-functioning riparian and wet meadow areas -inadequate residual herbaceous cover within nesting habitats -depletion of forbs and herbaceous species needed by hens (for egg laying) and by young
	all known habitats	• grazing too soon after fires or vegetation treatments, compromising successful revegetation and increasing the potential for invasion by cheatgrass or other undesirable species
	all known habitats	• livestock concentration within known habitats as a result of trailing, herding, turn-out areas and salt/mineral supplement placement
	all known habitats	• failure to adjust grazing during drought periods when competition for scarce resources intensifies

* Can cause direct mortality to individuals(P); Lek (L); Nesting (N); Brood Rearing (BR); Winter (W)

Appendix III
Factors Potentially Contributing to Risk

Program/Project	Population or Habitat Feature *	Factor
Grazing (continued)	W	• grazing in sage grouse wintering areas which results in high utilization levels of the sagebrush upon which sage grouse depend for winter nutrition
general management practices	all known habitats	• concentrations of livestock as a result of trailing, herding, turn-out areas, and salt/mineral supplement placement in known habitats
	all known habitats	• locating wild horse capture facilities in known sage grouse habitat
	all known habitats	• failure to make necessary adjustments in wild horse population levels following wild fire rehabilitation efforts

* Can cause direct mortality to individuals(P); Lek (L); Nesting (N); Brood Rearing (BR); Winter (W)

Appendix III
Factors Potentially Contributing to Risk

Program/Project	Population or Habitat Feature *	Factor
Grazing (continued) range improvement projects	all known habitats	• construction of water developments that result in increased livestock utilization in known sage grouse habitats (in some situations, water developments can benefit sage grouse by expanding their habitat use areas, or by reducing livestock use of known habitats)
	all known habitats	• design, construction, and/or improper maintenance of spring developments that result in loss of water and riparian attributes
	all known habitats	• construction of riparian exclosures that are of insufficient size to accommodate use by sage grouse
	all known habitats, P	• construction of fences (including exclosure fences) that cause direct mortality by birds flying into them or that provide perch sites for avian predators within known habitats
	all known habitats	• construction of livestock facilities (livestock troughs, fences, corrals, handling facilities, etc.) that result in livestock concentrations in known habitats
	all known habitats, P	• installation of water troughs without wildlife escape devices

* Can cause direct mortality to individuals(P); Lek (L); Nesting (N); Brood Rearing (BR); Winter (W)

Appendix III
Factors Potentially Contributing to Risk

Program/Project	Population or Habitat Feature *	Factor
Vegetation Treatments	all known habitats	• failure to control and reverse pinion/juniper encroachment into existing and historic sage grouse habitats
	all known habitats	• vegetation manipulation (e.g., sagebrush removal) within or adjacent to known sage grouse seasonal use areas resulting in unsuitable or non beneficial changes in vegetation composition, density, and/or structure
	all known habitats	• vegetation treatment seeding mixtures which do not include a variety of native grasses, forbs, and shrubs (e.g., sagebrush) to allow for the recovery of the ecological processes and habitat features of the potential natural vegetation
	all known habitats	• vegetative treatments inappropriate to the soil, climate, and land form of the area, or within areas highly susceptible to invasion by cheatgrass or other invasive non-native species
	all known habitats	• post vegetation treatment grazing management which does not allow for successful attainment of treatment objectives and/or long term health of the vegetation community.
	L, N	• treating vegetation during the breeding season
	N, BR, W	• seed mixes that include crested wheatgrass in sufficient quantities to preclude the establishment of other species in the seed mix
	all known habitats	• vegetation treatments which do not provide for islands of untreated shrub vegetation for cover
	N	• maintenance of existing seedings (i.e. sagebrush removal or control) which reduces

* Can cause direct mortality to individuals(P); Lek (L); Nesting (N); Brood Rearing (BR); Winter (W)

Appendix III
Factors Potentially Contributing to Risk

Program/Project	Population or Habitat Feature *	Factor
Vegetation Treatments (continued)	N, BR, W	• seeding mixes which include quantities of crested wheat sufficient to preclude the establishment of other species in the seed mix
	N, BR	• moderate to high utilization rates during late season or winter thereby removing residual nesting cover
	all known habitats	• vegetation treatments which do not provide for "islands" of undisturbed vegetation
Fuels Management	all known habitats, P	• prescribed fires of large acreage in known sage grouse habitats
prescribed fire	all known habitats	• prescribed fires in areas which are highly susceptible to invasion by cheatgrass or other invasive non-native species or within soil, climate, and land form areas incompatible with objectives of the treatment
	all known habitats	• failure to evaluate prescribed fire results and to re-treat those areas where treatment objectives were not achieved
	all known habitats	• post fire grazing management which does not allow for successful attainment of treatment objectives
	all known habitats	• habitat loss due to escaped prescribed fire
other fuels management tools	N, BR	• adverse effects to nesting and brood rearing habitat as a result of using livestock in spring as a tool to reduce fuel loads
	all known habitats	• failure to use strategically placed greenstrips to protect important sage grouse habitats from fires

