Elko County, Nevada
Greater Sage Grouse
Management and Conservation
Strategy Plan
September 19, 2012

Division of Natural Resource Management
Elko County, Nevada
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ELKO COUNTY BOARD OF COMMISSIONERS

The Elko County Greater Sage Grouse Management and Conservation Strategy Plan is formally approved and adopted by the Elko County Board of Commissioners, on this the 19th day of September, 2012.

R. Jeff Williams, Chairman

Glen Guttry, Vice Chairman

Charlie Myers, Commissioner

Demar Dahl, Commissioner

Warren Russell, Commissioner

Attest: Carol Fosmo, Elko County Clerk
EXECUTIVE SUMMARY

The Elko County Greater Sage Grouse Management and Conservation Strategy Plan is based on the best available scientific and commercial data. This includes scientific reports as well as empirical data that is derived from the direct observations of dependable witnesses. Available written journals of explorers and settlers traveling through Elko County prior to 1850 indicate that Sage Grouse populations were very nominal. Conversely, the USFWS imply that they have identified writing of explorers that state the great abundance of Sage Grouse populations and habitat in northern Nevada. The USFWS affirms that these writings did not always describe the physical presence of Sage Grouse but represented the presence of sagebrush as potential Sage Grouse habitat, although not all sagebrush is considered Sage Grouse habitat. The Sage Grouse populations were speculated by the USFWS through conjectured identification of sagebrush and assumed habitat quality and quantity taken from the referenced journals of explorers and settlers. However, there are many writings and accounts that quantify that the Sage Grouse population increased in the late 1800s following European settlement of our region. Historical writings, personal and scientific accounts of Sage Grouse from 1920 to 1980 indicate the highest historic numbers may have in fact occurred in the Twentieth Century. It is Elko County strategy and policy to return Sage Grouse to the population numbers of 1950’s. Elko County questions conjecture that identifies the highest population of Sage Grouse having occurred pre-European settlement or that would return populations to the levels speculated by the USFWS as being Sage Grouse populations between 1800 and 1850.

Testimony received by Elko County in 2010 and 2011 indicates the peak Sage Grouse populations coincide with much greater numbers of agricultural developments supplying water and habitat including livestock cattle and sheep, grazing within Sage Grouse habitats. It is Elko County primary policy to restore the influences and conditions that coincide with the peak Sage Grouse populations and the most productive Sage Grouse habitat. Elko County believes and has provided information herein that identifies inaccuracies leading to changes in federally managed public land use policies over the past 75 years by the federal land management agencies. Federal land use policies that have created and enhanced the habitat plight and predicament that the western states are now enduring. The changes that reduced livestock grazing and other multiple uses on federally managed public lands that have lead to habitat decadence and overgrowth eventually leading to catastrophic wild fires that have destroyed millions of acres of wildlife and wildlife habitat including the Greater Sage Grouse and its habitat.

Elko County maintains herein that the alleged best current scientific data utilized by the USFWS, in their summation of the measures and policies for Sage Grouse population and habitat protection and conservation is not the best current scientific information available. Elko County insist that that federal land managers must base Sage Grouse and habitat decisions on the best current available science and not the threat of litigation. Elko County argues that the current data and information utilized by the USFWS to develop the posture and summation of federal land and wildlife managers will cause further loss of millions of acres of federally managed public lands resources, wildlife and wildlife habitat. Consequently the process also causes the decline or loss of many multiple uses including but not limited to mining, mineral exploration, recreation, agriculture and livestock grazing, while having severe negative impacts to the local, regional and national economies.

The Elko County Greater Sage Grouse Management and Conservation Strategy Plan offers an alternative view of the issue and problems concerning the Greater Sage Grouse population declines and habitat loss. Elko County challenges the presumption or conjecture that the Greater Sage Grouse should be listed. The Endangered Species Act itself affirms that the regional Greater Sage Grouse populations do not meet the criteria for listing based on the current
estimated population. Elko County recognizes and understands the significance of the Greater Sage Grouse to our culture and history. In recognition of the Sage Grouse habitat and population issues and concerns the plan set forth measures, strategies and policies herein to identify and promote conservation, preservation and rehabilitation of the Sage Grouse populations and habitat on federally managed public lands as well as private properties. The proposed strategies, measures and policies must be developed in a manner that promotes and continues the “multiple use concept” on federally managed public lands. It also promotes and protects the right of private property ownership from further federal oversight and unnecessary control.

Elko County concludes that federal land management agencies have changed multiple use and livestock grazing policies and procedures that where historically proven to be the best management practices that provided sustainability to the regional economy, livestock, wildlife and wildlife habitat. The current federal land management policies implemented on public lands has led to millions of acres of lost habitat for all wildlife and has created the current predicament concerning the Sage Grouse populations and habitat. Elko County discerns that the federal land managers must alter their past changes in policies and return the public lands back to historical levels of multiple use and livestock grazing without further restriction and constraint on the people of the United States.

**Sage Grouse Habitat Current and Historic Overlaid on Satellite Imagery**
1.0 GREATER SAGE GROUSE POPULATION HISTORICAL ASSESSMENT

1.1 Introduction

This Elko County Greater Sage Grouse Plan will provide information and conclusions that will be the suitable basis for management decisions by state agencies and federal land management agencies that will result in more Sage Grouse and healthy productive Sage Grouse habitat. It is the policy of Elko County that natural resource management is to be based on factual data provided by dependable observations, objective scientific investigation, verified models, and measurable accomplishments. Conjecture and unsupported (false) assumptions will not be considered. This plan will also provide pertinent information and ask the questions that pertain to the laws and policies governing our public lands and wildlife management. Elko County expects that every party will faithfully follow the law and tell the truth about sage grouse biology. Whenever necessary, Elko County will question the veracity of statements made by agency officials, the authority of the federal laws including the Endangered Species Act, and the relevance of various laws concerning the Greater Sage Grouse including its candidacy as an endangered species. Elko County does not accept every federal or NDOEW statement as factual and believes many to be the opinions of the agencies and do not accurately represent the factual information concerning Sage Grouse in Elko County.

The United States Fish and Wildlife Service (USFWS) speculates the peak historic populations of the Greater Sage Grouse as 1.6 to 16 million birds existed over 20 million acres range wide in the west prior to European settlement. These speculations from the USFWS are based on journals of government expeditions and other explorers. The journals as per the USFWS many times referred to the types, location and variance in sizes of sage and other vegetation. The USFWS formulated an equation to estimate the populations of Greater Sage Grouse and other wildlife based on these observations. The USFWS also developed the ability to determine how much area was considered habitat for the Greater Sage Grouse and determined that for each square kilometer of poor condition two birds were present and for each square kilometer of good condition habitat as many as ten birds existed.

The speculations based on how much historical sagebrush habitat was available, were derived by Dr. Mike Schroeder, Washington Department of Fish and Wildlife. Dr. Schroeder used the 1850’s as the time frame reference for estimating how much sagebrush habitat was available. Dr. Schroeder’s work shows historic vs. current distribution. Historical distribution, was speculated from published records from historical publications and journals and the pre-settlement distribution of “potential habitat”. (Schroeder et al., 2004) This speculation was used to set the population of Sage Grouse basically in poor sagebrush habitat area, he “guessed” 2 birds, in good sagebrush habitat area, he “guessed” at 10 birds per square acre. Obviously, sagebrush habitat has changed and does all the time due to a variety of reasons over any number of years and not all sagebrush is considered Sage Grouse habitat.

Many questions arise from the USFWS claims that they have evaluated the historical reports of populations of Greater Sage Grouse. As indicated above, the claims of substantial sage grouse populations are conjectural and represent a simplistic description of conditions that simply did not occur in the Great Basin during the first half of the Nineteenth Century”. Would the journals that were used by the USFWS to estimate the
population not have specifically referred to the great abundance of bird themselves, as they did in description of all other wildlife that were observed by the explorers? Wouldn’t the journal have referred to the blackening of the skies with the Greater Sage Grouse if there were in fact the abundance of population that they have estimated? There are many journals available from explorers and settlers of the 1800’s crossing the Great Basin that do not indicate the abundance of any wild life in northern Nevada and conversely offered stories of plight and un-sustainable harsh high desert lands. There are many journals and stories of the inability of the explorers and settlers crossing northern and central Nevada to sustain even their meager existence, having to kill and butcher their own horses, mules and other animals to survive. Wouldn’t the abundance of such a large ground dwelling bird have been so noted in their journals and stories. Journals that where so concise that they measured the quantity and quality of the vegetation that enabled the USFWS to estimate historic wildlife populations?

Documentation of Greater Sage Grouse populations from the 1800’s to the early 1960’s has been far less than precise with many assumptions and guesses concerning the peak era of the Sage Grouse population. However, many local journals and personal observation of ranchers and residents of northern Nevada would state that the 1920’s through the 1970’s was the time that they remember the largest populations of Sage Grouse. These were the years prior to the changes in federal land policies that now restrain multiple use and often prohibit grazing and these were the years when Sage Grouse flocks flying up from the privately developed meadows would “blacken the sky”. These were the years that thousands of acres of irrigated meadows were developed as settlers diverted streams for irrigation and the water rights from nearly every stream or spring were claimed as private property under the appropriation doctrine. The period that developed the most agriculture lands for cash crops and water resources for not only livestock but for wildlife as well. Private development of springs and meadows greatly increased the acreage of essential habitat for sage grouse, especially for brood rearing in early summer as well as all wildlife. This period of time is well documented but has all but been excluded by the USFWS during their assessment of the Sage Grouse. Currently the USFWS estimates that there are as many as 535,000 birds range wide and in Nevada the number is speculated to be somewhere between roughly 70,000 to 90,000 Sage Grouse.

The Endangered Species Act requires sound science for determination of a candidate to be listed. Questions that would arise from the historical population estimates that the USF&SWS have utilized are; Is the best science available to warrant such a detrimental and costly conclusion that affects the lives and economies of so many dependent on the Public Lands of the United States?

Historically, it is presumed that Sage Grouse decline was caused by a combination of overhunting, habitat loss, degradation, and fragmentation. The USFWS speculates that human disturbance has an impact on Sage Grouse due to direct habitat loss and fragmentation resulting from wildfire, invasive species (e.g., cheatgrass, juniper, and noxious weeds), energy development, urbanization, agricultural conversion, intensive grazing, and infrastructure development. Grazing by livestock is the most common form of land use in Sage Grouse habitat. However, the effects of grazing on Sage Grouse habitat vary widely with the timing and intensity of use and various environmental factors. Correct and historical levels of grazing have shown to have a positive impact on Sage Grouse habitat, meaning this land use can be compatible with healthy Sage Grouse habitat.
Meaningful and successful Sage Grouse management can’t just mean saying ‘no’ to regional and local economic activities. It is vital that local and state Sage Grouse management and conservation efforts are maintained and expanded without causing devastation to local socio-economic factors. Without sensible local, state and federal level management strategies that are informed and directed by local stakeholders, we will be encumbered by the federal, one-size-fits-all approaches that will have severe everlasting harmful impacts on the social and economic lifeblood of our region and heritage.

1.2 Background:

Western states have seen conflicts over natural resources for more than a century. These conflicts have involved issues such as grazing, roads, fences, mineral, oil and gas development, urban expansion, spread of invasive species, water rights, Native rights, timber harvest, recreation and pollution. Recent additions to the list include development of alternative energy such as wind and solar power. In many cases, the more recent conflicts have involved the protection of endangered and threatened species, often with one group of advocates seeing listed species as an obstacle to their development goals or property rights, and another group advocating protection in line with their environmental, scientific, or economic goals. Such controversy has developed in 11 western states over Sage Grouse, whose numbers have said to be threatened by livestock grazing, roads, fences, power lines, urban expansion, and energy development.

In March 2010, the U.S. Fish and Wildlife Service (USFWS), in response to petitions and lawsuits, issued a determination that listing the Sage Grouse under the Endangered Species Act (ESA) was warranted but precluded by the need to list species with a more urgent need of protection. Thus, the Sage Grouse is treated as a candidate species and does not have the protections that a listed species would have.

The Greater Sage Grouse, as professed by the USFWS as to once being abundant in western sagebrush habitat in 16 states and having dropped in population is now found in only 11 states. The USFWS attributes its decline to several factors; increased use of Sage Grouse habitat by ranching, mining, recreation, oil and gas development, decreased sagebrush due to noxious invasive species, and loss of habitat due to more frequent fires. However, the extent of the decline is not certain, and many dispute that the Sage Grouse is in peril.

The species is found in the northern two thirds of Nevada and is most common in the northern and east-central parts of the state. The Greater Sage Grouse (Centrocercus urophasianus) is a large, gallinaceous (chicken-like), upland game bird. Sage Grouse are dependent on sagebrush habitats nesting on the ground under sagebrush and feeding on sagebrush, broad-leafed flowering plants (forbs) and insects. Although still considered common in Elko County, available data and anecdotal accounts indicate Nevada’s populations have experienced declines over the last half century, as have populations
around the western United States. The Greater Sage Grouse was petitioned for protection under the Endangered Species Act multiple times in the early 2000s. In 2005, the U.S. Fish and Wildlife Service determined the Greater Sage Grouse was not warranted for such protection but urged the recent range wide conservation emphasis be continued.

The Greater Sage Grouse are closely associated with sagebrush species (genus Artemisia), which they require for food and cover. Unlike other chicken-like birds, they lack muscular gizzards for grinding hard items, so they must eat relatively soft foods. In winter they eat almost entirely sagebrush leaves. Breeding hens and chicks eat many non-woody plants and insects, and, in summer, hens may seek out relatively moist habitats that provide an abundance of these foods. Greater Sage Grouse mate on leks, which are open sites away from nesting areas where males congregate year after year to court females. As with other lekking species, Greater Sage Grouse males do not provide any parental care; females mate on the lek and then leave to nest and raise the young on their own. Male Sage Grouse perform their striking displays on leks from late winter through spring, with most of the activity occurring around sunrise each day. In displaying, a male erects dark plumes on the top of his head, forms a fan with his long, pointed tail feathers (in the manner of a peacock) and inflates a pair of yellow air sacs, which protrude conspicuously through the breast feathers during the display. He then throws his head back rapidly while deflating the air sacs, producing a low-pitched "plopping" sound. Females choose mates based on several criteria, including the quality of the "plopping." A few males obtain almost all the mates, and most males on a lek never mate at all in a given year.

It has been extensively declared by the USFWS that before the late 1800s, Greater Sage Grouse were much more widespread and abundant than they are now; for instance, a rhetorical report from Wyoming in 1886 describes flights of thousands of Sage Grouse, a description that would not apply anywhere today. The USFWS reports in the last forty years, censuses at leks have documented an overall decline of about fifty percent. Sage Grouse numbers in Nevada have decreased over this period, although apparently not as drastically as for the species as a whole. The decline has been attributed by the USFWS to (1) habitat destruction by conversion to agricultural land; (2) habitat degradation due to grazing, human-caused changes in the frequency and intensity of fires and associated increases in invasive plants; and (3) hunting and poaching. For many people concerned with the preservation of natural environments, the decline of the Greater Sage Grouse has come to symbolize the loss and degradation of sagebrush habitats. Conversely the decline in Greater Sage Grouse populations coincided with direct changes in BLM and USFS reductions of 50% or more of grazing permits and the numbers of domestic animals such as cattle and sheep permitted to graze federally managed lands. The decrease also correlates with the frequency and scale of the catastrophic wildfires that are attributed to the abundance of decadent and decaying fuels, ultimately destroying not only the Sage Grouse and habitat but all wildlife and wildlife habitat.

In 2012, a collaboration of government agencies and other organizations produced detailed plans for the conservation of Sage Grouse populations in Nevada and much of the western states, to be carried out primarily at a local level. In 2005, after receiving three petitions to list the Greater Sage Grouse as an endangered or threatened species, the U.S. Fish and Wildlife Service (USFWS) determined that the species does not warrant protection of this kind. This decision was considered a victory for ranchers, farmers, and oil and gas developers who have an economic interest in the use of lands occupied by Sage Grouse and a defeat for environmentalists interested in protecting the birds by maintaining natural sagebrush habitats.
The listing of the Greater Sage Grouse as a threatened or endangered species will have severe significant negative impacts on Elko County. Land development, land uses, water use, and recreational activities would be severely affected. Sage Grouse still thrive over much of their range in Elko County. Nevada still has relatively large populations of birds in Elko, northern Humboldt, northern Washoe, Eureka, and White Pine Counties. The following Elko County Greater Sage Grouse Management and Conservation Plan defines proactive actions that will be implemented to address localized problems before the species truly reaches a threshold of vulnerability from which recovery might be difficult. The plan will provide measures for the protection and enhancement of Greater Sage Grouse Population and protection, preservation and rehabilitation of the Greater Sage Grouse habitat.

FIGURE 1A
Nevada Sage Grouse Distribution
1.3 History:

Historic abundance of Sage Grouse is difficult to determine due to limited long-term data on population size and trends and the circumstantial nature of much of the existing evidence. For example, the presence of Sage Grouse was recorded in archaeological excavations of an Indian cave and a shelter in northwestern Nevada and another cave in Utah near Wendover, Nev., (Grayson 1988). Sage Grouse remains were found in deposits as old as 10,000 to 11,000 years. At the Utah site, local extinction of Sage Grouse and other species apparently coincided with the retreat of Lake Bonneville, only to reappear in the more recent strata.

In 1867 and 1868, the ornithologist, R. Ridgeway (1877), surveyed birds across central Nevada. He listed Sage Grouse as birds characteristic of sagebrush and in his conclusions... “we saw it so seldom that little was learned of its habits, particularly during the breeding season. It came under our notice only late in summer and during the autumn, when it was found to be abundant in certain localities, but by no means uniformly distributed”.

A review of historic information in personal journals, newspapers and publications by Robert McQuivey, retired Nevada Division of Wildlife biologist of Reno, Nevada, found few references of abundant Sage Grouse during exploration and emigration in the 1840s and 1850s or early settlement following 1860. More common was recording of game scarcity. Local abundance was sometimes recorded, however, paralleling the conclusion made by Ridgeway (1877).

Since about 1860, settlement led to changes in plant communities and predator control that favored increased Sage Grouse populations. Some populations grew during the 1870s with increased reports of birds harvested by hunters. During the 1880s, Sage Grouse numbers probably reached their highest peak and then declined. During that era, market hunting also peaked. Hunting laws began around 1890 with liberal seasons and bag limits. As time passed and bird populations decreased, there were reductions of hunting seasons length and bag limits beginning around 1900, continuing until the late 1920s. More recently, Sage Grouse numbers peaked in the 1950s followed by a general and continued decline in numbers.

Implementation of government sponsored predator control coincided with the development of ranches, livestock grazing on public lands and hunting. The control programs included large efforts to eliminate predators of domestic cattle and sheep using shooting, trapping and poisoned baits. The result was a reduction of coyotes and other Sage Grouse predators such as golden eagles. Poisoned baits increased the vulnerability of scavengers like ravens, a Sage Grouse egg predator. In the late 1940s an efficient poison, 1080, was added to the poison bait selection, primarily for mammal control. Predator control using poisons ceased when banned by government edict in 1972. How predator control programs influenced Sage Grouse numbers is open to speculation, because it is not supported by scientific study. (Nevada Division of Wildlife, personal communication). Nevada Wildlife Federation Enhancing Sage Grouse Habitat....A Nevada Landowners Guide - January 2002
Factors Affecting Sage Grouse Numbers: The Ranchers’ View

A survey of all ranchers in Nevada with public grazing allotments was conducted between March 29, 2002 and July 5, 2002. The response rate was 47.9 percent, or 246 returned surveys (Thomsen). Several questions in the survey addressed respondents’ perceptions about Sage Grouse. Responses to the following question are of particular relevance to the current study: “Do you think Sage Grouse populations are in decline?” All ranchers answered this question, with 103 responding ‘yes’, 97 ‘no’, and 44 declaring that they were uncertain whether population had declined. Those who had responded ‘yes’ were asked to identify reasons why they thought Sage Grouse populations had declined.

The most important factor cited by respondents was predation, followed by hunting and wildfire (with many respondents identifying ravens and coyotes as particular problems and/or ranking predation above the other reasons). After range management policies and invasive weeds, other reasons given for perceptions about declining populations included over and under grazing, urban encroachment, and climate. Of respondents who did not think grouse populations declined or did not know whether they had, twenty-eight indicated that predation was a major threat to Sage Grouse.

Concluding Remarks

In addition, ranchers were asked to respond to the statement, “Wildlife species that are considered threatened or endangered are unaffected by livestock grazing,” using a five-point Likert scale with +2 indicating strongly agree, +1 agree, 0 neutral, −1 disagree and −2 strongly disagree. The average of 244 responses was +1.05, indicating that most ranchers do not consider livestock grazing to be detrimental to the habitat of species such as Sage Grouse. Indeed, under-utilization of range by domestic livestock, fire suppression and poor range management practices were considered by 12 respondents to contribute to reduced Sage Grouse numbers.

The important question needing to be addressed is: Is the Sage Grouse threatened with extinction and should it be listed as an endangered species? We sought to provide at least a partial answer to this question using empirical results from models of Sage Grouse numbers reported from sightings and lek data in Elko County, Nevada. Sage Grouse migrate within an area of not more than about 3,000 km2 (Connelly et al. 2000, p.969). Thus, the Sage Grouse in Elko County can be considered a single population and the results derived here may be applicable to other populations in the western United States.

It should be noted that the State of Nevada does not do a good job enumerating Sage Grouse, and that efforts to do so have declined in recent decades. Sage Grouse populations reported through sightings and observations at leks are a function of the effort that goes into enumerating them – the more effort that is
spent counting Sage Grouse, the more grouse one finds. Thus, it may well be that, at least for Elko County in Nevada, stated declines in population numbers are simply the result of a failure to count grouse. More broadly, across many species and regions, inconsistency in data collection poses a challenge for analyzing population trends and their underlying determinants.

The analysis is relevant to ongoing policy discussions regarding the potential listing of this species under the Endangered Species Act and the likely economic impacts of (and human responses to) such listing. There currently is substantial debate regarding the magnitudes and causes of population decline, and therefore a variety of opinions regarding whether changes in land management practices (e.g., grazing) would in fact lead to appreciable benefits in terms of enhancing populations. The results fail to confirm that a reduced aggregate number of cattle on the range would enhance the population size of the Sage Grouse. In fact, increases in cattle numbers are associated with higher grouse counts per unit of counting effort, ceteris paribus. Though changes in grazing management techniques (for any given cattle stocking rate) may be beneficial to the Sage Grouse, the data necessary to test this hypothesis were not available.

The research methodology employed here is generally applicable to analyzing factors influencing a variable that is estimated with varying effort. The approach may be transferable to other species currently proposed for listing under the Endangered Species Act as well as, more generally, species being considered for various designations under federal or State laws and regulations. (Anthropogenic and Natural Determinants of the Population of a Sensitive Species: Sage Grouse in Nevada - G. Cornelis van Kooten, Alison J. Eagle, Mark E. Eiswerth, and Hui Feng – August 2004)


It was determined that there had been a continual decline in Sage Grouse numbers across Nevada for the past 30 years. In Washoe County, the numbers of grouse hunters declined 66%-, from 2295 hunters in 1970, to 760 hunters in 1982. While during the same period the number of birds harvested declined from 5805 birds in 1970 to 1120 birds in 1982, a decline of 81%- (Shiver and Retterer, 1988) found summer production estimates in Washoe County very low with an average of 1.1 chicks/100 hens compared to 3 chicks/100 hens or more in other parts of the State.

In the Spring of 1988, 1,400 large brown chicken eggs, 7 eggs per nest, were placed in 200 simulated Sage Grouse nest in two study areas in northern Washoe County and at one location on the Saval Ranch in Elko County. The latter area was considered Greater Sage Grouse canopy cover and also enjoyed Greater Sage Grouse production. At the two study areas in Washoe County, 100% of the eggs were destroyed in the first 2 weeks; 84% of the nests were destroyed in the first 3 days. At the Saval Ranch in Elko County, just 3% of the nests were destroyed in 10 days. Ravens were believed to be the chief nest predator.

Reference was made to research done in Idaho in 1981 by R. E. Autenrieth, where it was determined that nest predation was the greatest constraint on Sage Grouse
populations. After a raven control program was initiated it was found that 51% of all nest survived predation in the raven control area as compared to only 6% nest survival in the uncontrolled areas. It was noted that magpies, badgers, and even ground squirrels prey on the Sage Grouse eggs. Of 200 nests with 7 eggs each, 1,064 eggs were removed by predators in a 2 week period in the Autenrieth study. Ravens were determined to be the greatest predator, with dummy nest losses of 39%-occurring in "good Sage Grouse habitat".

In a separate study done in 1942, game researcher, Warren Allred found in Wyoming that 80% of all Sage Grouse nest were being destroyed by predators -of which 23% were attributed to ravens and 14% to coyotes. It was determined that even in areas completely protected from hunting, Sage Grouse were steadily declining. Allred, Warren J., "Predation and the Sage Grouse," Wyoming Wildlife, Vol. 7 (1942), pp. 3-4.

**Nest Predation of Greater Sage Grouse in Relation to Microhabitat Factors and Predators.** Peter S. Coates,1 Department of Biological Sciences, Idaho State University, Pocatello, ID David J. Delehanty, Department of Biological Sciences, Idaho State University, Pocatello, ID Journal of Wildlife Management 74(2):240–248; 2010; DOI: 10.2193/2009-047

Greater Sage Grouse (Centrocercus urophasianus) range has declined substantially since Euro-American settlement of western North America (Schroeder et al. 2004). Many populations within the remaining range also are in decline (J. W. Connelly, Western Association of Fish and Wildlife Agencies, unpublished report). Nest survival is a natural antecedent to population recruitment and renewal. The primary source of Sage Grouse nest failure is predation, accounting for an average of 94% of nest loss (Moynahan et al. 2007); hence, nest predation can be a limiting factor for population sustainability (Nelson 1955, Gregg et al. 1994, Schroeder and Baydack 2001). While predation is a natural component of game-bird reproduction, its effect on population viability may vary with habitat and predator composition (Evans 2004).

Loss of nesting habitat and increases in predator population numbers can interact and be important causal factors in nest predation of ground-nesting birds (Evans 2004). Many attributes of nesting habitat features can influence whether a nest survives, such as degree of concealment of eggs or parents from predators (Deeming 2002) or modulating thermal flux (Ar and Sidis 2002). Nest habitat features identified as important to Sage Grouse include presence of sagebrush (Artemisia spp.; Connelly et al. 1991), canopy cover (Wallestad and Pyrah 1974, Gregg et al. 1994), grass height (Gregg et al. 1994, Holloran et al. 2005), and understory cover (Gregg et al. 1994, DeLong et al. 1995). Loss of these features can diminish rates of nest survival (Connelly et al. 1991, Gregg et al. 1994, Holloran et al. 2005).

However, confirmation of the identity of Sage Grouse nest predators and the effects of confirmed predators under varying microhabitat conditions is poorly documented and such knowledge might help guide management actions. Generalist predators that reach high numbers in human altered habitats are of great conservation concern because they can substantially reduce prey populations (Garrott et al. 1993, Schneider 2001) and these predators have been shown
to continue depredating bird nests even at low prey densities (Polis et al. 1997, Sinclair et al. 1998). Common ravens (Corvus corax) are generalist predators that use visual cues to locate eggs and young of many animals (Boarman and Heinrich 1999), including Sage Grouse (Schroeder et al. 1999, Schroeder and Baydack 2001), and ravens can have substantial predatory impacts on prey populations (Andre´n et al. 1985, Boarman et al. 2006). Raven numbers have increased 300% in the western United States since 1980 (Sauer et al. 2008) and remain high despite reductions in natural prey (Boarman 1993). In desert environments, population increases are thought to be caused by anthropogenic resource subsidies such as food (e.g., landfills; Webb et al. 2004) and nest substrate (e.g., transmission towers; Knight and Kawashima 1993). An understanding of the effects of raven abundance on nest predation in relation to habitat factors would aid management efforts designed to promote Sage Grouse population viability, such as managing nesting habitat to reduce raven population size and reduce the chance of ravens finding and depredating nests. We evaluated predation at Sage Grouse nests in relation to microhabitat factors and raven abundance to help guide Sage Grouse management plans.

The primary objective is to use the information theory (Anderson 2008) to compare a priori models (hypotheses) of Sage Grouse nest survival consisting of covariates supported by the literature (e.g., microhabitat variables) to models of Sage Grouse nest survival that additionally included a covariate of raven abundance. The ravens where analyzed as opposed to other known Sage Grouse nest predators, because ravens have been reported as a synanthropic predator (Boarman et al. 2006, Leu et al. 2008) and are thought to be detrimental to Sage Grouse populations (Autenrieth 1981; J. W. Connelly, unpublished report). Another objective was to confirm the identities of predators at depredated Sage Grouse nests using around-the-clock videography and test for differences in microhabitat characteristics of depredated nests in relation to species of nest predator. In particular, the evaluated hypothesis, that nests with less surrounding vegetation are more likely to be depredated by visually cued predators like ravens and other corvids (Connelly et al. 1991).
1.4 Plan Purpose, Goals and Objectives:

1.4.1 Plan Purpose:

The purpose, goals and objectives of the Elko County Greater Sage Grouse Management and Conservation Plan is to provide:

- An alternate consideration concerning the listing issue as well as development of management, conservation, preservation and restoration strategies for the Greater Sage Grouse and its habitat in Elko County. It is also to provide and alternative assessment of the Greater Sage Grouse as a candidate for listing as and endangered species.

- Preserve our local and regional socio-economic sustainability and natural heritage through proper management and conservation of Greater Sage Grouse by means of cooperation and collaboration ensuring that, to the greatest extent feasible, Sage Grouse populations and their habitat are maintained, enhanced, or restored on public lands, and that such activities are promoted on private lands through development and implementation of conservation actions that will balance ecologically diverse, sustainable, and contiguous sagebrush habitats, Sage Grouse populations, and local economic considerations.

- Establish measures and guidelines that will promote Sage Grouse preservation, conservation and restoration in conjunction with continued perpetuation and expansion of local, state and regional economies.

- The plan will provide data and initiatives to identify the Greater Sage Grouse habitat necessities and establish proper management and conservation measures to conserve, protect and restore habitat needed to sustain healthy Greater Sage Grouse populations. The plan will institute conservation, preservation and restoration of the Greater Sage Grouse populations and habitat without converse devastation of multiple uses on public lands.

1.4.2 Plan Goals:

The Goals of the plan are not only to conserve, protect and restore Greater Sage Grouse Populations and habitat it is also to protect the rights of the citizens and the multiple use concept that has been the heritage and culture of this region prior to the inception of the BLM, USFS and USF&WS as federal land managers. Extended goals are to enhance and develop conservation, preservation and restoration measures to ensure that the Greater Sage Grouse is not listed as an endangered species:

- Provide pertinent data and sufficient legal thought to the general public that the Greater Sage Grouse should not be and is not a legal or viable candidate for placement on the endangered species list.
• Manage to improve habitats and promote stronger populations, keeping the best habitats and populations viable and resilient. Conserve sagebrush ecosystems that continue to function and remain capable of providing high quality habitat into perpetuity, to maintain a sufficient quantity of these habitats in a high quality condition at all times and maintain Sage Grouse populations in a viable status.

• Preserve our natural heritage through conservation of Greater Sage Grouse by means of cooperation and collaboration ensuring that, to the greatest extent feasible, Sage Grouse populations and habitat are maintained, enhanced, or restored on all lands in Elko County while also ensuring that the public lands multiple use concept is maintained and local, state and regional economies are not debilitated.

• Through careful planning that relies on local engagement and sound science, we must demonstrate that mining, mining exploration, livestock grazing, energy development, and recreation can coexist with Greater Sage Grouse across its range.

• Develop working groups of sportsmen, ranchers, mining companies, recreationist and all other users of public lands to collaboratively develop management strategies that not only ensure the long-term viability of the greater Sage Grouse, but also recognize the continued importance of the economic engines of the Elko County.

• Establish relevant issues associated with the decline of Sage Grouse populations and habitat including:
  - Habitat Quantity
  - Habitat Quality/Nutrition
  - Habitat Fragmentation
  - Changing Land Uses
  - Livestock Grazing
  - Fire / Wildfire
  - Predation
  - Disturbance
  - Disease
  - Hunting
  - Sage Grouse Life Cycles
  - Climate/Weather
  - Noxious - Invasive weeds / plants
  - Wild / Feral Horses & Burros
  - Mining / Exploration
  - Energy development
  - Disease West Nile / Other
  - Pesticides
  - Urban Encroachment
  - Recreational Disturbance
  - Roads and motorized vehicles
  - Other Wildlife Management in sagebrush habitat
1.4.3 **Plan Objectives:**

The framework to be used in the Elko County Greater Sage Grouse Protection Plan to conserve Sage Grouse and Sage Grouse habitat is multi-faceted and consists of various strategies developed by Elko County that address general conservation categories:

- Population and habitat management measures that focus on maintaining existing healthy populations and habitat conditions;

- Habitat enhancement and rehabilitation actions where on-the-ground projects have been identified and developed to mitigate verified risks;

- Education and outreach to promote long-term conservation through widespread stewardship and proper land use ethics; and

- Regulations and policies to facilitate implementation of management actions.

- Establish guidelines that will permit for the development of Sage Grouse Conservation Programs that will not cause detriment to local, state and regional economies.

- Provide incentive based directives for the private property owner to develop management methods for Sage Grouse population and habitat preservation and restoration.

**Mules Ear a Favored Habitat of Sage Grouse**
FIGURE 2
Western States Sage Grouse Habitat - USGS
1.5 Endangered Species Act – An Alternative Observation


Introduction:

Numerous petitions to the US Fish and Wildlife Service (FWS) requesting that the Greater Sage Grouse be listed under the Endangered Species Act (ESA) brought one question to the forefront, should the Greater Sage Grouse be listed as endangered or threatened? Many believe that the answer is a settled “Yes” based upon the March 23, 2010 USFWS Findings which concluded that “listing the greater Sage Grouse (range wide) is warranted, but precluded by higher priority listing actions.” See USFWS Findings, page 13910.

However, a thorough review of all the information presented in the USFWS Findings demonstrates that the USFWS conclusion that the Greater Sage Grouse is warranted for listing is not supported by the best scientific and commercial data that was considered in their analysis. The purpose of this paper is to revisit the question in light of all of the data that was presented in the March 23, 2010 USFWS Findings.

Should the greater Sage Grouse be listed as endangered or threatened?

Any answer to this question must be consistent with the primary purposes of the ESA and its definitions of endangered and threatened species. The ESA states that the primary purposes of the Act are to: 1] “provide a means whereby ecosystems upon which endangered species and threatened species depend may be conserved” and, 2] “provide a program for the conservation of such endangered species and threatened species” (see ESA, Sec. 2(b) Purposes). Since these purposes apply specifically to “endangered species and threatened species” a finding that a species is either endangered or threatened must occur before a species, or the ecosystem (habitat) upon which it depends, falls under the purview of the Act.


By definition under the ESA, an “endangered species” is “any species which is in danger of extinction” and a “threatened species” is “any species which is likely to become an endangered species within the foreseeable future” (see ESA, Definitions, Secs. 3(6) and 3(20)) (1). Thus, under the ESA, a species can only be listed as endangered if it faces imminent extinction, or as threatened if it is at risk of extinction in the foreseeable future.

Given the different definitions for an endangered species and a threatened species under the ESA, the initial question (Should the Greater Sage Grouse be listed as endangered or threatened?) becomes two distinct questions. First, does the Greater Sage Grouse face imminent extinction and therefore warrant listing as an endangered species? Second, is the Greater Sage Grouse at risk for extinction in the foreseeable future and therefore warrant listing as a threatened species?

**Does the Greater Sage Grouse face imminent extinction and therefore warrant listing as an endangered species?**

In order to address this question, it is necessary to know the minimum effective population of Greater Sage Grouse needed to maintain long-term genetic diversity and safeguard the species from the risk of imminent extinction. The U.S. Fish and Wildlife Service’s analysis in their March 23, 2010 USFWS Findings identified geographically isolated Greater Sage Grouse populations of fewer than 50 breeding adults as being at short-term risk of extinction, and identified geographically isolated Sage Grouse populations of fewer than 500 breeding adults as being at long-term risk of extinction (see USFWS Findings, page 13959)2.

The USFWS Findings further reported “a minimum effective population size must be 5,000 individuals to maintain evolutionary minimal viable populations of wildlife” (see USFWS Findings, page 13959) (2). With respect to Greater Sage Grouse in particular, the USFWS Findings reported “up to 5,000 individual Sage Grouse may be necessary to maintain an effective population size of 500 birds” because of comparatively low reproductive rates, a highly polygamous mating system, individual male breeding success, and juvenile death rates (see USFWS Findings, page 13985) (2).

The current estimated population for greater Sage Grouse exceeds 535,000 birds (see USFWS Findings, Table 4, page 13921) (2), which is 107 times greater than a minimum effective population of 5,000 birds. The USFWS Findings express concern that many greater Sage Grouse populations have already fallen well below a population of 5,000 birds, potentially compromising their genetic diversity (see USFWS Findings, page 13985) (2).

However, for purposes of determining if greater Sage Grouse are endangered, the question is not if there are any geographically isolated populations that fall below 5,000 birds, but rather if there is a geographically connected population (to allow the free exchange of genetic information) that exceeds a minimum effective population of 5,000 birds. If a single geographically connected population exceeding 5,000 birds exists, the species as a whole does not face imminent extinction, and thus does not legally qualify as “endangered” under the ESA.
The USFWS Findings identified two strongholds of contiguous sagebrush habitat for Greater Sage Grouse, the southwest Wyoming Basin (southwest Wyoming and northwest Colorado) and the Great Basin (straddling Idaho, Oregon, and Nevada) (see USFWS Findings, pages 13950 and 13962) (2). These stronghold areas contain high densities of breeding males and sizeable Greater Sage Grouse populations that have been maintained even under the alleged existing threat factors, and these are expected to remain strongholds in fifty years (see USFWS Findings, pages 13962, 13986, 14008, and 14009) (2).

These stronghold areas are each projected to currently support Greater Sage Grouse populations that are at least 10 times larger than a minimum effective population of 5,000 birds, and are each projected to maintain populations that are at least 5 times larger than the minimum effective population in thirty years if existing and anticipated threat factors continue without constraint. Thus, there are at least two discrete Greater Sage Grouse populations that currently greatly exceed a minimum effective population of 5,000 interbreeding birds, and they are expected to continue to greatly exceed such a minimum effective population over the next thirty years, so the species does not face imminent extinction and does not legally qualify as “endangered” under the ESA.

Is the Greater Sage Grouse at risk for extinction in the foreseeable future and therefore warrant listing as a threatened species?

The FWS Findings reported contemporary rates of decline for Greater Sage Grouse estimated by several sources. Connelly et al. 2004 estimated the rate of decline from 1986 to 2003 to average 0.37% per year, and reported that some populations actually increased during that period (see USFWS Findings, page 13922) (2). At that rate of decline, it would take more than 1,260 years for the estimated current Greater Sage Grouse population to dwindle to a minimum effective population of 5,000 birds range wide, and it would take more than 1,060 years for each of the stronghold areas to fall below a minimum effective population of 5,000 birds. In contrast, WAFWA 2008 estimated the rate of decline from 1985 to 2007 to be 1.4% per year (see USFWS Findings, page 13922) (2). At that rate of decline, it would take more than 330 years for the estimated current Greater Sage Grouse population to dwindle to a minimum effective population of 5,000 birds rangewide, and it would take more than 280 years for each of the stronghold areas to fall below a minimum effective population of 5,000 birds.

Speculating about what might occur 280 to 1,260 years from now reaches into the remote future, well beyond the foreseeable future. The greater Sage Grouse is not at risk for extinction in the foreseeable future, so is not legally qualified to be listed as “threatened” under the ESA.

The greater Sage Grouse is not warranted for listing as endangered or threatened.

As discussed above, the greater Sage Grouse is not faced with imminent extinction and is not at risk for extinction in the foreseeable future, so is not legally qualified to be listed as either “endangered” or “threatened” under the ESA.
The USFWS Findings’ conclusion to the contrary (finding that the greater Sage Grouse is warranted for listing range wide) is not supported by the best scientific and commercial information disclosed therein. The conclusion that listing is warranted also conflicts with subsequent estimates that such a listing would require ESA restrictions to be imposed within the 75% breeding density area which accounts for approximately 400,000 birds within 27% (50 million acres) of the currently occupied greater Sage Grouse range (186 million acres) (see Doherty et al. 2010, page 2) (3).

If the greater Sage Grouse were really rare enough to warrant listing under the ESA, it is unconceivable that its population could be so numerous and widespread that the listing would require protection of more than 400,000 individual birds across a swath of land covering over 50 million acres. Given that Greater Sage Grouse are so numerous and well distributed, and are projected to persist so far into the future under existing circumstances, it is nonsensical to classify the species as endangered or threatened.

Other Concerns

The USFWS Findings attempt to justify their warranted but precluded finding based upon several other concerns, including population trends, habitat fragmentation (primarily due to oil and gas development in the Wyoming Basin and interrelated wildfire and spreading invasive plant communities in the Great Basin), and adequacy of regulatory mechanisms to protect greater Sage Grouse. However, the cumulative impact of all of these concerns is addressed in the above described analysis regarding the minimum effective population needed to safeguard the greater Sage Grouse from imminent extinction and the risk of extinction in the foreseeable future.

Thus, regardless of the seriousness of these concerns, they do not rise to the level, singularly or in combination, to result in a need to list the Greater Sage Grouse under the ESA. Since the Greater Sage Grouse is not legally qualified to be listed as either “endangered” or “threatened” under the ESA, any perceived need to address these concerns regarding Sage Grouse management cannot be compelled under the color of the ESA.

Population Trends

The USFWS Findings admit that Greater Sage Grouse “numbers are difficult to estimate due to the large range of the species, physical difficulty in accessing some areas of habitat, the cryptic coloration and behavior of hens (Garton et al. in press, p. 6), and survey protocols” and ultimately conclude “since neither presettlement nor current numbers of Sage Grouse are accurately known, the actual rate and magnitude of decline since presettlement times is uncertain.” See USFWS Findings2, pages 13921 and 13923.

Despite the recognition that the rate and magnitude of change in Greater Sage Grouse populations over time is uncertain, the USFWS Findings assume that greater Sage Grouse populations have significantly declined from pre-settlement populations based primarily upon conclusions from several sources indicating that “Sage Grouse population numbers in the late 1960s and early 1970s were likely two to three times greater than current numbers”. See USFWS Findings (2), page 13922. Note that the cited high populations in the late 1960s and early 1970s tell us nothing about pre-settlement numbers. The USFWS Findings report that “three groups of researchers using different statistical methods (but the same lek count data) concluded that rangewide Greater Sage Grouse have experienced long-term population declines in the past 43 years, with that decline lessening in the past 22 years.” See USFWS Findings2, page 13923. These recent historical observations are consistent with testimony of Nevada residents that have firsthand memories dating back that long ago, or earlier, some as far back as the 1930s. But again, looking back 43 years, or even 80 years, tells us nothing about pre-settlement Greater Sage Grouse numbers.

The USFWS Findings ultimately conclude “although the declining population trends have moderated over the past several years, low population sizes and relative lack of any sign of recovery across numerous populations is troubling.” See USFWS Findings2, page 13987. But this conclusion is based primarily upon the observed Greater Sage Grouse population declines from the high numbers in the 1960s to today, which cannot be used to establish how current Greater Sage Grouse populations compare to pre-settlement populations. Yet, based primarily upon estimated populations at these two points in history, the FWS Findings assume a relatively linear trend line for Sage Grouse populations, and thus presume that pre-settlement Greater Sage Grouse populations were abundant.

The USFWS Findings claim that “early reports suggested the birds were abundant throughout their range” and estimate that historical populations ranged from 1.6 million to 16 million birds. See USFWS Findings2, pages 13920 and 13921. They then look forward in time and forecast that without regulatory intervention, a persistent downward trend will continue into the future, and Sage Grouse populations will eventually reach levels near or below the minimum effective population, putting the species at risk for eventual extinction. They seem oblivious to the fact that at the maximum estimated contemporary (1985 to 2007) rate of decline of 1.4% annually (see USFWS Findings, page 13922) it would take over 330 years for the estimated current greater Sage Grouse population to dwindle to the minimum effective population of 5,000 birds, a time frame that reaches way past the foreseeable future.

The Greater Sage Grouse population trend assumed by the USFWS Findings is depicted graphically by the dashed grey trend line in Figure 1. The downward trend between the 1960s and today is assumed to be relatively steep due to rapid agricultural conversion of sagebrush habitat starting in the late 1960s. Except for a period of accelerated decline associated with commercial hunting in the 1930s, the downward trend in Greater Sage Grouse populations is projected to extend back in time prior to the 1960s at a somewhat slower rate of decline.

Likewise, the downward trend in Greater Sage Grouse populations is forecast to continue into the foreseeable future, at a slightly slower rate. This forecast leads to the conclusion that Greater Sage Grouse populations will eventually reach levels near or below the minimum effective population (as high as 5,000 breeding adults), putting the species at risk for eventual extinction. See the dashed grey trend line depicted in Figure 1, herein.

However, we know from documented sources that the assumed higher Greater Sage Grouse population levels in the early and mid 1800s depicted by the dashed grey trend line are simply
wrong, at least with respect to known Greater Sage Grouse population levels at various points in the recorded history of the Great Basin. Greater Sage Grouse within the Western Region, particularly the Great Basin, were scarce during the pre-settlement period, much less abundant than today. Ira Hansen, Nevada State Assemblyman, prepared a report (available from Western Range Service upon request) regarding pre-settlement Greater Sage Grouse populations throughout Nevada and the Great Basin based upon written accounts of early explorers in the region. Those early written accounts indicate that between about 1820 and 1850, Greater Sage Grouse were uncommon, being observed only rarely by the explorers, and were seldom included in the diets of the Native Americans due to the scarceness of the bird.

Similarly, in Part III of the King Exploration Report (King) April 4, 1867 to August 1869, Ornithologist Robert Ridgway reported “birds characteristic of the sagebrush are not numerous, either as to species or individuals, but several of them are peculiar to these districts;” including Centrocercus urophasianus (Greater Sage Grouse). See King (4), page 324, underlined emphasis added. Regarding Greater Sage Grouse, Ridgway reported “(a)lthough this large and well-known Grouse was met with throughout the sagebrush country between the Sierra Nevada and the Wahsatch (sic), we saw it so seldom that little was learned of its habits, particularly during the breeding-season.” See King (4), page 600, underlined emphasis added.

Lest anyone assume that Sage Grouse were seldom seen during these explorations because the vegetative cover was significantly heavier than it is today, and thus allowed the birds to better hide themselves, consider Ridgway’s following characterization of the sagebrush communities under the section titled Birds of the sagebrush (see King, page 323) (4):

The term "sage-brush" is the western vernacular for that shrubby growth which prevails over the valleys, mesas, and desert mountain slopes of the Great Basin to the utter exclusion of all other vegetation, except in isolated and extremely restricted places. One species, the "everlasting sagebrush" (Artemisia tridentata), composes by far the larger part of that growth, "covering valleys and foot-hills in broad stretches farther than the eye can reach, the growth never so dense as to seriously obstruct the way, but very uniform over large surfaces, very rarely reaching to the saddle-height of a mule, and ordinarily but half that altitude."

The forecast that Greater Sage Grouse populations will continue to significantly decline into the foreseeable future also appears to be wrong based upon recent studies within the Great Basin. Nevada Department of Wildlife studies report that greater sagegrouse populations increased within the state from 2008 through 2010. A complete picture of Great Basin Greater Sage Grouse numbers since written records began indicates:

1] Pre-settlement populations were low, far less than today, but well scattered;
2] Populations dramatically increased between the late 1800s and early 1900s;
3] Populations peaked in about 1930 and remained high through the 1960s (perhaps interrupted by a moderate dip due to commercial hunting);
4] Populations declined rapidly from the 1970s through about 2000; and,
5] Populations declined more slowly from 2000 through 2010, and have even increased during the last part of this period in certain locations.

Figure 1 displays these circumstances graphically. All available information regarding estimated Great Basin Greater Sage Grouse numbers from the early 1800s to present is shown as triangular data points in Figure 1, connected by a smoothed black line. To determine the overall direction of change in Great Basin Greater Sage Grouse populations over time, a linear trend line (5) for the Great Basin data is depicted in Figure 1 as a solid grey line, which increased over time. This is the exact opposite of the assumed downward trend predicted by the FWS Findings based upon the period between the 1960s and the present. It is unreasonable to base conclusions regarding long-term population trends only upon knowledge regarding population levels at two points in history, 1960 and today, when we have knowledge regarding Sage Grouse populations at other times.

When interpreting graphic representations of data like that presented in Figure 1 herein, it is helpful to develop biologically relevant explanations for the points where the population curve significantly changes slope or reverses direction. The population trend explanations suggested by the FWS Findings have the potential to explain only two of the deflections shown in Figure 1 for Great Basin Greater Sage Grouse populations. Commercial hunting could explain the population decline depicted in the 1930s, and agricultural conversions may partially explain the alleged “rapid” population decline beginning in about 1970. However, agricultural conversions were taking place as early as the turn of the century, and Great Basin Greater Sage Grouse populations were significantly increasing at that time, rather than decreasing. Thus, while agricultural conversions may help explain the population decline beginning in about 1970, they are counter-intuitive when trying to explain the rapid population increases that occurred at the turn of the century.

Note (5): The only purpose for fitting this linear trend line to non-linear data was to determine whether the overall direction of change over time was upward or downward. A calculated linear trend based upon nonlinear data is not very useful for any other purpose.
Figure 1. Historic Greater Sage-Grouse Population Trends

- Great Basin
- Range-Wide
- Linear (Great Basin)

Estimated Sage-Grouse Population

Year
1800 1850 1900 1950 2000 2050

Commercial Hunting
Agricultural Conversions

High Sheep & Cattle Density; Few Large Fires; Concerted Predator Control
Livestock Reduced; Many Fires; Restricted
Predator Control

Projected Trend under a Return to Effective Management: Increase Grazing to Reduce Fuel Loads and Reduce Fire; Increase Predator Control

Linear Trend Based on All Historic Great Basin Population Estimates

Projected Trend Line Assumed by FWS Findings, Predominantly Based on 1960s & Current Range-Wide Population Estimates
Indeed, human disturbances of all sorts, roads, railways, fences, reservoirs, towns, homesteads, farms, mines, etc. flourished in the early to mid 1900s, and so did the Sage Grouse. The mere presence of human activity seems to have little biologically relevant connection to Sage Grouse population trends. However, specific human activities appear to correlate positively with Greater Sage Grouse population trends. Livestock grazing management, with its associated intensive development of meadows, hayfields, and surface water sources increased markedly in the Great Basin in the late 1800s and early 1900s, and Greater Sage Grouse populations boomed.

During this period, high livestock densities (both sheep and cattle) reduced fine wildfire fuel loads across the Great Basin, and wildfires were relatively rare and small. Higher densities of livestock dung also supplied an abundance of insect activity, particularly in closely grazed meadows and riparian areas, and the close grazing stimulated succulent new herbaceous growth and increased the forb component in these meadows and riparian areas, thereby increasing the quantity and quality of the forage supply for Sage Grouse. At the same time, concerted predator control was practiced. In fact, predator control was encouraged, subsidized, and implemented on a vast scale by Federal, State, and County governments, and was conducted by individuals throughout the west.

By the mid 1900s, Federal and State regulations were implemented and all of the grazing management practices discussed above were controlled and moderated. The Greater Sage Grouse population boom moderated at about the same time. By the late 1960s, livestock numbers and grazing levels were significantly scaled back across the west, and predator control programs were largely curtailed. Fire fuel levels increased, and the incidence of large-scale wildfires rose exponentially. Greater Sage Grouse population trends reversed and started to rapidly decline.

Thus, intensive livestock management which diminished the frequency and size of wildfires, and concerted predator control which greatly reduced Greater Sage Grouse loses to these killers, are management actions in the Great Basin that seem to be highly relevant to the biology of the Greater Sage Grouse and help explain the trajectory of their populations over time. As shown in Figure 1 on page 11 herein, it is reasonable to assume that a return to effective management to increase livestock grazing levels, reduce fire fuel loads and wildfire impacts, and increase predator control would result in another significant upward trend in Greater Sage Grouse populations.

**Habitat Fragmentation**

Proposed Greater Sage Grouse conservation measures to provide heavier cover levels through further livestock grazing reductions, and the lack of conservation measures to address ever increasing predation levels, are a prescription to assure that Greater Sage Grouse populations ultimately decline. Heavier cover for Greater Sage Grouse translates to higher fire fuel loads across the landscape, and substantial fuel loads make large scale wildfires inevitable in many sagebrush communities, particularly within the Great Basin area. Repeat burns increase the conversion of plant communities to cheatgrass, which increases wildfire frequency and limits the ability of sagebrush communities to reestablish, thereby increasing the fragmentation of Greater Sage Grouse habitat.
Thus, conservation measures that intend to benefit Greater Sage Grouse by providing them with more hiding cover will ultimately harm the species by converting significant swaths of existing habitat to annual grasslands that provide no habitat value for Greater Sage Grouse. This will concentrate the remaining birds in an ever shrinking area, making them more vulnerable to poorly controlled predator populations. In contrast, returning to the management practices discussed above under the heading “Population Trends” will reduce the risk of large-scale wildfires. This will prevent the habitat fragmentation that occurs as a result of such fires, particularly within the Great Basin area.

**Adequacy of Regulatory Mechanisms**

The USFWS Findings cited a perceived inadequacy of regulatory mechanisms as an important factor in their finding that the Greater Sage Grouse is warranted for listing under the ESA. However, their analysis completely failed to recognize or discuss the fact that many of the regulatory mechanisms that are thought to benefit greater sagegrouse have already been imposed in the Nation’s Wilderness Areas, National Wildlife Refuges, National Parks, and National Conservation Areas.

Less than 1% of the current Greater Sage Grouse breeding population needs to be conserved to support a minimum effective population as high as 5,000 birds. Because the species is heavily concentrated in high-quality portions of its occupied range (see Doherty, page 2), less than 0.15% of the total acreage in the highest breeding density portions of the occupied range needs to be conserved to support the minimum effective population. \(6\)

Likely, far more than 5,000 Greater Sage Grouse, and more than 0.15% of the species high quality breeding habitat, are located within existing Wilderness Areas, National Wildlife Refuges, National Parks, and National Conservation Areas. Thus, these nationally designated areas likely already support more Greater Sage Grouse than the minimum effective population needed to safeguard the species from extinction. Further, these nationally designated areas are already managed under special regulatory mechanisms that in many instances mirror the proposed mechanisms that current Sage Grouse planning strategies recommend for conservation of the species and its habitat.

Such nationally designated areas have the potential to protect a minimum effective population of Greater Sage Grouse under the type of regulatory mechanisms that the USFWS claims will provide them with sufficient protection from human disturbances and development. Thus, analysis of the status of the Greater Sage Grouse needs to include evaluation of its populations and trends in these nationally designated areas to determine how many Greater Sage Grouse they contain, and the extent to which their habitats are sufficient to sustain a minimum effective population of 5,000 birds under the regulatory mechanisms that are already in place.

**Note:** \(6\) Calculations: 5,000 effective pop. / 535,000 current pop. * 100 = 0.93% of population needed; 3.9% area / (25% / 0.93%) = 0.15% area needed (see Doherty, page 2 which reports that 25% of the known breeding population resides in 3.9% of its occupied range).3
If analysis of these nationally designated areas confirms that they currently support more than 5,000 Greater Sage Grouse, and demonstrates that their populations have been maintained or have increased under the regulatory mechanisms already implemented, then there is no need or justification, legally or biologically, to implement additional conservation measures anywhere else in the bird’s occupied range. In such case, the Greater Sage Grouse does not need to be listed under the ESA because its existence and trend in these nationally designated areas alone is sufficient to safeguard it from extinction.

In contrast, if analysis demonstrates that Greater Sage Grouse population trends in these nationally designated areas have declined, then the entire line of reasoning regarding the factors responsible for observed Greater Sage Grouse population trends must be reevaluated. If Greater Sage Grouse population declines have occurred in these nationally designated areas that received such recognition because of their expansive, wild, undisturbed characteristics, and have been largely protected from human disturbance and development since their designation, then factors other than habitat loss, destruction, and fragmentation due to man’s activities must be responsible for the Greater Sage Grouse population declines. Likewise, if Greater Sage Grouse populations have declined in these nationally designated areas despite the regulatory/policy mechanisms that constrain their use, all recommendations to implement similar regulatory restrictions across vast additional acreages of the Greater Sage Grouse range must be rejected entirely.

If regulatory/policy controls to minimize human disturbance have failed to allow Greater Sage Grouse populations to flourish within the vast wilderness areas and other nationally designated conservation areas, then it is unreasonable to apply such draconian control measures to broad landscapes beyond the boundaries of these areas in the vain hope that such regulations will somehow achieve in other locations what they failed to achieve in areas that are already protected. To implement regulatory mechanisms that are certain to severely interfere with other valid existing uses of the landscape and negatively impact local and regional economies in the face of evidence that such mechanisms did not improve the plight of the Greater Sage Grouse in these nationally designated areas would be unreasonable, irrational, and counter-productive. Instead, if the minimum effective population of Greater Sage Grouse necessary to protect the species from extinction cannot be supported within such nationally designated areas, then management practices that were in place when Greater Sage Grouse populations dramatically increased from the mid 1800s to early 1900s need to be identified and implemented again in other areas, including increased livestock grazing to reduce wildfire fuel loads, and concerted predator control practices.
1.6 Livestock Grazing and Wildfire

1.6.1 – Report by: Nevada Assemblyman Ira Hansen, District 33

At our January 27, 2012 Public Lands Committee meeting, a briefing paper by Bob Sommer, Fire Staff Officer for the Humboldt – Toiyabe National Forest, U.S. Forest Service, was read into the record. A single paragraph caught my eye: “…in 2007, the University of Nevada Cooperative Extension Service issued a report titled “Northeastern Nevada Wildfires 2006, part 2 – Can livestock grazing be used to reduce wildfires? They concluded “…livestock grazing is not a panacea for wildfire reduction on Northern Nevada rangelands.”

I had read the 2006 UNR report mentioned and recalled a quite different conclusion. In fact, the UNR report reads: “Can livestock grazing reduce the risk of large recurring wildfires? In a word yes, but with limitations…In site specific situations, livestock can be used as a tool to lower fire risk by reducing the amount, height and distribution of fuel. Livestock can also be used to manage invasive weeds in some cases and even to improve wildlife habitat. This under-utilized tool (emphasis mine)…”

In short, while grazing is not a “panacea”, (which means “cure-all”) it is a valuable tool and in the opinion of the authors of the 2006 UNR report an “under-utilized” tool as well. The basic question: how can we reduce the main cause of the million acre fires, the alien cheatgrass? Cheatgrass has been in Nevada since the 1890’s at least, yet the catastrophic fires did not start until the year 1999. For over a century the presence of cheatgrass did not result in fires of this magnitude. Why not? What did we do different then than now?

Also to consider is the business end of fires. As James Young, UNR range scientist for 43 years noted, “Fire suppression [has become] a multi-million dollar business that reaches from the rangelands of Nevada to corporate America It is not in everyone’s interest to biologically suppress the cheatgrass-wildfire cycle on Nevada rangelands.”

Today hundreds if not thousands are employed in a government funded range fire industry that was a token of what we see today when compared to only a little over a decade ago. The BLM/Forest Service fire budget is now in the hundreds of millions, and a range reseeding/recovery industry has been spawned as well, all relying paradoxically on a continuation of range fires. A conflict of interests exists; the successful long term solving of the million acre fires means the elimination of employment for this dramatically expanded bureaucracy.

What is the impact of livestock grazing on cheatgrass and hence wildfires? In 2008 at UNR a symposium was held by the leading experts in range management. They published their conclusions in “Great Basin Wildfire Forum: The Search for Solutions.” Here are several excerpts.

DR. PAUL TUELLER, professor of range ecology at UNR for 42 years: “The extreme fire years in the recent past must be due, in part, to the noted reduction in grazing the forage base, resulting in significant fuel buildup. The lower and sometimes upper reaches of the mountain ranges have turned yellow as a result of post-fire cheatgrass establishment…Development of intensive grazing strategies is needed to allow utilization of cheatgrass and reduce future fuel loads. Grazing animals will be the tools that must be used to make desirable changes in vegetation.”

DR. LYNN JAMES, director of the USDA ARS plant research laboratory at Logan, Utah for 35 years;”Fires depend on adequate fuels-grasses and certain shrubs. The larger the fuel load, the hotter the fire will burn and the more damaging it will be…An economical and efficient way to
remove excess grass is with an on-off grazing system. Fuel loads are reduced, while producers benefit from forage consumed by their livestock. Other grazing strategies can aid in preventing or managing wildfires and controlled burns. Fires that do occur burn with reduced intensity and a general upward trend in rangeland condition is sustained.”

DR. KEN SANDERS, professor of rangeland ecology at the University of Idaho for 32 years:”The third biggest threat is the reduction in grazing on public rangelands. If the proposed sage grouse habitat guideline that recommends leaving a grass stubble height of 18 centimeters is applied, it will not only result in an adverse economic impact on livestock producers ,but it will also result in increased, higher intensity wildfire due to a larger fuel load.”

DR. WAYNE BURHHARDT, UNR professor of range management, emeritus: “For the past 40 years, the management strategy, at least on public lands, has been to reduce or modify livestock grazing on these annual grasses, presumably to allow the re-establishment of native bunchgrasses. This has proven to be disastrous. Pre-adopted annual grasses [such as cheatgrass] can out-compete native bunchgrasses for early spring moisture on arid range sites. Reductions in grazing on these rangelands have not promoted the establishment of native flora, but rather have allowed flammable fuel build-up and increased fire frequency, intensity and spread. These unnatural fires remove the sagebrush overstory, prevent shrub re-establishment and create the conditions for the establishment of monotypic annual grasslands on what should be a shrub/grassland vegetation community.

Public land grazers have an important role in protecting the resource by reducing fire danger, by managing fuels and improving the health and productivity of the range. Grazing should be firmly established as a necessary tool in reducing fire danger. The public needs to understand that fine fuel reduction and weed control are positive aspects of grazing and that properly managed grazing is good for the land.”

DR. SHERM SWANSON, professor, Department of Natural Resources and Environmental Science, UNR: “The presence of grazing animals on the range should not be viewed as overgrazing, but rather as a valuable tool. When used properly, grazing can help achieve resiliency in desirable plant communities and responsible fire and fuels management.”

In USFS Fire Staff Officer Bob Sommer’s briefing paper he also wrote: “After the Murphy fire, the Idaho BLM State Director put together a team from both Nevada and Idaho…The purpose was to look at plant communities and livestock grazing in relation to the Murphy fire. The team concluded that much of the Murphy fire burned under extreme fuel and weather conditions that likely overshadowed livestock grazing as a factor influencing fire extent and fuel consumption.”

I bring this up as, while studying this question, I came across this quote from Dr. NEIL RIMBEY, professor and range economist at the University of Idaho. He wrote: “A tour of Idaho’s Murphy Complex fire and the Tongue Complex on Juniper Mountain in the late summer revealed graphic evidence that grazing may reduce fuel loads and even stop fires.”

Clearly, if both men are describing the same fire complex, and I believe they are, they seem to be reaching substantially different conclusions from what I assume are the same observations.

If fires require fuel, and the fuel causing the fires is cheatgrass, the goal then to block fires is to remove as much fuel – cheatgrass – as possible. Less fuel – less fire, and if cheatgrass has been around for over 100 years, and fires were relatively small and uncommon, livestock must have been the source of keeping this fuel in check.
So why no giant fires prior to 1999? This is why I am highly skeptical of the BLM and USFS. The same “experts” that now assure us they have the solution are the same “experts” that got us into our current mess. Starting in the 1950’s, the “experts” came in and told us the “range was over grazed” and the solution was a reduction of livestock. So they began to cut, small at first, huge by the 1980s and 1990s. Between 1982 and 1991, Nevada had a reduction of 180,000 head of cattle. The experts assured us this would reestablish healthy native plant communities and reduce the less desirable shrub species, primarily, ironically now, sagebrush. If you read the literature right up to the time of the massive fires, you will note the livestock industry was highly criticized for an alleged huge increase in sagebrush. Sagebrush and several other native shrubs are largely unpalatable for livestock. Hence, since they are not eaten and the more desirable plants are, they tend to increase in numbers, while the desirable palatable plants decline. This is especially ironic now in light of the fact the decline in sagebrush habitat is the primary reason the “experts” give as the cause to put the sage grouse on the endangered list.

Every decade or so in the government land management agencies there is an almost complete turnover of “range scientists”, as field personnel move up the management ladder, and a whole new crop of college-educated “experts” take their place. Yet Nevada ranches, most owned by the same families for generations, are “non-experts” totally at the mercy of their federal masters. This is not a put-down per se of all federal land management people, many if not most of which are good hardworking individuals. It is a statement explaining why I am highly skeptical of listening always to the “experts”, as their track record in Nevada has been horribly bad.

I have always believed the people who will be most harmed by bad land management practices are the ranchers themselves, hence they have a strong financial incentive to insure the long term health of the ranges they use. It is the ranchers who have been the most vocal critics of the Federal policies, warning of exactly what has come to pass. Yet today, if our most recent meeting is an example, we are shunting aside the “non-experts” who actually live on the ground, and are once again being dictated to by “experts” getting their marching orders from Washington D.C.

Incidentally, I have absolutely no connection with the livestock industry. I am in fact a contractor living in Sparks. But I have a strong interest in the plant communities and wildlife of Nevada and have spent literally years in Nevada’s backcountry. I have carefully read everything about these issues I can get my paws on (including the book “Cheatgrass” by Young & Clements. One of the few books, purchased in 2009, my wife teased me about buying. Not exactly on the NY Times best seller list!)

In conclusion, any reasonable person would agree, using domestic animals to reduce the quantity and spread of cheatgrass is the best solution currently available. The government required massive reduction in AUMs and livestock turn out time frames must be reversed if we are serious about having a public rangeland composed of native plants. Our current trend insures massive fires almost indefinitely, a huge taxpayer subsidized “range fire” industry, and a future Nevada landscape composed of the dull yellow color of monotypical stands of cheatgrass. Nevada will be the “Sagebrush State” no more.

IRA HANSEN, NEVADA ASSEMBLYMAN District 32
GREATER SAGE GROUSE MANAGEMENT AND CONSERVATION STRATEGY PLANNING ISSUES:

2.1 – Factors Affecting Greater Sage Grouse Populations and/or Habitats

The following issues were identified as potential factors contributing to the decline in Sage Grouse populations throughout the west and Elko County:

- Habitat Quantity / Quality / Nutrition
- Livestock Grazing / Agriculture
- Fire / Wildfire
- Predation
- Disturbance
  - Mining, Energy and Energy Transmission Development
  - Changing Land Uses / Urban and Rural Development
  - Recreation
  - Roads & Motorized Vehicles
  - Wild & Feral Horses & Burros
- Disease
- Hunting
- Life Cycles
- Climate/Weather
- Pesticides
- Noxious - Invasive weeds / plants
- Other Wildlife Management in sagebrush habitat

These factors, such as habitat quantity, habitat quality/nutrition, habitat fragmentation, fire / wildfire, changing land uses, livestock grazing, and disturbance, are addressed individually in chapter 6.0. Specific actions can be implemented through a protection plan to eliminate or reduce the potential impacts from these factors. Other factors, such as predation and hunting, fall under the specific jurisdictions and laws. Elko County can only develop recommendations for changes, but implementation would occur through other processes. Factors such as disease and cycles impact on the populations must also be considered.
2.2 – Planning Area Sage Grouse Habitat Categorization

The Sage-grouse Map was developed using a mapping framework produced by the Bureau of Land Management (BLM) that designates the restoration potential of sagebrush communities (R-values) within the known range of sage-grouse in Nevada. The R-values were developed in a geographic information system (GIS) by BLM State Office staff and District personnel, with cooperation from NDOW wildlife biologists, based upon existing vegetation cover, ecological site potential, and burned areas. R-value classifications were adapted from Sather-Blaire (2000) and are defined below.

Sage-grouse habitat was categorized into the following five classes using definitions established by the Nevada Energy and Infrastructure Standards to Conserve Greater Sage-Grouse (Nevada Governor’s Sage-Grouse Conservation Team 2010):
Category 1 – Essential/Irreplaceable Habitat

The lek itself and associated nesting habitat is categorized as essential and irreplaceable habitat. The interrelationships between the vegetal characteristics of a given area, female nest site selection, and movement patterns of the population that drive males to establish a lek in areas of female use is spatially and temporally dynamic and has yet to be successfully recreated (ODFW correspondence 2008). However, focusing solely on the lek location and a certain buffer around the lek does not always adequately represent those areas that are crucial to the long term survival of particular populations, especially those that are migratory. Several telemetry monitoring efforts, particularly in eastern Nevada, have shown that females will move up in elevation from the lek sites to more mesic habitats to both nest and raise their broods. These habitats should also be considered as Category 1 habitats that are essential and irreplaceable. Category 1 habitat often corresponds to the R-0 habitat definition (see definitions above).

Category 2 – Important Habitat

Suitable and diverse winter habitats and high quality brood rearing habitats are significant to the long-term persistence of sage-grouse populations. Winter habitats are very important to sage-grouse due in large part to their complete dependence on sagebrush during the late fall and winter months (Connelly et al. 2000). Depending on the year and the snowpack in a given area, winter habitats elevate in importance as snow accumulations rise. Because of the loss of sagebrush in Nevada over the last decade (approximately 2.6 million acres or 12% of available sage-grouse habitat), winter habitat is at a premium and depending on the particular PMU, could actually be considered essential and irreplaceable. Considering this further, the loss of Wyoming big sagebrush over the last decade coupled with the long recovery period of 50-120 years (Baker 2006) for this species, a “no net loss” or “net increase” policy should be adopted for this seasonal habitat. In Nevada, winter habitats are essentially comprised of mountain big sagebrush, Wyoming big sagebrush and/or low sagebrush communities. Plants within these communities are usually taller than at random sites (Connelly 1982, Schoenberg 1982). Also, 5 sagebrush canopy cover is typically greater than 20% at wintering sites (Hanf et al. 1994, Eng and Schladeleier 1972, Homer et al. 1993). High quality winter habitat may correspond to the R-2 habitat definition, but there are situations where important winter habitats could be nested within R-0 habitats as well.

Brood rearing habitats are also a very important component of sage-grouse habitats. A mosaic of upland sagebrush vegetation intermixed with mountain meadows and spring systems compose brood rearing habitat. These habitat types are fairly limited in Nevada because of the dry climate exhibited throughout the majority of the Great Basin. These habitats have been impacted by improper livestock grazing practices (whether prior or current), overutilization by wild horses, and pinyon and juniper encroachment. Due to past and current perturbations to these habitat types, a “no net loss” or “net benefit” policy should be adopted for this seasonal habitat type. In theory, high quality brood rearing habitat corresponds best to the R-0 habitat definition; however, there are instances where high quality brood rearing habitat could be nested within R-1 and R-2 habitat definitions.

Category 3 – Habitat of Moderate Importance

These habitats are those that are not meeting their full potential due to any number of factors, but serve some benefit to sage-grouse populations. These habitats can serve as
nesting, brood rearing, winter or transitional habitat, but are marginal. For the short-term, these habitats may only be of limited value on a seasonal basis, but could serve additional long-term values if certain habitat components (most importantly sagebrush) return to the site.

Habitats within this Category could correspond to R-1, R-2 or R-3 habitat definitions. R-1 habitats generally tend to be upper elevation sagebrush habitats, normally mountain big sagebrush communities that have recently burned. These areas are likely to return to a mountain big sagebrush community within 35-100 years (Baker 2006) and would then serve greater value to sage-grouse, but presently may only be of marginal value during the brood rearing period for example. R-2 habitats with ample sagebrush, but little understory exist at various elevation and topography types. These areas can often be treated with passive management techniques, which are recommended in xeric sagebrush communities that receive ≤12” of precipitation. Pinyon and juniper encroached sagebrush habitats, or R-3 habitats that have not crossed a threshold, may be of value to sage-grouse depending on the level of encroachment. These areas can be restored through a number of treatment techniques such as hand thinning, mechanical treatment using equipment or prescribed fire and certainly be of future value.

**Category 4 – Low Value Habitat and Transitional Range**

Habitats within this category currently contribute very little value to sage-grouse other than transitional range from one seasonal habitat to another or minimal foraging use. Habitats within this category that correspond to R-3 habitat definitions have not completely crossed a threshold where restoration efforts would be ineffective, but would be very expensive with secondary work needed to recover the understory. The cost/benefit ratio is too high to apply recovery efforts at this time. Similarly, habitats that correspond to the R-4 habitat definition may not have necessarily crossed the restoration threshold, but restoration would be very expensive and also require secondary or tertiary treatments to control invasive plant species post treatment.

**Category 5 – Unsuitable Habitat**

This category, in essence, represents non-habitat at this time unless greater strides are made with respect to restoration techniques. In general, habitat is in such poor condition that restoration efforts would not be feasible or effective. Non-habitat can either be designated non-habitat areas delineated within seasonal distribution maps or areas that have undergone substantial change and are not likely to recover. These areas could be lower elevation sagebrush habitats that have burned and are now annual grasslands dominated by various invasive weeds. Areas such as these are not likely to recover without substantial effort and expense. Other examples of habitat alteration that could render an area to be considered “non-habitat” include agricultural conversion, or cultivation, and urban/suburban development. Category 5 habitat could correspond to the R-3 or R-4 habitat definitions. These areas have little potential to produce sagebrush plant communities and are currently dominated by pinyon/juniper woodlands or annual grasses and forbs.

**Not Applicable – Non-habitat**

The Not Applicable (N/A) category identifies areas of no consequence to sage-grouse, such as dense conifer stands, alpine cliffs and rock outcrops, playas, and human disturbances such as highways, gravel pits, mines, and populated places.
2.3 – Habitat Quantity

Changes in habitat quantity result from alteration of sagebrush habitats to other vegetation types. These changes may be short-term, or temporary, if the alteration results in sagebrush reestablishment over time, or they may be permanent if the alteration prevents sagebrush reestablishment. Primarily wildfires have resulted in the conversion of approximately 251,600 acres of sagebrush rangelands to annual grasslands in Elko County since 1980. The acreage converted has included Sage Grouse winter, breeding, nesting, and brood habitat. Within the Strategy area, large blocks of annual grasslands are most prevalent within the western portion of Elko County; however, cheatgrass is an understory component of many plant communities throughout the county.

Newly hatched broods need forbs and insects available in close proximity to the nest location – they have to walk to areas with adequate food sources and those are characterized by the understory of low sagebrush plant communities. By the same token, as the forbs in low sagebrush plant communities mature and dry up (desiccate) the broods walk or partially fledged chicks fly short distances as they travel to the next seasonal habitat which is typically within meadows during the summer. That summer foraging is within naturally occurring meadows, meadows created by irrigation, or cultivated hay fields (alfalfa seems to be preferred).

The encroachment of pinyon-juniper woodlands from woodland sites to rangeland sites has also been responsible for loss of sagebrush habitats. Approximately 354,500 acres of pinyon-juniper encroachment has occurred within the planning area. Fire suppression or extended fire intervals allow pinyon-juniper to spread across the landscape (Tausch 1999). Chemicals in the foliage of the juniper trees prevent other species of grasses and shrubs from germinating or establishing under the juniper canopy. As the juniper begins to dominate the site, the shrub-herb community is essentially lost or greatly reduced, depending on the site conditions. Sage Grouse do not use pinyon-juniper woodlands, and the encroachment of this plant community into sagebrush-herb communities represents a loss of habitat for Sage Grouse. Due to the loss of understory in many of the pinyon-juniper stands, conversion back to sagebrush-herb communities is not a simple process. Where sagebrush still exists in the understory, several options for restoration are available. The issue of pinyon-juniper encroachment is most prevalent in the southern half of the Strategy area.

During the late 1950s and early 1960s, several varieties of crested wheatgrass were used to control halogeton and increase livestock forage production on western rangelands. These seedings were conducted primarily on gentle terrain at lower elevations (Wyoming sagebrush sites). The converted sites impacted nesting habitat, early brood habitat, and winter habitat. Although some seedings were used by Sage Grouse for breeding (leks), the overall impact has been considered to be detrimental to Sage Grouse (Braun 1998). Some seedings where sagebrush has reestablished have been noted as being used by Sage Grouse for winter use (Back et al. 1984) and nesting (K. McAdoo, personal communication). BLM records (Rich 1999) indicate that the cumulative acreage of rangeland seedings on BLM administered lands in the west increased from approximately 100,000 acres in 1962 to 2.75 million acres by 1997. This acreage does not include private land seedings. According to the BLM Elko Field Office, about 396,500 acres of public lands within the Elko Field Office area were converted to crested wheatgrass or other exotic species (not including fire rehabilitation projects). This represents about
three percent of the land area in Elko County. Private land seedings were likely to have affected at least the same amount of acreage.

Not all sagebrush removal was followed by seeding of exotic grasses. Sagebrush control projects designed to remove sagebrush and allow native grasses to increase in abundance followed a pattern similar to crested wheatgrass seedings. Brush control projects on BLM administered lands in the west accounted for approximately 100,000 acres in 1962 and increased to approximately 1.4 million acres by 1976. Only about 300,000 acres of BLM administered lands have been converted to grasslands since 1976 (Rich 1999). Where sagebrush has been allowed to reestablish on these lands, Sage Grouse habitats have likely been reestablished. Where follow-up treatments have been conducted, Sage Grouse have been effectively removed from the acreage. Sagebrush rangelands have also been converted to a variety of other agricultural uses, including hay production, through various forms of irrigation. While this acreage has reduced the amount of winter or nesting habitat, much of the irrigated land has received use as summer foraging habitat.

The rapid expansion of the mining industry in and around Elko County starting in the 1980s also minorly impacted Sage Grouse habitats. While most of the acreage will be reclaimed to support sagebrush communities, some acreage has been converted to salt desert shrub or exotic grasses, and some acreage represented by the open pits will remain permanently unavailable to Sage Grouse. Some of these impacts have been mitigated by off-site projects intended to rehabilitate annual grasslands. Many mines have contributed mitigation funds to experimental land treatments that have been instrumental in developing management tools for this strategy. Although mining disturbance is very visible during active mining, the actual acreage involved represents less than two percent of Elko County’s land mass.

2.4 – Habitat Quality/Nutrition

The quality of the habitat contributes to the effectiveness of many of the other factors. Disease, predation, hunting, and disturbance are less likely to affect populations when habitat quality is high and both the birds and the populations are resilient. Population impacts from unfavorable weather conditions are also somewhat ameliorated by having high quality habitats. Managing for quality habitats, while maintaining and restoring habitat quantity, are probably the two most important factors for long term sustainability of Sage Grouse populations.

Habitat quality also pertains to the integrity of the plant communities. Invasive weeds, annual grasses, and exotic species (desired or undesired) all detract from habitat quality. For each invasive weed, annual grass, or exotic species there is one less forb, native grass, or sagebrush seedling that can be supported within the community. These species also increase the risk of conversion from a shrub-herb community to an annual grassland-noxious weed community following catastrophic events (see habitat quantity, above). Habitat quality was also addressed by conducting a habitat condition assessment. The purpose of the assessment was to determine five broad categories of habitat condition and mapping the location of habitats of each condition class. The five habitat conditions (R-0, R-1, R-2, R-3, and R-4) are described as follows:
• **R-0** – Areas with desired species composition that have sufficient, but not excessive sagebrush canopy and sufficient grasses and forbs in the understory to provide adequate cover and forage to meet the seasonal needs of Sage Grouse.

• **R-1** – Areas with potential to produce sagebrush plant communities that have good understory composition of desired grasses and forbs, but lacks sufficient sagebrush canopy. These areas could be characterized by native perennial grasslands post fire or seeded perennial grass rangelands.

• **R-2** – Existing sagebrush plant communities with insufficient desired grasses and forbs in the understory.

• **R-3** – Areas dominated by pinyon/juniper woodland that may have the potential to produce sagebrush plant communities. These areas include sagebrush sites that have been encroached by pinyon/juniper woodlands, as well as other pinyon/juniper dominated sites that may provide potential value to sage-grouse.
   
   o **X-3** – Pinyon/Juniper areas that have crossed the threshold from sagebrush ecological site to pinyon/juniper or juniper woodland or have only had a potential for woodland plant community.

• **R-4** – Areas with potential to produce sagebrush plant communities, but are dominated by annual grasses, annual forbs, or weeds.
   
   o **X-4** - Areas that have crossed the threshold from sagebrush ecological site to annual grasses, perennial weeds or bare ground or a non sagebrush ecological site.

In addition to the upland habitats, the riparian meadows and springs are important habitats for Sage Grouse in late summer. The BLM Elko Field Office has rated 912 miles of riparian areas in terms of lotic proper functioning condition (PFC) and has estimated that 178 miles (19.5 percent) of the riparian areas were at PFC, 153 miles (16.8 percent) were functioning at risk with an upward trend, 122 miles (13.4 percent) were functioning at risk with a downward trend, 125 miles (13.7 percent) were functioning at risk and trend was not determined, and 335 miles (36.7 percent) were not functioning. In addition, of the approximately 5,600 acres of lentic habitat within the planning area, approximately 2,700 acres have been evaluated with regard to PFC. Of the acreage evaluated to date, 2,137 acres (78.5 percent) were rated at PFC, 70.5 acres (2.6 percent) were functioning at risk with an upward trend, 97.1 acres (3.6 percent) were functioning at risk and trend was not determined, 288.2 acres (10.6 percent) were functioning at risk with a downward trend, and 130.2 acres (4.8 percent) were not functioning. These totals do not include riparian habitats on private lands and represent only the total riparian areas that have been assessed.

The habitat parameters from the Sage Grouse Guidelines (Connelly et al. 2000) were used to determine where Sage Grouse seasonal habitats occur within the basic conceptual successional model. Pre-nesting, early brood habitat, and nesting habitat all fall within the time period when herbaceous vegetation is dominant or co-dominant with sagebrush. The forbs and insects are important components of the pre-nesting diets of hens and early diets of chicks. The abundant herbaceous cover also provides the lateral screening cover for the nest site and to help conceal the hen when she leaves or returns to the nest. Late
summer and winter habitats have a higher component of shrubs than the “production” habitats associated with nesting and early brood habitat. Herbaceous vegetation in the uplands is not an important factor in late summer and winter.