* Can cause direct mortality to individuals(P); Lek (L); Nesting (N); Brood Rearing (BR); Winter (W)

Appendix III
Factors Potentially Contributing to Risk

Program/Project	Population or Habitat Feature *	Factor
Fire Management (initial attack, suppression forces, response time, etc.)	all known habitats	• fire management plans which do not incorporate known sage grouse habitat information and priorities for fire suppression
	all known habitats	• inadequate fire suppression resources
	all known habitats	• inadequate sage grouse habitat information for resource advisors, or failure to communicate/coordinate with fire personnel
	all known habitats	• "backfiring" and/or "burnout" operations which result in the loss of known sage grouse habitat where other options may be more desirable
	all known habitats	• locating fire camps, staging areas, helibases, etc. within known sage grouse habitats
Fire Rehabilitation (seeding mixtures, site preparation, etc.)	all known habitats	• seeding mixtures which do not include a variety of native grasses, forbs, and shrubs (e.g., sagebrush) to allow for the ecological needs of sage grouse.
	all known habitats	• seeding mixtures which include native species inappropriate to the soil, climate, and land form of the area, or within areas known to be highly susceptible to invasion by cheatgrass or other invasive non-native species with which native species compete poorly
	all known habitats	• failure to evaluate wildfires as soon as possible to determine if seeding is necessary to recover ecological processes and achieve habitat objectives.
	all known habitats	• failure to evaluate rehabilitation results and re-treat as necessary those areas that did not achieve rehabilitation objectives or which have become dominated by monotypic stands of cheatgrass or invasive exotic species.

* Can cause direct mortality to individuals(P); Lek (L); Nesting (N); Brood Rearing (BR); Winter (W)

Appendix III
Factors Potentially Contributing to Risk

Program/Project	Population or Habitat Feature *	Factor
rehabilitation priorities	N, BR, W all known habitats	• inadequate definition of rehab priorities • competition with other resource values (e.g., areas proximate to urban interface may receive greater attention than habitat of higher value in remote areas)
Realty Actions linear utilities, communication sites, rights of way	all known habitats, P all known habitats all known habitats all known habitats	• construction of overhead transmission/distribution lines/ communication sites proximate to known habitat resulting in direct mortality of birds flying into lines, providing perch sites for avian predators, or causing habitat fragmentation • poor timing of construction activities in known habitats, resulting in disturbance or displacement of birds • construction of access roads that result in increased vehicular traffic within known habitats • loss of habitat resulting from failure to successfully reclaim disturbed areas
land exchanges, land sales, R&PP leases, Desert Land Entries	all known habitats	• land exchanges, sales, leases, etc. which result in a net loss of sage grouse habitat, or fragmentation of habitat
Recreation organized and dispersed recreational use	all known habitats, P all known habitats, P	• transportation (road layout and maintenance) plans which do not incorporate known sage grouse habitat information • lack of awareness by recreationists of potential impacts to sage grouse

* Can cause direct mortality to individuals(P); Lek (L); Nesting (N); Brood Rearing (BR); Winter (W)

Appendix III
Factors Potentially Contributing to Risk

Program/Project	Population or Habitat Feature *	Factor
developed recreational use	all known habitats, P all known habitats, P	• recreation sites unwittingly located within or proximate to known sage grouse habitat and/or without provision for control of impacts to sage grouse • special recreational use permits (competitive and commercial) authorized within known sage grouse habitat
Noxious Weeds, Other Invasive Plants, and Insects general management practices	all known habitats all known habitats	• failure to implement an effective integrated weed management plan • introduction of weed seed to new areas through failure to clean contaminated vehicles and equipment
herbicides and pesticides	N, BR, P N, BR	• direct mortality resulting from use of inappropriate pesticides/herbicides or incorrect timing of application • localized loss of non-target insects (ants and beetles) or plants important for brood nutrition/survival

* Can cause direct mortality to individuals(P); Lek (L); Nesting (N); Brood Rearing (BR); Winter (W)

Appendix III
Factors Potentially Contributing to Risk

Program/Project	Population or Habitat Feature *	Factor
Minerals, Locatable, Saleable and Leasable exploration/development/ extraction	all known habitats	• exploration or mining activities occurring during critical periods within or adjacent to leks, nesting or wintering areas resulting in disturbance and/or displacement of birds
	all known habitats	• construction of access routes, mine facilities and/or ancillary facilities (e.g., power lines, communication sites, perimeter fences, etc.) and/or roads that result in loss or fragmentation of known sage grouse habitats
	all known habitats	• loss of habitat due to reclamation failure
	all known habitats	• mine de-watering activities which result in losses of water sources or riparian areas

* Can cause direct mortality to individuals(P); Lek (L); Nesting (N); Brood Rearing (BR); Winter (W)