2.5 – Habitat Fragmentation

Habitat fragmentation consists of breaking up large areas of habitat into smaller, isolated areas of habitat. Species need to move through “non-habitat” to use the resulting patchwork of suitable habitats. The “non-habitats” can be physical/psychological barriers (e.g., roads or fences), blocks of unsuitable habitat (e.g., crested wheatgrass seeding or annual grassland), or other zones that a species avoids due to predation risks (e.g., adjacent to transmission lines). Fragmentation impacts vary by species due to the home range, daily range, and territorial requirements of different species. A species that spends an entire lifetime on only a few acres may not be impacted by the construction of a road or implementation of a crested wheatgrass seeding within a quarter mile of its home range, whereas a species that requires a large home range or seasonal habitat area may be impacted by breaking a large block of habitat into smaller patches. There is very little data pertaining to road density and Sage Grouse.

Preliminary estimates of road mileage within the planning area include 775 miles of primary and secondary roads (paved Interstate highway and State highways, respectively), 2,511 miles of hard improved roads (gravel/county roads), and 17,833 miles of unimproved roads. Utility line support structures may also influence habitat use. There has been some suggestion that predation on male Sage Grouse at leks is increased by raptors using transmission line supports as perches near leks. This has not been demonstrated in a scientifically controlled study and seems very unlikely to occur. The premise by Hall that transmission line structures provide an advantage for raptors to prey on males at leks needs to be examined. Leks are used for many years. This consistency in time and space makes the lek a predictable resource. Raptors will attempt to exploit this resource with or without perches.

A resource that is predictable in time and space can be hunted efficiently on the wing, using the element of surprise. Use of existing cover (i.e., flying low over the sage brush to decrease the angle of detection) and using the existing topography (i.e., approach from the blind side of the ridge) are more likely to be successful than initiating the attack from a perch in full view of ten to 50 prey. Although the literature indicates that attacks by eagles at leks are common, the attacks are most often unsuccessful (Scott 1942, Stanton 1958, Rogers 1964, Wiley 1973b, Autenrieth 1981). The timing of the breeding display before dawn to shortly after sunrise has been hypothesized as a response to predation pressure (Hjorth 1970, Hartzler 1974, Bergerud 1988b, Phillips 1990). This is a period when sufficient light is present to effectively display but there is insufficient light to make the Sage Grouse highly visible. It is also the time when owls return to their day roosts and prior to initiation of hunting by eagles, although there is some overlap of the breeding display with the hunting period of both owls and eagles.

The addition of support towers or other perches into otherwise perch-free habitats does not necessarily equate to increased predation pressure on the leks. Avian predators can prey on males at the lek with or without the transmission line. However, where the support tower is relatively close to the lek, the presence of a predator in full view may be sufficient to make the males too “nervous” to display, resulting in lek abandonment. There is likely some “comfort zone” that Sage Grouse have with regard to elevated perches such as rock outcrops, woodlands, and transmission lines. Avoidance of these
structures up to a distance whereby detection of a raptor leaving the perch allows sufficient time for escape would seem to be a prudent behavior.

In contrast to leks, nests are a resource that are unpredictable in space, but somewhat predictable in time (i.e., only during the breeding season). Detection is a necessary step to successful predation. A “perch and search” approach is an effective strategy for this type of resource, especially when there are cues to the nest location. The hen leaves the nest at least twice per day to feed, defecate, and exercise; this is accomplished by sneaking through the vegetation until some distance from the nest. At this point, the hen may fly to another area. If the flight is detected, or if the hen is detected while sneaking from the nest, ravens will investigate the area in search of the nest. This may be unsuccessful for several attempts; however, the hen leaves the nest by a different route during each recess, and the patient predator can narrow down the search area within a few days. The end result is a high level of nest predation.

Successful Sage Grouse hens have high nest site fidelity. However, if nest success in an area is low due to nest predation, fewer and fewer young would be produced. Eventually, over a period of years, the number of nesting hens in the vicinity of the transmission line would be expected to decline through natural mortality. Without replacement hens being produced, breeding opportunities for the males would decline, and subsequently, attendance at the lek would decline.

Typical Late Summer Sage Grouse Habitat
FIGURE 4
Greater Sage Grouse Habitats Categorization Map
Nevada – BLM
FIGURE 5
Currently Occupied Greater Sage Grouse Habitats
Nevada – BLM

TABLE 1A
Estimated Acreage of Habitat Condition by Population Management Unit (PMU) within the Planning Area

<table>
<thead>
<tr>
<th>PMU</th>
<th>R-0 (Intact)</th>
<th>R-1 (Perennial Grassland)</th>
<th>R-2 (Poor)</th>
<th>R-3 (P/J)</th>
<th>R-4 (Cheatgrass)</th>
<th>Non-Habitat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desert</td>
<td>569,272</td>
<td>17,860</td>
<td>438,631</td>
<td>0</td>
<td>7,856</td>
<td>75,963</td>
<td>1,108,582</td>
</tr>
<tr>
<td>Island</td>
<td>192,912</td>
<td>410</td>
<td>189,240</td>
<td>2,485</td>
<td>19,119</td>
<td>66,064</td>
<td>259,380</td>
</tr>
<tr>
<td>North Fork</td>
<td>1,261,252</td>
<td>62,011</td>
<td>187,934</td>
<td>57,022</td>
<td>37,573</td>
<td>167,124</td>
<td>1,731,231</td>
</tr>
<tr>
<td>Tuscarora</td>
<td>588,029</td>
<td>284,186</td>
<td>284,108</td>
<td>0</td>
<td>126,560</td>
<td>102,229</td>
<td>1,385,112</td>
</tr>
<tr>
<td>South Fork</td>
<td>364,428</td>
<td>272,808</td>
<td>130,189</td>
<td>4,033</td>
<td>2,926</td>
<td>102,342</td>
<td>1,014,121</td>
</tr>
<tr>
<td>O'Neil Basin</td>
<td>630,096</td>
<td>144,535</td>
<td>119,904</td>
<td>11,078</td>
<td>14,524</td>
<td>43,627</td>
<td>538,120</td>
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<tr>
<td>Snake</td>
<td>245,647</td>
<td>103,340</td>
<td>162,402</td>
<td>139,454</td>
<td>0</td>
<td>39,771</td>
<td>912,217</td>
</tr>
<tr>
<td>Gollagher</td>
<td>368,148</td>
<td>204,442</td>
<td>318,979</td>
<td>62,080</td>
<td>4,332</td>
<td>435,077</td>
<td>1,115,040</td>
</tr>
<tr>
<td>Ruby Valley</td>
<td>253,339</td>
<td>41,233</td>
<td>186,311</td>
<td>78,339</td>
<td>38,683</td>
<td>143,543</td>
<td>790,647</td>
</tr>
<tr>
<td>East Valley</td>
<td>334,982</td>
<td>8,789</td>
<td>78,339</td>
<td>38,683</td>
<td>0</td>
<td>143,543</td>
<td>790,647</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,805,105</strong></td>
<td><strong>1,169,614</strong></td>
<td><strong>2,017,698</strong></td>
<td><strong>354,491</strong></td>
<td><strong>251,573</strong></td>
<td><strong>1,625,911</strong></td>
<td><strong>10,224,392</strong></td>
</tr>
</tbody>
</table>
2.6 – Changing Land Uses

Change in land use refers to a change from wildlife habitat or livestock grazing to another land use that represents a long-term or permanent change. This includes changes associated with construction of reservoirs, recreational developments, urban development, or other human developments. The impacts are similar to those discussed under Habitat Quantity, but because of the permanent or long-term nature of these changes, the habitat values are generally not recoverable.

For established plants, growth at the beginning of the growing season is based on the carbohydrate reserves in the root system. As the above ground leaves develop, they begin to conduct photosynthesis and produce additional carbohydrates for plant growth. Eventually, the transfer of carbohydrates from the roots to the growing shoots ceases, as the above ground plant parts reach sufficient mass to support additional growth. At this point, additional growth results in carbohydrates transferred from the above ground plant parts to the roots, replacing the carbohydrates used thus far in the growing season. Nutrients and water continue to be transported to the above ground parts of the plant to be used for reproduction. The replacement of root reserves continues until the seeds (or fruits) are ripe and the plants begin to desiccate in advance of dormancy during the non-growing season.

The various grasses, forbs, and shrubs initiate growth at different times and go dormant at different times, or in the case of sagebrush, continue to conduct photosynthesis throughout the year. But in general, they follow the pattern of carbohydrate use and production described above. From this discussion, it is apparent that a plant must have sufficient root reserves at the beginning of the growing season to support the plant until sufficient new growth is obtained so that the equilibrium between carbohydrate use and carbohydrate production is established. The level of root reserves for the current year is determined during the previous growing season by factors such as moisture and nutrient levels, competition with other plants, herbivory, or disturbance (e.g., fire).

The carbohydrate cycle provides one mechanism for understanding how herbivory can affect plant condition and survival. Using the carbohydrate cycle model, the potential impacts of foliage removal can be analyzed. Grazing early in the season reduces the amount of above ground foliage, requiring more root reserves to be utilized before reaching the equilibrium point. Root reserves that are used to produce the early green up are removed as foliage by the herbivore. Repeated grazing of the same plant in the same year during the early growth period stresses the plant, perhaps to the level that formation of the reproductive parts cannot be achieved, especially if the growing season is not of sufficient duration to allow the plant to replenish the root reserves. Repeated early season grazing over subsequent years continually lowers the root reserves, reducing the ability of the plants to produce seeds (Laycock 1979). However, this requires that all plants be grazed and that all portions of the plant be removed. Any herbivory that results in only a portion of the plant being removed, or only affects a portion of the total number of plants, would have less of an impact.

Not all plants initiate growth at the same time; therefore, the herbivore may switch among plants during the season. The more species of plants available, the less likely any one species will experience the bulk of the herbivory. Also, with a shorter the grazing period, it is more likely that some plants will be in a growth stage that is not impacted by herbivory. Altering the grazing period from one year to the next also reduces the likelihood that any one species would be impacted every year. Slight to moderate levels
of grazing, with non-uniform distribution of the grazing, are likely to have less impact during the early season than heavy, repeated, and uniform grazing within a pasture.

Grazing during the latter portion of the growing season can limit reproduction and reduce the ability of the plant to replenish the root reserves. Re-growth of foliage is less likely as soil moisture declines, and the plant has switched physiological pathways to produce the reproductive parts. Without re-growth, the unused foliage must replenish the root reserves. The caveat provided above for early season herbivory also applies; partial removal of the foliage, or only grazing some of the available plants, will reduce the impact.

Grazing the above ground foliage during the dormant period does not impact the carbohydrate reserves. Foliage removal during this period does not impact the plant; however, the protein level of the foliage declines as the foliage dries out, reducing the value of the forage to the herbivore. Bork et al. (1998) found that repeated fall grazing by domestic sheep in southeastern Idaho decreased shrub cover and increased perennial grass and forb cover. Sheep utilized more brush in their diet during this time period because of the lowered nutritional value of the dormant herbaceous vegetation.

West et al. (1984) found no increase in total herbaceous production in big sagebrush range in Utah following 13 years without livestock grazing. In southeastern Idaho, 25 years without livestock grazing in the sagebrush steppe resulted in only a five percent increase in basal cover of perennial grasses (Anderson and Holte 1981). Neuman (1993) demonstrated that root stress (in the form of oxygen deficiency and root restriction), reduces leaf growth and results in increased starch concentration in the leaves (i.e., carbohydrates were not translocated to the roots). Therefore, in the absence of herbivory, the ability of the plant to replenish root reserves can be impacted by other factors, and thus the long-term changes in plant communities that result from plant-plant interactions can occur.

The previous discussion demonstrates that herbivory by wild or domestic animals can impact the herbaceous vegetation; however, it also demonstrates that herbivory can be conducted with minimal impact to the vegetation. By adjusting grazing systems to vary the seasonal timing and intensity of herbivory, and allowing plants to replenish the root reserves, grazing and other land use objectives can be achieved. These impacts and lack of impacts are put into historical perspective in the following discussion.

Over the last 150 years, the combination of plant-animal interactions (herbivory) and plant-plant interactions have resulted in changes in the plant communities on western landscapes. The prevalence of grazing in the west has resulted in many people reaching the conclusion that all of the plant community changes have been the result of livestock grazing. As the above discussion demonstrated, herbivory can impact vegetation, but the degree of impact is dependent on the intensity of herbivory (i.e., how much of each plant and what proportion of the total number of plants are consumed), the period of time that the herbivory takes place (i.e., early, late, or after the growing season), the duration of the herbivory (i.e., how long during the growing season the herbivory occurs), repeated herbivory at the same time of the year every year, and other stresses on plant physiology.

Major climatic changes were occurring at the time of European man’s settlement of Nevada. The Little Ice Age was ending and the climatic regime experienced in the 300 years preceding about 1850 was changing from cold and wet to warm and dry. The climatic conditions that supported relatively high vegetation cover, including both
sagebrush and herbs, changed to conditions that favored the competitive advantages of shrubs and trees, especially sagebrush (longer growing season, deeper root system, and adaptations for retaining limited moisture). The season-long grazing practiced during the early part of this period, combined with a gradual shift to a warmer and drier climate, proved favorable for shrub dominance over most of the Great Basin.

Establishment of the Forest Reserves, precursors to the National Forests, and later the establishment of the Grazing Service part of the Department of the Interior, the Bureau of Land Management (BLM), resulted in changes to grazing on public lands. Although the initial missions of the Forest Service (USFS) and the BLM included forage production, the management objectives were to improve range condition that had deteriorated during the 1800s and early 1900s. The dominance of the shrub component of the plant communities eventually led to “range improvement” practices. Range improvements included sagebrush control, fencing to create pastures for livestock control, and eventually, crested wheatgrass seedings to increase forage production. Water developments, such as spring developments, water distribution systems, and wells were also completed to facilitate livestock distribution. Some of these range improvements, such as the water distribution systems, wells, and fences, had immediate benefits for wildlife. Where crested wheatgrass was established to replace halogeton, improvement for wildlife occurred. However, where sagebrush lands were converted to crested wheatgrass, the net impact in the short-term was loss of wildlife habitat. Irrigated pastures also increased habitat values for wildlife.

As the science of range ecology developed, the grazing systems were being designed based on an understanding of plant physiology. Rest-rotation and deferred-rotations systems were based, in part, on the carbohydrate model presented above. A three-pasture rest-rotation system limits the impacts of herbivory on the forage plants by allowing early grazing one year, complete rest the second year, and late or dormant season use the third year. This provides two full growing seasons out of every three years for the plants to complete the growth cycle to produce seeds and replenish root reserves. The one year of early season grazing may not stress the plants if the stocking rate, duration of grazing, and distribution of livestock are adjusted to the site. A deferred rotation basically changes the use from early season to late season from one year to the next. As with the rest-rotation system, this allows herbivory during one growing season, but eliminates livestock grazing during the growing season or until late in the growing season the following year.

Short-duration, high intensity grazing and active herding of livestock are other practices that show promise for minimizing the impacts of herbivory on western rangelands. These types of grazing systems have resulted in improvements in range condition. However, when Wyoming sagebrush exceeds 10 - 12 percent canopy cover, or mountain big sagebrush exceeds 15 -20 percent canopy cover, sagebrush begins to out compete and displace the herbaceous understory (Winward 1991, 2000), even in the absence of grazing. The stress placed on the herbaceous plants affects the ability of the plants to replenish the root reserves, and eventually the herbaceous plants are greatly reduced within the community. In the absence of grazing, the competitive interactions between shrubs and herbaceous plants would be expected to lead to shrub dominance, but not the complete absence of herbaceous plants. In the presence of grazing, the additional stress of herbivory would drive the system to a greater degree of shrub dominance, further decreasing the herbaceous understory.
This movement beyond the historic plant equilibrium may represent crossing a plant community threshold, and is one “impact of grazing” on rangeland vegetation. However, this impact is largely from lack of vegetation management, rather than from grazing (i.e., lack of disturbance, such as fire, to remove the shrubs). Maintenance of the herbaceous understory is dependent upon disturbance to the sagebrush overstory; changes in grazing practices alone cannot prevent sagebrush from becoming the dominant vegetation. Once sagebrush is dominant, changes in grazing practices alone cannot restore the herbaceous understory.

As discussed above, competition between shrubs and the herbaceous understory occurs when shrubs obtain about 10 to 12 percent canopy cover in Wyoming big sagebrush communities and 15 to 20 percent in mountain big sagebrush communities (Winward 2000). Once that threshold is reached, the system will move to shrub dominance over time due to inter-specific competition if disturbance does not occur. The introduction of livestock grazing into this plant community dynamic decreases the time necessary to reach shrub dominance. Therefore, the natural disturbance interval is no longer the appropriate interval for the system.

A further effect of grazing is the reduction of herbaceous fuels in the sagebrush-herb community, especially where season-long grazing is practiced. The removal of the fine fuels effectively prevents fires from spreading over large acreages, extending the fire interval. The absence of disturbance allows the woody fuels to accumulate in excess of “natural” levels. As the shrub density and/or crown size increases, the shrubs become sufficiently close that the fine fuels are no longer required to maintain fire spread. The resulting “crown fires” are generally of high intensity and severity, with high potential for type conversion to annual grasslands. This “impact” can be eliminated by implementing fuels management plans that break up the contiguous fuels created under this scenario.

Recently, emphasis has focused on the maintenance and rehabilitation of riparian systems. Riparian stability or instability is generally perceived to be the result of poor land management practices. While improper grazing can certainly create riparian damage, there may be other underlying factors that contribute to riparian degradation. As with the other issues affecting Sage Grouse, there are many factors involved including overgrowth of willow and understory due to lack of grazing.

Recently, studies in western and central Nevada have identified that some riparian issues may be the result of climatic factors occurring over 2000 years ago (Miller et al. in press). Deposition of windblown sediments into drainages during extended drought may have built up the floodplains beyond the capacity of the streams to flush these sediments under drought conditions. Vegetation establishment on these areas of deep, fine sediments was sufficient to maintain the floodplain during normal events, but extreme events appear to cause these systems to seek the former equilibrium base condition (i.e., the channel level prior to sedimentation build up). Some of these extreme events that caused major head-cutting occurred before the introduction of domestic livestock into Nevada. This could be evidence that some of the incised streams may be a result of factors other than livestock grazing, or a combination of factors. Suzie Creek and Dixie Creek in Elko County may be two examples of streams where down-cutting is occurring through fine, wind deposited sediments that accumulated thousands of years ago.

This is not to imply that all riparian problems are the result of base level lowering and historic drought conditions. Utilization mapping of allotments in Elko County consistently demonstrate the heaviest utilization occurs on riparian areas and upland areas
adjacent to water sources, especially where grazing occurs late in the season (or hot season). Because riparian systems have higher soil moisture levels, the plants have the ability to re-grow after grazing and can replenish the root reserves, if grazing does not occur throughout the entire season. In addition, soil compaction occurs in moist soils as the result of concentrated use by livestock, reducing the water holding capacity of riparian soils.

Rehabilitation of riparian systems has been the focus of livestock management over the last 30 years. Attempts to fence riparian zones resulted in drastic changes in the vegetation, but long-term maintenance of exclosures has been ineffective, and the “improvements” can be reversed in relatively short time if the fences fall into disrepair. In addition to creating a maintenance problem, fencing riparian areas also resulted in some areas converting from a riparian meadow to riparian shrub zones. The rank growth of grass and/or shrubs changed the wildlife values of these fenced areas, benefiting shrub-dependent species and decreasing the value of these areas for open meadow species, such as Sage Grouse.

Small exclosures around springs or riparian zones are being replaced with riparian pastures. This essentially creates a small pasture within a larger existing pasture. The riparian pasture is large enough to permit grazing under controlled or prescriptive conditions. By including some adjacent rangelands within the pasture, the pressure on fences is reduced because the livestock are farther away from the riparian vegetation and are not as persistent in trying to enter the pasture. The prescriptive grazing allows for management of the upland vegetation and the riparian zone.

Proper management of riparian systems requires an understanding of the ecological basis for the overuse that occurs in these systems. A lactating cow has higher nutritional and water requirements than a steer. During the early part of the growing season, the nutritional needs can be met while grazing fresh grass on the uplands. The succulent herbaceous forage provides much, but not all of the water requirements. Therefore, some use of a riparian area or an area near a water source is anticipated. As the growing season progresses and the upland vegetation begins to lose moisture content, more of the cow’s water needs must be met by either free water, or from more succulent vegetation found in riparian areas. This increased need for water coincides with higher daytime temperatures and increased solar radiation.

The cows seek areas with shade, such as willow stands, aspen stands, pinyon-juniper woodlands, or areas of Basin big sagebrush. As the uplands continue to desiccate, the protein level of the herbaceous vegetation declines, and the nutritional demands of the lactating cow can no longer be met by grazing the uplands. The quantity of forage required to obtain the same level of nutrition increases as the forage dries in late summer. Foraging efficiency becomes a factor in where to forage. Steep hillsides with dry forage do not provide the same efficiency as valley bottoms with riparian vegetation, water, and shade. Therefore, the riparian areas become more attractive.

The situation with yearling steers is similar, but the nutritional and water requirements are not as great as for a lactating cow. Therefore, steers can and do get more of their water requirement from the upland vegetation longer into the season, and they can meet their nutritional needs from the upland vegetation until late summer. Steers are also more likely to feed on steep slopes. As a result of these factors, utilization mapping of yearling steer operations tend to show less concentrated use of the riparian zone and more extensive use of the uplands.
Riding to move livestock out of riparian areas and experiments with herding to keep livestock on the move have shown promise as techniques that can minimize impacts to riparian systems. However, to be effective, there must be another water source or riparian area to which the livestock can be moved. Using the uplands and riparian areas in conjunction with each other by moving livestock out of riparian areas or by herding, rather than using the uplands and riparian areas sequentially, has potential to decrease impacts to the riparian areas.

These techniques can be facilitated by proper vegetation management. Foraging efficiency is not only dependent on the nutritional level per bite of forage, but also on the number of bites of forage that can be obtained over time. Rangeland dominated by sagebrush with a depleted understory cannot be foraged as efficiently as the same landscape with less shrub cover and more herbaceous cover. Old, ungrazed plants are less palatable to livestock and have less nutritional value compared to younger plants or plants that have been moderately grazed the previous year. Consequently, portions of pastures that are distant from water are likely to have more older or ungrazed plants than areas closer to water.

Herding livestock into these areas to force them to graze the plants will stimulate new growth in subsequent years, making the plants more nutritious and palatable to livestock. Shrub thinning to create opportunity for establishment of more herbaceous plants can also be used to attract livestock to these areas. As a result, some grazing pressure can be transferred from the riparian areas to the uplands.

As we develop a better understanding of the processes that affect landscape changes (i.e., geomorphic processes, plant-animal interactions, plant-plant interactions), the ability to manage these changes will increase. As we develop a better understanding of how these various processes interact, the “cause and effect” relationships that we perceive today are likely to change.
FIGURE 6
Greater Sage Grouse Habitats
Nevada Habitat Map – USFWS / USDA / BLM
The trend toward increased size, intensity, and frequency of wildfires in recent years has focused attention on fire ecology. The climatic, paleobotanic, and historic evidence indicates that fire was a factor in the sagebrush ecosystem long before European man’s arrival (Miller and Wigand 1994, Miller and Rose 1999, Miller and Eddleman 2000). The landscape that existed in the early 1800s was a result of the interaction of geomorphic conditions, climatic factors, and fire history. The role of Native Americans in modifying the landscape in northeastern Nevada is not well documented. Escaped fires from camps are likely to have occurred on occasion, but the intentional use of fire to affect vegetation change on the landscape may not have been a technique used by Shoshone and Paiute tribes in this area. The reliance on pine nuts as a food staple would suggest that extensive burns in the pinyon-juniper woodlands would not have been beneficial in the short-term.

Geomorphic features, such as soil, topography, and drainage patterns influence fire behavior. Soils determine the productivity of a site, as well as the vegetation that exists on the site. Low sagebrush is generally associated with claypan soils. This plant community has low fuel loading, low structure, and wide spacing between plants, all factors that retard the spread of fire. Conversely, deep soils along drainages or valley bottoms often support dense vegetation, such as Basin big sagebrush and Great Basin wildrye. The heavy fuel loading, continuous fuels, and high structure are factors that create intense fire conditions. Topography can also influence the spread of fire. For example, south facing slopes generally are dry sites that do not support dense vegetation. These slopes can function as a fire break under some conditions. The more mesic north slopes support a higher fuel loading, such as the mountain brush type, and are more likely to carry a fire than the vegetation on a south slope.

Perhaps the major factor in pre-settlement fire patterns was the configuration of drainages on the landscape. The extensive dendritic patterns typical of the North Fork of the Humboldt River, consisting of many tributaries dissecting the landscape, were riparian areas of high fuel loading, but also areas of fuel with high moisture content. During “normal” years, these natural greenstrips probably acted as fire breaks, limiting the size of fires. The topography associated with these drainages may also have influenced the fire pattern. The drainages with east-west orientation would be bordered on the north side by a south-facing slope, further adding to the fire break potential. During drought years when fuel moisture would have been lower, the high fuel loading typical of riparian areas would have contributed to the fire intensity and allowed fires to continue across the landscape. Other areas, such as Ruby Valley and Independence Valley (east of Wells), were lacking the extensive dendritic drainage patterns. In these areas, mountain creeks become intermittent flows at the valley floor where the flows enter the ground water in the alluvial deposits.

Climate changes also influenced fire ecology. The 300 years preceding European settlement of Nevada was a period of cooler temperatures and higher precipitation than currently exists (Miller and Eddleman 2000). The increased moisture would have favored plant production, and the combination of cooler temperatures and higher moisture conditions would have been less favorable for large, intense fires. In general, small, widely spaced fires are expected under these conditions, resulting in a mosaic of vegetation age classes on the landscape. However, even during this period known as the Little Ice Age, drought conditions occurred periodically. Fire history also influences the vegetation that exists on a site at any given time. For example, in a Wyoming big sagebrush site, during the first ten years after a fire the site is
generally dominated by grasses. During the next ten to 15 years, shrubs begin to establish and add to the fuel loading. From 15 to 40 years post-fire, the shrub component increases and the herbaceous vegetation decreases. After 40 years, the shrub component dominates the site and fuel loading is high. A lightning strike in each of these site conditions will result in different types of fires with different vegetation responses. Each range site responds to varying fire intensities differently from other range sites. However, some general patterns exist that serve as a basis for understanding the role of fire frequency or fire interval. Fire frequency is the number of times a site burns over a specified number of years. For example, four burns in 100 years. Fire interval is the average time between burns. Using a fire frequency of four burns in 100 years equates to a fire interval of 25 years. In general, fire frequency and fire interval are related to fuel loading and the frequency of ignitions.

For a mountain big sagebrush community, historic fire intervals are estimated to be on the order of 25 years (Winward 2000, Gruell et al. 1994, Miller and Rose 1999). Following a fire in this community, mountain big sagebrush often establishes within the first few years. Within ten to 15 years, a brush community is well established and the site has sufficient fuel loading to burn again under “normal” conditions. This vegetation community is generally found above 6,500 feet amsl and is subject to a higher frequency of storm events or ignition strikes. This results in a long term average fire frequency of approximately four fires every 100 years, or a fire interval of 25 years. Due to the random nature of lightning strikes and the variability of conditions (relative humidity, fuel moisture, wind speed, etc.) at the time of a lightning strike, there is considerable variability associated with the 25 year average fire interval.

The fire interval for Wyoming big sagebrush communities is somewhat longer, perhaps 50 to 100 years (Wright and Bailey 1982), or as short as 40 years (Winward 2000). Wyoming big sagebrush is found at lower elevations than mountain big sagebrush and on more xeric sites. Wyoming big sagebrush seedling establishment is also dependent on two consecutive years of normal or above normal winter precipitation (Maier et al. 2001); therefore, establishment of this species after a fire is weather dependent. Sagebrush seed does not establish far from the mother plant, which also limits the rate at which Wyoming big sagebrush re-colonizes a burn. As indicated above, it may take up to 40 years before Wyoming big sagebrush is sufficiently established to provide fuel loading capable of sustaining a fire. Considering the combination of conditions suitable for ignition and time required to establish sufficient fuel loading, a 40- to 100 year fire interval for this vegetation community is a reasonable estimate.

Low sagebrush, as indicated above, does not burn often. Estimates of pre-settlement fire intervals for the low sagebrush community range from 100 to 200 years (Young and Evans 1981, Miller and Rose 1999). This may be less a function of fuel loading, which may reach optimum in less than 100 years, and more a function of ignition frequency under the extreme conditions (extremely low relative humidity with high winds) necessary to burn this vegetation type. The conditions under which low sagebrush communities burn are the conditions under which catastrophic fires occur, and every plant community burns.

At the end of the Little Ice Age and the introduction of livestock in the Great Basin, the conditions that led to these fire intervals changed. The Little Ice Age ended around 1850 and the climate started to shift from cool and wet to warm and dry. These climatic changes over the last 150 years, in the absence of grazing, would have resulted in less fuel production, but increased frequency of suitable burn conditions. More frequent burns
would have resulted in less shrub dominance on the landscape and more areas dominated by herbaceous plants. The spacing of the bunch grasses would have been greater, due to the reduced moisture availability. However, livestock grazing also influenced the fire interval. Season-long grazing and the high stocking rates that were typical of the late 1800s and early 1900s reduced the availability of herbaceous fuels by late summer. Shrub removal as fuel for mining communities, shrub reduction by sheep grazing, and reduced shrub establishment due to drier conditions also reduced fuel loading. Consequently, lightning strikes, no matter how frequent or under all but extreme conditions, were not likely to start a fire, or the fires were not able to spread very far.

Changes in grazing following the creation of Timberland Reserves (1891), implementation of forest grazing regulations (1911), and passage of the Taylor Grazing Act (1934) resulted in fewer livestock and better distribution of livestock on public lands. Sagebrush was reestablishing in areas where it had been removed for fuel as the mining boom waned. By the mid-1900s sagebrush was a dominant plant on the rangelands and a variety of age classes existed. Fuel loading had increased by this time, but grazing was still sufficiently heavy to keep fine fuels in check. The lack of herbaceous understory and the abundance of sagebrush, along with the spread of halogeton, resulted in sagebrush control and crested wheatgrass seedings to increase livestock forage. Cheatgrass was becoming more common in the understory of many sagebrush communities and dominating disturbed sites, but was not a major concern in the 1950s.

Records of large wildfires between 1900 and 1960 are negligible. However, in the 1960s, several large fires occurred in northern Nevada. The northern portions of Lander and Eureka counties had large acreages burned, and cheatgrass began its domination of Boulder Valley and areas near Beowawe and Dunphy, Nevada. Over the next 40 years, areas that had historic fire intervals of 40 to 100 years prior to settlement and only small fires between 1850 and 1960, burned on average once every decade. The spread of cheatgrass from these areas to other sagebrush communities increased the flammability of these communities, resulting in cheatgrass dominance as fires started in these altered plant communities. By 1999, the open stands of sagebrush of the 1950s had become dense stands of sagebrush, many with a cheatgrass understory. The extreme conditions in July and August of 1999, combined with thousands of lightning strikes, caused wildfires that burned over 1.7 million acres in the Great Basin. Similar situations occurred in 2006 and 2007, in Elko County alone burning more than 750,000 acres. Not all of the acres burned converted to cheatgrass and not all of the acreage required emergency rehabilitation; however, the acreage that was sagebrush is not likely to support sagebrush for the next 10 to 15 years or longer.

The major fire outbreaks that have occurred over the last four decades have been the result of changing conditions on the landscape (e.g., changes due to lack of livestock grazing, cheatgrass expansion, sagebrush domination, cumulative impacts of historical fire suppression efforts, etc.) and changing climatic conditions. Consequently, the fire interval has decreased on large acreages of rangelands to a decade or less. This decreased interval (or increased fire frequency) is not favorable for shrub establishment. Continuation of this pattern will result in a change from sagebrush dominated rangelands to grass dominated rangelands; either perennial grasses, annual grasses, or a combination of both.

Since 1980, approximately 2.5 million acres or 3,906 square miles of sagebrush habitat have been affected by fire in Elko County alone. Intact sagebrush remains on 9,809,800 acres, perennial grasslands (i.e., areas seeded to crested wheatgrass since the 1950s, areas
seeded following fires since 1980, areas burned above 6,000 feet elevation in the past five years and not seeded following wildfire, and areas burned below 6,000 feet elevation in the past ten years and not seeded following wildfire) occur on approximately 1,342,000 acres, and annual grasslands (cheatgrass monocultures created by wildfires and to a lesser extent, livestock grazing) occur on 326,300 acres.

The pinyon-juniper woodland has undergone similar changes in fire ecology. Miller and Tausch (2001) estimated that juniper and pinyon woodlands have increased ten-fold during the past 130 years in the Intermountain West. Much of this acreage involves lands that formerly supported sagebrush and Sage Grouse habitats. Within the planning area, pinyon-juniper encroachment is estimated to have occurred on approximately 354,500 acres. The reader is directed to literature by Miller and Rose (1995, 1999), Miller and Wigand (1994), Miller et al. (2000), Gruell et al. (1994), and Neilson (1987) for discussions of fire history, fire ecology, and post-settlement changes in the pinyon-juniper woodlands.

“Wildfire Devastation”
2.7.1 – Effects of Wildfires

In 2008 the Nevada Department of Wildlife determined that a total of 307 known lek locations were burned during the 1999-2007 fires seasons. Of these, 131 were classified as active leks. There are a total of 1,981 lek locations (912 classified as active*) documented in the updated (January 2008) Nevada lek database. These figures translate into 14.4% of the total number of active leks being directly affected by wildfire over a 9 year period. Moving outward from these fire polygons in 3.2 km increments up to 9.6 km, the number of active leks affected could be as high as 551 or 60.4%. Figure 7 shows a map of the year around Sage Grouse range, all known leks and the fire polygons from 1999 through 2007 and depicts the drastic effects that wildfire has had on Sage Grouse in Nevada.

- A total of 21,894,043 acres of the four selected sagebrush ecological systems exists within the range of Greater Sage Grouse in Nevada.

- 2,561,013 acres of these sagebrush ecological systems burned during the 9 fire seasons spanning 1999-2007. This figure represents an 11.6% loss of key sagebrush habitat types that Sage Grouse depend on.

- 1,954,024 acres (76% of the total sagebrush burned) are considered sagebrush ecological systems other than Montane. These are the ecological systems most at risk from invasive annual establishment such as cheatgrass (Bromus tectorum) as well as other invasive weed species and will be the most difficult to recover. It is likely that this area will not serve as functional Sage Grouse habitat for several decades if not longer.

- With the basic fabric of the habitat changing, it doesn’t promise well for Nevada’s wildlife species. Sage Grouse, a native species whose numbers are threatened, have lost numerous strutting grounds, used for mating. Over the past few years their nesting and brood-rearing habitat has been lost as well effectively lost habitats for the next 30-50 years – conservatively.

- Summer wildfires in Nevada burned nearly 2.5 million acres in 2006 and 2007, most of which were in Elko County. The NBU–Nevada Wildfire Disaster Fund has been set up to allow individuals and interested organizations the chance to donate money to help pay for the purchase of seed and its timely dispersal over scorched winter ranges.
FIGURE 7
Effects of Wildfires Nevada – NDOW 2008
FIGURE 8
Wildfires 1990-2010 Western States
Greater Sage Grouse Habitat
19,000,000 Acres
2.8 – Disturbance

Disturbance refers to direct interference with Sage Grouse, rather than a habitat disturbance, and can include many types of disturbance. Increased traffic on a road that formerly had little traffic and is located near a lek is an example of a disturbance that may cause the birds to abandon a lek. This has been documented near new mines when the traffic level increases. Similarly, a new housing development near seasonal habitats may result in Sage Grouse abandoning that habitat as people or their pets disrupt seasonal activities. The impact of military flyovers has been raised as a concern, but studies have not been conducted to determine if impacts actually occur. Recreational viewing of Sage Grouse at leks or on wintering grounds is also a concern if the number of visits becomes high or the actions of those viewing the birds are not appropriate. Very little work has been done to document these types of impacts or the extent to which they affect populations. However, disturbance is an issue that should be included in planning documents.

2.8.1 – Mineral Mining / Exploration

Many of the nation’s mineral resources are located in Sage Grouse habitats across eastern Nevada and Elko County. Different levels of mining activity can affect Sage Grouse populations if habitats are lost, fragmented, or changed in ways unfavorable to grouse.

Effects of mining development on Sage Grouse are not extensively documented. Exploration and development may negatively affect Sage Grouse habitat and populations, but long-term impacts after reclamation are not clearly understood. Research suggests that mining development can displace Sage Grouse and that displaced grouse may return in some cases to the site after mining related activities have ceased, but populations may not attain pre-development levels.

Declines are attributed to effects of human disturbance, roads and power lines that fragment habitat, placement of infrastructure in areas once free from structures, alteration of vegetation composition through introduction of noxious weeds and other non-native plants, and disruptive noise near leks. Initial site disturbance and remaining structures can potentially enhance habitat for avian and mammalian predators. Current research in several western states is directed at identifying and quantifying impacts of mineral mining and energy development on Sage Grouse.

2.8.2 – Energy development / Wind / Transmission

Given the nature of the shifting national energy policy, it is anticipated that energy developments nationwide will become more prominent. Nevada’s geography, geology and climate are favorable in many locations for renewable energy development including wind, solar, geothermal, oil/gas and biomass; ranking Nevada one of the top states for development of these resources.

Proposed development of domestic energy resources, including wind energy, is expected to impact the sagebrush steppe ecosystem in the western United States. The Greater Sage Grouse relies on habitats within
this ecosystem for survival, yet very little is known about how wind energy development may affect Sage Grouse.

Estimated effects of wind turbines on Sage Grouse include noise, habitat fragmentation, and increased predator access. Sage Grouse generally avoid areas where tall structures, such as wind turbines, are present (USDOE 2009). Generator noise, motion, and height may negatively affect Sage Grouse (Manville 2004). Sage Grouse “leks,” or breeding grounds, are the most important sites for the longevity and permanence of the species. Disturbance to these areas could cause dispersion and mortality (Manville 2004). Due to the large seasonal migratory patterns of Sage Grouse, population protection recommendations can involve large areas of land. The USFWS suggests a five mile buffer from wind turbines to leks to mitigate Sage Grouse mortality (Manville 2004).

It is not fully understood as to what extent the development of wind energy resources will affect Sage Grouse populations. Information on local and landscape-level impacts is needed. Before-after control-impact studies are needed to determine impacts to grouse, and information gained could be used within an adaptive management strategy. Research protocols and efforts should be developed collaboratively between industry, resource management, and the research community.

Electricity bulk is transferred through a power transmission network to substations, which will require a network of transmission lines with supporting tall, vertical structures. Both investor-owned electric utilities and Rural Electric Co-ops deliver electricity through power lines throughout the state. The current density of lines in Sage Grouse habitat is lower than in urban or other rural areas due to lower human population density. Increasingly popular rural subdivisions and increasingly levels of energy development will account for most of the new power lines in Sage Grouse habitat.

Power lines can provide additional hunting perches for raptors in otherwise treeless areas. Sage Grouse also may be injured or killed by flying into these structures. Power lines most likely impact grouse near leks, in brood-rearing habitat, and in wintering areas that also support large numbers of wintering raptors. Potentially construction of new power lines contributes to habitat degradation when accompanied by new roads or other infrastructure, e.g., pipelines, fences, etc.

The U.S. Fish and Wildlife Service strongly encourages electric utilities to address raptor electrocution problems on power lines nationwide by preventing raptors from perching or making poles safe for raptors to perch on. Installation of perch prevention devices may protect raptors in areas with low densities of prey, but raptors will still try to land on such poles located near concentrations of prey. It is important that parties involved with power lines utilize the Avian Power Line Action Committee 1994 guidelines when designing raptor perch sites and perch guards.

Burying lines would reduce or eliminate electrocution of raptors and perch sites. Burying high-voltage (Transmission) lines is very difficult both
technically and economically. Burying lower voltage (Distribution) lines costs substantially more than equivalent overhead facilities and creates a potential for invasion of noxious weeds. Locating the cause of outages on underground lines is difficult and greatly increases the time required for subsequent repair and are very cost prohibitive to install and maintain. Underground repairs also involve a greater disturbance of ground and vegetation.

Proposed generation facilities may include fossil fuel plants (coal and natural gas) and wind power. Such facilities also may include associated infrastructure (buildings, roads, railroads, power lines, pipelines etc). When sited in sagebrush habitats, these plants and the associated infrastructure may contribute to destruction, fragmentation, or degradation of sagebrush habitats.

2.8.3 – Agriculture

Sage Grouse require large expanses of sagebrush habitats with healthy, diverse understories of grasses and forbs. In some areas, past management of rangelands has altered the density, structure, and composition of sagebrush communities sometimes creating a variety of conditions that do not meet the desired condition described for Sage Grouse seasonal needs. Composition of grasses and forbs, condition and densities of sagebrush, and other habitat-related conditions vary across Elko County and include extremes. Variation may result from environmental factors such as climate and/or land management practices, e.g., fire management, grazing, weeds, recreation etc. Restoring or enhancing Sage Grouse habitats requires diverse strategies. Disagreement among professionals often arises regarding the ecological role, or successional relationships, of “mature” or “decadent” stands of sagebrush, the need to manipulate sagebrush communities, method of control, and extent of treatment. Prior to sagebrush manipulation on public land, a thorough review by an interdisciplinary team should be conducted. To determine potential effects, the review should include an analysis of historic treatments on similar habitat nearest the area in question.

Conserving sagebrush habitats on private and public lands is by far the most effective approach to assuring long-term maintenance of Sage Grouse abundance and distribution in Elko County. Incentive-based, voluntary programs should be made available for protecting privately-owned Sage Grouse habitats from detrimental habitat conversion. In some areas, there are opportunities for planting cropland back to sagebrush-grassland habitat. It is important to note, however, sagebrush plantings are costly, can have a high failure rate, and may provide less effective habitat for Sage Grouse compared to native sagebrush habitats. Because of this, we view sagebrush-grassland planting as a secondary approach to Sage Grouse conservation.

2.8.3.1 – Agricultural Development
By all accounts, Sage Grouse were rare when Europeans first entered the Great Basin, as documented. However, the populations of Sage Grouse in Nevada rapidly increased following the introduction of agriculture and livestock in the mid to late 19th century. “Clouds” of birds, creating “thunderous” noise as they concurrently rose into flight, are recorded by the late 1800s and early 1900s.

For example, from interviews of “old timers” published by the Northeastern Nevada Historical Society: “Sage chickens (Sage Grouse) were so plentiful in the 1890’s…they clouded the sky…the birds were always thick in the meadows. As I passed by, they would rise up like a bunch of blackbirds…oh they were thick.” (George Gruell interview of Syd Tremewan, 1964).

Another: “When we lived on Gance Creek (around 1900) there were lots of sage hens. I have seen them fly up the mountain right behind our house…they sounded like thunder…I am not exaggerating, there were thousands.” (George Gruell interview with George Nelson, 1966).

For a more scientific documentation of this huge rise in Sage Grouse during this time frame, Robert “Bob” McQuivey, a 30 year NDOW biologist, by literally reviewing all of the early newspapers, journals and laws passed in Nevada, has documented this population explosion. I have read some of his extensive research, which I am currently attempting to get published. In a nutshell, it confirms the above observations. (Robert “Bob” McQuivey, NDOW Biologist Retired).

So, what caused this dramatic change, from almost nothing to abundance?

1. Habitat manipulation and expansion, especially meadows and man-made hayfields.

2. The mechanical removal of sagebrush and pinyon/juniper trees primarily for fuel.

3. The introduction of non-native plants, especially common dandelion, alfalfa, and other forbs.

4. Livestock grazing.

5. Stable supplies of water in areas previous dry or intermittent.

6. Predator control.

It should be noted none of the man-made changes were done intentionally to benefit Sage Grouse. It was simply coincidental.
**Habitat Changes:** As settlers started to quickly dot the Nevada landscape, one of their first acts was to create a meadow of sorts for their domestic animals. For large ranches it was to primarily grow hay and expand lush grazing areas. Yet even the smallest start-up ranch had horses and generally a milk cow or two. By fencing an existing meadow, finding a level piece of sagebrush covered ground, damming the local spring or stream, and irrigating, meadows were both expanded and created new.

As well documented, Sage Grouse have a symbiotic relationship to meadows. They especially relish certain forbs (most of us would call them “weeds”), and insects common on meadows. However, when meadows are not basically “mowed down”, Sage Grouse avoid them. Livestock usage, by eating the plants, actually increases Sage Grouse usage. For example, from “The Relationship of Cattle Grazing to Sage Grouse”, a thesis done at UNR by Carol Evans in 1986: “Klebenow (1982) found that birds tended to avoid meadow areas of dense rank vegetation, but would use the areas once they were “opened up” by grazing. Oakleaf (1971) reported that heavily grazed meadows…were utilized by Sage Grouse, while succulent areas of ungrazed meadows…were not used as feeding areas. After cattle grazed and left a meadow, Sage Grouse were observed to concentrate there in greater numbers than before the grazing…” (DeRoucher, 1980).

This flies in the face of the common misconception that grazing harms Sage Grouse. As Evans noted: “During the last three surveys, observed use of grazed meadows was significantly higher than expected.” Why? “Grazing by cattle prior to the cessation of plant growth…increases the quality of the food forb resources for Sage Grouse. Grazing increases the succulence of forbs by interrupting and delaying maturation. New leaf tissue is higher in crude protein…than mature tissue. Sage Grouse appeared to seek sources of succulent forbs by selecting for meadows grazed by cattle.”

**New Plants:** Non-native plants can be harmful, like cheatgrass, or beneficial. Common dandelion, just like the ones you find in your lawn, is not native to Nevada. The good news: Sage Grouse love to eat it. Food studies of Sage Grouse show it to be a primary and dominant dietary item today. As Evans noted: “A study of this unique forb (dandelion) might yield important insights into how the environment for Sage Grouse has changed and how Sage Grouse have responded…the distribution of dandelion is closely tied to grazing…it increases with grazing and is noticeably less abundant in communities protected for long periods…dandelion unlike other forbs, retained its succulence long after maturation…dandelion is an exotic and not native to Sage Grouse habitat…”

Other plants introduced include alfalfa, which also is highly attractive to Sage Grouse; as are the insects these new man-made...
meadow complexes attracted. All in all, the huge increase in meadows or meadow-like fields and hay producing areas were the primary catalyst for Sage Grouse expansion, all done together with livestock grazing.

**Mechanical Removal of Sagebrush:** Primarily for fuel, the removal of sagebrush also benefitted Sage Grouse by removing older less productive plants and allowing younger more succulent plants to grow. As recorded in 1877: “Sagebrush is about the only fuel in this timber-less country and hundreds of thousands of cords of it are annually consumed...like the grand forests of the Sierras, the wild sage of the Great Basin is rapidly disappearing and as it is a plant of exceedingly slow growth, it is not improbable that it may ultimately become extinct...” (from the “Tuscarora Times Review” as quoted in McQuivey’s work).

This also helps explain why areas recorded by the early explorers as vast seas of sagebrush were later described as grass dominated by the 1890s. The fear of sagebrush going extinct was obviously grossly exaggerated, and its rapid recovery was a boon for the sagebrush-eating Sage Grouse, as the younger plants and re-growth were much more productive in the leaves they eat, especially in winter. The removal of Pinyon/Juniper trees over much of Nevada during this same time frame had much of the same effect.

**Water Development:** Allowing livestock to graze areas otherwise off limits due to an absence of consistent drinking water, was also a boon for Sage Grouse. Windmills, stock ponds, spring improvements, earthen dams in strategic spots to catch run-off, and irrigation of formerly sage covered flats converted to hay meadows all greatly expanded habitat availability for Sage Grouse.

**2.8.3.2 – Livestock Grazing**

Livestock grazing is possibly the most contentious, polarizing, politically charged and complex issue facing those who make and implement public land policy. Advocates for removing livestock argue that their “evidence” of ecological damage is incontrovertible, and their opponents argue that grazing can be managed in a sustainable and ecologically friendly manner (Clifford 2002). Attempts to integrate empirical results have not quelled the argument that “the science is out there” to bolster the argument of any of the various interests in this contentious debate (Vavra et al. 1994).

The key issue before us is this: to restore grouse populations and habitat, sagebrush systems will have to be managed for the benefit of the bird. How this affects livestock grazing is a complex question. Overall, most of the research on Sage Grouse habitat needs took place, and continues to take place, on habitats that are grazed. We can see from the range of data that Sage Grouse and grazing coexist in many, if not most, areas so we know with
reasonable certainty that Sage Grouse and livestock are not mutually exclusive.

There are few scientific, peer-reviewed articles that address the grazing and Sage Grouse issue, none that are designed experiments, and none with replicates. Most of what is available reflects conclusions or thoughts without empirical data, or it represents gray literature. Our general opinion is that any argument that livestock grazing presently is the primary cause of Sage Grouse population decline cannot be supported by available research. Conversely, the alternative hypothesis, that grazing has had no effect on Sage Grouse populations cannot be supported either. Our conclusion does not dismiss the reality that grazing history is often linked to the spread of invasive species that in turn increased fire frequencies, resulting in further habitat loss, fragmentation and degradation.

A great deal of research data has been generated on the habitat characteristics associated with Sage Grouse seasonal ranges. These data can help us to understand and manage for characteristics needed for healthy Sage Grouse populations. Again, virtually all of these data were gathered from Sage Grouse habitats that are grazed. Relatively healthy populations of Sage Grouse occur where domestic livestock graze Sage Grouse habitats, and grazing management in these areas results in habitat characteristics that support Sage Grouse populations. However, low density or declining Sage Grouse populations also occur in some areas characterized by depleted herbaceous understories that may be the result of past or present grazing practices. Changes in grazing management may be necessary to increase these Sage Grouse populations, but experimental data are lacking to guide these management decisions.

The empirical data available on Sage Grouse habitat includes some uncertainties. Nonetheless, good data on the vegetative characteristics necessary for Sage Grouse success, regardless of land use is available. We can manage grazed areas for those characteristics if we choose to do so.

In the final analysis, grazing considerations will always be important to maintain habitat quality, but, do not appear as important in the next three to five years for the recovery of Sage Grouse as are fire, habitat loss, invasive species and the other alternatives that we discuss in other sections. In the long run, ranchers and the communities in which they live need to make some difficult and complex decisions about how to achieve the mix of vegetative characteristics that best support Sage Grouse population growth and habitat.
2.8.4 – **Recreation**

Sage Grouse are sensitive to disturbance at breeding leks, at nest sites, and in wintering habitats. Human activity in these habitats may intentionally focus on Sage Grouse (lek viewing, monitoring, photography, etc.), or may be incidental to other recreational activities (OHV use, hiking, skiing, horseback riding, etc.). Disturbances can be diminished or minimized at critical times and on seasonal ranges by concentrating use at designated times of year or day, restricting activities within 1.5 miles of leks (Joslin and Youmans 1999), and/or allowing certain types of use only at designated sites, e.g. viewing, photography at leks.

Monitoring Sage Grouse populations and habitats is essential at leks and other habitats. Other multiple use activities also may disturb leks and other habitats. Recreational and monitoring activities should be considered cumulatively with other activities as part of assessing overall levels, effects, and approaches for managing human disturbance of Sage Grouse. Hunting as a recreational activity does not concentrate human use on seasonal ranges.

2.8.5 – **Roads & Motorized Vehicles**

Roads throughout Elko County can have a variety of impacts on Sage Grouse and their habitats. Vehicle use on federal and state lands, both on and off roads, has increased significantly over the past few years and is impacting habitat quality (Mattise 1995). Severity of impacts may be directly related to the amount of vehicle travel occurring. For example, the impact from an interstate highway through sagebrush-grassland could have a particularly devastating effect on Sage Grouse, whereas the impact from small amounts of motorized cross-country travel occurring in the same area could be of little consequence to Sage Grouse during non-nesting or other non-critical time periods.

2.8.6 – **Urban Development**

As human population growth continues in Elko County, pressure to subdivide land may further conflict with Sage Grouse. An increase in number of roads will cause continued habitat fragmentation and loss and a potential decline and/or shift in populations. In addition, a potential increase in mineral mining and associated exploration and production in
Elko County and neighboring counties will substantially increase the number of roads. Indirect impacts on wildlife and wildlife habitat from road development and use during exploration and production includes trails, 2-track, bladed, and graveled roads. These impacts have been well documented for a variety of development projects (Trombulak and Frissell 2000) and include habitat fragmentation and direct loss of birds due to vehicles, stress, displacement, and increased hunting pressure. Roads also may affect an animal’s reproductive success (Gutzwiller 1991). An increase in roads and other cross-country travel also contributes to the spread of noxious weeds and an overall decrease in wildlife habitat, including Sage Grouse habitat.
2.8.7 – *Wild & Feral Horses and Burros*

Wild horses and burros have the potential to impact habitats used by Sage Grouse by reducing grass, shrub, and forb cover and increasing unpalatable forbs and exotic plants including cheatgrass (Beever and Aldridge 2011). Effects of wild equids on habitats may be especially pronounced during periods of drought or vegetation stress. Wild equids have different grazing patterns than domestic livestock, thus increasing the magnitude of grazing across the entire landscape (Beever and Aldridge 2011).
2.9 – Predation

The following discussion focuses on predation specifically as it relates to Sage Grouse. Predation is the most important proximate cause of Sage Grouse mortality (Braun 1975, Bergerud 1988a, Autenrieth 1986, Schroeder et al. 1999); almost every Sage Grouse will eventually be eaten. Sage Grouse are known to be included in the diet of a variety of species. Sage Grouse eggs, new-born chicks, and juvenile birds have a greater number of predators and are more vulnerable to predators than are adult birds. The differential adult sex ratio also indicates that males have higher mortality than females (Schroeder et al. 1999).

Although nest predation is a natural component of Sage Grouse reproduction, habitat changes may interact with predator communities and incubation behavior, leading to Sage Grouse population declines. Continuous videography at natural Sage Grouse nests has been used to document fine-scale incubation rhythms, identify predators, and record predation behavior in northeastern Nevada. An information-theoretic modeling approach was used to relate factors that characterized habitat, timing of incubation, and predators to nest success and incubation rhythms. Local raven numbers were also experimentally reduced to measure the effects of raven reduction on Sage Grouse nest success.

Females exhibited relatively high incubation constancy (96%) and employed a bimodal distribution of incubation recess that peaked during morning and evening twilight. Common ravens (Corvus corax) and American badgers (Taxidea taxis) were confirmed destroying nests. Raven depredations were mostly crepuscular. Yearling Sage Grouse nests failed more than those of adults, and yearling recesses were longer and more frequent and occurred during times of greater daylight than those of adults. Recess duration, nest failure, and probability of raven-caused depredation were positively related to raven abundance. Compared to adults, yearlings appeared to face greater trade-offs between foraging and concealing eggs. Raven reduction increased Sage Grouse nest success, but badgers appeared to partially compensate for removal. Nest herbaceous understory was positively related to incubation constancy. This likely was due to the effects of understory at nests on parental energy savings by reducing parent heat loss.

Differences were detected in nest habitat characteristics between nests depredated by ravens and badgers, such as shrub-canopy cover, herbaceous understory, and forb biomass. Canopy cover was inversely related to raven depredation. Thus, habitat characteristics appeared to interact with predator composition and abundance, increasing the probability of Sage Grouse nest failure. Ravens are generalist predators now occurring in high abundance in North America and forage within degraded Sage Grouse nest habitat. Ravens appear to influence incubation behavior and depredation rates and in some areas may negatively influence Sage Grouse productivity. In human-altered landscapes, these negative effects may be substantial.
Table 2
Sage Grouse Predators and Life Stage at which Predation Occurs

<table>
<thead>
<tr>
<th>Predator</th>
<th>Life Stage at which Predation Occurs</th>
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<tbody>
<tr>
<td></td>
<td>Nest/eggs</td>
</tr>
<tr>
<td>Golden eagle</td>
<td>x</td>
</tr>
<tr>
<td>Red-tailed hawk</td>
<td>x</td>
</tr>
<tr>
<td>Ferruginous hawk</td>
<td>x</td>
</tr>
<tr>
<td>Swainson’s hawk</td>
<td>x</td>
</tr>
<tr>
<td>Rough-legged hawk</td>
<td>x</td>
</tr>
<tr>
<td>Northern harrier</td>
<td>x</td>
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<tr>
<td>Gyrfalcon</td>
<td>x</td>
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<tr>
<td>Northern goshawk</td>
<td>x</td>
</tr>
<tr>
<td>Cooper’s hawk</td>
<td>x</td>
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<tr>
<td>American kestrel</td>
<td>x</td>
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<tr>
<td>Merlin</td>
<td>x</td>
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<td>Common raven</td>
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<tr>
<td>American crow</td>
<td>x</td>
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<tr>
<td>Black-billed magpie</td>
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<tr>
<td>Coyote</td>
<td>x</td>
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<tr>
<td>Red fox</td>
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<td>Weasels</td>
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<td>Badger</td>
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<tr>
<td>Bobcat</td>
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<tr>
<td>Ground squirrels</td>
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Nest predation has been considered by some researchers to be the primary limiting factor for Sage Grouse populations (e.g., Batterson and Morse 1948, Autenrieth 1981, Gregg 1991, Gregg et al. 1994), and predation on eggs and birds was considered by Schroeder et al. (1999) as the primary cause of mortality. Reported nest success varies from less than 15 percent to as high as 86 percent (Schroeder et al. 1999), and is influenced by weather and habitat quality, as well as by predation. Studies have demonstrated that the primary nest predator species varies among study sites. Avian predators, primarily corvids (ravens, crows, and magpies), were the major predators of nests in Oregon and southern Idaho (Batterson and Morse 1948, Autenrieth 1981), while ground squirrels and badgers were the major predators in a study in Colorado (Gill 1965) and Wyoming (Patterson 1952). Survival of newly hatched chicks may also be influenced by predation, but nutrition, habitat quality, and weather are also significant variables in chick mortality (Pyle and Crawford 1996, Sveum 1998b, Blake 1970, Rich 1985).

Survival between hatching and the end of summer varies from approximately 40 percent (June 1963) to 60 percent (Wallestad 1975). Although a greater number of predators are known to prey on juvenile Sage Grouse, several factors lower the mortality rate at this life stage. After about six weeks of age the juveniles are able to take advantage of cover, detect predators, and escape by flying. Due to these factors, successful predators are more likely to take an individual juvenile Sage Grouse as the birds increase in size and ability to escape, whereas a single predator is more likely to take an entire clutch of eggs or brood of newly hatched chicks.

Data from 1998 for Elko County indicate a 37 percent reproductive success rate. The mean brood size in Elko County between 1966 and 2000 was 3.9 juveniles per hen (NDOW Region II Files). The average clutch size for Sage Grouse is between 6.6 and 9.1 eggs (Schroeder et al. 1999). Using the mid-range of the average clutch size (i.e., 7.9) and the average brood size during summer, a mortality rate of approximately 50 percent
occurs between egg-laying and summer. Wing data collected in Elko County during hunting seasons from 1996 through 2000 indicated that by fall, the average number of young per hen was 1.48 (range 0.78 young per hen in 1996 to 2.19 young per hen in 1999; NDOW Region II Files). This is well below the 1.75 young per hen ratio needed to just maintain the population level (Stiver, personal communication). Assuming the average clutch size is 7.9 (mid-range given above), the combined mortality rate of eggs and juvenile birds from April to October is approximately 80 percent.

Predation of adult Sage Grouse occurs, but overall survival of adult birds ranges from 55 to 67 percent for females and from 38 to 60 percent for males (Zablan 1993, Connelly et al. 1994, June 1963). Although there are several predators of adult Sage Grouse the relative impact of these predators on the population is less because the encounters may be less frequent during portions of the year and predators are less effective when preying on adults (Bean 1941, Beck 1977).

2.10 – Hunting

The axiom that upland species, being density regulated, are virtually unaffected by hunting pressure has a long history in the field of wildlife management (Errington 1945, Mardsen and Baskett 1958). Studies of hunting impacts on Sage Grouse in Colorado showed that harvest was a function of the total birds available in the fall (Braun and Beck 1985). Hunters generally harvested between 7 and 11 percent of the birds available in the fall, regardless of season length and bag/possession limits. The study concluded that hunting had no measurable impact on spring densities of Sage Grouse. Wallestad (1975) also concluded that hunting had little influence on Sage Grouse populations in Montana. Information from Idaho (Gray 1967, Autenrieth 1981), Oregon (Willis et al. 1993), and Wyoming (Patterson 1952) indicate that harvest rates range from less than 3 percent to approximately 25 percent.

Zunino (1987) and Stigar (1989) studied hunted and non-hunted areas over a four-year period in northern Washoe County, Nevada. The hunted area purposely received high hunting pressure and had a harvest rate of 25 percent, which is the upper value for the normal harvest rate of less than 3 percent to 25 percent. The number of birds increased on both the hunted and non-hunted areas, but the increase was greater on the non-hunted area. Artificial nest predation studies on the same area indicated that the populations were also withstanding severe nest predation by ravens (Stigar 1989, Alstatt 1995). The studies indicated that while hunting was the major cause of fall mortality, the populations were able to withstand some level of harvest, even while experiencing high levels of nest predation.

In contrast, studies on bobwhite quail (Robinette and Doer 1993), sharp-tailed grouse (Gregg 1990) ruffed grouse (Kubisiak 1984), and Sage Grouse (Johnson and Braun 1999) suggest that hunting may be an additive form of mortality. These conflicting studies may be the result of studying populations during different population trends (increasing or decreasing) or populations existing in different quality habitats, which could influence recruitment. The early studies occurred during periods of population highs when the number of reproducing females was high and production would also have been high. A “surplus” of young is produced when populations are increasing (i.e., more recruitment than mortality), and such populations can withstand hunting pressure.

Connelly et al. (2000) analyzed band returns and radio-location/return data for Idaho Sage Grouse over a 23-year period. Harvest rates for females were greater than for males. Forty-six percent (46%) of the adult female mortality occurred in September and October.
compared to only twenty-eight percent (28%) of the adult male mortality, with 95 percent (95%) of the combined September-October mortality due to hunting. The differential mortality rates during this time period were attributed to females with juveniles remaining on meadows and riparian areas, while males and unsuccessful females were more dispersed in the upland vegetation. The relatively high rate of female mortality at this time of the year suggests that hunting may be additive to winter mortality, decreasing the size of the spring breeding population.

This study occurred during the decline in Sage Grouse across the west. A population that is declining by definition does not produce sufficient young to offset adult mortality. Therefore, additional mortality in the form of hunting leads to further population declines. Thus, this “new” science must be taken in context with the population dynamics and should not be interpreted that hunting will always cause population decreases. Population trend is an important factor in determining the level of hunting that is allowable.

Concern exists that local, isolated populations may be vulnerable to concentrated hunting pressure and some studies suggest that this is possible (Autenrieth 1981, Zunino 1987, Connelly et al. 2003). These populations may require special attention if they are to remain viable.

2.11 – Disease

Sage Grouse are known to harbor a variety of disease and parasitic organisms. Schroeder et al. (1999) provide a comprehensive listing of the parasites and disease agents. The mere presence of a disease organism or a parasite does not necessarily indicate a population level effect. Herman (1963) pointed out that a “healthy” wild animal carrying only a single pathogenic agent is a rare occurrence. Therefore, some background level of disease or parasites exists, but under most conditions these agents may be of little significance. However, under certain environmental circumstances, such as drought, one or more disease agents or parasites may increase to a level that impacts the local population (Herman 1963). The causal factors are likely to be different for different outbreaks and different localities.

Although disease outbreaks in Sage Grouse have been documented (Grover 1944, Batterson and Morse 1948, Honess and Winter 1956, Thorne 1969, Wallestad 1975), the conditions under which the outbreaks have occurred have not always been well documented. For coccidiosis, outbreaks appear related to drought, drying water holes, and/or contaminated water. As with most diseases, transmission is favored when Sage Grouse have a high probability of contact with other infected Sage Grouse, or when they are forced to use limited habitats. The concentration of birds at limited water sources may result in fecal contamination of the water and surrounding soils (Thorne 1969). A reversal of the conditions or seasonal dispersal of Sage Grouse can alleviate the problem (Wallestad 1975).

However, the West Nile virus has been recently introduced to the United States and has been the documented proximal cause of death in many avian species, including Sage Grouse. No Sage Grouse mortality has been attributed to this virus in Nevada, and due to the arid conditions, the risk may be lower in Nevada than in some other states. This is due to the fact that the virus is carried and spread by mosquitoes. Until there are reported cases in Nevada, the impact of this virus on Sage Grouse populations is unknown.
2.12 – Life Cycles

Rich (1985) analyzed 32 years of Sage Grouse lek counts in southern Idaho and determined that population peaks occurred about every ten years. Although Rich (1985) found some climatic factors that correlated with the population changes, cause and effect relationships were not evident. Braun (1998) reviewed population data throughout the area of Sage Grouse distribution and concluded that Sage Grouse populations do not fluctuate on a regular or cyclic basis.

In Nevada, the population data has indicated declining populations since the 1950s, with some rebound in the 1970s. If cycles are occurring in Nevada, they are being masked by the downward trend in the state population.

2.13 – Climate/Weather

Long term climatic changes are discussed elsewhere in the document in relation to vegetation and Sage Grouse populations. Other than extended periods (i.e., hundreds of years) of drought, or periods like the Little Ice Age, where climatic changes drive plant community changes, climate is not a major factor in short-term population fluctuations. However, weather, which is a short-term expression of climatic factors, is likely to have influence on annual populations.

Weather can influence the availability and quality of Sage Grouse food and energetics. As discussed above, newly hatched chicks have limited reserves in the yolk sac and must acquire a high energy/high nutritional diet during the first few days after hatching. This diet is composed primarily of insects, and insect availability is highly dependent on weather. Cold, wet weather causes many insects to seek shelter and become inactive, reducing their availability to Sage Grouse chicks. Chicks that are stressed are more vulnerable to predators and to direct effects of weather. If chicks survive the first few days, warm, dry weather can reduce forb production on upland sites, forcing the birds to use riparian areas before they have developed sufficient mobility and flight capability to escape predators. During cold, dry winters Sage Grouse may not find suitable snow for snow roosting, reducing their ability to build up energy reserves for spring breeding. All of these factors can limit recruitment to the population in any given year. Because these types of weather events generally occur over a broad area, population effects can be realized.

In contrast, warm, wet springs that promote forb production and insect abundance, or wet summers that extend the growing season on the upland sites, and winters with abundant snow should all contribute to higher Sage Grouse population recruitment. Therefore, weather is a factor in Sage Grouse population changes, but not a factor that can be managed.
2.14 – Noxious – Invasive Weeds / Plants

Over the last 50 years, noxious weeds have spread at an unprecedented rate across Nevada and Elko County. Certain species of plants are currently designated as “noxious” in Montana (http://www.mtweed.org/Identification/identification.html). “Noxious” applies only to species so designated by the Nevada Department of Agriculture (NDA). County weed boards may add species to local lists that have not been designated by the state, but at a minimum must include those species designated by NDA. Resource managers, both public and private, have a statutory responsibility to develop management plans for treatment of noxious weeds on the land they own and/or manage. The magnitude of weed infestations, however, often prevents appropriate and timely treatments.

Noxious weeds and other invasive plant species, such as annual grasses, displace more desirable native plant species and cause significant adverse biological and economic effects by reducing productivity of healthy rangeland. Noxious weeds impact all classes of wildlife and domestic livestock. Plant species designated as noxious weeds are classified as either established and spreading or newly introduced—or are recognized as potential invaders. Noxious weed species present in adjoining states and provinces are a threat in Nevada.
Although introduction and subsequent spread of weeds can occur through several means, the most pervasive occurs along transportation and floodplain corridors. One of the primary concerns of resource managers is the spread of noxious weeds by vehicles. Disturbed ground typically serves as the initial point of establishment, with the amount of disturbed ground being directly proportional to the overall susceptibility of an area to weed invasion.

Disturbance can take many forms and causes; the most common being human-caused activities, such as road building and use and the rise of rural subdivisions. However, often overlooked, but equally important, are climatological and biological influences. Recurrent flooding and wildfires, as well as prolonged drought, can disturb plants and topsoil over large areas. Biological forms of ground disturbance include burrowing activities by small mammals and localized over-use by livestock and/or wild ungulates. These large- and small-scale disturbances provide opportunity for invasive species to become established.

Herbicide treatment is the most widely employed method to control noxious weeds. For most noxious weeds in Nevada, this method of treatment provides immediate, effective results. Problems occur when weed seeds have been allowed to build up in the soil and/or surrounding land areas and left untreated. Re-establishment in such cases occurs from seed banks and off-site reinvasion. This cycle of treatment/re-establishment is expensive to treat and requires dedication and immediate action by resource managers when weeds reappear within treated areas. Prevention, which requires focused purposeful action in surrounding infested and un-infested areas, provides the most cost-effective control. Prevention works best when management strategies acknowledge a threat and prioritize efforts to eliminate potential sources of infestation and expansion.

Chemical control of noxious weeds is efficient but might pose some toxicological risk to Sage Grouse and other wildlife during treatment. Pathways of exposure include absorption from treated plants, inhalation of chemical particles suspended in the atmosphere, and direct ingestion of treated plants. If properly applied, however, toxicological risks would be minimal. A reduction of forbs important to Sage Grouse during brood-rearing could have more serious consequences to local populations, with the magnitude of effects dependent on the scale of treatment.

2.15 – Pesticides

Pesticides may directly poison birds or indirectly affect birds by reducing the abundance of invertebrates. Herbicide treatment of rangeland may result in the loss of cover for nesting, brood-rearing, and loafing. Spraying of herbicides primarily degrades habitat for Sage Grouse by increasing fragmentation. In Colorado, spraying of herbicides resulted not only in decreases in sagebrush cover and frequency of sagebrush plants and forbs, but also in lek abandonment (Braun and Beck 1977). In addition, the application of pesticides, often for grasshopper control, affects Sage Grouse by killing insects otherwise used as food (Johnson 1987).

Pesticides also directly poison birds after intake of contaminated insects; mortality rates directly attributable to pesticide application were 15% for Sage Grouse feeding in sprayed alfalfa fields in Idaho (Blus et al. 1989, Connelly and Blus 1991).
2.16 – Other Wildlife Management in Sagebrush Habitat

The sagebrush ecosystem is home to unique plant and wildlife species, and is very important to the overall ecological health of much of Nevada. Many birds and mammals depend on sagebrush habitat for survival. In the last century, changes caused by livestock grazing, conversion of lands to agriculture, the introduction of exotic plant species, and wildland fire have altered and fragmented sagebrush vegetative communities throughout the Intermountain West. The loss of sagebrush habitat is negatively affecting numerous species that depend on sagebrush ecosystems for all or part of their existence including greater Sage Grouse as well as pygmy rabbits, mule deer and golden eagles. Other examples of sagebrush dependent species include sage sparrow, ferruginous hawks, Brewer's sparrow and sage thrasher.

Mule deer, pronghorn antelope and rabbits utilize sagebrush for a critical food source. Sagebrush provides breeding and nesting grounds and also provides shelter and protection from the elements and predators for other small animals such as the sagebrush Vole, sagebrush lizard, Least chipmunk, ground squirrel and pygmy rabbit. Many other birds, rodents, insects and animals are associated with and require sagebrush to sustain life. (McAdoo et al. 1989, J. Wildlife Management)

The decline of the Sage Grouse in the Northwest shrub-steppe landscape is perhaps the most publicized issue related to habitat degradation and decline among sagebrush-associated species. However, many other important avian species are dependent on sagebrush and its attributes for survival. Despite the uniform appearance of large expanses of sagebrush steppe, there exists much diversity within this habitat that is essential to the survival of the many species of birds that inhabit this landscape. While many species depend on sagebrush, they may differentially utilize it as shelter, forage, breeding sites, nesting sites or other purposes. Birds also differ in their preferences for specific plant associations, patch size, shrub density, vertical structure, understory composition and various other attributes.

The populations of many of the avian species found within these habitats are generally thought to be declining (Dobkin and Sauder 2004). Much of the population trend data for these shrub steppe species is obtained through annual Breeding Bird Surveys (BBS). Although these surveys can provide important information regarding the status of these species, some areas within sage steppe habitat are among the least consistently sampled of all areas covered by the BBS (Dobkin and Sauder 2004). The BBS routes that do exist in this region under-represent sagebrush habitats and some of the species are considered poorly detected by BBS methodology (Dobkin and Sauder 2004). As a result, the specific status of many of these populations in the NW High Desert remains unknown or disputed.

As management practices and restoration practices are refined to protect Sage Grouse, it is important to understand the diversity of habitats within sage steppe ecosystems that are in need of conservation to properly protect a wide variety of avian species. The following species accounts detail the ecology of several avian species affected by human utilization and degradation of sagebrush steppe and whose requirements can help shape appropriate sagebrush-steppe management.
Sagebrush has been demonstrated to be a critical food source for several game species during various seasons of the year. Big sagebrush is a highly nutritious and digestible food source for big game animals. During winter, big sagebrush has a higher crude protein level and digestibility than most other shrubs or grasses. Shrubs (primarily sagebrush) are used almost exclusively by pronghorn from November through March and moderately through the other months (WGFD 2009). Pronghorn antelope (Antilocapra americana) prefer short growing sagebrush, presumably because their keen eyesight is adapted for detecting danger at long distances (McAdoo et al. 2003).
3.0 HABITAT CONSERVATION ASSESSMENT

3.1 – Planning Area

Elko County is the second largest county in Nevada and the fourth largest county in the continental United States, covering 17,181 square miles, an area larger than each of the nine smallest states in the United States. The total surface area of 10,995,840 acres accounts for 15.5 percent of the total surface area of Nevada (Figure 10). Approximately 71 percent, or 7,852,280 acres, of the county is in public ownership, with approximately 6,778,200 acres administered by the Elko Field Office of the Bureau of Land Management (BLM), approximately 1,068,140 acres administered by the Humboldt National Forest, U.S. Forest Service (USFS) and 5,926 acres administered by the U.S. Fish and Wildlife Service (USFWS).

The climate is described as a continental temperature regime with arid to semi-arid conditions in the valleys and lower mountain slopes and sub-humid conditions near the crests of the higher mountains. Precipitation is strongly orographically controlled. Air masses generally move eastward, with most of the precipitation originating from the Pacific Ocean. Average annual precipitation ranges from six inches on the valley floors to over 20 inches on the higher mountains (e.g., the Jarbidge, Independence, Ruby, and East Humboldt ranges). Arid conditions are due in large part to the rain-shadow effect created by the Sierra Nevada Range. Much of the precipitation occurs as snow, with over 100 inches occurring in the high mountains. Mean annual temperature ranges from 45°F to 50°F, but summer temperatures can exceed 100°F and winter low temperatures below 0°F are not uncommon, especially in valleys where orographic ponding of cold air occurs.

Elko County includes portions of four of Nevada’s fourteen hydrographic regions or water basins. The northern portion of the county (Owyhee Plateau) lies within the Columbia Plateau Province and the waters are part of the Snake River Basin. This portion of the county is characterized by rolling plateaus of low relief with steep, narrow canyons and interspersed with buttes. The remaining portion of the county includes portions of the Humboldt River Basin, Great Salt Lake Basin, and the Central Region Basin, and is within the Basin and Range Province. This area is characterized by a pattern of north-south trending mountain ranges and intervening alluvial valleys. Most of the county is more than 5,000 feet above mean sea level (amsl), with many mountain summits ranging from 8,000 to more than 10,000 feet amsl. Ruby Dome in the Ruby Mountains is the highest peak at an elevation of 11,387 feet amsl. In addition to the four major hydrographic regions in Elko County, there are forty-two hydrographic areas and sub-areas that are either partially or wholly within Elko County. These hydrographic areas and sub-areas are defined as hydrographic units within a major water basin and typically consist of a single valley or discrete drainage area. Eight of these hydrographic areas are contained within the Snake River Basin; seventeen hydrographic areas lie within the Humboldt River Basin; five hydrographic areas and four hydrographic sub-areas are within the Central Region Basin; and four hydrographic sub-areas are contained within the Great Salt Lake Basin.

The combination of climate and topography provides a variety of vegetative types, ranging from the saltgrass and salt desert shrub communities in the basins to the alpine community at the mountain peaks. The salt desert shrub communities consist of plant species with tolerance for alkali and salt affected soils and low precipitation. The northern desert shrub communities extend from intermediate to high elevations on non-saline, medium textured soils. The mountain brush communities occur at intermediate to
high elevations on soils derived from volcanic and sedimentary parent material. Pinyon-
juniper communities are located at intermediate elevations on limestone derived soils that
are well drained, and range from shallow to deep. The forest communities consist of
coniferous and shrub species on mountain slopes between 7,000 and 9,000 feet amsl with
moderate to high annual precipitation. The alpine zone occurs above the timberline at
approximately 10,000 feet amsl. The extreme climatic conditions at these elevations are
conducive to low growing, decumbent life forms, except for some tree species that
survive on sheltered slopes. Riparian zones with deciduous trees, shrubs, and plants
requiring higher soil moisture occur throughout the elevational and plant zones. The
“sagebrush ecosystem” includes elements of the forest, mountain brush, northern desert
shrub, pinyon-juniper, and riparian communities.

The planning area is within the sagebrush biome, the largest semi-arid ecosystem in the
western United States. The sagebrush biome consists of the sagebrush steppe ecosystem
type and the more arid Great Basin sagebrush ecosystem type (Kuchler 1985). The
northern portion of the planning area (Owyhee Plateau/Border River Plain) is within the
sagebrush steppe ecosystem type, which is characterized by an overstory of sagebrush
(Artemisia spp.) and understory of perennial grasses and forbs. The southern portion of
the planning area is within the Great Basin sagebrush ecosystem type and also has an
overstory of sagebrush, but the herbaceous component of the understory contributes a
minor portion of the total plant cover (West 1983). The more arid conditions of the Great
Basin sagebrush ecosystem type result in longer recovery periods following fire, or other
disturbances, and restoration of plant communities is less successful (West 1983). An
extensive discussion of the potential natural flora of the two ecosystem types is presented
by Miller and Eddleman (2000).

The diversity of vegetation within the planning area supports a variety of wildlife species,
including 246 species of birds, 76 mammals, and 28 reptiles and amphibians. Numerous
species of fish occur in the streams, lakes, and reservoirs. Most of the wildlife species use
riparian zones for some portion of their life cycle, or as part of their seasonal or daily
range. Other species are found only in one or two of the vegetative communities
described above. The combination of landscapes, geologic features, soils, vegetative
communities, wildlife species, and historical sites provide a variety of recreational and
land use opportunities.

Prior to 1828 the area was inhabited by Western Shoshone and Northern Paiute Indians.
European influence on the landscape began in 1828 with the arrival of French fur trappers
and fur traders. Various trapping and exploration parties passed through the region
between 1828 and 1843, when a wagon trail was established along the Humboldt River as
part of the east-west movement to California and Oregon. Ranching began in 1859 when
the first large herd was wintered on the flood plain of the Humboldt River. The Humboldt
River continued to be the major travel route, as the Central Pacific Railroad Company
established rail tracks in 1868. Elko developed as a railroad town, with lots available for
sale in 1869, but mining north of Elko soon followed and the Idaho-Elko Toll Road was
constructed to connect the community and railroad hub to the mining activities to the
north. Railroad, ranching, and mining have been the cornerstone industries of the county
through the present day, each industry having its own economic cycles, with the “boom
and bust” nature of the mining industry perhaps the most extreme. Gaming, tourism and
outdoor recreation have also been a part of the economic well-being of the county in
recent decades.

Following World War II, increasing population and prosperity in the United States
resulted in an increase in outdoor recreation and an increased awareness by the general
public of the environment. Agencies once dominated by foresters and range conservationists began adding planners, biologists, botanists, archaeologists, recreation specialists, and other resource specialist positions to the local staffs. The close relationship between commodity users and the agencies that were charged with providing food and fiber for a growing and prospering nation was being widened by a public wanting more recreational opportunities and agencies developing policies to address a myriad of new public land laws. The focus from fiber and forage production began to shift, and changes in land uses accompanied the shift, as did changes in the way lands were managed and how the agencies arrived at management decisions. Agencies developed policies in response to public demands that lead to on-the-ground changes in management. The environmental movement of the 1960s and 1970s was challenged by the sagebrush rebellion of the late 1970s and 1980s which also spawned a state’s rights movement of the 1990s.

These controversies were and continue to be set in the “win-lose” arena; one side cannot win without the other side losing. These controversies divert attention from the functionality of the entire system and focus instead on how to allocate resources for various interests. The move toward managing functioning systems and collaborative decision making was a response to resolving environmental issues as well as the social issues embroiled in these controversies. These species are considered an indicator species for the health of the land and uses a variety of habitats. Second, the current focus on Sage Grouse, with potential for listing under the ESA, creates a window of opportunity to demonstrate that local planning can develop long-term solutions to these complex issues.

The following sections provide the basis for developing ecosystem plans. As indicated above, Sage Grouse are a landscape-scale species, as well as an indicator of the health of the landscape. The underlying assumption is that management that provides quality habitat for Sage Grouse is likely to provide quality habitat for other sagebrush-dependent species. This should not be interpreted to mean that all species have the same habitat requirements. However, by providing the variety of conditions on the landscape needed for the seasonal habitats of Sage Grouse, a continuum of habitat conditions would be available for other species as well.

Sagebrush is the major component of Sage Grouse habitat; it shelters, protects, and provides sustenance for the bird. The winter diet of Sage Grouse consists almost exclusively of sagebrush leaves. Because of this dependency of Sage Grouse on sagebrush, the ecology of both the Sage Grouse and sagebrush plant community need to be understood before management actions can be formulated. By understanding the plant community ecology and the plant-animal relationship, the need for ecosystem maintenance becomes more apparent.

The ecosystem approach is based on dynamic plant communities. As stated above, the landscape is heterogeneous. The heterogeneity is based in part on geologic, soil, landform, elevation, and precipitation factors, and in part on plant responses to these factors such that plant assemblages, or communities, can be identified. However, the plant communities are also dynamic and change over time. The change in plant communities over time is commonly referred to as plant or community succession. For example, a grassland that results from a fire today may be a sagebrush-grassland community at some time in the future. Both the grassland and the sagebrush-grassland are part of the sagebrush plant community.
FIGURE 10
Elko County Planning Area
3.2 – Sage Grouse Biology and Habitat Requirements

Sage Grouse biology includes the basic information about the bird (i.e., taxonomy, distribution, and life history), the habits of the bird (i.e., food habits and habitat requirements), and the natural mortality factors affecting the bird (i.e., predators and diseases).

3.2.1 – Taxonomy and Description

Sage Grouse (Centrocercus urophasianus), is a member of the family Phasianidae (grouse and ptarmigan) and is one of seven species of grouse found in North America. They are also known as the sage hen, sage chicken, or sage cock. Lewis and Clark provided the first written accounts of this species during their 1805 expedition. The species was formally described as Tetrao urophasianus by C.L. Bonaparte (1827) and later placed in a monotypic genus Centrocercus, meaning “spiny-tailed pheasant,” by Swainson and Richardson (1832). The species was later differentiated into two subspecies, the Western Sage Grouse (C. u. phaios) and the Eastern Sage Grouse (C. u. urophasianus) (Aldrich 1946, 1963; AOU 1957). However, similarities in appearance and morphological measurements have resulted in poorly defined ranges. The Western Sage Grouse was considered to occur west of a contact zone traversing diagonally across southeast Oregon, northwest Nevada, and northeast California. The Eastern Sage Grouse was said to occur east of this zone ( Schroeder et al. 1999). Recent genetic work has indicated that differences between the two subspecies do exist (Oyler-McCance et al. 2001), but the difference is not sufficient to warrant a subspecies designation.

Additional DNA work has identified a small population in southwest Colorado with distinct genetic and behavioral characteristics. This population, referred to as the Gunnison Sage Grouse, has been recognized by the American Ornithologists’ Union as a new species of grouse, Centrocercus minimus. Centrocercus urophasianus is now referred to as the Greater Sage Grouse, and this species is the focus of this strategy. Genetic testing has also identified a population of Sage Grouse in Mono County, California and Lyon County, Nevada that may be genetically distinct (Oyler-McCance et al. 2001). The small sample size available for analysis has provided inconclusive evidence of this population being a subspecies, but there is sufficient evidence to warrant additional work.

Largest of the North American grouse, Sage Grouse show strong sexual dimorphism. Males range from 27 to 34 inches in length and weigh five to seven pounds, while females are 18 to 24 inches in length and weigh from two to three pounds. They are a grayish-brown bird with a dark belly, and long, pointed tail feathers. The throat of the male is black, bordered with white at the rear. Two air sacs (esophageal pouches), covered with short, stiff, scale-like white feathers, are found on each side of the lower neck and upper breast. When the pouches are distended, two yellow, pear-shaped patches of bare skin (cervical apteria) are exposed. A yellow fleshy comb occurs above the eye, and long filoplumes arise from the back of the neck and head. The female has the same general appearance but lacks the air sacs and has a white throat. The feet are feathered to the toes on both sexes. Their dark belly and absence of white outer tail feathers distinguishes them from the sharp-tailed grouse during flight.

Sex ratios of male to female have been reported to range from 1:1.1 to 1:2.6 for adults (Braun 1984). Sex ratios are primarily based on information gathered from
wing samples of harvested birds. Males have more conspicuous coloration than females and congregate for breeding display at the same locations for up to several months each year; therefore more adult males may be killed by predators than females, accounting for the disparity in the sex ratio. Sage Grouse that reach adulthood are relative long-lived. However, the majority of young born in any given year will not reach the age of one. Birds that reach three or four years old are considered old birds (Wallestad 1975); however birds five years and older are not unusual (Rue 1973).

Sage Grouse engage in a lek mating system. The males perform a strutting display (Bond 1900, Scott 1942, Gullion 1957, Schroeder et al. 1999) that includes fanning the tail feathers in an upright fashion that exposes white-tipped under tail feathers, expanding the esophageal pouches that expose the yellow skin patches, and erection of the yellow eye-combs and filoplumes. The expansion of the pouches also produces a series of “plops.” These activities are accompanied by movements and postures directed at other males (Hjorth 1970, Wiley 1973a). The display is an active defense of the breeding territory by each male (Hartzler 1972). Only a few males on a lek or strutting ground do the majority of the mating (Gibson et al. 1991, Scott 1942, Lumsden 1968, Wiley 1973b, Hartzler and Jenni 1988). Mating is the only role males have in the mating system, having no incubation or parental care. Territorial behavior is not exhibited by males off the leks, and male flocks are not uncommon during the rest of the year (Beck 1977).
FIGURE 11
Range Wide Greater Sage Grouse Habitat
Current & Historic
3.2.2 – Distribution

Historically, Sage Grouse were found throughout most of the western United States (Figure 11), including portions of 16 states, and along the southern border of three western Canadian provinces (AOU 1983, Aldrich 1963, Johnsgard 1973). Sage Grouse distribution closely paralleled the range of sagebrush (Artemisia sp.) from British Columbia, Alberta and Saskatchewan in the north; western Nebraska and the Dakotas to the east; Nevada, Utah, New Mexico and Oklahoma to the south, and eastern Oregon, Washington, and California to the west (Patterson 1952, Aldrich 1963, Guiquet 1970, Johnsgard 1973).

Sage Grouse currently range from southeastern Alberta and southern Saskatchewan to the north; western North and South Dakota to the east; Colorado, Utah, and Nevada to the south, and western California, eastern Oregon and Washington to the west (Johnsgard 1983, Drut 1994). The core of Sage Grouse populations has contracted to include land in Colorado, Idaho, Montana, Nevada, Oregon, and Wyoming with remnant populations in other states. Even within this remaining core area of their range, populations have dramatically declined (Braun 1998, Wisdom et al. 1998). Sage Grouse have been extirpated in British Columbia, Nebraska, New Mexico and Oklahoma (Braun 1991, 1993). Braun (1993) considered populations remaining in Alberta, North Dakota, Saskatchewan, South Dakota, California, Colorado, Utah and Washington to be "greatly reduced" or "marginal."
Within Nevada, Sage Grouse are presently distributed from the approximate center of Nevada northward, with the northeastern block of counties providing the most continuous habitat (Nevada Division of Wildlife [NDOW] 2000). The distribution of historic and current leks within Elko County suggests that Sage Grouse are found where sagebrush has dominated the landscape, historically or presently. Based on clusters of leks, known brood rearing areas, limited radio telemetry data, and professional judgment, ten Population Management Units (PMUs) were identified for Elko County (Figure 13). It is currently assumed that each PMU contains a Sage Grouse population. However, until more information is available, the PMUs provide a basis for planning and plan implementation. These boundaries should be considered temporary and subject to change as more is learned about Sage Grouse distribution and movement patterns in the planning area.

Numbers of Sage Grouse in Nevada and in Elko County are currently unknown; however, using a series of assumptions and numbers based on range wide population studies, the Sage Grouse population for each of the ten PMUs within the planning area was estimated (Table 3 & 4). Based on these PMU, the 2005 estimate of Sage Grouse within the planning area was between 37,600 and 45,100 birds.
TABLE 3  
2005 Population Estimate for Each Population Management Unit (PMU)

<table>
<thead>
<tr>
<th>PMU Designation</th>
<th>Total Known Leaks</th>
<th>Low-end Estimate</th>
<th>High-end Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desert</td>
<td>14</td>
<td>696</td>
<td>836</td>
</tr>
<tr>
<td>East Valley</td>
<td>8</td>
<td>398</td>
<td>477</td>
</tr>
<tr>
<td>Gollaher</td>
<td>104</td>
<td>5,172</td>
<td>6,207</td>
</tr>
<tr>
<td>Northfork</td>
<td>202</td>
<td>10,046</td>
<td>12,055</td>
</tr>
<tr>
<td>O’Neil</td>
<td>167</td>
<td>8,305</td>
<td>9,967</td>
</tr>
<tr>
<td>Ruby Valley</td>
<td>35</td>
<td>1,741</td>
<td>2,089</td>
</tr>
<tr>
<td>Snake</td>
<td>53</td>
<td>2,636</td>
<td>3,163</td>
</tr>
<tr>
<td>Southfork</td>
<td>46</td>
<td>2,288</td>
<td>2,745</td>
</tr>
<tr>
<td>Tuscarora</td>
<td>105</td>
<td>5,222</td>
<td>6,266</td>
</tr>
<tr>
<td>Islands</td>
<td>22</td>
<td>1,094</td>
<td>1,313</td>
</tr>
<tr>
<td>Totals</td>
<td>756</td>
<td>37,598</td>
<td>45,118</td>
</tr>
</tbody>
</table>

TABLE 4  
Elko County Sage Grouse Strutting Ground Trend Counts, 1986 – 2000
3.2.3 – Movements/Migration

Sage Grouse populations can be non-migratory size. (Berry and Eng 1985, Connelly et al) Grouse will generally move up in elevation from (1988, Wakkenin 1990, Fischer 1994, Beck) spring through fall as snow melt occurs and (1975, Wallestad 1975), depending on location and associated land form. Non-migratory or “resident” populations may spend the entire year within an area 39 mi.2 (10,000 ha) or less in size. Where topographic relief allows, Sage Grouse will generally move up in elevation from spring through fall as snow melt occurs and plant growth advances (Savage 1968, Klebenow 1985). Movements between seasonal ranges vary because of differences associated with gender, behavior, seasonal habitat quality and distribution, and weather (Connelly et al. 1988).

Brood movement from nesting/brood areas to summer area may be a function of desiccation of forbs in brood areas, which causes movement to higher elevations with later plant phenology (Pyrah 1954, Crawford 1960, Gill and Glover 1965, Savage 1968, Wallestad 1971, Connelly et al. 1988, Wakkenin 1990, Fischer et al. 1966). Mid-summer movements are uncommon because the birds are molting (Dalke et al. 1963). Movements to fall/winter range correspond to increasing use of sagebrush as the major food item, and movements may be related to food quality (Beck 1977, Remington 1983, Barrington and Back 1984). Movements during winter are related to snow depths and food quality/availability (Bean 1941, Crawford 1960, Beck 1977, Autenrieth 1981, Barrington and Back 1984). Winter and nesting areas may be close to one another if autumn movements retrace summer movements (Connelly et al. 1994). Some birds may move to nesting areas in mid-winter if the weather is mild (Berry and Eng 1985, Schroeder et al. 1999).

In migratory populations, seasonal movements may exceed 47 mi. (75 km) (Dalke et al. 1963, Connelly et al. 1988) and home ranges may exceed 579 mi.2 (150,000 ha) (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. The factors that initiate migratory movements may be the same factors that initiate seasonal movements in resident populations, especially considering that migratory populations and resident populations may share some seasonal habitats. Movements may be longer than necessary to locate acceptable habitat, suggesting site fidelity (Berry and Eng 1985, Connelly et al. 1988, Schroeder et al. 1999).

Radio telemetry data for Nevada, collected by NDOW, confirm that populations may be resident or migratory, and the movements and migration vary between and among populations. NDOW has found that migration occurs between leks, breeding areas, forage areas, and winter grounds. Some Sage Grouse do not migrate, wintering on the breeding grounds; others migrate following the breeding season and spend summer and fall nearly 40 miles from the breeding area, returning to the breeding area to winter, while other populations separate and migrate up to twenty miles to two different wintering grounds.

3.2.4 – Breeding/Nesting

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Each year, male Sage Grouse congregate in late winter through spring to display their breeding plumage and to attract hens for mating. Generally, the lek sites are traditional, with the same lek sites used year after year (Scott 1942, Batterson and Morse 1948, Wiley 1978, Autenrieth 1981). Leks are generally small open areas from 0.2 to 12 acres in size, with either low or no sagebrush and surrounded by taller more dense sagebrush. The big sagebrush on the outskirts of the leks is necessary as a food source, for escape cover, for nesting females, and for loafing during the day (Patterson 1952, Gill 1965, Klebenow 1985). Examples of lek sites include landing strips, old lake beds or playas, low sagebrush flats, and openings on ridges, roads, crop land, and burned areas (Connelly et al. 1981, Gates 1985).

Males begin displaying in the early predawn hours, retire during the mid-morning, and sometimes return to leks from dusk until late into the night, displaying by moonlight (Simon 1940, Scott 1942, Batterson and Morse 1948). According to Connelly et al. (2000), Sage Grouse appear to select breeding sites “opportunistically” within potential nesting habitat. Schroeder et al. (1999) state that there is no evidence that lek habitat is limiting for Sage Grouse.

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.

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 4 miles (6.2 km) of the lek; however, some hens may nest more than 12 mi. (20 km) away from the lek (Autenrieth 1981, Wakkinen et al.1992, Fischer 1994, Hanf et al. 1994).

Females fly to the edge of the lek, and then walk through the lek, sometimes congregating with other females. Choice of when to mate seems to be solely a decision of the female, who indicates her readiness by crouching in front of the chosen male. After mating the female flies off to initiate a nest. Sage Grouse males are polygynous; the only contribution made to reproduction is the mating act itself. All nest building, incubation and brood rearing is done by the female.

Nesting and early brood-rearing in Nevada generally occur from April through June. 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 nest consists of a shallow depression on the ground, mostly under big sagebrush, with residual grasses or other vegetation for concealment of incubating hen (Terres 1991). Nest lining is sparse, consisting of dry grasses, sagebrush leaves and a few feathers (Batterson and Morse 1948, Autenrieth 1981). Heights of shrubs at nesting sites vary, but studies indicate that there is some preference for shrubs that are taller than the average shrub height for the given site (Keller et al. 1941, Trueblood 1954, Klebenow 1969, Wallestad and Pyrah 1974, Autenrieth
Reported shrub height at nest sites range from 9 inches to 39 inches (Patterson 1952, Klebenow 1969, Autenrieth 1981, Gregg et al. 1994, Sveum et al. 1998a, Schroeder et al. 1999). Autenrieth (1981) found that a “bush providing an umbrella effect” was preferred.

Nesting habitat is characterized by primarily Wyoming big sagebrush communities that have 15 to 38 percent canopy cover and a grass and forb understory (Connelly et al. 1991, Gregg et al. 1994, Sveum et al. 1998a). Residual cover of grasses is also important (Klebenow 1969, Connelly et al. 1991, Gregg 1991, Gregg et al. 1994, Sveum et al. 1998a), ranging from 3 percent to 30 percent cover at successful nest sites. The importance of the residual cover may be relative to the structure of the shrub cover.

Where the “umbrella effect” is sufficient, residual herbaceous cover may not add much protection to the nest in terms of detection by predators. However, Autenrieth (1981) found that nest sites with greater understory cover had a warmer microclimate than the ambient air temperature one meter above the nest, and that nest temperature dropped less at sites with greater understory than sites with less understory during periods when the hen was off the nest.

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. When shrub canopy cover exceeded 10 to 12 percent in the Wyoming big sagebrush vegetation type, and approximately 15 percent in basin and mountain big sagebrush vegetation types, grass and forb cover needed for Sage Grouse cover and forage could decrease due to competition with shrubs. Therefore, maintenance of adequate nesting habitat is a function of shrub canopy cover.

Although the guidelines for maintenance of Sage Grouse habitat (Braun et al. 1977) recommended no sagebrush control within two miles (three kilometers) of a lek to protect nesting and brood areas, several studies have demonstrated that hens will nest at considerable distance from the lek (Peterson 1980, Autenrieth 1981, Fischer 1994). Wakkinen et al. (1992) concluded that nest sites were selected independent of lek location, and Autenrieth (1981) concluded that nest locations were related to quality of nesting cover.

Clutch size (number of eggs in one nest) 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). Sage Grouse eggs have olive or olive buff shells, marked with brown spots and dots. (Harrison 1978). Eggs are laid three to 14 days after copulation at a rate of two eggs every three days (Peterson 1980). Incubation by the female takes 25-28 days, and is initiated within two days after the last egg has been laid (Peterson 1980). During incubation the hen will leave the nest for up to approximately a half-hour, twice a day to feed and loaf (Autenrieth 1981). These recesses from incubation generally occurred during early morning and evening. Recesses during mid-morning or mid-afternoon are less common, and may be related to hen condition.
Nesting rates vary from year to year and from area to area (Schroeder 1997, Connelly et al. 1993, Gregg 1991, Bergerud 1988a, Coggins 1998). This variation is most likely a result of available quality forage (nutritional level) 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 1988a). Renesting may do little to increase overall population numbers. 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. Sage Grouse show a strong nest site fidelity and return to nest in the same area each year (Kerster and Willis 1986).

3.2.5 – Food Habits

Sage Grouse is the only North American grouse species that does not have a muscular grinding gizzard. The Sage Grouse gizzard is the non-muscular portion of the stomach that secretes mucus, but is incapable of macerating the food. Therefore, food sources are limited to insects and soft plant parts. As discussed below, this is an adaptation for winter survival while feeding on sagebrush.

Chick diets include forbs and invertebrates (Klebenow and Gray 1968, Drut et al. 1994). Insects are an important component of early brood-rearing habitat (Drut et al. 1994, Fischer et al.1996a). Insects, primarily beetles and some ants, comprised over 50 percent of total diet the first week after hatching (Klebenow 1969). Savage (1968) reported that ants were a frequent food item, observing Sage Grouse feeding directly at the ant hill. Autenrieth (1981) found insect availability to be critical in the first three weeks after hatching. Johnson and Boyce (1990) determined through feeding trials that Sage Grouse chicks require 15 grams of insects per day to maintain one to three-week old chicks in healthy condition. Chicks greater than three weeks old survived without insects in the diet, but growth rates were significantly reduced. Insects occurring in juvenile Sage Grouse diets include beetles (Order Coleoptera; Families Scarabeidae, Chrysomelidae, Tenebrionidae, Carabidae, Coccinellidae), ants (Order Hymenoptera; Family Formicidae), grasshoppers (Order Orthoptera; Family Locustidae), weevils (Order Coleoptera; Family Curculionidae), and lace bugs (Order Hemiptera; Family Tingidae) (Rasmussen and Griner, 1938, Klebenow and Gray 1968, Peterson 1970). Proportion of each insect in the diet varied with age of the chicks, and may be reflective of the habitats used and the life stages of the insects.

Forbs increase in the diet after the first week and remain the major food item for juveniles throughout the summer. Some of the forbs found in quantity in the diets of juvenile Sage Grouse include common dandelion (Taraxacum officinale), common salsify (Tragopogon dubius), prickly lettuce (Lactuca serriola), pepperweed (Lepidium densiflorum), Harkness gilia (Linanthus harknessii),
tapertip hawksbeard (Crepis acuminata), loco (Astragalus convallarius), phlox (Phlox longifolia), and common yarrow (Achillea millifolium) (Klebenow and Gray 1968, Peterson 1970). Sagebrush (Artemisia sp.) occurs in only trace amounts until chicks are about five weeks old (Klebenow and Gray 1968, Klebenow 1969, Peterson 1970).

The proportion of insects and plant material in the chick diet are indirectly proportional to each other. Insects make up the greatest proportion of the young chick diet and the percentage of insects declines as the percentage of plant material increases (Stiver personal communication). Plant use parallels the phenology of a given species (Klebenow and Gray 1968). As plants desiccate, Sage Grouse cease to feed on them.

Summer food habits of adult grouse are similar to juvenile food habits, with some differences in proportion of foods eaten. Plant material comprises a larger proportion of the adult diet in early and mid-summer and insects make up less of the adult diet during these periods. However, the actual food items (i.e., species of plant or insect) taken by adults overlaps considerably with juveniles (Rasmussen and Griner, 1938, Wallestad et al. 1975). Alfalfa (Medicago sativa) and sweet clover (Melilotus sp.) are eaten by Sage Grouse (Batterson and Morse 1948, Autenrieth 1981, Peterson 1970), but these species may be taken incidental to dandelion, salsify, prickly lettuce, and insects (Batterson and Morse 1948, Peterson 1970).

The use of sagebrush increases in late summer and continues to be the major food item until spring (Girard 1937, Rasmussen and Griner 1938, Patterson 1952, Leach and Hensley 1954, Klebenow and Gray 1968, Peterson 1970, Wallestad et al. 1975). Several species of sagebrush are used by Sage Grouse including Wyoming big sagebrush (Artemisia tridentata wyomingensis), mountain big sagebrush (A. t. vaseyana), low sagebrush (A. arbuscula longiloba), black sagebrush (A. arbuscula nova), fringed sagebrush (A. frigida), and silver sagebrush (A. cana).
4.0 SOCIAL AND ECONOMIC AFFECTS AND IMPACTS OF SAGE GROUSE CONSERVATION AND PRESERVATION


- Agriculture / Livestock Grazing
- Mining / Exploration
- Energy / Energy Transmission / Communications
- Recreation / Roads
- Local and Regional Economies
- Socio-Economic Considerations Including Consequences of Federal Listing

4.1.1 – Agriculture - Economics of Livestock Grazing and the ESA

As discussions about listing the greater Sage Grouse under the Endangered Species Act intensify, it can be expected that anti-grazing groups will demand the removal of cattle from public lands in the name of Sage Grouse recovery. Even if such a ban does not occur, altered public land grazing regulations based on the current understanding of Sage Grouse habitat needs will be expected. Moreover, some policy changes could be required prior to an official listing since the Bureau of Land Management lists the Sage Grouse as a “sensitive species,” and U.S. Forest Service lists it as a “management indicator species.” These designations require land agencies to manage for and meet the needs of the species.

While the condition of spring habitat is critical for the survival of Sage Grouse, this spring period is important for rangeland production and livestock production as well. The Policy Analysis Center for Western Public Lands (PACWPL) estimates the value of spring grazing for livestock production. They also estimate the economic consequences of eliminating spring grazing and reducing overall grazing capacity on public lands. The projected economic consequences of the two policy changes would be applicable for numerous other endangered species and land-use issues where similar policy changes have been suggested.

The policy impact economic models used in this analysis are structured for western livestock ranches that rely on both deeded and public lands for grazing capacity. The models developed were dynamic, multi-period, linear programming models designed to use land, livestock and financial resources so as to maximize discounted net ranch income over a 40-year planning horizon. For this analysis, the models are applied to three specific ranching areas in Idaho, Oregon and Nevada that will potentially be impacted by policy changes related to Sage Grouse recovery. The analysis focuses on the impacts to net ranch income and optimal (profit-maximizing) livestock production with the removal of one month of spring forage use and the phased-in removal of public land forage from the representative ranch operations. Eliminating BLM grazing to improve habitat for
Sage Grouse would have extreme significant negative impacts on the economic viability of affected western ranches. Early spring grazing is valuable because few alternative forage sources are available at that time. In most cases, the only feasible forage alternative would be to feed hay.

Rowe and Bartlett (2001:64) concluded that once hay was needed to compensate for public forage losses, reducing herd size would be the most cost-effective adjustment. The PACWPL results generally support this conclusion. Making alternative grazing resources available during the spring always minimized losses relative to feeding hay or reducing herd size. If complete flexibility of other deeded forages were possible, the economic loss of restricting the early use of BLM lands was minimal.

The economic value of the BLM forage during the spring period was found to be 5 to 10 times the value in other seasons later in the year for both the Idaho and Nevada models. In this case, the elimination of spring grazing was equivalent to a permanent cut because the BLM forage could not economically be used at a later date. The economic impacts of reducing BLM grazing in any season were found to vary widely depending on several key factors. First, various ranches will be able to substitute alternative forages to varying degrees as federal AUMs are eliminated. Substituting forages always minimized economic losses relative to the option of feeding hay and reducing brood cow herd size. Those ranches with restricted seasons of forage availability will have less ability to substitute alternative forages if BLM grazing is removed.

Economic losses from removing federal forage ranged from $2.50/AUM for the Jordan Valley, Idaho model, $5.50/AUM for the Northeastern Nevada model, to nearly $20/AUM for the Lake County, Oregon model. This is a wide range in economic value, but other similar studies in the literature report even wider ranges. The contributory value of public land grazing permits for livestock production varies widely depending on the seasonal complement of forage and pasture resources, and the level of dependency on federal lands.

Note (1) More detail on model assumptions, background and economic results is provided in the PACWPL report “Ranch-Level Impacts of Changing Grazing Policies on BLM Land to Protect the Greater Sage Grouse: Evidence from Idaho, Nevada and Oregon.”
FIGURE 14
Basic Conceptual Model With Proper Grazing, Loamy 8-10” p.z. Range Site

Nevada Cattle are Vital to the Economy and Range Management
4.1.2 – Mining

The passage of the General Mining Law of 1872 favored economic development allowing individuals to claim and mine public lands for mineral deposits, which resulted in thousands of mines developed across the West. Current environmental laws that require remediation of such mining sites were not in place during most of this period.

Mining has been integral to Nevada’s history, from Native American use of its mineral wealth to fashion arrowheads, spear points, and tools to today’s modern industrial mining operations. In fact, Nevada’s silver deposits were the key to statehood: A driving force in the state’s economy in the mid 19th century, they were a major reason for Nevada’s admission into the United States in 1864. While gaming and tourism now dominate the state’s economy, Nevada remains a nationally and internationally significant source of metals and minerals.

The history of mining in Nevada clearly illustrates the industry’s cyclical nature. Finding ways to translate the economic boost from mining operations into long-term, sustained economic development remains a key challenge for our industry.

Over the past three decades, the mining industry has invested more than $30 billion dollars in exploration, operations, and equipment in Nevada. This foundation for the industry, and the existence of vast, still-unexplored mineral resources, holds promise for continued mineral development in the state’s future.

Operating a mine responsibly requires dedication and careful thought about how mining activities will impact local residents – both human and non-human alike. Mining companies apply many measures to conserve and protect wildlife and wildlife habitat from physical or chemical harm resulting from their operations, and many times also take specific steps to mitigate unavoidable impacts and even enhance habitat near the mine to offset impacts occurring within the mine area itself.

Wildlife conservation begins with understanding both the local populations and habitat, and modern mines make a strong effort in completing studies prior to and while expanding operations. Many of today’s mines are built on or around historic mine operations, where older mine features such as adits and shafts often provide habitat for bats. These features, however, also may threaten the safety of other wildlife and general public. A common mitigation measure enacted by mines secures them while preserving their value to bat populations, utilizing features such as bat gates to prevent access by humans and large animals, while still allowing bats to continue to benefit from the shelter they provide.

Chemicals used in mining are carefully managed to help avoid adverse effects on wildlife. For example, cyanide solution from leach pads is collected in lined ponds that are either netted or employ floating, high-density polyethylene “bird balls” to keep birds out. High fences are also built around these ponds to keep larger animals from accessing them. Companies minimize ponding on the surface of leach pads through regular inspections and rotation of lines, use of low-drip tubes and emitters, and when possible, solution is conveyed in closed pipelines rather than open flow, lined ditches. All of these measures serve to keep wildlife from coming into contact with chemicals used to process ore.
Often, protection and mitigation measures can have a positive impact on wildlife habitat, such as improving freshwater resources to draw animals away from the processed water used in operations. Enhancements include: diverting a portion of unused water to a new location, or working with partners on neighboring ranch and public lands to improve spring site flows or access. At Ruby Hill mine, water and native species planted during concurrent reclamation were attracting deer to the site. To reach these reclaimed areas, deer would cross one of the mine’s main haul roads so the company developed a new watering location on another side of the mine to help minimize the risks to both deer and the mine’s truck operators.

Collaboration with local landowners and regulatory agencies continues during site closure. As land is reclaimed, careful consideration is given to the seed mixes used to re-vegetate the site. Within a single site, this can involve careful planning to match plant species with such things as elevation, aspect, precipitation range, and use of different land features that mimic local topography. Ongoing monitoring provides important information about which species and techniques are most successful.

Any natural resource extraction by definition impacts the environment. However, it is the manner in which these activities are carried out that is crucial in minimizing adverse effects. Mitigation and conservation measures being employed at mines serve as an example of how wildlife can co-exist, and often even flourish in and around mine sites.

The moderate footprint of mining operations makes environmental stewardship a key sustainability issue for the industry. Less than 2% of the federally managed public lands in Nevada are utilized for mineral mining operations. However, important aspects of this responsibility are addressing our actual and potential impacts to land, water, and air; reducing resource use; developing more sustainable technologies; applying best practice in mine closure; and working to maintain, enhance, and restore habitat.

Mining and Mineral Exploration in Nevada has co-existed with Sage Grouse and Wildlife for over 125 years. Mining is one of the most important components in the Regional and State Economy.
FIGURE 15
Nevada Active Mines & Energy Producers

Compiled by
David A. Davis and Ronald H. Hess
2000

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**Common practices:** Many companies strive to protect the environment and maintain ecosystem health through:

- Compliance with state and federal laws and regulations
- Management systems and procedures that help us meet legal and regulatory requirements, minimize impact, and monitor and continually improve our environmental performance
- Specific environmental performance improvement initiatives at our operations and with suppliers
- Effective reclamation of disturbed sites to leave healthy and productive post mining landscapes as part of our environmental legacy
- Partnerships to address environmental issues with government agencies and other stakeholders, such as environmental NGOs

**Compliance with Laws and Regulations:** The mining industry in Nevada is heavily regulated and subject to a comprehensive set of federal, state, and county laws and regulations designed to prevent or minimize environmental impacts. Because of this high level of expectation and oversight, compliance with regulations is a critical aspect of individual company sustainability efforts.

This framework requires thorough analysis – before, during, and after operation - of potential impacts to surface and groundwater, air, soil, plants, wildlife, aquatic organisms, archaeological resources, human health, social conditions, and economic conditions by technical experts and scientists. The resulting data is used to develop plans to prevent or mitigate these impacts. All mining operations submit comprehensive environmental management plans and applications to regulatory agencies for review and approval prior to issuance of permits for exploration, construction, operations, and closure. Public review and input are incorporated into state and federal regulatory review processes at multiple points to ensure that all significant issues associated with a project, and public concerns, have been addressed.

Because of the preponderance of public lands (87 percent of land area) in Nevada, companies must meet the requirements of the National Environmental Policy Act (NEPA). NEPA analysis requires completion of a formal Environmental Impact Assessment or Statement as part of the permitting process. Regular reporting to regulatory agencies on many aspects of environmental performance and resource management, and inspections by regulatory officials, are required throughout the life of a mining project. Obtaining the necessary permits and permissions to develop a mine requires a significant investment of both time and money. Once an economical mineral deposit is identified, it can take up to 10 years to conduct studies and obtain permits before a mine is constructed. In some cases, more than $1 billion dollars may be invested before any minerals or metals are produced. In other words, mining is a risky investment and significant hurdles must be overcome before a mine begins production.
Effective Reclamation and Productive Post-Closure Landscapes
Before any ground is disturbed, mining companies must ensure that adequate funds are available to complete reclamation and remediation of exploration and mining sites. In Nevada this process takes the form of bonds and sureties held by the Nevada Department of Environmental Protection, the Division of Minerals, the U.S. Bureau of Land Management, and the U.S. Forest Service. This provides assurance to the public that, should a company be unable to fulfill the activities required for reclamation and closure of a mine, funds are available to regulatory agencies to complete these tasks. Bond amounts are determined through development of comprehensive reclamation plans that detail the engineering, construction and environmental costs required to physically and chemically stabilize, reclaim, and restore areas disturbed by mining. Reclamation plans and cost estimates are prepared following detailed state and federal regulatory guidelines and must be approved by these agencies prior to project approval.

Partnerships for Environmental Protection, Conservation, and Enhancement
Developing and implementing an effective strategy to address an environmental concern sometimes requires collaboration with other stakeholders, such as government agencies and community organizations. Partnerships allow us to benefit from the skills and resources our partners possess, and ensure the participation of all parties necessary to achieve success. We discuss several additional examples of partnerships between the industry and stakeholders on environmental protection and enhancement initiatives in the following sections.

Economic Impacts of Mining
For the purpose of estimating Gross State Product (GSP) and impact multipliers, i.e., the total number of jobs, total state output, and state household income, the U.S. Department of Commerce breaks down the industry into two components: value added from mining, and the value of mining services. The summaries of employment, output and household income impacts below combine these two categories, while the table below separates the two sectors.

- Between mining and mining services, mining increased state output by **approximately $12.3 billion** in 2010 compared to $10 billion in 2009 including both direct and indirect impacts.
- Generated more than **63,900 total jobs** in Nevada in mining and industries supplying goods and services to the industry.
- Contributed almost $3 billion to Nevadans’ personal incomes in 2010.
- Economic impacts derive both from mining and, to an almost equal extent, support services of contractors and suppliers. Below is a breakdown of impacts from these sources from the U.S. Department of Commerce:
4.1.3 – Exploration

In 2010 exploration activity in Nevada reversed a 2-year downward trend and increased from $111 million spent on exploration in 2009 to $214 million, a 93 percent increase. This was the highest level of exploration expenditures recorded since the survey was started in the mid 1990’s.

This increase is clearly due to the large increase in gold prices seen in the last two years. And, it should be noted that the figure probably underestimates exploration expenditures because the Division must rely on voluntary reporting and tends to get most of its responses from larger companies and mineral exploration tends to attract a relatively large number of smaller companies.

Press releases from industry sources clearly indicate that “junior” exploration companies are very active in Nevada, so the survey clearly misses a lot of exploration activity. On the other hand, the larger companies that respond probably spend the bulk of the money on exploration.

4.1.4 – Mining Economics:

Continued growth in lesser developed markets like China and India is likely to keep demand for basic materials strong and benefit Nevada’s minerals industry. In addition, financial uncertainty in Europe and, to some extent, the U.S., has kept precious metals markets strong, although volatile. Nevada is also a major producer of lithium, used in high performance batteries that have many applications including hybrid automobiles.

Can Nevada afford to regulate the mining industry as proposed by the BLM Interim Management Policies? The Mining industry has shown cooperation to accommodate BLM, USFS and USFWS regulation, requirement and demands. The mining industry has contributed many millions of dollars to wildlife and wildlife habitat conservation and will continue to contribute through the federal permitting process. The United States is slowly becoming a country that is solely dependent on our energy and food needs. Mining is currently our only source of commodity recognized by the world in general. Are we to continue to regulate all our countries resources to the point of complete co-dependency on foreign subsidies?

4.1.5 – Energy / Energy Transmission / Communications

Geothermal energy is another important new resource. At present, geothermal plants in Nevada produce 1.38 million megawatt hours per year of electricity—or enough to power 80,000 homes. By some estimates, this figure could increase to as much as 2000 megawatt hours of electricity and more than a billion dollars in revenue for the state by 2025.

The Bureau of Land Management (BLM) is the agency responsible for managing geothermal leases on all federally managed public lands. Not all federally managed public lands are open to geothermal leasing. For example, geothermal exploration cannot occur in Wilderness Areas, wilderness study areas (WSA’s), or areas of critical environmental concern (ACEC’s). Once a geothermal lease has been submitted, the case is handled by the local BLM field office in which the
lease occurs. A fairly lengthy review process is required before a geothermal lease is approved. This process also applies to all renewable energy sources, energy transmission and communications.

The BLM has implemented interim management policies (IM 2012-043) for Sage Grouse habitat conservation prior to the NEPA process being completed. The policies and procedures identified in this IM are designed to minimize habitat loss in PPH and PGH and will advance the BLM’s objectives to maintain or restore habitat to desired conditions by ensuring that field offices analyze and document impacts to PPH and PGH and coordinate with states and the Fish and Wildlife Service.

The BLM has deferred a decision on a wind energy project and several gas and oil leases that would have provided much needed economic resources and tax base for the local government. The proposed wind project had been in the planning stages for six years or more and had expended a great deal of money to prepare a site specific and habitat specific Environmental Impact Statement concerning the Greater Sage Grouse in addition to a general Environmental Impact Statement. This issue along with long BLM, USFS, NEPA and DOE permitting processes and requirements already in affect raises questions of our national priorities in relation to our addiction to foreign oil and being self sustainable. It appears that United States will not only depend on foreign sources for oil and energy but will at some point due to the trends concerning agriculture will also become import dependent for our food.

Statewide, it is not uncommon that resources commercially developed by people and needed by wildlife overlap. Developing resources in a way that avoids or minimizes impacts to wildlife is often recommended by wildlife managers. Among other things, avoiding or mitigating wildlife and habitat impacts takes foresight, planning, and coordination with state wildlife agency personnel and/ or federal land management agencies.

With the knowledge that habitat loss and fragmentation of sagebrush ecosystems is one of the greatest threats to greater Sage Grouse in the west, some companies have been stepping up to the task of designing projects in a way that minimizes habitat disturbance and have staff thinking outside of the box to help ensure the successful reclamation of disturbed habitat.

4.1.6 – Recreation

The listing of the greater sage-grouse as a threatened or endangered species would have a significant impact on Nevada. Land development, land uses, water use, and recreational activities would be affected. While sage-grouse still thrive over much of their range in Nevada, with relatively large populations of birds in Elko, northern Humboldt, northern Washoe, Eureka, and White Pine Counties.

Human population growth and the trend for rural lifestyles have resulted in urban development within previous Sage Grouse habitats. These types of land use changes are anticipated to increase as the population of Nevada increases, and as demands for certain types of recreation increase. In Nevada the opportunity for urban development is somewhat limited by the current land status. Most of Nevada is public land administered by federal agencies. The bulk of the private
land is associated with the checkerboard land status along the Union Pacific railroad corridor that traverses Nevada east to west, irrigable lands and water sources, and a few large blocks of private land created through various land exchanges. The private lands within the checkerboard corridor have been recently made available for purchase and rural developments and ranchettes have increased in these areas, or are likely to occur.

Recreation, inclusive of OHV, dispersed camping, hunting fishing, hiking, bicycling and many other forms is a primary component to Elko County and the regional economy as has been for many years. Many use the vast open spaces for different forms of recreational values. Elko County has developed as a “Point of Destination.” The primary recreational uses in Elko County are considered low intensity and are compatible with the natural state of the land. Recreation is the largest user of federally managed public lands and must be maintained under the Multiple Use Sustained – Yield Act of 1960, FLPMA (43 U.S.C. 1701 et seq) and the Recreation and Public Purposes Act (68 Statute 173; 43 United States Code 869 et. seq.) to protect and sustain the local and regional economies and culture.

4.1.7 – Local and Regional Economies

The foundation of a county’s economy is those businesses which sell some or all of their goods and services to buyers outside of the county. Such a business is a basic industry. To produce these goods and services for “export” outside the county, the basic industry purchases inputs from outside of the county labor from the residents or “households” of the county and inputs from service industries located within the county and inputs from service industries located within the county. The flow of labor, goods and services in the county is completed by households using their earnings to purchase goods and services from the county’s service industries. It is evident from the interrelationships that a change in any one segment of a county’s economy will have reverberations throughout the entire economic system of the county.

Consider, for instance, the Cattle Ranching and Farming Sector, and its impacts on the local economy. The Cattle, Ranching and Farming Sector’s activities can be considered a basic industry as it draws dollars from outside the area. These dollars may hire a few people from the household sector such as laborers to herd the livestock. However, most of the local economic linkages are from the Cattle Ranching and Farming Sector’s purchasing goods from the service sectors. These include businesses such as restaurants, gas stations, hotels and other retail businesses. As earnings increase in these businesses, they will hire additional people and buy more inputs from other businesses. Thus the change in the economic base works its way throughout the entire local economy.

The total impact of a change in the economy consists of direct, indirect and induced impacts. Direct impacts are the changes in the activities of the impacting industry, such as the reduction of operations by the Cattle Ranching and Farming Sector. The impacting business, such as the Cattle Ranching and Farming Sector, changes its purchases of inputs as a result of the direct impact. This produces an indirect impact in the business sectors. Both the direct and indirect impacts change the flow of dollars to the community’s households. The local households alter their consumption accordingly. The effect of this change in local household consumption upon businesses in a county is referred to as an induced impact. A
measure is needed that yields the effects created by an increase or decrease in economic activity. In economics, this measure is called the multiplier effect.

Federal grazing plays a large role in Elko County agricultural production. According to the 1997 Census of Agriculture, 177 ranches held grazing permits or approximately 41% of total agricultural operations in Elko County (436) in 1997 and 68% of operations with a beef cow inventory (262) in 1997. Of these ranches, 144 held grazing permits with the BLM, 61 held grazing permits with the USFS and 16 held permits with other types of land owners. Note that some owners had grazing permits with more than one type of agency.

Current data on the number of available animal unit months (AUMs) was collected from Elko County regional offices of the BLM, USFS and U.S. Fish and Wildlife Service. The data is displayed in Table 4. Total permitted AUMs in Elko County in 2006 were estimated to be approximately 847,058 with 85% of the total permitted AUMs on BLM lands and the remaining 15% on USFS land. A small amount of grazing was permitted on the Ruby Lake National Wildlife Refuge. Actual AUMs used were less than the permitted amount and vary from year to year. Another study of Elko County grazing estimated that as much as 49% of total AUMs used by the cattle industry were provided by federal grazing land (Torell et al. 1981). In addition to being a large portion of total AUMs, often the timing of forage availability on federal lands increases their importance to the ranch operation. Because of the seasonal factors, several studies have found that the value of an AUM from federal lands is greater than the value of AUMs from other sources (Torell et al. 1981; Torell et al. 2002).

In 2003, the U.S. Bureau of Census defined a new classification of counties which are designated as “Micropolitan Statistical Areas.” To be classified as a Micropolitan Statistical Area, a group of counties must have a community of at least 10,000 to 49,999 people, be distant from a large city, and have proportionately few residents commuting outside the area. The Northeastern Nevada counties of Elko and Eureka comply with these requirements and have been designated as the Elko Micropolitan Statistical Area (S.A.). The Elko Micropolitan S.A. is the primary area of the state’s mining industry. During First Quarter 2007, the Elko Micropolitan S.A. employed 5,202 mining employees, which consists of 44.07% of total state of Nevada mining employment. Also for the Elko Micropolitan S.A., the mineral industry accounted for 20.42 percent of total area employment.

As for the Gold and Silver Ore Mining Sector in First Quarter 2007, employment was 5,099 employees in the Elko Micropolitan S.A. Elko Micropolitan S.A. made up 58.93 percent of total State of Nevada Gold and Silver Ore Mining Sector employment. As for the Support Activities for Metal Mining Sector employment, the Elko Micropolitan S.A. had 782 employees in First Quarter 2007. This was 74.90 percent of total State of Nevada employment in the Support Activities for Metal Mining Sector employment. This sector’s employment data may be somewhat under reported given Eureka County employment in this sector was not disclosed. Using the IMPLAN input-output model database (Minnesota IMPLAN Group, Inc., 2006), sectoral location quotient values show which sectors are importers, self-sufficient, and exporters. In 2004, there were 146 economic sectors in the Elko Micropolitan S.A.
The twenty top sectors made up approximately $3.0 billion in output, or 82 percent of total the Elko Micropolitan S.A. output in 2004. The Gold, Silver and Other Metal Ore Mining Sector in the Elko Micropolitan S.A. recorded a value of output of $1.58 billion which was 43.77 percent of total Elko Micropolitan S.A. value of output. This output level ranks the Gold, Silver and Other Metal Ore Mining Sector as the largest of the Elko Micropolitan S.A.’s 146 economic sectors in sectoral value of production. The value of production for the Support Activities for Other Mining Sector in 2004 was $92.9 million which was 2.57 percent of total Elko Micropolitan S.A. value of output. This ranked the Support for Other Mining Sector seventh among the Elko Micropolitan S.A.’s economic sectors in value of output. In total the Gold, Silver and Other Metal Ore Mining Sector and the Support Activities for Other Mining Sector, or what will be denoted as the Hard Rock Mining Sector, make up approximately 46 percent of total Elko Micropolitan S.A. economy output. The top twenty employment sectors made up approximately 74 percent of total Elko Micropolitan S.A. employment in 2004.

The Gold, Silver and Other Metal Ore Mining Sector in the Elko Micropolitan S.A. in 2004 had 3,958 employees which were 16.17 percent of total Elko Micropolitan S.A. employment. This employment level ranks the Gold, Silver and Other Metal Ore Mining Sector first among the Elko Micropolitan S.A.’s 146 economic sectors as to level of sectoral employment. The employment level for the Support Activities for Other Mining Sector in 2004 was 335 employees which was 1.37 percent of total Elko Micropolitan S.A. value of output. This ranked the Support for Other Mining Sector sixteenth among the Elko Micropolitan S.A.’s economic sectors in employment. In total the Hard Rock Mining Sector, made up approximately 17.5 percent of total Elko Micropolitan S.A. employment.

In 1994 an Economic Impact report was prepared by Dr. George F. Leaming, PH.D. of the Western Economic Analysis Center. The report is titled “The Impact of Federal Lands Policies on the Economy of Elko County, Nevada”, and evaluates public land management policies and their impacts to the local economy of Elko County. The report was updated and revised in the fall of 2010 to provide current data sets on the USFS and BLM management policies concerning public lands and the relations to multiple uses, accessibility and their direct negative impacts to the specific components of the Elko County economy.

Dr. Leaming wrote “the current and proposed federal land use policies will have severe negative impacts on the economic future of the county”. The 2010 report states that in 2008, approximately 20% of Elko County’s economy was recreation based. One third or 7% of the county recreation economy was lodging, entertainment and gaming based. Two thirds or 13% of the County economy of the recreation business was tourist business associated with outdoor recreation. Dr. Leaming wrote, outdoor recreation is the biggest user of public lands at approximately 90% of all public lands in Elko County. Mining represents the largest contributor to the local economy at approximately 70% and the smallest use of public lands at less than 2%. Agriculture is the second largest user of public lands at 85% and represents approximately 6% of our economy. Recreation accounts for approximately 20% of our local economy and relies heavily on full access to public lands.
The report referenced negative economic impacts relative to the loss of federal lands used for and specific to the three following elements; Mining, Agriculture and Recreation opportunities. The implied impacts were primarily relative to the loss of motorized access into and within the public lands. The report states that public lands that aren’t inclusive of motorized access and only permit non-motorized access largely go un-used.

The Leaming report states that 2/3rds of the tourism base of Elko County Economy came from outdoor recreation primarily on public lands. In Elko County 2006 through 2008 outdoor recreation generated an average of $165 million annually in outdoor recreational uses through commercial retail sales, services, lodging and personal income. In the 1994 and 2010 report Dr. Leaming’s based these estimates on accessible public lands and consideration of the impacts on the creation of road less and/or wilderness areas.

Dr. Leaming’s report further discusses the direct and indirect economic impacts to Elko County in the mining industry when public lands are lost to “road less or wilderness”. The mining operations of the area provide a huge part of our economic infrastructure, not necessarily due to direct proceeds in Elko County, but indirectly due to the mine employee population. The current mines operate normally on a twenty five year life with constant continued exploration and expansion.

Dr. Leaming also provides the elements that would be most affected, including direct impacts to the county’s long and short term economy. The long term impacts due to the proposed federal land policies would be on existing users such as mining, livestock and businesses serving outdoor recreation. Another long term impact would be the restrictive use of public lands discouraging or “cooling effect” of prospective multiple uses such as the development of potential mining operations, hunting lodges, ski resorts or any other type of use that would rely on the necessity of motorized access to the forest. The “cooling effect” can also be applied as a short term impact applicable to current recreation and multiple uses on public lands.

Short term effects to the economy would directly impact retail, service and goods related elements. Long term impacts would be a direct impact to the gross incomes of mining, livestock and outdoor recreation. These impacts would affect the net incomes of businesses serving these industries. This would trickle down and affect the retailers and services, their employees, regional suppliers and their employees, local suppliers and their employees.
4.1.8 – Socio-Economic Considerations Including Consequences of Federal Listing

Communities in Elko County are reflective of diverse and complicated relationships between natural resource extraction industries (agriculture, minerals, energy development, etc.), landownership (private vs. public) and local, state, and federal laws and regulations. Rural communities are also somewhat reflective of cyclic (boom/bust) economies and global economics that drive commodity prices. However, regional economies of northeastern Nevada are considerably more sustained and diverse due to location and proximity of larger and denser areas of population (Salt Lake City, Twin Falls, Reno and Las Vegas). We strongly believe the in order to be successful, management recommendations and solutions designed to improve Sage Grouse populations and habitats must be reflective and sensitive to local socio-economic issues.

State and federal agencies must coordinate with local landowners, county, and local governments to develop solutions that will meet ecological requirements while maintaining the social and economic values of the local community to the greatest extent possible. Participation by local stakeholders in the planning process has also helped to ensure that recommendations and guidelines presented in the Plan will meet the needs of the community. In many instances, cooperation between landowners and agencies results in more cost-effective and efficient habitat improvement projects that ultimately benefit both Sage Grouse and local interests.

Elko County knows that a listing action will severely threaten our livelihood by the curtailment of mineral exploration and mining, possibly eliminating public lands grazing, curtailment of overhead energy transmission lines, renewable energy (primarily wind) and many forms of recreation. If the Greater Sage Grouse were to be designated as endangered there may be serious consequences for the mineral and exploration industries and its local employees of our region. Some ranchers believe that if the Sage Grouse receives federal protections they will no longer be able to access their US Bureau of Land Management (BLM) or Forest Service (USFS) allotments to raise their cattle. Without these allotments ranchers would not be able to continue ranching as they will not have enough land to both raise their cattle and their feed. This will lead them to sell their property and leave the ranching way of life.

Listing the Sage Grouse under the provisions of ESA as well as implementing preservation and conservation measures will have a variety of local impacts. Activities that could be affected include mineral extraction mining, mineral exploration, noxious weed control, roadway and easement maintenance, land development, land division, livestock grazing management, hunting, wildlife management, and motorized and non-motorized vehicle recreational land use. Broadly applying “take” regulations under the ESA will create significant social and economic local and regional impacts. There will be an increase in bureaucratic processes in environmental permitting and compliance for most all multiple uses on federally managed lands including recreation. Ultimately, the listing or over regulation could result in slowing of growth and the elimination of new projects because of the increased cost of environmental permitting, mitigation and compliance.
In the event of listing or implementation of excessive preservation and conservation measures, this Plan and rangewide conservation assessments and strategies, must be utilized by the USFWS to develop a federal recovery plan that is cognizant and reflective of social and economic protection and sustainability of the region and Elko County. Therefore, the USFWS, NDOW and the State of Nevada Governor’s Sage Grouse Conservation Committee as a policy must involve and include local stakeholders in the preparation of federal recovery plans to help minimize the social and economic impacts of implementing recovery actions and measures. It is the policy of Elko County to fully protect the health, safety, and welfare of citizens and that includes protection of existing private property rights found within federally regulated lands in the form of rights-of-way, easements, and water rights (Refer to the 1866 Mining Act and RS2477, RS2339, and RS2340).

4.2 – Lack of Available Specific Socio-Economic Impact Information

The USFWS, BLM and USFS have approved and implemented Sage Grouse Population and Habitat Conservation plans and measures prior to fully understanding the full potential of the negative impacts throughout the western states. NEPA requires the that a socio-economic impact statement be provided for each Environmental Assessment or Environmental Impact Statements on all actions taken or made on federally managed public lands.

Many implemented plans throughout the west make mention of sustainability and concern of the impacts that Sage Grouse population and habitat conservation will cause. However, the implications and actual impacts are not revealed nor comprehensively identified or studied. The BLM and USFS have implemented interim Sage Grouse conservation measures that have impacted proposed projects in Nevada and Elko County. The impacts are currently being experienced by the County and region.

The interim grazing requirements currently utilized by the BLM and USFS would measurably impact the economies of the region during the 1st year and for subsequent years if the requirements remain in place. The impact to cattle ranching output and employment would depend on how long the perceived policies would be in place. The impacts should be considered over the following time periods: 1 year, 5 years, 10 years, and 20 years. The 1 year time period provides a basis for the impacts to the local communities. The 5 year period is the probable interim requirement period. The 10 year period coincides with the allotment management plan review period. And the 20 year period covers the life of the RMP.

4.2.1 – USFS & BLM Interim Management Practices

If the restrictions were viewed as being for only 1 year then the majority of the ranchers would find a way to compensate for that year. However, if ranchers believe the restrictions are for multiple years, or indefinitely, many may choose to cease operations, even in the 1st year. In 2008 two researchers, Brunson and Huntsinger (Brunson and Huntsinger 2008), completed two case studies of ranchers in California and, “one-third to one-half stated that they would have to sell their ranches if they lost their public allotments, because the operation would no longer be viable.” Once the ranches are sold, they most likely would be subdivided as they are worth more as residential developments than they are as agricultural land.
There are several studies that show the current trend of fragmentation of ranch lands into smaller ranchettes or residential developments. Either of these two scenarios results in decreased wildlife habitat, including Sage Grouse habitat. Cattle ranching and public land grazing are an integral part of the communities of Elko County and the region. The proposed reductions to public land grazing will not allow adequate time for the home ranches to grow hay to support their herds during the time public lands grazing is not available. While adjustments may be possible for one or several years, the majority of ranches would not be able to survive or sustain given their current size and hay requirements. Many ranchers, already operating at a loss and supplementing ranch income with outside wages would opt to sell the ranch. Ranch land is often worth more as development lands and once sold for development or conservation easements is lost to ranching (Synder 2006). This would prohibit ranching from ever returning to the same level.

The loss of ranches will also mean the loss of businesses that exist to support the ranches. If there are not enough ranches these businesses will be forced to close creating a ripple effect throughout the communities. Most likely ranch land would be divided into smaller sections or placed into conservation easements which both are detrimental to wildlife habitat as well as the loss of ranching and agricultural customs of Elko County.

Unlike mineral, oil and gas development ranching is not a boom and bust industry. Ranching and agriculture has greatly contributed to the stability and economics of our area for over 150 years. To undermine this culture by placing the interim and planned grazing restriction on lessees would change the economics, traditions and culture of Elko County and the region forever.
5.0 HABITAT – QUANTITY / QUALITY & NUTRITION / FRAGMENTATION

5.1 – Habitat Quantity

Changes in habitat quantity result from alteration of sagebrush habitats to other vegetation types. These changes may be short-term, or temporary, if the alteration results in sagebrush reestablishment over time, or they may be permanent if the alteration prevents sagebrush reestablishment. Wildfires, and to a lesser extent, historic livestock grazing practices, have resulted in the conversion of approximately 251,600 acres of sagebrush rangelands to annual grasslands in Elko County since 1980. The acreage converted has included Sage Grouse winter, breeding, nesting, and brood habitat. Once converted to annual grasslands, these areas will not revert back to a sagebrush community without extensive measures. The resulting annual grasslands create a greater risk of additional habitat loss due to the ease with which the annual grasslands can be ignited and spread fires into adjacent, intact sagebrush habitats. Within the Strategy area, large blocks of annual grasslands are most prevalent within the western portion of Elko County; however, cheatgrass is an understory component of many plant communities throughout the county.

The encroachment of pinyon-juniper woodlands from woodland sites to rangeland sites has also been responsible for loss of sagebrush habitats. Approximately 354,500 acres of pinyon-juniper encroachment has occurred within the planning area. Fire suppression or extended fire intervals allow pinyon-juniper to spread across the landscape (Tausch 1999). Chemicals in the foliage of the juniper trees prevent other species of grasses and shrubs from germinating or establishing under the juniper canopy. As the juniper begins to dominate the site, the shrub-herb community is essentially lost or greatly reduced, depending on the site conditions. Sage Grouse do not use pinyon-juniper woodlands, and the encroachment of this plant community into sagebrush-herb communities represents a loss of habitat for Sage Grouse. Due to the loss of understory in many of the pinyon-juniper stands, conversion back to sagebrush-herb communities is not a simple process. Where sagebrush still exists in the understory, several options for restoration are available.

During the late 1950s and early 1960s, several varieties of crested wheatgrass were used to control haloggeton and increase livestock forage production on western rangelands. These seedings were conducted primarily on gentle terrain at lower elevations (Wyoming sagebrush sites). The converted sites impacted nesting habitat, early brood habitat, and winter habitat. Although some seedings were used by Sage Grouse for breeding (leks), the overall impact has been considered to be detrimental to Sage Grouse (Braun 1998). Some seedings where sagebrush has reestablished have been noted as being used by Sage Grouse for winter use (Back et al. 1984) and nesting (K. McAdoo, personal communication). BLM records (Rich 1999) indicate that the cumulative acreage of rangeland seedings on BLM administered lands in the west increased from approximately 100,000 acres in 1962 to 2.75 million acres by 1997. This acreage does not include private land seedings. According to the BLM Elko Field Office, about 396,500 acres of public lands within the Elko Field Office area were converted to crested wheatgrass or other exotic species (not including fire rehabilitation projects). This represents about three percent of the land area in Elko County. Private land seedings were likely to have affected at least the same amount of acreage.
Not all sagebrush removal was followed by seeding of exotic grasses. Sagebrush control projects designed to remove sagebrush and allow native grasses to increase in abundance followed a pattern similar to crested wheatgrass seedings. Brush control projects on BLM administered lands in the west accounted for approximately 100,000 acres in 1962 and increased to approximately 1.4 million acres by 1976. Only about 300,000 acres of BLM administered lands have been converted to grasslands since 1976 (Rich 1999). Where sagebrush has been allowed to reestablish on these lands, Sage Grouse habitats have likely been reestablished. Where follow-up treatments have been conducted, Sage Grouse have been effectively removed from the acreage. Sagebrush rangelands have also been converted to a variety of other agricultural uses, including hay production, through various forms of irrigation. While this acreage has reduced the amount of winter or nesting habitat, much of the irrigated land has received use as summer foraging habitat.

The rapid expansion of the mining industry in and around Elko County starting in the 1980s also impacted Sage Grouse habitats. Environmental analysis of mining impacts for operations managed by Barrick Goldstrike Mines, Inc., Newmont Mining Corporation, AngloGold, Inc., Glamis Dee Gold Mining Co., and others have indicated loss of habitat, either temporary or permanent, due to mine development. While most of the acreage will be reclaimed to support sagebrush communities, some acreage has been converted to salt desert shrub or exotic grasses, and some acreage represented by the open pits will remain permanently unavailable to Sage Grouse. Some of these impacts have been mitigated by off-site projects intended to rehabilitate annual grasslands, and Barrick Goldstrike Mines, Inc. contributed mitigation funds to experimental land treatments that have been instrumental in developing management tools for this Strategy. Although mining disturbance is very visible during active mining, the actual acreage involved represents less than two percent (2%) of Elko County’s land mass.

5.2 – Habitat Quality and Nutrition

The quality of the habitat contributes to the effectiveness of many of the other factors. Disease, predation, hunting, and disturbance are less likely to affect populations when habitat quality is high and both the birds and the populations are resilient. Population impacts from unfavorable weather conditions are also somewhat ameliorated by having high quality habitats. Managing for quality habitats, while maintaining and restoring habitat quantity, are probably the two most important factors for long term sustainability of Sage-Grouse populations.

Habitat quality also pertains to the integrity of the plant communities. Invasive weeds, annual grasses, and exotic species (desired or undesired) all detract from habitat quality. For each invasive weed, annual grass, or exotic species there is one less forb, native grass, or sagebrush seedling that can be supported within the community. These species also increase the risk of conversion from a shrub-herb community to an annual grassland-noxious weed community following catastrophic events (see habitat quantity, above).

Habitat quality was also addressed by conducting a habitat condition assessment. The purpose of the assessment was to determine five broad categories of habitat condition and mapping the location of habitats of each condition class within each PMU. The five habitat conditions (R-0, R-1, R-2, R-3, and R-4) are described as follows:
• R-0: Habitat areas with desired species composition that have sufficient, but not excessive, sagebrush canopy and sufficient grasses and forbs in the understory to provide adequate cover and forage to meet the seasonal needs of Sage Grouse.

• R-1: Habitat areas which currently lack sufficient sagebrush and are currently dominated by perennial grasses and forbs, yet have the potential to produce sagebrush plant communities with good understory composition of desired grasses and forbs.

• R-2: Existing sagebrush habitat areas with insufficient desired grasses and forbs in the understory to meet seasonal needs of Sage-Grouse.

• R-3: Sagebrush habitat areas where pinyon-juniper encroachment has affected the potential to produce sagebrush plant communities that provide adequate cover and forage to meet the seasonal needs of Sage-Grouse.

• R-4: Habitat areas which have the potential to produce sagebrush plant communities, but are currently dominated by annual grasses, annual forbs, or bare ground.

Condition assessment will be used as a planning tool for the watershed assessments. Approximately 78 percent of the planning area is comprised of R-0, R-1, and R-2 habitats; therefore the potential exists to improve habitat quality on almost 8 million acres.

In addition to the upland habitats, the riparian meadows and springs are important habitats for Sage-Grouse in late summer. The BLM Elko Field Office has rated 912 miles of riparian areas in terms of lotic proper functioning condition (PFC) and has estimated that 178 miles (19.5 percent) of the riparian areas were at PFC, 153 miles (16.8 percent) were functioning at risk with an upward trend, 122 miles (13.4 percent) were functioning at risk with a downward trend, 125 miles (13.7 percent) were functioning at risk and trend was not determined, and 335 miles (36.7 percent) were rated as not functioning. In addition, of the approximately 5,600 acres of lentic habitat within the planning area, approximately 2,700 acres have been evaluated with regard to PFC. Of the acreage evaluated to date, 2,137 acres (78.5 percent) were rated at PFC, 70.5 acres (2.6 percent) were functioning at risk with an upward trend, 97.1 acres (3.6 percent) were functioning at risk and trend was not determined, 288.2 acres (10.6 percent) were functioning at risk with a downward trend, and 130.2 acres (4.8 percent) were not functioning. These totals do not include riparian habitats on private lands and represent only the total riparian areas that have been assessed.

The habitat parameters from the Sage Grouse Guidelines (Connelly et al. 2000) were used to determine where Sage-Grouse seasonal habitats occur within the basic conceptual successional model. Pre-nesting, early brood habitat, and nesting habitat all fall within the time period when herbaceous vegetation is dominant or co-dominant with sagebrush. The forbs and insects are important components of the pre-nesting diets of hens and early diets of chicks. The abundant herbaceous cover also provides the lateral screening cover for the nest site and to help conceal the hen when she leaves or returns to the nest. Late summer and winter habitats have a higher component of shrubs than the “production”
habitats associated with nesting and early brood habitat. Herbaceous vegetation in the uplands is not an important factor in late summer and winter.

5.3 – Habitat Fragmentation

Habitat fragmentation consists of breaking up large areas of habitat into smaller, isolated areas of habitat. Species need to move through “non-habitat” to use the resulting patchwork of suitable habitats. The “non-habitats” can be physical/psychological barriers (e.g., roads or fences), blocks of unsuitable habitat (e.g., crested wheatgrass seeding or annual grassland), or other zones that a species avoids due to predation risks (e.g., adjacent to transmission lines). Fragmentation impacts vary by species due to the home range, daily range, and territorial requirements of different species. A species that spends an entire lifetime on only a few acres may not be impacted by the construction of a road or implementation of a crested wheatgrass seeding within a quarter mile of its home range, whereas a species that requires a large home range or seasonal habitat area may be impacted by breaking a large block of habitat into smaller patches. There is very little data pertaining to road density and Sage Grouse.

There is evidence that Sage Grouse will use roads for leks, but the level of traffic would have to be light during the hours of breeding display for this to be successful. In general, the fewer the roads and the lighter the traffic level, the less impact there is to Sage-Grouse from roads. Preliminary estimates of road mileage within the planning area include 775 miles of primary and secondary roads (paved Interstate highway and State highways, respectively), 2,511 miles of hard improved roads (gravel/county roads), and 17,833 miles of unimproved roads. This equates to approximately 1.2 miles of road per square mile. Utility line support structures may also influence habitat use. There has been some suggestion that predation on male Sage Grouse at leks is increased by raptors using transmission line supports as perches near leks. This has not been demonstrated in a scientifically controlled study and seems very unlikely to occur. The premise by Hall (in press) that transmission line structures provide an advantage for raptors to prey on males at leks needs to be examined. Leks are used for many years. This consistency in time and space makes the lek a predictable resource. Raptors will attempt to exploit this resource with or without perches.

A resource that is predictable in time and space can be hunted efficiently on the wing, using the element of surprise. Use of existing cover (i.e., flying low over the sage brush to decrease the angle of detection) and using the existing topography (i.e., approach from the blind side of the ridge) are more likely to be successful than initiating the attack from a perch in full view of ten to 50 prey. Although the literature indicates that attacks by eagles at leks are common, the attacks are most often unsuccessful (Scott 1942, Stanton 1958, Rogers 1964, Wiley 1973b, Autenrieth 1981). The timing of the breeding display before dawn to shortly after sunrise has been hypothesized as a response to predation pressure (Hjorth 1970, Hartzler 1974, Bergerud 1988b, Phillips 1990). This is a period when sufficient light is present to effectively display but there is insufficient light to make the Sage-Grouse highly visible. It is also the time when owls return to their day roosts and prior to initiation of hunting by eagles, although there is some overlap of the breeding display with the hunting period of both owls and eagles.

The addition of support towers or other perches into otherwise perch-free habitats does not necessarily equate to increased predation pressure on the leks. Avian predators can prey on males at the lek with or without the transmission line. However, where the support tower is relatively close to the lek, the presence of a predator in full view may be
sufficient to make the males too “nervous” to display, resulting in lek abandonment. There is likely some “comfort zone” that Sage Grouse have with regard to elevated perches such as rock outcrops, woodlands, and transmission lines. Avoidance of these structures up to a distance whereby detection of a raptor leaving the perch allows sufficient time for escape would seem to be a prudent behavior.

In contrast to leks, nests are a resource that are unpredictable in space, but somewhat predictable in time (i.e., only during the breeding season). Detection is a necessary step to successful predation. A “perch and search” approach is an effective strategy for this type of resource, especially when there are cues to the nest location. The hen leaves the nest at least twice per day to feed, defecate, and exercise; this is accomplished by sneaking through the vegetation until some distance from the nest. At this point, the hen may fly to another area. If the flight is detected, or if the hen is detected while sneaking from the nest, ravens will investigate the area in search of the nest. This may be unsuccessful for several attempts; however, the hen leaves the nest by a different route during each recess, and the patient predator can narrow down the search area within a few days. The end result is a high level of nest predation.

Successful Sage Grouse hens have high nest site fidelity. However, if nest success in an area is low due to nest predation, fewer and fewer young would be produced. Eventually, over a period of years, the number of nesting hens in the vicinity of the transmission line would be expected to decline through natural mortality. Without replacement hens being produced, breeding opportunities for the males would decline, and subsequently, attendance at the lek would decline.

**FIGURE 16**
Rangewide Breeding Densities
GREATER SAGE GROUSE POPULATION AND HABITAT CONSERVATION, PRESERVATION AND RESTORATION MEASURES AND STRATEGIES:

6.1 – Habitat Quantity / Quality / Nutrition / Fragmentation

The overall conservation objective identified in the Elko County Sage Grouse Management and Conservation Strategy Plan is to produce and maintain neutral or positive trends in populations and maintain or increase the distribution of Sage Grouse in the Plan Area. Analyses conducted by Knick and Hanser (2011) concluded that the WAFWA conservation objective may no longer be possible due to natural and anthropogenic threats that are degrading remaining sagebrush habitats. They recommended focusing conservation on areas critical to range-wide persistence of this species (Knick and Hanser 2011). Other areas within the range of Sage Grouse have a high uncertainty for continued population persistence (Wisdom et al. 2011) due to fragmentation from anthropogenic impacts.

The conservation strategies identified below are targeted at threat improvement through adequate regulatory mechanisms and proactive conservation actions, thereby addressing the conservation parameters of resistance and resiliency. The intent is to reduce the maximum extent practicable anthropogenic impacts affecting Sage Grouse habitat loss and fragmentation. If this is not achieved, the long-term persistence of this species will be compromised. Due to the variability in ecological conditions, species’ and threat status, and differing cultural perspectives across the Sage Grouse range, developing detailed, prescriptive species or habitat actions is biologically untenable and inappropriate at the range-wide scale. The plan recognizes the specific strategies or actions deemed necessary for a successful threat restructuring plan must be developed and implemented at the state and local level, with involvement of all stakeholders.

The approach included retention to the maximum extent practicable populations and habitats necessary to provide essential conservation parameters – redundancy, representation, and resiliency – for this species. The plan identifies ways to incorporate resistance, which would indicate that populations and habitats are healthy and robust even in the presence of threats. While some populations within the range of Sage Grouse are at significant threat risk, none are immune to the threat of habitat loss and fragmentation.

Many stakeholders within the sagebrush ecosystem have worked diligently to proactively minimize the impacts of their projects on the species. Voluntary efforts can be very effective in successful threat improvement to the level that a listing determination is not warranted. Currently, proactive voluntary conservation efforts for Sage Grouse are being implemented in portions of the species’ range. The plan recommends that agencies engaged in voluntary conservation actions collect information on the geographic scope of these efforts, the sustained benefits from their implementation, and the likelihood that they will continue to be implemented in the future.

In species conservation, the intent of providing redundancy is to ensure a species will persist even if habitat and some populations are lost due to a catastrophic event. Some of the PACs could be lost, wholly or in part, to catastrophic events, particularly in areas where wildfires are prevalent. The redundancy built into the state planning efforts will allow for some of these losses and still permit long-term species conservation. If
restoration is not possible, then efforts should be made to restore the components lost within the plan area.

The plan recommends that the maps developed by the State of Nevada for the purpose of Sage Grouse conservation be re-evaluated on a regular basis so that new information can be incorporated as soon as it becomes available. By maintaining “living” maps of the habitat areas necessary to provide redundancy and representation, threat improvement actions can be more accurately implemented, or modified if appropriate. Additionally, new restoration opportunities may be identified, thereby increasing management flexibility. Basing management decisions on out-of-date data may threaten the success of long-term conservation actions and threat improvement actions.

6.1.1 – Habitat restoration and conservation of Quality, Quantity, Nutrition and Fragmentation.

6.1.1.1 – Management Goal 1: To produce and maintain neutral or positive trends in populations and maintain or increase the distribution of Sage Grouse and habitat in the plan area.

*Issue:* Long-term conservation of Sage Grouse and their habitat, by maintaining viable, connected, and well-distributed populations across the plan area.

*Actions:*

1) Encourage to stop or curtail the decline of continuing habitat and population losses by acting to establish the necessary strategies in order to improve the impacts of stressors contributing to population declines and range erosion.

2) Target management and restoration. Some Sage Grouse populations may warrant more than the improvement of the impacts to maintain birds on the landscape. In these instances, and particularly with impacts resulting from wildfire, it may be critical to not only reduce threats to these populations but additionally to improve population health through active management (e.g. habitat restoration).

3) Engage all stakeholders in conservation through threat improvement. Successful implementation of voluntary strategies to conserve Sage Grouse requires that all stakeholders participate in threat improvement, regardless of the size, type, ownership, or location of the threat impact.

4) When avoidance is not possible, minimization and mitigation of the impacts should be implemented to sustain the functional value of the area impacted.

5) The State of Nevada and NDOW must develop maps and a monitoring system the purpose of Sage Grouse conservation to be revised and re-evaluated on a regular basis so that new information can be incorporated as soon as it becomes available.
a) Use local data on threats and ecological conditions (including status of local sage-grouse populations and their associated habitats).

b) Maintain the diversity of sagebrush habitats essential to provide for all Sage Grouse seasonal and life history stages.

c) Maintain genetic and physical connectivity.

6) Develop effective strategies for improving the impacts of wildfire in Sage Grouse habitats. This can include development of preventative strategies (e.g. strategic placement of fire-fighting resources) as well as effective habitat restoration.

7) State of Nevada and Federal sources must increase funding and support for key research projects that will remove uncertainties for Sage Grouse management.

6.2 – Agriculture / Livestock Grazing

Sagebrush communities provide habitat for Sage Grouse, produce a diversity of tangible commodities, and satisfy many societal values that are important to the U.S. economy and the well-being of Nevada and U.S. citizens. Sagebrush-dominated rangeland in Nevada that is occupied by Sage Grouse includes private, tribal, state, and federally managed public lands.

Sagebrush communities typically have forage value for livestock as well as providing quality habitat for Sage Grouse. Livestock affects on Sage Grouse habitat, and on the birds, is normally positive, rarely negative, or neutral depending on the specific grazing prescription and on the ecological site. Livestock grazing has been responsible for retaining expansive tracts of sagebrush dominated rangeland from conversion to cropland. In terms of habitat quality, properly managed grazing can stimulate growth of grasses and forbs, and thus livestock can be used to manipulate the plant community toward a desired condition. For example, rest-rotation grazing systems designed after Horman (1970) provide for long-term range health and, in comparison to other systems, was found to produce up to four times as many prairie grouse (i.e., sharp-tailed grouse and prairie chickens) compared with other grazing systems on the Fort Pierre National Grasslands (Rice and Carter 1982). The effect of improved residual cover, in response to grazing management, would likely have positive implications for Sage Grouse habitat. Management may not, however, restore all degraded range through grazing alone. Likewise, appropriate grazing practices may not totally compensate for other influences affecting Sage Grouse abundance.

In response to environmental concerns, livestock operators and other land managers have developed stock water sources on uplands and have constructed fences to shift grazing from riparian to upland areas. Meeting objectives for riparian areas may increase removal of vegetation on upland sites. To minimize the potential impact of removing important understory vegetation, flexible grazing management programs need to be planned and implemented while considering the needs of Sage Grouse. Federal land managers also should consider potential effects, such as disturbance or mechanical
damage to sagebrush, caused by livestock concentrations near leks during the breeding season or on key winter habitats.

Cooperative research is needed to identify and evaluate the effects of various grazing management plans on the interaction of Sage Grouse, commodity production, and societal values. Results should be used to develop grazing plans that eliminate or minimize potential conflicts.

The Bureau of Land Management and the United States Forest Service administer grazing allotments within Nevada, most of which include Sage Grouse habitat. Grazing permit renewal processes and allotment evaluation procedures include mechanisms for adjusting grazing to address seasonal Sage Grouse concerns. Grazing allotments under managed grazing systems are intended to improve rangeland health with regard to the regional Resource Advisory Council Standards and Guidelines. Other BLM programs that may potentially play a role in Sage Grouse conservation and livestock management include the Healthy Forest Initiative/Hazardous Fuels Reduction program, Weeds Program, and the Rangeland Improvement Program.

6.2.1 – Managing Agriculture, Livestock Grazing, Sage Grouse and Habitat

6.2.1.1 – Management Goal 1: Manage agriculture and livestock grazing to maintain and enhance conditions necessary for a properly functioning sagebrush community that addresses the long-term needs of agriculture, livestock grazing and Sage Grouse habitat.

Issue: Address conflicting priorities for land uses, species, and habitats

Actions:

1) Use current or developed scientific data and user based historic information to establish baseline information when evaluating soil conditions and ecological processes and when monitoring seasonal Sage Grouse habitats.

2) Encourage livestock managers to work with federal land managers to set site specific habitat objectives and implement appropriate grazing management to achieve those objectives and maintain or improve vegetation condition and trends as well as maintain the multiple use concept and sustain local agriculture industry and economy.

3) Offer private landowners incentives when and where appropriate to achieve Sage Grouse habitat objectives.

a) Funding to be available through NDOW granted by Ruby Pipeline specific to Sage Grouse Conservation, Preservation and Restoration.

Issue: Potentially significantly altered sagebrush communities may have been lost by past management practices.

Actions:
1) Encourage livestock managers to work with federal land managers to establish, develop and implement appropriate management strategies and range management practices where soil conditions and ecological processes will support Sage Grouse and desired livestock commodities as well as maintain the multiple use concept and sustain local agriculture industry and economy.

   a) Establish suitable and obtainable habitat objectives and goals for sagebrush communities that have deteriorated while maintaining multiple uses.

2) Offer private landowners incentives when and where appropriate to achieve Sage Grouse objectives where appropriate to develop or expand Sage Grouse habitat and maintain agricultural uses.

   a) Funding to be available through NDOW granted by Ruby Pipeline specific to Sage Grouse Conservation, Preservation and Restoration.

**Issue:** Drought may result in the degradation of native plant communities, and reduces forage production and Sage Grouse habitat.

**Actions:**

1) Encourage Livestock managers to develop drought management strategies or plans, e.g. water facilities, forage sources, formulated for implementation during periods of drought. Assist managers in the development of drought management strategies.

2) Consider effects of livestock and wildlife distribution on Sage Grouse prior to developing additional water sources.

3) Encourage and offer private land owners incentives when and where appropriate to achieve Sage Grouse objectives.

**Issue:** Riparian areas (wet meadows, seeps, streams) are important resources for Sage Grouse and livestock.

**Actions:**

1) Encourage livestock managers to design and implement livestock grazing management practices to achieve riparian management objectives.

2) Promote livestock mangers to modify or adapt pipelines and natural springs, where practical and feasible, to create small wet meadows as brood habitat.

3) Help ensure the sustainability of desired soil conditions and ecological processes within upland plant communities following implementation of strategies to protect riparian areas. This can be achieved by:
a) Promote livestock managers to protect natural wet meadows and springs from overuse while developing water for livestock.

b) Encourage livestock managers to plan the location, design, and construction of new fences to minimize impacts on Sage Grouse and habitat.

**Issue:** Potential for Sage Grouse to be disturbed by concentrations of livestock near leks or winter habitat.

**Actions:**
1) Encourage livestock manager to not over concentrate livestock on leks or other key Sage Grouse habitats.

   a) Promote livestock managers to avoid placement of salt or mineral supplements near leks during the breeding season (Mar-Jun).

   b) Encourage livestock managers to avoid supplemental winter feeding of livestock, where practical, on Sage Grouse winter habitat and around leks.

6.2.1.2 – **Management Goal 2:** Assess the impacts of fencing for livestock on Sage Grouse and Sage Grouse habitats.

**Issue:** Existing fences near breeding, brood-rearing, or winter habitats can increase the risk of collision mortalities and/or predation on Sage Grouse by hawks, eagles, and ravens by providing perches.

**Actions:**
1) If portions of existing fences are found to pose a significant threat to Sage Grouse as strike sites or raptor perches, mitigate through moving or modifying posts, etc. Actions may include increasing the visibility of the fences by flagging or by designing “take-down” fences and implementation of a comprehensive predator control program.

2) Offer private landowners incentives when and where appropriate to achieve predator control and Sage Grouse objectives.

**Issue:** Proposal of new fences near Sage Grouse leks and winter ranges.

**Actions:**
1) Develop incentive based practices of avoiding placing fences through or near leks and winter ranges on state and federal lands.

2) Offer private landowners incentives when and where appropriate to achieve Sage Grouse objectives.
6.2.1.3 – **Management Goal**: Minimize impacts of using pesticides and herbicides to control insects and herbaceous plants that provide a food source for Sage Grouse and other wildlife.

**Issue**: Pesticides and herbicides may adversely impact the kinds and number of foods available in the form of insects and forbs and can directly affect chick survival.

**Actions**:
1) Evaluate ecological consequences of using pesticides to control grasshoppers or other insects.

2) Evaluate ecological consequences of broadcast herbicide use on forbs and other important Sage Grouse foods.

3) Minimize use of pesticides and herbicides within known grouse nests, leks, or brood-rearing areas.

4) Develop educational materials detailing the effects of pesticides and herbicides that can be used to evaluate their effects on Sage Grouse.

6.2.1.4 – **Management Goal 4**: Curtail and stop further prohibitive and over management of federally managed public lands.

**Issue**: Federal government over management and reductions in grazing allotment AUMs.

**Actions**:
1) Develop Adaptive Management and collaborative processes instituted to consider possible solutions, implement on-the-ground changes/enhancement activities and monitor for results.

2) Adaptive management practices should be implemented on a local basis, involving an inclusive opportunity for all locally affected stakeholders (private sector and government). Inherent in Adaptive Management is that it recognizes progression towards ultimate resource goals through measurable objectives.

3) Discourage and prevent additional regulations and prohibitions limiting and preventing livestock grazing and agricultural uses on federally managed lands as well as private properties.

4) Encourage federal land managers to develop and maintain policies that support Sage Grouse and Livestock cohabitation.

6.2.1.5 – **Management Goal 5**: Utilize and expand where appropriate existing grazing permits and new grazing permits designed to achieve rangeland health standards, to properly manage grazing and identify
opportunities for livestock grazing to be used as a management tool to improve habitat quality and reduce wildfire threats.

_Issue:_ Educate livestock operators to establish a comprehensive understanding of seasonal habitat requirements in conjunction with providing flexibility for the livestock operator and the land management agency to cooperatively make seasonal range management decisions to respond to vegetation management objectives including fuels reduction.

_Actions:_

1) Implement appropriate prescribed grazing conservation actions at scales sufficient to influence a positive population response in occupied Sage Grouse habitat.

2) Allow flexibility in management that will utilize targeted grazing management to reduce the fuel load and fire risk to enhance and protect seasonal habitats for Sage Grouse.

3) Continue to use pasture rotation, seasonal deferment, improved stockmanship, and other livestock grazing practices that have been proven to be effective in contributing toward maintaining Sage Grouse populations.

4) Address incompatible grazing strategies when compelling and credible cause-and-effect relations have been identified cooperatively by the land management agency and the allotment permittee through rangeland management monitoring techniques appropriate in the Great Basin and consistent with Sage Grouse habitat objectives.

5) In Sage Grouse management areas, design water developments (springs/well overflow areas, etc.) to include water and mesic habitats for Sage Grouse.

6.2.1.6 – **Management Goal 6:** Develop a Pilot Project to monitor the affects of historical grazing, predator control and range management methods and their impacts on the Sage Grouse Populations and Habitat.

_Issue:_ Lack of current specific data concerning the effects on Sage Grouse Populations and Habitat when utilizing historical Livestock Grazing, Predator Control and Range Management policies and measures.

_Actions:_

1) Propose the identification of a specific Pilot Project area of approximately 72 square miles to 216 square miles in size to implement historical livestock grazing, predator control and range management polices to develop scientific data related to the Sage Grouse populations and habitat.
2) Implement and develop the Pilot Project using historical livestock grazing, predator control and range management polices to develop scientific data related to the Sage Grouse populations and habitat.

a) Funding through the State of Nevada Department of Wildlife & BLM from Ruby Pipeline Sage Grouse Conservation funds.

6.3 – Fire / Wildfire

Fire in varying intensity and force has always been present in sagebrush communities. The benefits and detrments to Sage Grouse habitats and relative frequency of fire often are subjects of disagreement. Wildfire has been a factor in the loss of mature sagebrush habitat and affects sagebrush communities differently depending on the species of sagebrush. Fire management actions are divided into two categories: suppression of wildfires and prescribed fire. Both wild and prescribed fires can have cumulative effects on sagebrush habitat and the species that depend on it.

Prescribed fires are planned events with specific objectives; however, changes and variation in conditions at the site can change the actual outcome. Use of prescribed fire in the sagebrush community can result in a net loss of sagebrush and is of concern to those desiring to maintain a mature sagebrush community. Some private landowners and public land managers consider fire an effective tool to manage sagebrush stands with dense sagebrush cover and suppressed herbaceous cover. Some stakeholders hold that prescribed burning reduces the risk of wildfire and other factors that otherwise might adversely affect the sagebrush community. Yet others are concerned about both spatial and temporal effects that fire can have on wildlife that depend on the sagebrush community.

Wildfires are less predictable and unplanned, and they have the most significant effect in the densest sagebrush. Suppression actions can serve to either protect sagebrush communities or destroy habitat. The highest suppression priorities are human life, community protection, and resource considerations. Thus, prior knowledge of important Sage Grouse habitat is necessary if consideration is to be given in light of higher priorities.

Fire suppression over the last 150 years has dramatically contributed to the current conditions. Grazing that removed the understory or fine fuels that carried the fire between shrubs, was responsible for changing the fire frequency (fire interval) and fire intensity. The low to moderate intensity fires that would normally have burned and maintained a mosaic of vegetation conditions on the landscape could not occur without the fine fuels. The combination of suppression and modification of the fire frequency and interval allowed the shrub component or the pinyon-juniper component of the plant community to increase in density and cover, creating vast acreages of woody fuels. The density of shrubs and/or trees over vast acreages has crossed a threshold that allows these plant communities to burn without the fine fuels. The result due to the reduction of livestock grazing has been larger fires with greater fire effects.

6.3.1 – Managing the Impacts of Wildfire and/or Prescribed Burns
6.3.1.1 – Management Goal 1: Manage prescribed fire in sagebrush habitats to result in no long-term net loss.

Issue: Reduction of sagebrush by prescribed fire.

Actions:
1) Prescribed fire should not be used unless:
   a) Biological and physical limitations of the site and impact on Sage Grouse are identified and considered.
   b) Management objectives for the site, including those for wildlife, are defined,
   c) Potential for weed invasion and successional trends are well understood, and
   d) Capability exists to manage the post-burn site properly, including a funded monitoring schedule, to achieve a healthy sagebrush community as well as maintain the multiple use concept and sustain local agriculture industry and economy.
   e) Capability to appropriately and reasonably manage livestock grazing, weeds, reseeding or other activities that potentially influence the outcome of rehabilitation or treatment in a manner that achieves the desired condition of the burned site as well as maintain the multiple use concept and sustain local agriculture industry and economy.

2) Develop local or regional management guidelines, or consider the following guidelines if fire is used as a tool elsewhere:
   a) Evaluate cumulative effects of sagebrush treatment by considering ecological units, evaluate the degree of fragmentation, and maintain a good representation of mature sagebrush,
   b) Forecast effects for the length of time necessary for sagebrush to return to desired condition to determine treatment types and intervals,
   c) Use available data and local knowledge to identify the effects of fire on sagebrush communities,
   d) Use caution in reducing sagebrush cover in and following drought periods,
   e) Work cooperatively with public agencies, ranchers and private landowners to establish reasonable conservation objectives for the project area.

3) Develop various treatments including livestock grazing to improve habitats over the long term if sagebrush stands do not meet objectives for Sage Grouse.
4) Consider livestock grazing, mechanical treatments and prescribed fire if actions are required to remove conifers that encroach on Sage Grouse habitat.

5) Avoid treatments to Sage Grouse habitat in areas that are susceptible to invasion by cheatgrass or other invasive plant species.

6) Protect sagebrush along riparian zones, meadows, lakebeds, and farmlands that include important Sage Grouse habitat.

7) Wash vehicles and heavy equipment for fires prior to arrival at a new location to avoid introduction of noxious weeds.

**6.3.1.2 – Management Goal 2:** Manage wildfire and fuel loads in sagebrush habitats to result in no long-term net loss.

**Issue:** Reduction of sagebrush and Sage Grouse habitat by wildfire.

**Actions:**

1) Implement appropriate historical livestock grazing practices that will limit or reduce fine fuels and fuel loads that lead to catastrophic fires principal to net loss of Sage Grouse and Wildlife Habitat.

2) Coordinate with appropriate resource staff including fire specialists, wildlife biologists, and range ecologists to incorporate new Sage Grouse habitat and other wildlife habitat information needed to set wildfire suppression priorities related to resources.

3) Identify the location of known Sage Grouse habitat and other wildlife habitats of concern to avoid disturbance or degradation by temporary facilities, e.g., fire camps, staging areas, and heli-bases.

4) Incorporate known Sage Grouse habitat information into each Wildfire Situation Analysis to help determine appropriate suppression plans and prioritize multiple fires.

5) Identify areas of high potential wildfire and provide fuel reduction measures including historical level livestock grazing to help remove understory and fine fuels prior to wildfires.

6) Retain unburned areas of Sage Grouse habitat, e.g., interior islands and patches between roads and fire perimeter.

**6.3.1.3 – Management Goal 3:** Actively manage Sage Grouse management areas across all jurisdictions with the goal of restoring and establishing resiliency after wildfire.

**Issue:** Development of a Statewide comprehensive wildfire management program that engages all interagency partners, (federal, state & local), to
reduce the threats of catastrophic wildfire, rapidly suppress wildfires when small, and rehabilitate wildfire damaged lands after a wildfire such as the Nevada Division of Forestry’s proposed “Wildland Fire Protection Program.”

**Actions:**

1) Establish and implement a framework across all land jurisdictions for pre-suppression actions to minimize ignitions and alter fuel conditions in order to avoid to the extent possible - large damaging conflagrations.

2) Develop and implement fire suppression plans and strategies across all land jurisdictions for occupied Sage Grouse habitat areas.

3) Plan and implement sage brush enhancement and restoration treatments in appropriate ecological sites following fires that are consistent with Sage Grouse management objectives.

4) Where appropriate, support market-based, flexible, proactive solutions that take advantage of economies of scale.

**Issue:** Occupied Sage Grouse habitat should be managed to establish resilient ecosystems by implementing the following strategies and actions to protect, maintain and improve sagebrush steppe habitat.

**Actions:**

1) Strengthen and improve interagency wildfire prevention activities statewide through targeted wildfire prevention messages including education on habitat loss, updating interagency agreements, conducting wildfire prevention workshops, and demonstration projects.

2) Establish an entity that can collect and consolidate funding and develop common criteria and requirements for habitat protection and monitoring such as the Sage Grouse Advisory Council or Technical Team.

3) Complete landscape level habitat assessments in, and in proximity to, priority Sage Grouse habitat areas to identify those habitat areas that are at the highest risk of wildland fire.

4) Construct targeted, well designed fuel breaks and “green strips” to break up fuel continuity, reduce fire size, and create safe areas for fire suppression activities. Use the best adapted plant materials to re-vegetate green strips with fire resistant species. Fund and schedule regular maintenance activities of green strips as needed. Avoid locating fuel breaks in occupied Sage Grouse habitat unless not other options are available that will result in the same level of habitat protection.
5) Support a business environment that incentivizes beneficial uses of biomass and excess fuels (e.g. stewardship contracting, landscape level/long term projects, etc.).

6) Identify state and county highway/road and utility right of ways for fuel breaks, replacing invasive, fire prone species with fire resistant species and other fuels reduction treatments.

7) Identify and utilize all cross-boundary authorities available to improve project coordination and implementation on the ground. Support reauthorization and expansion of “Good Neighbor” authorities to include all states.

8) Utilize NDF Conservation Camp Crews for fuels reduction project implementation and as federal grant match.

9) Develop authorities and expedite the process to implement targeted livestock grazing for fuels reduction projects in strategic areas for protection of Sage Grouse and sage brush habitat.

10) Utilize a suite of active vegetative treatments (e.g. mechanical, targeted livestock grazing, prescribed fire, chemical, etc.) to reduce weed invasion and maintain post-fire resilient landscapes and control excessive fuel loading throughout the Sage Grouse management area and constructed fuel breaks.

**Issue:** Manage wildland fires in the Sage Grouse management area to reduce the number of wildfires that escape initial attack and become greater than 300 acres.

**Actions:**

1) Identify and develop “suppression” plans, including mapping of occupied Sage Grouse habitat, to improve initial attack suppression actions.

2) Updating Fire Management Plans and dispatch run cards and update agreements to ensure “closest forces” concepts are being utilized at all times, particularly non-federal suppression resources (e.g. NDF helicopters, crews, and volunteer fire departments).

3) Establish and utilize Nevada Interagency Incident Management Teams for wildfires in occupied and potential Sage Grouse habitat areas.

4) Increase initial attack capability by training and equipping Nevada Volunteer Firefighters, agricultural, and industry work forces such as the Wildfire Support Group for assignment during periods of high fire activity. Trained volunteers who are remotely located should serve as first responders as necessary and appropriate.
5) Integrate suppression resource locations with occupied and potential habitat areas and pre-position resources as conditions dictate.

6) Develop a “suitcase” interagency suppression task force for pre-positioning during high wildfire hazard periods.

7) Within occupied and potential habitat areas, eliminate the tactic of “burning out” unless there are direct life safety threats.

8) Utilize the interagency Fire Planning Assessment (FPA) system1 to optimize utilization of fire suppression resources (e.g. engines, aircraft, water tenders, hand crews, etc.).

9) Designate occupied and potential habitat as a “high priority value” for suppression resource allocation in the Geographical Area Coordination Centers and within the FEMA-Fire Management Assistance Grant criteria.

10) Develop a specific and concise package of information on Sage Grouse habitat for incoming Incident Management Teams (IMTs) to ensure an understanding of Nevada conservation priorities that will be included in all ‘Delegations of Authority’ and ‘Fire Management Plans.’

11) Assign a local, trained resource advisor with Sage Grouse expertise on all fire suppression responses in occupied Sage Grouse habitat areas.

**Issue:** Carefully review and evaluate all burned areas greater than 200 acres in size within Sage Grouse management areas in a timely manner to ascertain the reclamation potential for reestablishing Sage Grouse habitat, enhancing ecosystem resiliency, and controlling invasive weed species.

**Actions:**

1) Complete burn severity assessments and identify ecological site potential in, and in proximity to, occupied and potential Sage Grouse habitat areas to identify the areas with the highest potential for restoration of habitat function following fires. Focus rehabilitation efforts on areas of highest potential success based ecological site conditions (soils, precipitation zone, and geography). Utilize re-vegetation seed mixtures that include native and adapted plant seed that will quickly stabilize soils, help to provide long term hazardous fuels reduction, and increase ecosystem resiliency in appropriate locations.

2) Expand authorizations to include fire restoration projects under NEPA Categorical Exclusion provisions.

3) Expand and improve the NDF Seedbank & Plant Material program in conjunction with federal partners. Utilize NDF
Conservation Camp Crews for native seed collection and rehabilitation activities.

4) Develop plans and acquire the necessary resources (e.g. seed collection, seeding equipment pools, trained staff, etc.) for post fire rehabilitation activities and warehouse viable seed stockpiles.

Stakeholder Actions

5) Identify funding opportunities from federal, state, local, industry and land users dedicated to implementing prioritized habitat enhancement, restoration, and conservation activities.

6) Continue to focus research and monitoring efforts through demonstration projects on improving rehabilitation and re-vegetation successes in harsh environments.

6.4 – Predation and Predation Management

Predation is the most important proximate cause of Sage Grouse mortality (Braun 1975, Bergerud 1988a, Autenrieth 1986, Schroeder et al. 1999); almost every Sage Grouse will eventually be eaten. Sage Grouse are known to be included in the diet of a variety of species. Sage Grouse eggs, new-born chicks, and juvenile birds have a greater number of predators and are more vulnerable to predators than are adult birds. The Nevada Department of Wildlife (NDOW) identifies Ravens, Skunks, Coyotes, Foxes, Bobcats and Badgers as the primary predators of the Greater Sage Grouse, although many other rodents and animals also prey on the nest and Sage Grouse. The Raven by far inflicts the majority of damage to the Sage Grouse populations due to its affinity to assault the nested eggs and chicks. Ravens are also known predators of waterfowl and shore bird nests and chicks. USDA-APHIS-Wildlife Service’s was requested by NDOW to help reduce impacts caused by raven predation in designated areas. (NDOW Predation Management Plan FY2012)

Survival between hatching and the end of summer varies from approximately 40 percent (June 1963) to 60 percent (Wallestad 1975). Although a greater number of predators are known to prey on chicks, several factors lower the mortality rate at this life stage. After about six weeks of age, the chicks are able to take advantage of cover, detect predators, and escape by flying. As the birds increase in size and their ability to escape improves, a predator is more likely to take an individual juvenile Sage Grouse, whereas a single predator is more likely to take an entire clutch of eggs or brood of newly hatched chicks that cannot yet escape by flight.

Sage Grouse are most vulnerable during the first few weeks after hatching. Insects and forbs are critical during this period and climatic conditions greatly influence the availability of these food items. In addition to lack of forage, heavy rainfall along with unseasonably cold temperatures during hatching may decrease production (Wallestad 1975). Stress due to lack of quality food items or from weather conditions also make the chick more vulnerable to predators. On the other hand mortality rates for adult Sage Grouse are generally considered to be relatively low when compared to other upland game birds (Connelly et al. 1993, Zablan 1993).
Predation occurs throughout the year and what may seem like an obvious limiting factor on the population may only be part of a bigger issue. Monitoring the effects of predator control on Sage Grouse populations was conducted through analysis of wings collected during the general hunting season. Wings were analyzed to determine age, sex, nest success of females, and days since hatch of chicks.

Predation of adult Sage Grouse occurs, but overall survival of adult birds ranges from 55 to 67 percent for females and from 38 to 60 percent for males (Zablan 1993, Connelly et al. 1994, June 1963). Although there are several predators of adult Sage Grouse, the relative impact of these predators on the population is less because the encounters may be less frequent during portions of the year and predators are less effective when preying on adults (Bean 1941, Beck 1977).

Predator control has been shown to be an effective tool during the breeding season to gain increased survival through the nesting and early brood life cycle stages (Coates 2012). The common raven was identified as the most frequent predator during nesting in Sage Grouse predator studies conducted by USGS in the Great Basin (Coates personal communication). Raven populations have increased 600 percent in the Great Basin over the last 50 years based upon USGS breeding bird survey results. Subsidized food sources such as landfills and road kill, elevated nest platforms provided by transmission lines, and landscape alterations influence predator populations. Predation is often tied to habitat quality, particularly in areas where an interface exists between wildfire and remaining habitat.

6.4.1 – Predation Management goals and objectives:

6.4.1.1 – Management Goal 1: Manage predation to enhance Sage Grouse survival and production.

Issue: Predator numbers have changed, and the predator populations in Elko County and Nevada have increased immensely due to a sharp increased of Raven Populations and lack of control programs.

Action:

1) Assess population status and trends of important predator species (both native and invasive).

2) Expand public information efforts designed to increase public awareness on the role of habitat, predation on Sage Grouse population trends.

3) Initiate County Wide Predator Control Programs.

4) Encourage Ranchers and Farmers to apply for Raven Permits through NDOW.

Issue: Man-caused alterations on the landscape have modified conditions and may directly facilitate increased predation.

Action:

1) Reduce man-made perches and conifer encroachment in Sage Grouse breeding, nesting, and wintering habitats.
a) Placement of power poles should be equipped with anti perch devices to detour predator nesting.

b) Wind electricity generation towers are to be placed in areas that will not enhance predator advantages near lek or habitat areas.

2) Reduce the availability of predator "subsidies" such as human-made den sites such as nonfunctioning culverts, old foundations, wood piles and other supplemental food sources including garbage dumps / transfer sites, spilled grain, dead animal pits etc… that contribute to increased predator numbers.

a) Placement of fences in lek areas should follow prescriptions that will identify or mark the fence location to Sage Grouse such as fence markers.

b) Consider removal of any unnecessary fences–they can hinder wildlife movements and contribute to mortality.

c) Encourage and develop programs to provide wildlife escape ramps from livestock water troughs.

f) Collaborate and coordinate with garbage collection, disposal companies and ranchers to develop enclosed or self closing solid waste collection structures to alleviate Raven food sources.

a) Funding to be available through NDOW granted by Ruby Pipeline specific to Sage Grouse Conservation, Preservation and Restoration.

3) Reduce availability of road – kill opportunities by removal of animal carcasses.

4) Focus on predation when it is shown to be depressing Sage Grouse populations, consider predator management actions specific to the predator species, site, and situation.

5) Consider expanded opportunities to exterminate non-protected, invasive species where appropriate.

6) Address and eliminate conflicting regulations between the Migratory Bird Treaty Act and the Endangered Species Act. Pursue additional harvest permits in excess of the current 2,000 bird limit from the USFWS for raven control.

6.4.1.2 – Management Goal 2: Develop a Pilot Project to monitor the affects of historical grazing, predator control and range management methods and their impacts on the Sage Grouse Populations and Habitat.
**Issue:** Lack of current specific data concerning the effects on Sage Grouse Populations and Habitat when utilizing historical Livestock Grazing, Predator Control and Range Management policies and measures.

**Actions:**

1) Propose the identification of a specific Pilot Project area of approximately 72 square mile to 216 square miles in size to implement historical livestock grazing, predator control and range management polices to develop scientific data related to the Sage Grouse populations and habitat.

2) Implement and develop the Pilot Project using historical livestock grazing, predator control and range management polices to develop scientific data related to the Sage Grouse populations and habitat.

   a) Funding through the State of Nevada Department of Wildlife & BLM from Ruby Pipeline Sage Grouse Conservation funds.

**6.5 – Human Disturbance**

**6.5.1 – Mining and Exploration**

Development of mineral resources in Elko is a primary and vital component of the local and state economy, and there is no evidence that mineral resource development projects have adversely affected Sage Grouse populations. Mineral development can be managed temporally or spatially in Sage Grouse management areas. The nature of mineral exploration is such that new understanding of geologic terrains, geology, geophysics, geochemistry, cryogenesis, and other aspects of mineral exploration will result in areas not currently identified with exploration activity and/ or mineral potential becoming exploration targets and potentially mineral developments (i.e. mines).

The mining industry has worked successfully with the BLM, USFS, USFWS and NDOW to plan projects that incorporate wildlife objectives. A three-year advanced planning window, often used at this time, allows the opportunity to incorporate avoid, minimize, and mitigate concepts in project design and to identify appropriate mitigation.

**6.5.1.1 – Management Goal:** Continue to foster the strong conservation ethic that the mining industry has shown through implementation of effective reclamation of disturbed lands to preserve, protect, and improve habitat in occupied and potential habitat areas.

**Issue:** Manage and maintain effective and sustained mining and exploration activities on federally managed public lands.

**Actions:**
1) Implement a centralized impact assessment process overseen by the federal and state land management that provides consistent evaluation, reconciliation, and guidance for project development that avoids or minimizes conflicts with Sage Grouse in occupied Sage Grouse habitat.

2) Consistent with BLM 43 CFR 3809 regulations for Notice-level operations, allow exploration and other mineral-related activities that create not more than five acres of surface disturbance and are subjected to BLM’s existing discretionary authority to consider other information including cumulative impacts.

3) Consideration and credit for compensatory mitigation should include habitat based efforts (i.e. sagebrush habitat enhancement and restoration) along with other options such as fuels reduction, green stripping and fire suppression support.

4) Follow a strategy that seeks to avoid conflict with Sage Grouse by locating facilities and activities in non-habitat wherever possible.

5) Recognize existing state and federal regulatory mechanisms that govern mining and exploration activities, including BLM 43 CFR 3809 surface management regulations for hard rock mining, USFS 36 CFR 228A regulations governing mining and exploration, and NAC 519A regulations for reclamation of mining and exploration projects, that are adequate to conserve Sage Grouse and sagebrush habitats in the interim until future suitable conservation plans are approved.

6) Aggressively engage in reclamation efforts as projects are completed, and target reclamation where the ecological site potential exists in occupied and potential Sage Grouse habitat. Focus efforts on habitat that has the greatest potential for use by Sage Grouse as guided by ecological site descriptions and other restoration priorities established by the Council.

7) Recognize that stipulations for other species (e.g. raptors) may impede the ability to effectively reclaim areas of impact and remove those barriers in order to achieve immediate and effective reclamation.

8) Prioritize areas for habitat improvement utilizing sound resource information including soil surveys, ecological site descriptions, and Sage Grouse population data.

9) Design exploration projects to the minimum requirements for mineral access and the betterment of habitat. Ensure roads and other ancillary features that impact Sage Grouse habitat are designed to avoid where feasible and otherwise minimize and mitigate impacts in the short and long term.
10) Differentiate between short- (exploration) and long-term (active mining) impacts and manage timing of operations and physical disturbance accordingly.

**Issue:** Recommendations for mineral resources in the December 2011 National Technical Team report entitled “A Report on National Sage Grouse Conservation Measures” to withdraw lands with high-priority sage-grouse habitat from mineral entry.

**Actions:**

1) This proposal to prohibit mineral exploration and development in high-priority habitat areas is not consistent with the mandate in the Federal Land Policy and Management Act of 1976 “FLPMA”.

2) FLPMA requires BLM to manage public lands for multiple uses and to consider a wide range of resource values – including the need to protect wildlife – in the context of the Nation’s needs for minerals, energy, food, fiber, and other natural resources:

   a) “… the public lands [shall] be managed in a manner that recognizes the Nation’s need for domestic sources of minerals, food, timber, and fiber from the public lands including the implementation of the Mining and Minerals Policy Act of 1970 [at] 30 U.S.C. 21a…” (43 U.S.C. 1701(a)(12)]

3) FLPMA does not authorize the subordination of any multiple uses in preference for a single land use such as Sage Grouse habitat conservation. Because mineral resources can only be developed where they are discovered and can only be discovered in areas with favorable geology, co-location of mineral projects and Sage Grouse habitat is unavoidable in some areas.

4) The presence of high-quality Sage Grouse habitat in geologically favorable areas must not preclude mineral exploration and development.

5) New deposits continue to be discovered in Nevada – including new discoveries in areas outside of the recognized mining districts.

**Issue:** Mineral resource and exploration activity maps prepared by the Nevada Bureau of Mines and Geology to identify mineral resource areas (mines and exploration targets) that should be excluded from core habitat area boundaries to minimize resource conflicts. Augment mineral data with input at local working group meetings and other mineral information that becomes available to refine the maps.

**Actions:**

1) Do not adopt prescriptive surface disturbance acreage limits that are modeled after the Wyoming strategy because this aspect of Wyoming’s plan is inappropriate for Nevada.
2) The Wyoming acreage limitations were designed to accommodate Wyoming’s oil and gas industry.

3) Analogous disturbance restrictions for Nevada will not accommodate hardrock mineral exploration and development which differ substantially different in nature and in scale from oil and gas exploration and development.

4) The Wyoming measures would not address the key threats to Sage Grouse habitat in Nevada (i.e., wildfire and invasive species).

5) The Wyoming measures would be very detrimental to Nevada’s mineral industry and would harm Nevada’s economy.

**Issue:** Pursuant to the Wyoming Sage Grouse Strategy, recognize that the wildlife protection, reclamation requirements, and financial assurance provisions in existing Nevada state and federal laws and regulations governing mineral exploration and development already protect Sage Grouse habitat and achieve the appropriate balance between mineral activities and conservation objectives.

**Actions:**

1) Develop Nevada-specific off-site mitigation banking measures as one way to compensate for unavoidable impacts to Sage Grouse habitat due to mineral development.

2) Off-site mitigation banking measures could be used to offset longer-term impacts to Sage Grouse habitat areas or for mining features that unavoidably create surface disturbance areas that are difficult to reclaim to conditions suitable for Sage Grouse habitat (like open-pit mines).

3) Design the off-site mitigation banking measures to create opportunities for a wide range of Nevada project developers to address the principal threats to Sage Grouse habitat in Nevada (e.g., wildfire and invasive species).

**Issue:** Continue to require effective and comprehensive on-site reclamation of mineral disturbances. BLM, the Forest Service, and the NV Division of Environmental Protection currently co-manage over $1 billion in mineral reclamation bonds.

**Actions:**

1) A substantial portion of these bonds is specifically dedicated to re-vegetation including site-specific seed mixes and reclamation monitoring to verify the success of re-vegetation efforts. The agencies do not release bond monies until they have verified that re-vegetation complies with site-specific re-vegetation success criteria.
2) Much of the surface disturbance associated with mineral activities (especially exploration) is temporary and can be successfully reclaimed to restore habitat values.

6.5.2 – Changing Land Uses / Urban and Rural Development

Change in land use refers to a change from wildlife habitat to another land use that represents a long-term or permanent change. This includes changes associated with construction of reservoirs, recreational developments, urban spread, mining, wind energy development or other developments. The impacts are similar to those discussed under Habitat Quantity, but because of the permanent or long-term nature of these changes, the habitat values are generally not recoverable.

Human population growth and the trend for rural lifestyles have resulted in urban development within previous Sage Grouse habitats. These types of land use changes are anticipated to increase as the population of Nevada increases, and as demands for certain types of recreation increase. In Nevada the opportunity for urban development is somewhat limited by the current land status. Most of Nevada is public land administered by federal agencies. The bulk of the private land is associated with the checkerboard land status along the Union Pacific railroad corridor that traverses Nevada east to west, irrigable lands and water sources, and a few large blocks of private land created through various land exchanges. Selection of town sites during settlement resulted from a variety of factors including access, water, presence of building materials, safety, etc. Many sites clearly were Sage Grouse habitat and contained components that could be used for winter habitat, lek sites, and brood use areas. More recently, placement of residential dwellings and subdivisions in Sage Grouse habitats has become common. Some residences and subdivisions (ranchettes) are far removed from towns and have been placed within Sage Grouse winter and brood habitats as well as on lek sites.

6.5.2.1 – Management Goal: To encourage private lands and rural developments to maintain existing Sage Grouse habitat and establish new habitats.

Issue: Maintaining existing sagegrouse habitats-at-risk from development or conversion to other land uses on private lands:

Actions:

1) Provide habitat conservation information to the land owners so that they are aware of the importance of private lands to Sage Grouse conservation.

2) Use landowner incentives to provide a means of conducting habitat management on private lands.

3) Amend County Code to educate land owners and potential developers to encourage identification and preservation of Sage Grouse habitat.
4) Amend County Code to encourage preservation, conservation and promote development design to protect and develop Sage Grouse habitat.

5) Provide incentives to land owners and developers to maintain and promote Sage Grouse habitat.

6.5.3 – Roads – Recreation / Mining / Exploration

Settlement of western rangelands resulted in development of road/highway systems dissecting Sage Grouse habitats. Most roads/highways were established without regard to important Sage Grouse use areas. Thus, roads/highways transect brood habitat, lek sites, winter habitat as well as migration corridors. In addition to loss of habitat, roads/highways cause direct mortality of Sage Grouse (especially high speed paved roads/highways) and may result in reduction of Sage Grouse use of leks within ½ mile because of noise. No estimate of total direct or indirect habitat loss is available. However, there is little information related to the effects of motorized recreation on the Grouse. Based on the very little amount of available current science it appears that motorized recreation in, any of its forms, does not have a significant impact on the Sage Grouse.

There is negligible to little information anywhere related to the effects of motorized recreation on the Grouse and there are no definitive studies to that effect cited anywhere in the database. Particularly considering the intense scrutiny and collective scientific energy expended on this species. The USFWS listing petition decision supports this as well. Motorized recreation and/or OHV/ORV is barely mentioned and mostly anecdotal in nature. However, OHV-related site-specific research may be needed to fine tune vehicle-based recreation on roads, trails, and areas so that future Grouse-friendly motorized access is assured.

While the impacts to Grouse are negligible, motorized recreation on Federal lands, both public (BLM) and Congressionally reserved (Forest Service), has become meaningfully and increasingly important. In a 2005 report prepared by the USDA Forest Service (FS) entitled; “Off-Highway Vehicle Recreation in the United States, Regions and States: A National Report from the National Survey on Recreation and the Environment (NSRE).” It stated that OHV annual sales were shown to have more than tripled between 1995 and 2003. A newer USDA Forest Service report from August 2008 titled “Aug 7, 2008 News Releases from the Southern Research Station: Outdoor Recreation Increasing among American Adults” as well as subsequent annual statistics from the Motorcycle Industry Council (MIC) show that trend to be continuing with All Terrain Vehicle (ATV) sales accounting for up to 70% of all OHV sales. This trend is expected to continue upwards for decades to come as more traditional forms of outdoor recreation see a decline. It also shows that total OHV participation/use days are 44.2 million/year, up over 56% from 2000 to 2007.

National OHV economic impacts may conservatively exceed 10 billion dollars/year (in 2004 alone the economic affects in CA were 4.5 Billion USD) and a more recent OHV study done in AZ contributes another 3.3 Billion USD. The need to manage this major OHV recreational use by the public has been historically addressed by the federal land management agencies such as the BLM and the FS, as well as by state, county, local and tribal agencies. The current trend
for summer motorized recreation management leans heavily on a “designated travel” strategy, where cross-country travel is discouraged or forbidden except under Special Use Permit (SUP).

6.5.3.1 – **Management Goal 1**: Establish where valid existing rights exist, work with permit or lease holders (e.g., rights of way, oil and gas leases, etc.) to develop mutually agreeable actions that will have neutral or beneficial effects to Greater Sage Grouse habitat.

**Issue:** Where the BLM retains authority and discretion (e.g., Applications or Permit to Drill (APDs), rights-of-way authorizations/re-authorizations, etc.), apply stipulations, conditions or restrictions (e.g., noise limitations, minimization of habitat fragmentation.

**Actions:**

1) Work with permit holders for ongoing exploration and mine developments to minimize adverse effects (roads, acres of disturbance, etc.) on Greater Sage Grouse habitat.

2) Work with permit holders for proposed exploration and mine developments to minimize adverse effects (roads, acres of disturbance, etc.) on Greater Sage Grouse habitat.

3) Work with project proponents to develop appropriate off-site mitigation measures to minimize population-level effects.

**Issue:** For geophysical activities, apply seasonal timing limitations to eliminate or minimize surface disturbing activities within nesting/brood rearing habitat and winter concentration areas.

**Actions:**

1) Inventory, evaluate and prioritize existing structures (e.g., fences, power lines, watering facilities) and where not associated with valid existing rights, modify, relocate or remove those which result in the loss of functional Greater Sage Grouse habitat or populations.

2) Within 1.25 miles of occupied leks, mark fences to aid in visibility by Greater Sage Grouse, where collisions have been documented or where Greater Sage Grouse are at a relatively high risk of collision. Higher risk areas may include flatter topography; span in excess of four meters between T-posts, lack of wooden posts, or fence densities greater than 1 km/sg. km. Fence collision risks may also be higher in winter or other seasonal concentration areas.

**Issue:** Special Recreation Permits Ongoing Authorization/Activities

**Actions:**

1) Evaluate existing Special Recreation Permits (SRP) in or near Sage Grouse LEK’s and modify or cancel if habitat altering or other physical disturbance impairs a major life history function of the Sage Grouse, such as breeding, migration or winter survival.
2) Within specific Sage Grouse habitat, consider limited use recreational sites if use of such sites results in disturbance that impairs a major life history function of the Sage Grouse, such as breeding, migration or winter survival.

**Issue:** Proposed Authorizations/Activities

**Action:**

1) Defer approving SRPs in specific Sage Grouse habitat unless the permitted activity will have a neutral or beneficial effect on Greater Sage Grouse habitat or populations.

**Issue:** OHV ongoing Authorizations/Activities / Proposed Authorizations /Activities.

**Actions:**

1) If absolutely necessary implement temporary seasonal closure or restrictions in areas, where appropriate and justified, if authorizations result in habitat altering or other physical disturbance impairs a major life history function of the Greater Sage Grouse, such as breeding, migration or winter survival.

2) Where valid existing rights exist, work with permit or lease holders (e.g., rights of way, mineral rights holder, oil and gas leases, etc.) to develop mutually agreeable actions that will have neutral or beneficial effects to Sage Grouse habitat.

3) Where the BLM retains authority and discretion (e.g., Applications for Permit to Drill (APDs), rights-of-way authorizations/re-authorizations, etc.), apply stipulations, conditions or restrictions (e.g., noise limitations, minimization of habitat fragmentation.

6.5.4 – Renewable Energy; Transmission Lines & Corridors

For the State of Nevada to meet both renewable energy goals and Sage Grouse conservation measures close coordination is required with various groups within the west that are identifying transmission corridors. While existing transmission corridors, such as pipelines, roads, and overhead electrical transmission lines, are generally well defined at the present time, there are a series of transmission corridors being studied to consider long term transmission needs to meet the nation’s renewable energy.

6.5.4.1 – Management Goal: In occupied Sage Grouse habitat areas, limit conflict through avoidance of impacts and adaptive management.

**Issue:** Elko County and the State of Nevada to meet renewable energy goals and Sage Grouse conservation measures close coordination.

**Actions:**

1) Follow a strategy that seeks to avoid conflict with Sage Grouse by locating facilities and activities in non Sage Grouse habitat.
2) Site new linear features in existing corridors or, at a minimum, co-locating with existing linear features in occupied and potential Sage Grouse habitat.

3) Aggressively engage in reclamation / weed control efforts during pre-and post-project construction.

4) Apply measures to deter raptor perching and raven nesting on elevated structures.

6.5.5 – Wild / Feral Horses and Burros

Grazing by wild horses and burros and expansive herd populations can impact vegetation cover of herbaceous and shrub species, damage riparian habitat and stringer meadows, and adversely affect Sage Grouse habitat if not managed within appropriate management levels (AML). Current regulatory mechanisms to manage horse herds at appropriate management levels in herd management areas are difficult to enforce due to prolonged litigation and limiting program capacity for successful placement and adoption of excess horses.

6.5.5.1 – Management Goal 1: Manage wild horses at appropriate management levels (AML).

Issue: Avoid and minimize impacts to Sage Grouse management areas.

Actions:
1) Maintain wild horses at appropriate management levels in designated herd management areas (HMA) throughout Sage Grouse management areas.

2) Evaluate conflicts with HMA designations in occupied and potential Sage Grouse habitat areas and modify Land Use Plans and Resource Management Plans to avoid negative impacts to Sage Grouse.

3) Resolve conflicts between the Wild and Free Roaming Horse and Burro Act and the Endangered Species Act.

6.6 – Disease

Sage-Grouse are known to harbor a variety of disease and parasitic organisms. Schroeder et al. (1999) provide a comprehensive listing of the parasites and disease agents. The mere presence of a disease organism or a parasite does not necessarily indicate a population level effect. Herman (1963) pointed out that a “healthy” wild animal carrying only a single pathogenic agent is a rare occurrence. Therefore, some background level of disease or parasites exists, but under most conditions these agents may be of little significance. However, under certain environmental circumstances, such as drought, one
or more disease agents or parasites may increase to a level that impacts the local population (Herman 1963). The causal factors are likely to be different for different outbreaks and different localities.

Although disease outbreaks in Sage-Grouse have been documented (Grover 1944, Batterson and Morse 1948, Honess and Winter 1956, Thorne 1969, Wallestad 1975), the conditions under which the outbreaks have occurred have not always been well documented. For

Northeastern Nevada Stewardship Group Elko County Sagebrush Ecosystem
Conservation Strategy coccidiosis, outbreaks appear related to drought, drying water holes, and/or contaminated water. As with most diseases, transmission is favored when Sage-Grouse have a high probability of contact with other infected Sage-Grouse, or when they are forced to use limited habitats. The concentration of birds at limited water sources may result in fecal contamination of the water and surrounding soils (Thorne 1969). A reversal of the conditions or seasonal dispersal of Sage-Grouse can alleviate the problem (Wallestad 1975).

However, the West Nile virus, has been recently introduced to the United States and has been the documented proximal cause of death in many avian species, including Sage-Grouse. No Sage-Grouse mortality has been attributed to this virus in Nevada, and due to the arid conditions, the risk may be lower in Nevada than in some other states. This is due to the fact that the virus is carried and spread by mosquitoes. Until there are reported cases in Nevada, the impact of this virus on Sage-Grouse populations is unknown.
6.6.1 – Research needed to identify impacts of diseases to Sage Grouse Populations.

6.6.1.1 – Management Goal: To identify and mitigate negative disease effects on Greater Sage Grouse populations specific to sites and regions.

Issue: Lack of available current specific scientific data and information concerning disease relations within Sage Grouse populations in specific areas and regions and their large scale effects.

Actions:
1) The USFWS and NDOW to develop and initiate research programs designed to specifically target identify the variety and effects of disease on Greater Sage Grouse populations within specific regions and areas.

6.7 – Hunting

Studies of hunting impacts on Sage Grouse in Colorado showed that harvest was a function of the total birds available in the fall (Braun and Beck 1985). Hunters generally harvested between 7 and 11 percent of the birds available in the fall, regardless of season length and bag/possession limits. The study concluded that hunting had no measurable impact on spring densities of Sage Grouse. Wallestad (1975) also concluded that hunting had little influence on Sage Grouse populations in Montana. Information from Idaho (Gray 1967, Autenrieth 1981), Oregon (Willis et al. 1993), and Wyoming (Patterson 1952) indicate that harvest rates range from less than 3 percent to approximately 25 percent.

Connelly et al. (2000) analyzed band returns and radio-location/return data for Idaho Sage Grouse over a 23-year period. Harvest rates for females were greater than for males. Forty-six percent of the adult female mortality occurred in September and October compared to only twenty-eight percent (28%) of the adult male mortality, with ninety-five percent (95%) of the combined September-October mortality due to hunting. The differential mortality rates during this time period were attributed to females with chicks and juveniles remaining on meadows and riparian areas, while males and unsuccessful females were more dispersed in the upland vegetation. The relatively high rate of female mortality at this time of the year suggests that hunting may be additive to winter mortality, decreasing the size of the spring breeding population.

Concern exists that local, isolated populations may be vulnerable to concentrated hunting pressure and some studies suggest that this is possible (Autenrieth 1981, Zunino 1987, Connelly et al. 2003). These populations may require special attention if they are to remain viable.

The USFWS examined the effects of hunting on greater Sage Grouse in their status review of the species. In its January 2005 finding on whether or not to list the species as threatened or endangered under the Endangered Species Act, the USFWS determined that hunting as currently regulated by state wildlife agencies was not a significant threat to the conservation of Sage Grouse. The expert panel used by the USFWS to make this determination ranked hunting 17th out of 19 potential threats. In the letter dated January 30, 2008, the USFWS states, “We are not aware of any new information that would
change the results of that analysis,” and, “it would not be necessary or appropriate to apply the PECE (Policy for Evaluation of Conservation Efforts When Making Listing Decisions) framework to conservation actions related to hunting that have already been demonstrated to be effective and do not threaten the species.”

6.7.1 – Harvesting and Hunting goals and objectives:

6.7.1.1 – Management Goal 1: Manage for harvests that respond to changes in Sage Grouse populations and maintain or increase Sage Grouse populations.

Issue: There is a single harvest structure for the entire state, but regionally Sage Grouse may have different population characteristics and status.

Action:

1) Divide Sage Grouse habitat into regions based on clearly defined differences in ecological and/or population characteristics, which would allow for different season structures.

   a) Potential temporary closure to hunting and motorized travel except on established accepted road due to loss of habitat from wildfire.

2) Develop an adaptive harvest management strategy clearly define “identifiers” for each season structure based on population trend. If a threatening decline became apparent in one or more ecotype segments.

3) Recommend against opening a Sage Grouse season in the appropriate segment(s).

   a) If a threatening decline is defined as 3 or more consecutive years with average lek survey levels at 45% or more below the long-term average, determined using leks with 10 or more years of consecutive data.

4) Establish Sage Grouse seasons on an annual basis using the current year’s lek data and other appropriate survey data. This would include the development of a statistically reliable trend monitoring protocol for inventorying lek attendance of male Sage Grouse.

Issue: There are strong opposing viewpoints on the influence of hunting on Sage Grouse populations.

Action:

1) Develop studies to comprehensively identify and evaluate the influence of hunting on Sage Grouse in Nevada and what would constitute a maximum harvest rate.
2) Establish standardized wing collection protocol to evaluate the influence of environmental conditions on Sage Grouse productivity and population trends.

3) Identify small populations of Sage Grouse that are genetically isolated from other populations that could be at risk of overharvest.

4) Expand public information efforts designed to increase public awareness of the role of Sage Grouse hunting.

6.8 – Life Cycles / Migration

Rich (1985) analyzed 32 years of Sage Grouse lek counts in southern Idaho and Nevada determined that population peaks occurred about every ten years. Although Rich (1985) found some climatic factors that correlated with the population changes, cause and effect relationships were not evident. Braun (1998) reviewed population data throughout the area of Sage-Grouse distribution and concluded that Sage Grouse populations do not fluctuate on a regular or cyclic basis.

In Nevada, the population data has indicated declining populations since the 1950s, with some rebound in the 1970s. If cycles are occurring in Nevada, they are being masked by the downward trend in the state population.

The largest grouse in North America, the greater sage grouse is a chicken-like bird reaching lengths of up to 30 inches, heights of up to two feet, and weights of four to seven pounds. Males are larger than females and have a white breast, a black throat and belly, a yellow comb, and yellow air sacs that are inflated during mating displays. Females have grayish brown plumage and a buff-colored throat with black markings. Greater sage grouse generally live from 1 to 1.5 years, but some have been known to live up to 10 years in the wild.

Sage grouse stay in the same general region year-round but range widely between leks, brood-rearing areas, wet meadows and riparian zones, loafing and feeding areas, and winter habitat. In general, summer habitat consists of sagebrush stands and forb-rich wet meadows and riparian areas, while winter habitat is located in lower-elevation sagebrush-dominated landscapes that continue to provide green forbs.

6.8.1 – Greater Sage Grouse Life Cycles

6.8.1.1 – Management Goal 1: To establish sound science based on logical and proper methods to establish Historic Sage Grouse populations, and habitat and provide of better understanding of Sage Grouse Life Cycles.

Issue: Lack of current and sound scientific knowledge of past Sage Grouse populations and habitat.

Actions:
1) USFWS, NDOW, BLM & USFS must develop sound science to further understand historic and current life cycle trends to better
evaluate historical populations of Sage Grouse and Sage Grouse Habitat.

2) USFWS, NDOW, BLM & USFS must develop better methods of establishing current and historical Sage Grouse populations and Sage Grouse habitat areas.

6.9 – Climate / Weather / Drought

Sagebrush-dominated rangelands are generally xeric with average annual precipitation ranging from 15 to 32 cm. Evaporation and evapo-transpiration ratios are generally high except in northern latitudes and effective moisture for plant growth is extremely variable. Drought commonly occurs either seasonally or for periods of several years and is normal within the distribution of Sage Grouse. If average moisture conditions are considered, generally on-half of each 10 or 20 year period will have less than average moisture (Palmer 1965). Thus, habitat management for average herbaceous production could result in improper use in 50% of the years. Declining Sage Grouse populations in the mid 1930's coincided with drought (Patterson 1952:68-69) throughout the west. A period of dry years in the late 1980's and early 2990's also seemed to coincide with apparent low Sage Grouse populations (Connelly and Braun 1997). Drought is believed to affect Sage Grouse populations through increased nest predation and early brood mortality caused by decreased herbaceous cover and forb availability which may also affect insect abundance (Klebenow and Gray 1968, Peterson 1970, Drut et al. 1994 a and b, Gregg et al. 1994, Fischer et al. 1996).

Impacts of global climate change have the potential to affect Greater Sage Grouse as the consequences of these changes interact with known stressors that are already affecting populations (USFWS 2010). The sagebrush ecosystem is characterized by hot dry summers and cold winters with most precipitation in winter and spring. Global climate-change models predict more variable and severe weather events, higher temperatures, drier summer soil conditions, and wetter winter seasons (Miller et al. 2011). The current distribution of sagebrush is predicted to decrease 12% for each degree of temperature increase (Neilson et al. 2005). Further decrease in distribution of sagebrush is attributed to increased levels of atmospheric carbon dioxide that is predicted to favor expansion of cheatgrass (Bromus tectorum) and exacerbate the fire cycle in cheatgrass dominated systems (Miller et al. 2011). Climate change may potentially impact Greater Sage Grouse by amplifying effects of parasites and disease (Christiansen & Tate 2011; Walker & Naugle 2011). Greater Sage Grouse occupy a small fraction of their original distribution in Washington. Thus, any climate change impacts have the potential to put the remaining range at risk. This issue is problematic because Sage Grouse have nowhere to go since they are already at the northern extent of their distribution.

Among the many factors that can affect Sage Grouse production, weather is considered to be an important aspect. The prairie climate is subject to extreme variability including hot versus cold and drought versus excess precipitation and occasional flooding. Harsh weather can have direct impacts on Sage Grouse nesting success and chick survival. Climatic variations may also impact Silver Sagebrush (Artemisia cana), which is the dominant food source for Sage Grouse adults and juveniles, particularly in the fall and winter. Climate variation can also affect forb and insect availability important to sage grouse at various times of the year.
The increase in cold and wet springs may have affected Greater Sage Grouse clutch and brood success. Several studies on the Northern Great Plains have shown that cold and wet weather conditions during nesting times can have adverse effects on clutch and brood success. Heavy rainfall at egg-laying or incubation, or unseasonably cold weather with precipitation during hatching may decrease Greater Sage Grouse production (Wallestad 1975).

Studies indicate that hot and dry conditions can adversely affect Greater Sage Grouse chick survival. Aldridge (2001) concluded that drought conditions decreased clutch and brood success in southeastern Alberta in 2001. Only 17% of 52 birds captured in 2001 were yearlings, compared to 25% from 1998 to 2000. This number should be around 50% for a stable population (Aldridge 2001). Flanders-Wanner et al. (2004) found that each day in June with air temperature above 35°C resulted in a 16 to 20% decrease in the juvenile to adult success ratio of Sharp-tailed Grouse in Nebraska. Drought may also affect Sage Grouse populations by reducing herbaceous cover at nests and the quantity and quality of food (forbs and insects) available for hens and chicks during spring (Connelly et al. 2000). Sage Grouse chicks less than 21 days old require insects in the diet for survival and development, whereas older chicks need insects to achieve maximum growth rates (Johnson and Boyce 1990).

6.10 – Noxious – Invasive Weeds and Plants

Over the last 75 years, noxious weeds have spread at an unprecedented rate across Nevada. The magnitude of weed infestations, however, often prevents appropriate and timely treatments. Noxious weeds and other invasive plant species, such as annual grasses, displace more desirable native plant species and cause significant adverse biological and economic effects by reducing productivity of healthy rangeland. Noxious weeds impact all classes of wildlife and domestic livestock. Plant species designated as noxious weeds are classified as either established and spreading or newly introduced or are recognized as potential invaders. Noxious weed species present in adjoining states and provinces are a threat in Nevada.

Although introduction and subsequent spread of weeds can occur through several means, the most pervasive occurs along transportation and floodplain corridors. One of the primary concerns of resource managers is the spread of noxious weeds by vehicles. Disturbed ground typically serves as the initial point of establishment, with the amount of disturbed ground being directly proportional to the overall susceptibility of an area to weed invasion.

Disturbance can take many forms and causes, the most common being human-caused activities, such as road building and use and the rise of rural subdivisions. Often overlooked, but equally important, are climatological and biological influences. Recurrent flooding and wildfires, as well as prolonged drought, can disturb plants and topsoil over large areas. Biological forms of ground disturbance include burrowing activities by small mammals and localized over-use by livestock and/or wild ungulates. These large- and small-scale disturbances provide opportunity for invasive species to become established.

Herbicide treatment is the most widely employed method to control noxious weeds. For most noxious weeds in Montana, this method of treatment provides
immediate, effective results. Problems occur when weed seeds have been allowed to build up in the soil and/or surrounding land areas and left untreated. Re-establishment in such cases occurs from seed banks and off-site reinvasion. This cycle of treatment/re-establishment is expensive to treat and requires dedication and immediate action by resource managers when weeds reappear within treated areas. Prevention, which requires focused purposeful action in surrounding infested and uninfested areas, provides the most cost-effective control. Prevention works best when management strategies acknowledge a threat and prioritize efforts to eliminate potential sources of infestation and expansion.

Chemical control of noxious weeds is efficient but might pose some toxicological risk to Sage Grouse and other wildlife during treatment. Pathways of exposure include absorption from treated plants, inhalation of chemical particles suspended in the atmosphere, and direct ingestion of treated plants (Montana Fish, Wildlife and Parks 1994). If properly applied, however, toxicological risks would be minimal. A reduction of forbs important to Sage Grouse during brood-rearing could have more serious consequences to local populations, with the magnitude of effects dependent on the scale of treatment. However, resource managers must realize that untreated noxious weeds are ultimately more effective at competitively displacing desirable plant components than short-term, transient impacts from proper herbicide application.

6.10.1 – Managing impacts of noxious weeds and other invasive species and their control on Sage Grouse.

6.10.1.1 – Management Goal: Identify current noxious weed infestations within and adjacent to occupied Sage Grouse habitat or suspected ranges.

Issue: Current information on existing weed infestations is insufficient for comprehensive and successful weed management.

Action:
1) BLM, USFS and NDOW to inventory and map existing noxious weed populations within and adjacent to occupied Sage Grouse habitat or suspected range.

6.10.1.2 – Management Goal: Implement habitat-specific weed management plans for known Sage Grouse ranges.

Issue: Appropriate weed management can’t be performed without habitat-specific information.

Action:
1) Develop habitat-specific weed management plans for known Sage Grouse ranges, using the inventory and map information developed in the action described above.

6.10.1.3 – Management Goal: Maintain habitat quality for both wildlife and livestock interests through proactive weed management.

Issue: Weed infestations result in loss of native grass, forb, and sagebrush abundance and diversity.
Action:
1) Promote measures that prevent the introduction and spread of weed seeds and other reproducing plant parts.

6.10.1.4 – Management Goal: Prevent the initial establishment of weeds within or on lands surrounding Sage Grouse habitat.

Issue: Noxious weeds spread quickly and without regard to ownership or management boundaries. Without immediate treatment, noxious weeds become a problem to all surrounding landowners. Effective weed management cannot occur in isolation or to the exclusion of any land managers within an area.

Actions:
1) Develop and implement management techniques that minimize the risk of infestation.
2) Encourage the use weed seed-free livestock forage and mulch.
3) Thoroughly clean personal clothing, pets, all vehicles and machinery before moving into non-infested areas.
4) Where feasible, isolate livestock from known infestations and avoid vehicle movement through infested areas.
5) Delay movement of livestock for a time period necessary to prevent viable weed seeds from passing through animals’ digestive tracts or remaining physically attached when moving from infested to non-infested areas.
6) Use weed-free seed for re-establishment of vegetation.
7) Eliminate unnecessary soil disturbance and vehicle access/movement into occupied Sage Grouse habitat. Limit vehicle use to established roads only.
8) Regularly monitor access points and roads for weed establishment.

6.10.1.5 – Management Goal: Ensure that land managers and users (general public) are educated about the threat noxious weeds pose to native plant communities and work together to find appropriate management solutions.

Issue: Cooperative integrated weed management efforts are essential in order to have successful Sage Grouse habitat.

Actions:
1) Develop partnerships with regional public and private land management units. Solicit involvement of local weed management
specialists, private landowners, wildlife biologists, and range ecologists to share knowledge and responsibilities on noxious weed issues.

2) Establish goals and set priorities that encompass the needs of both livestock and wildlife managers so all parties are working under a similar plan.

3) Provide training to appropriate staff on the proper selection and use of herbicides, including effects that climatic conditions and soils types have on applications of herbicides.

4) Maintain proper operating herbicide application equipment as well as proper herbicide application records, according to Nevada pesticide laws.

5) Conduct monitoring and develop follow-up procedures for treated areas.

6) Participate in integrated weed management training conducted by state and federal agencies, local experiment stations, and local (county) weed districts.

6.10.1.6 – Management Goal: Minimize effects of weed control treatments on non-target organisms.

Issue: It is important to maintain viable sagebrush habitat and populations of Sage Grouse while eradicating infestations of noxious weeds.

Actions:

1) Employ integrated weed management treatment methods such as a combination of biological and cultural, e.g., grazing, mowing, or seeding, treatments in conjunction with herbicides to manage weeds in Sage Grouse habitat.

2) Use the most selective herbicides where chemical treatment is appropriate, to minimize loss of non-target plant species.

3) Restore plant communities with desired species adapted to the site, using proven management techniques where biologically feasible. A restoration program may be necessary if conditions prevent natural native plant reestablishment.

6.10.1.7 – Management Goal: Provide the necessary funding mechanisms and dedicated labor to act immediately when new infestations are identified within Sage Grouse habitat.

Issue: New weed infestations are often undetected.

Action:

1) Establish a monitoring protocol to detect new infestations.
**Issue:** Weed management may not be an identified budget item in Sage Grouse management plans.

**Action:**
1) Weed management costs should be an identified budget item in Sage Grouse management plans. Money should be dedicated for monitoring and education as well as direct treatment expenses.

**Issue:** Funding and/or human resources may not be available when new infestations are discovered.

**Action:**
1) Establish partnerships or formal agreements with local (county) weed districts if appropriate to utilize their equipment and/or personnel.

6.10.2 – Pinyon-Juniper Encroachment

Pinyon-juniper encroachment is ranked as the second-highest concern in the state, and has the highest degree of reliability for habitat enhancement and restoration results in the appropriate sites identified by ecological site potential. Loss and fragmentation of Sage Grouse habitat in Nevada is exacerbated by expansion of pinyon pine and juniper into sagebrush habitat types.

Phases of woodland encroachment have been described as follows: Phase I, trees are present but shrubs and herbs are the dominant vegetation that influence ecological processes on the site; Phase II, trees are co-dominant with shrubs and herbs and all three vegetation layers influence ecological processes on the site; and Phase III, trees are the dominant vegetation and the primary plant layer influencing ecological processes on the site (from Miller, et al. 2008). Recent research in Nevada shows that Sage Grouse actively avoid pinyon and juniper when patch sizes are greater than 200 meters wide (Coates 2012 Personal Communication). Shrub cover in Phase I and Phase II sites are generally thought to be recoverable with treatments to remove invasive trees. Phase III sites cannot be recovered by removal of trees alone and require extensive restoration treatment to reestablish sagebrush cover important for Sage Grouse habitat.

Research has found that in Nevada, 50,000 to 60,000 acres of pinyon and juniper move into a state of non-recovery (Phase III) each year. The urgency of reversing this trend cannot be underestimated. (Tausch personal communication). Large areas of pinyon-juniper-encroached sagebrush habitat and over stocked pinyon-juniper woodlands are in need of restoration. Overstocked stands are further stressed by vast areas of insect- and disease-caused tree mortality and are now experiencing uncharacteristically large and severe wildland fires.

6.10.2.1 – Management Goal 1: Initiate landscape level treatments in potential Sage Grouse habitat areas to reverse the effects of pinyon and juniper encroachment and restore healthy, resilient sagebrush ecosystems.
Issue: Overstocked stands are further stressed by vast areas of insect- and disease-caused tree mortality and are now experiencing uncharacteristically large and severe wildland fires.

Actions:

1) Inventory and prioritize areas for treatment of Phase I and Phase II encroachment in occupied and potential Sage Grouse habitat areas to restore habitat resiliency, reduce avian predator perches, and increase forb and grass cover.

2) Prioritize areas for treatment of Phase III pinyon-juniper encroachment in strategic areas to break up continuous, hazardous fuel beds. Treat areas that have the greatest opportunity for recovery to suitable Sage Grouse habitat based on ecological site potential. Old growth trees would be protected on woodland sites.

3) Aggressively implement plans to remove Phase I and Phase II encroachment and treat Phase III encroachment to reduce the threat of severe conflagration and restore occupied Sage Grouse habitat where possible.

4) Allow temporary road access to Phase I, Phase II, and Phase III treatment areas. Construct access roads where access is needed with minimum design standards to avoid and minimize impacts.

5) Allocate sufficient resources to fully address habitat loss and degradation in the next ten years.

6) Share project funding between all appropriate agencies and jurisdictions by designing and completing NEPA for large-scale, watershed-based treatments over a period of years, rather than ad hoc projects.

7) Incentivize and assist in the development of bio-fuels and other commercial uses of pinyon and juniper resources.

8) Increase the incentives for private industry investment in biomass removal, land restoration, and renewable energy development by authorizing stewardship contracts for up to 20 years.

9) Establish a target goal for number of acres to be treated annually.

6.11 – Other Wildlife Management Issues

Wild ungulates and other native herbivores, e.g., ground squirrels, may negatively affect habitats upon which grouse depend. Wild herbivores can contribute to the reduction of shrub canopy and/or herbaceous understory in nesting and brood-rearing habitats. Wild
ungulates most often affect habitats of limited size within a landscape that includes stream sides and wet meadows that under most conditions provide an abundance of forbs and insects needed by sage grouse broods. These areas become increasingly important as dry conditions typically progress through summer.

Other land uses can compound the effects on areas of concentration by wild ungulates and other native herbivores. These conditions are especially important to address during periods of drought. Any attempt to resolve potential conflicts from wildlife use in sage grouse habitats depends on the knowledge and cooperation of local landowners and resource managers. Where evidence of adverse impacts by wild ungulates or other native herbivores is available, obtaining quantitative, site-specific measurements of vegetation conditions is paramount to assure that assessments are objective, and causes are accurately determined.

6.1.1 – Managing impacts of other Sagebrush dependent wildlife and habitat.

6.11.1.1 – Management Goal 1: Manage for wild herbivore populations commensurate with the capability of sagebrush communities to sustain Sage Grouse, other sagebrush dependent species, and other land use objectives.

Issue: High concentrations of wild herbivores in localized areas may reduce habitat effectiveness for Sage Grouse.

Actions:
1) Identify and map key Sage Grouse habitats where other wild herbivores are having significant impacts.

2) Establish an inventory and vegetative monitoring schedule to quantitatively determine the extent of the effects in key areas.

3) Determine seasons of expected use and assess the potential impact to Sage Grouse habitat.

4) Develop plans that keep ungulate population levels consistent with the sites capability to support them.

6.11.1.2 – Management Goal 2: Provide for an adequate amount of functioning riparian and wetland habitat during critical periods such as brood rearing.

Issue: Wetlands and other riparian habitats may be vulnerable to overuse by wild herbivores on some sites. This can sometimes be exacerbated seasonally, during droughts, and/or by other land use practices.

Actions:
1) Identify levels of use by wild herbivores in affected riparian areas.

2) Identify other land use practices occurring in riparian habitats.
3) Assess current management practices in respect to findings.

4) Determine whether management changes are needed.

5) Have drought management plans in place to allow for the rapid implementation of alternate management strategies.

6.11.1.3 – Management Goal 3: Develop a Pilot Project to monitor the affects of historical grazing, predator control and range management methods and their impacts on the Sage Grouse Populations and Habitat.

**Issue:** Lack of current specific data concerning the effects on Sage Grouse Populations and Habitat when utilizing historical Livestock Grazing, Predator Control and Range Management policies and measures.

**Actions:**

1) Propose the identification of a specific Pilot Project area of approximately 72 square mile to 216 square miles in size to implement historical livestock grazing, predator control and range management polices to develop scientific data related to the Sage Grouse populations and habitat.

2) Implement and develop the Pilot Project using historical livestock grazing, predator control and range management polices to develop scientific data related to the Sage Grouse populations and habitat.

   a) Funding through the State of Nevada Department of Wildlife & BLM from Ruby Pipeline Sage Grouse Conservation funds.
6.12 – Habitat Restoration & Conservation Funding Sources

The nation’s rural landowners, its farmers, ranchers, and forest owners, provide not only food and fiber for the world, but also a host of environmental benefits, including habitat for wildlife. Nearly two thirds of all species federally listed as threatened or endangered exist on private lands. Conservation efforts on these lands generate outdoor recreation and economic activity that result in sustained growth for local communities and landowners.

The Environmental Quality Incentives Program (EQIP) is a voluntary program that provides financial and technical assistance to agricultural producers through contracts up to a maximum term of ten years in length. These contracts provide financial assistance to help plan and implement conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air and related resources on agricultural land and non-industrial private forestland. In addition, a purpose of EQIP is to help producers meet Federal, State, Tribal and local environmental regulations.

The Wildlife Habitat Incentive Program (WHIP) is a voluntary program for conservation-minded landowners who want to develop and improve wildlife habitat on agricultural land, nonindustrial private forest land, and Indian land. The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for private and Tribal land to develop or improve high quality habitat that supports fish and wildlife populations of National, State, Tribal, and local significance. Through WHIP, the USDA’s Natural Resources Conservation Service (NRCS) provides technical and financial assistance to landowners and others to develop upland, wetland, aquatic, and other types of wildlife habitat on their property.

WHIP is reauthorized under Section 1240N of the Food Security Act of 1985 (16 U.S.C. 3839bb-1) as amended by the Food, Conservation, and Energy Act of 2008 (2008 Farm Bill). The 2008 Farm Bill extends the authority to the Secretary for carrying out the program during fiscal years 2008 through 2012.

6.11.1 – Federal and State Funding Availability for Partners in Sage Grouse Conservation Efforts

State, local and federal officials have been working for years to keep the Sage Grouse from being listed by federal officials for special protection under the Endangered Species Act. Elko County supports and encourages Sage Grouse conservation projects undertaken in partnership with a variety of stakeholders and consistent with Local and State led Sage Grouse conservation plans.

In order to provide for the long term protection of wildlife on private and public lands, there have been many grants and federally funded programs created that supports aggressive habitat conservation and restoration activities designed to develop partnerships with Federal, State, Local governments, private property owners and non-governmental organizations. There are many habitat enhancement and restoration funds available that support projects that are best able to maintain and manage wildlife habitat to help ensure self-sustaining populations and a natural abundance and diversity of wildlife resources on private and public lands.
This list of potential funding sources is not intended to be all encompassing. Various private foundations, companies and individuals not listed below often partner in conservation efforts. Finding and making contact with these potential partners is best accomplished on a local level. The list below includes funding sources that can address various scales of projects ranging from the individual landowner to multi-state efforts.

**U.S. Fish and Wildlife Service**
http://grants.fws.gov/
http://Partnerships.fws.gov/

**Natural Resource Assistance Grants:**

*Partners for Fish and Wildlife Program* – Provides assistance to private landowners who want to restore or improve habitat on their property. The project is developed, often with help from USDA’s Natural Resources Conservation Service, state fish and game agency or other conservation organizations. The landowner is reimbursed based on the cost sharing formula in the agreement, after project completion.

*Private Stewardship Program* – Provides grants or other assistance on a competitive basis to individuals and groups engaged in private conservation efforts that benefits species listed or proposed as endangered or threatened under the Endangered Species Act, candidate species, or other at-risk species on private lands within the United States. Maximum Federal share is 90%.

*Cooperative Conservation Initiative* – To support efforts to restore natural resources and establish or expand wildlife habitat, maximum Federal share is 50%.

*Multistate Conservation Grant Program* – To support sport fish and wildlife restoration projects identified by the International Association of Fish and Wildlife Agencies. Maximum Federal share is 100%.

*Tribal Landowner Incentive Program* – For actions and activities that protect and restore habitats that benefit Federally listed, proposed, or candidate species, or other at-risk species on tribal lands, maximum Federal share is 75%.

*Tribal Wildlife Grants* – For development and implementation of programs for the benefit of wildlife and their habitat, including species that are not hunted or fished, maximum Federal share is 100%.

*Conservation Grants* – Provides financial assistance to States and Territories to implement conservation projects for listed and non listed species, such as habitat restoration, species status surveys, public education and outreach, captive propagation and reintroduction, nesting surveys, genetic studies and development of management plans. Maximum Federal share is 75% for a single state or 90% for two or more states implementing a joint project.

*Landowner Incentive Grant* – To establish or supplement existing landowner incentive programs that provide technical or financial assistance including habitat
protection and restoration to private landowners for species at risk, maximum Federal share is 75%.

**National Fish and Wildlife Foundation**

*Answer the Call* – A partnership program coordinated by Quail Unlimited (QU) to improve the distribution and abundance of upland game birds and other wildlife resources on public land …ATC projects must involve work that will significantly benefit upland game birds. Required criteria include: 1) involvement by local QU and local FS or BLM unit(s); and 2) a minimum fifty percent of match to federal funds provided by local QU chapters. Additional criteria not required, but considered when rating projects, include: inclusion of partners in addition to the BLM, FS, and QU; a ratio of challenge to federal funds exceeding 1:1; visibility potential; youth involvement; and educational / demonstration value.  

*General Challenge Grant* – A conservation grant program that awards challenge grants, on a competitive basis, to eligible grant recipients, including federal, tribal, state, and local governments, educational institutions, and non-profit conservation organizations. Project proposals are received on a year-round, revolving basis with two decision cycles per year. Grants typically range from $10,000-$150,000, based upon need.”  

*Keep the Wild Alive* – An education, advocacy, outreach, and on-the-ground conservation project designed to raise awareness of and improve conditions for endangered species….Keep the Wild Alive's Species Recovery Fund (SRF) was created to spur habitat restorations, species reintroductions, private land conservation activities, and other creative endeavors that directly improve conditions for endangered species. During the past two years, National Wildlife Federation has awarded nearly thirty grants - each between $3,000 and $7,000 - to support innovative species conservation efforts.” The web info states that this is only for species already federally listed, but a peek at recently-funded projects reveals this is not strictly true.  
[http://www.nwf.org/keepthewildalive/apply.cfm](http://www.nwf.org/keepthewildalive/apply.cfm)

**U.S. Bureau of Land Management**

[http://www.blm.gov](http://www.blm.gov)

*Challenge Cost Share* – This program is designed to leverage funds with partners and other external funding sources to monitor and inventory resources; implement habitat improvement projects; partnership capacity building; develop recovery plans; protect or document cultural resources; provide enhanced recreational experiences; and to better manage wild horse and burro populations. A minimum of 1:1 match through new cash or in-kind goods and services is required for each project.

*Cooperative Conservation Initiative* – The CCI program was a new initiative in the President’s 2003 budget request to Congress to remove barriers to citizen participation in the stewardship of our natural resources and to help people take conservation into their own hands by undertaking projects at the local level. Projects must seek to achieve the actual restoration of natural resources and/or the
establishment or expansion of habitat for wildlife. Funding must be matched through new cash, materials, or in-kind service.

**National Fish and Wildlife Foundation** – The National Fish and Wildlife Foundation provides grants for projects to develop and implement environmental education, natural resource management, habitat protection and restoration and conservation policy. Approved projects are funded at a one-to-one ratio, with the Foundation matching each Federal dollar with one or more dollars of non-Federal funds.

**USDA, Natural Resource Conservation Service**
http://www.nrcs.usda.gov/programs

**Conservation Innovation Grants** – Conservation Innovation Grants (CIG) is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging Federal investment in environmental enhancement and protection, in conjunction with agricultural production. Under CIG, Environmental Quality Incentives Program funds are used to award competitive grants to non-Federal governmental or non-governmental organizations, Tribes, or individuals. CIG enables NRCS to work with other public and private entities to accelerate technology transfer and adoption of promising technologies and approaches to address some of the Nation’s most pressing natural resource concerns.

**Conservation Reserve Program** – The Conservation Reserve Program (CRP) provides technical assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers in complying with Federal, State, and tribal environmental laws, and encourages environmental enhancement.

**Conservation Technical Assistance** – The Conservation Technical Assistance (CTA) program provides voluntary conservation technical assistance to land-users, communities, units of state and local government, and other Federal agencies in planning and implementing conservation systems. This assistance is for planning and implementing conservation practices that address natural resource issues. It helps people voluntarily conserve, improve and sustain natural resources.

**Environmental Quality Incentives Program** – The Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

**Grasslands Reserve Program** – The Grassland Reserve Program (GRP) is a voluntary program offering landowners the opportunity to protect, restore, and enhance grasslands on their property. The Natural Resources Conservation Service, Farm Service Agency and Forest Service are coordinating
implementation of GRP, which helps landowners restore and protect grassland, rangeland, pastureland, shrubland and certain other lands and provides assistance for rehabilitating grasslands.

**Wildlife Habitat Incentives Program (WHIP)** – The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP USDA’s Natural Resources Conservation Service provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from 5 to 10 years from the date the agreement is signed.

**U.S. Forest Service**
http://www.fs.fed.us

**Forest Legacy Program (FLP)** – The Forest Legacy Program (FLP) is a voluntary federal program in partnership with states to protect environmentally important private forest lands threatened to conversion to non-forest uses to help maintain the integrity and traditional uses of private forestlands. FLP directly supports property acquisition as well as the purchase of conservation easements. FLP funded acquisitions serve public purposes identified by participating states and agreed to by the landowner. To qualify, landowners are required to prepare a multiple resource management plan as part of the conservation easement acquisition. The federal government may fund up to 75% of program costs, with at least 25% coming from private, state or local sources.

**Forest Stewardship Program (FSP)** – The Forest Stewardship Program (FSP) provides technical assistance to private forest landowners to develop plans for the sustainable management of their forests. The primary focus of the FSP is the development of comprehensive, multi-resource management plans that provide landowners with the information they need to manage their forests for a variety of products and services. Participation in the Forest Stewardship program is voluntary and available to any non-industrial private forest landowner committed to the active management and stewardship of their forested properties for at least ten years. The FSP is not a cost share program. Cost-share assistance for plan implementation may be available through other programs such as the Forest Land Enhancement Program.

**The Forest Land Enhancement Program (FLEP)** – The Forest Land Enhancement Program (FLEP) is a voluntary program for non-industrial private forest (NIPF) landowners that provides technical, educational, and cost-share assistance to promote sustainable forestry management practices. FLEP State Forestry Agencies in coordination with their State Forest Stewardship Coordinating Committees will develop a State Priority Plan for FLEP. Landowners must develop a forest management plan (Forest Stewardship Program) to be eligible for cost-share. The practices to be cost-shared and the cost-share rate will be described in the State Priority Plan.

Partnerships provide expanded opportunities for obtaining grants. Many funding sources prefer or require them because projects involving partnerships have an increased potential for success. In addition, funds available for grants can be
“leveraged” as they extend farther among partners. Attention to appropriate, effective strategies that match the requirements of potential funding sources during project planning and development can lead to successful grant procurement. A sample of funding opportunities is listed at our web address.

**Department of Defense**

**Legacy Resource Management Program** – In 1990, Congress passed legislation establishing the Legacy Program to manage, protect and conserve natural and cultural resources on military lands while supporting military readiness. Three principles guide the Legacy program — stewardship, leadership, and partnership. In order to support these principles, the Legacy Program emphasizes the following areas: Readiness and Range Sustainment; Integrated Natural Resources Management; Regional Ecosystem Management Initiatives; National and International Initiatives; Invasive Species Control; Monitoring & Predicting Migratory Patterns of Birds and Animals; Cultural Resources Management; Historic Preservation and Force Protection; Native American Issues; and Curation of DoD owned and Controlled Archaeological Collections, and Associated Records and Documents. [http://www.dodlegacy.org](http://www.dodlegacy.org)

**Strategic Environmental Research and Development Program (SERDP)** – funds basic and applied research and development efforts that address DoD user requirements. Conservation objectives include providing innovative methods, techniques, and tools to inventory and manage resources more efficiently and effectively. Areas of interest include: ecological forecasting (e.g., to benefit readiness and range preservation), ecosystem processes, threatened and endangered species, ecosystem restoration and mitigation (e.g., invasive species control), and cultural resources. Proposals based on specific Statements of Need (SONs) are solicited through an annual Call for Proposals and Broad Agency Announcement. [http://www.SERDP.org](http://www.SERDP.org)

**Readiness and Environmental Protection Initiative** – President Bush’s FY 2005 budget includes $20 million in the Defense Department budget to launch a new effort to sustain test and training space for our troops while assisting in the protection of valuable habitat and open space. The initiative will focus on dedicated funding to support new partnership projects working through cooperative agreements to acquire key conservation easements and other activities to prevent incompatible development around bases by protecting additional habitat. If funded, projects may use the “preserving habitat” authority under Section 2684a(2). Such projects would need to show a conservation benefit to the installation or range and consistency with the installation’s or range’s integrated natural resource management plan (INRMP), as well as contributing benefit to the broader regional ecosystem and landscape.

**State of Nevada**

**State Game and Fish Agency Programs** – State game and fish agencies have a wide variety of grant and partnership programs specific to their state. Some of the general programs available to the states through a Federal partnership include the following: Wildlife Restoration Program - To support restoration and
management of wildlife populations and provide public use opportunities and hunter safety programs.

**Hunter Education Enhancement Program** – To enhance existing hunter education programs. Maximum Federal share is 75%. State Wildlife Grants - To develop wildlife conservation plans and on-the-ground conservation projects. Maximum Federal share for planning grants is 75% and implementation projects are 50%.

**Nevada Department of Wildlife / Ruby Pipeline Endowment** – During the course of permitting their natural gas pipeline project that crosses Nevada and three other western states, Ruby Pipeline LLC entered into three voluntary Cooperative Agreements to implement conservation measures for Sage Grouse and Pygmy Rabbits, Threatened and Endangered Species and Migratory Birds. The Nevada Department of Wildlife and the Bureau of Land Management entered into an agreement with Ruby Pipeline LLC and received $8.8 Million for habitat protection and enhancement and other conservation efforts for the benefit of Sage Grouse and Pygmy Rabbits in Nevada.

Grant applications can be made by federal and state agencies and non-profit 501 (C) 3) corporations. Proposals that meet the specific criteria of location and subject are welcome from the responsible public, environmental contractors, the University, and governmental agencies. Applications are available from either NDOW or the BLM. All funds must be obligated within five years.

**Non-governmental Organizations**

There are also many non-governmental organizations that have assisted in species and habitat conservation over the years. Participation in specific projects require planning and discussion with the local, state, regional or national representative of the non-governmental organization you wish to partner with.

Effective implementation of the Elko County Greater Sage Grouse Management and Conservation Strategy Plan requires coordination and cooperation between the primary land management agencies, the primary wildlife management agencies, local and state governments, private landowners, and other interested parties. Implementation of the proposed actions, public education, monitoring and research components of the Elko County Greater Sage Grouse Management and Conservation Strategy Plan are to be incorporated into State of Nevada and Federal agency Resource Management Plans, annual budgets and other work plans where possible. The appropriate federal and state agencies will also rely on collaboration with existing initiatives and plans that share common or complimentary objectives with Sage Grouse Habitat Conservation, Preservation and Rehabilitation.

7.1 – Bureau of Land Management: The BLM manages Greater Sage Grouse habitat on federally managed public lands under statutory authority of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.), as amended. Statute and regulation identify the Bureau of Land Management Headquarters Office as the agency responsible for the establishment of broad policy for the management and protection of Wildlife and Sensitive Species Habitat at the National level. Delegation of Authority identifies the Nevada State Director as the person responsible for implementation of National Policy and establishment and implementation of regional policies for the management and protection of wildlife and sensitive species habitat within their states jurisdiction.

The BLM is obligatory to continue to monitor Greater Sage Grouse habitat and populations with the Nevada Department of Wildlife on an annual basis. Monitoring efforts will be coordinated with the appropriate federal, state and local agencies and tribal governments to ensure consistent techniques are utilized. The BLM is binding to continue to provide support and be actively involved with on-going research projects. The BLM shall also pursue research opportunities and seek funding sources to accomplish research and incentive programs identified in the Elko County Greater Sage Grouse Management and Conservation Strategy Plan. The BLM will utilize the resources available to further the purposes of conducting research projects such as described herein. Including research projects that may be proposed in the future may be considered even though they may not have been identified in the Elko County Greater Sage Grouse Management and Conservation Strategy Plan.

The BLM shall develop land use plans and resource management plans consistent with the goals, objectives and actions contained in the Elko County Greater Sage Grouse Management and Conservation Strategy Plan and determine if current BLM land use plans require updating through amendment or revision in order to achieve the goals and objectives identified in the Plan.

The BLM will ensure that any actions implemented on public lands will be in conformance with the Elko County Greater Sage Grouse Management and Conservation Strategy Plan and comply with the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), other applicable statutes and regulations, and ensure appropriate Native American consultation is conducted.

The BLM will seek funding opportunities that become available through the federal budget process, Cooperative Conservation Initiative (CCI) and Challenge Cost Share (CCS) programs, and through federal and state grant programs, including but not limited
to the Fish and Wildlife Fund, and seek additional funding opportunities with the National Fish and Wildlife Foundation to implement actions set forth in the Elko County Greater Sage Grouse Management and Conservation Strategy Plan and that pertain to the BLM administered lands or interest in lands.

7.2 – United States Forest Service: The Forest Service shall continue to participate and coordinate with both local and statewide organizations as per NEPA, in regards to implementation of projects identified as priority emphasis items in this Elko County Greater Sage Grouse Management and Conservation Strategy Plan identified herein. The Forest Service will comply with the appropriate regulatory requirements before any on-the-ground activities will occur. These requirements include the National Forest Management Act, National Environmental Policy Act (NEPA), Endangered Species Act, and the National Historic Preservation Act. Funding for any specific project(s) will be allocated on a Forest priority basis, which is based upon National, Regional, and Forest emphasis items. It is anticipated that implementation of actions that provide for the conservation of the Greater Sage Grouse and associated habitat will be a high priority.

7.3 – Nevada Department of Wildlife: The Nevada Department of Wildlife (NDOW) manages Greater Sage Grouse under statutory authority of the Nevada Revised Statutes (NRS) and Nevada Administrative Code (NAC). Statute and code identify the Nevada State Board of Wildlife Commissioners as the entity responsible for the establishment of broad policy for the management and protection of the States wildlife. NDOW is the agency charged with the execution of state law, and commission regulation and policy. NDOW is responsible to continue to monitor Greater Sage Grouse populations and habitat on an annual basis. Monitoring efforts will be coordinated with the appropriate federal agencies, adjacent state wildlife agencies, and applicable tribal governments to ensure consistent techniques are utilized.

NDOW is to assemble and compile monitoring results and other details regarding habitat improvement projects and/or conservation easements in an annual report. These reports are public information and are to be available upon request.

NDOW shall pursue habitat improvement as identified in the Elko County Greater Sage Grouse Management and Conservation Strategy Plan where applicable and will coordinate with the appropriate federal and state agencies, tribal governments, and private landowners to conduct these projects or ensure management practices are beneficial to greater Sage Grouse populations and habitat.

NDOW will continue to provide support and be actively involved with ongoing research projects. NDOW will seek funding from federal grants or state programs including, but not limited to; Wildlife Restoration Funds, State Wildlife Grants, the Wildlife Heritage Trust Account, and the Nevada Wildlife Foundation to implement the actions and research projects that pertain to NDOW set forth in the Elko County Greater Sage Grouse Management and Conservation Strategy Plan or proposed by the Elko County Board of Commissioners.

7.4 – Elko County: Elko County shall identify and propose habitat improvement and research projects on federally managed lands and privately owned properties. Elko
County shall encourage public education and best management practices within Elko County Code as applicable to the Elko County Greater Sage Grouse Management and Conservation Strategy Plan. Elko County shall coordinate with the appropriate federal and state agencies, tribal governments, and private landowners to conduct these projects or ensure management practices are beneficial to greater Sage Grouse populations and habitat.


- Identify and provide funding Sources for Sage Grouse habitat conservation, preservation and rehabilitation measures on privately owned property.
- Develop Sage Grouse and habitat education programs for users of federally managed public lands.
- Identify and implement research and development projects as identified in section 6 (6.4.1.2).

7.4.1.2 – Elko County Code and State Statute: Identify and amend local and state laws pertaining to development to encourage the implementation of developer planned Sage Grouse and habitat protection measures and strategies to prevent further loss of Sage Grouse habitat during development of privately owned lands.

7.4.1.3 – Federal Land Management: Promote and fulfill the Multiple Use Doctrine on federally managed land without further restriction while incorporating best management practices to preserve and promote Sage Grouse populations and habitat on federally managed public lands.

7.4.1.4 – Agriculture / Livestock Grazing: Elko County promotes and encourages the re-implementation of historical livestock grazing policies prior to 1950 by federal land management agencies.

- Historical livestock grazing policies promoted the removal of decadent over growth of fine fuels that currently exist.
- Historical livestock grazing policies promoted the creation and development of water resource and habitat to wildlife while promoting increases in wildlife populations.
Plan Conclusion:

The Board of Commissioners recognizes and embraces the importance of the Sage Grouse populations to the history and culture of Elko County. We also recognize the importance of conservation, preservation and rehabilitation of sagebrush habitat not only to the Sage Grouse but to other sagebrush dependent wildlife. The Elko County Greater Sage Grouse Management and Conservation Strategy Plan has provided measures and strategies to help ensure that Sage Grouse and wildlife habitat is protected and rehabilitated through education and non-regulatory methods. The Elko County Board of Commissioners have alternatively provided thought and data herein to the reader that potentially a preemptive exclusion from the Sage Grouse listing could be granted to the Northeastern Nevada region.

The Elko County Board of Commissioners assert that multiple uses on federally managed public lands are a very essential component to the Elko County and regional economy, customs and culture and that they can be maintained without further loss to Sage Grouse and habitat. Elko County has provided the Federal land management Wildlife agencies methods and strategies to help maintain the multiple use concept without further restrictions and regulatory bureaucracy. We encourage in the plan for the development of conservation and rehabilitation minded relationships with the federal land managers during permitting processes for continued resource development and use on federally managed public lands. We encourage the federal land management agencies to not employ or develop further restrictive measures and policies related to the Sage Grouse and habitat conservation and preservation.

The Elko County Greater Sage Grouse Management and Conservation Strategy Plan is designed to provide Sage Grouse management, conservation, preservation and rehabilitation measures, strategies and funding sources to the private property owner, public lands users, developer and federal land management agencies that will benefit the Greater Sage Grouse population and habitat in the region without the loss of Elko County’s heritage, culture and economy.
Works and Documents Cited:

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**Montana**


**Nevada**


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PREPARED BY: The Southwest Wyoming Local Sage-grouse Working Group

