

# **Southwest Wyoming Sage-grouse Conservation Plan**

*Version 2.0 (November 2013)*

**PREPARED BY:**

**The Southwest Wyoming Local Sage-grouse Working Group**



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## **SOUTHWEST WYOMING LOCAL SAGE-GROUSE WORKING GROUP MEMBERS**

### Current Members:

Corby McGinnis, Rancher, Fontenelle (Chair Jan. 2007-present)

Dave Baer, Sports person, Mountain View

Mary Lynn Corbett, Public at Large, Kemmerer

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Julie Lutz, Mining Industry, Green River

Mark Zornes, Wyoming Game & Fish Department, Green River

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### Past Members:

Don Hartman, Sports person, Green River

Chris Durham, Bureau of Land Management, Rock Springs

Adrian Hunolt, Natural Resource Conservation Service, Lyman

Brian Christensen, Natural Resource Conservation Service, Rock Springs

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Nick Kaczor, Bureau of Land Management, Rock Springs

Rena Piper, Mining Industry, Rock Springs (Chair Sept. 2004-Jan. 2007)

Lucy Wold, Facilitator

## EXECUTIVE SUMMARY

The Southwest Wyoming Sage-grouse Working Group (SWLWG) was established in September 2004 to develop and facilitate implementation of a local conservation plan for the benefit of sage-grouse and other species that use sagebrush habitats in the Southwest Wyoming Sage-grouse Conservation Area (SWGCA). The original Southwest Sage-grouse Conservation Plan (2007 plan) was completed in 2007. Since 2007, Wyoming Governors Dave Freudenthal and Matt Mead have issued executive orders addressing sage-grouse management that have become known as the Wyoming Core Area Strategy. In addition, the U.S. Fish and Wildlife Service (USFWS) in 2010 issued a “warranted but excluded” decision for listing the Greater Sage-grouse under the Endangered Species Act (ESA). Subsequent to this decision, the Service entered a court stipulated agreement to again determine the status of sage-grouse by late 2015. As a result of these significant policy decisions it became necessary to update the SWGCP. This conservation plan identifies strategies and commitments for the purpose of improving sage-grouse numbers and contributing to the rangewide effort to preclude the need for listing under the ESA. The Working Group has included 19 members since 2004 representing government agencies, industry, agriculture and wildlife.

### Conservation Assessment

Sage-grouse have declined across their range during the past 60 years, as has the quality and distribution of the bird’s requisite sagebrush-steppe habitat. Some of the highest densities of sage-grouse in North America are found in the sagebrush habitats of southwest Wyoming. Occupied habitat is fairly contiguous throughout much of the area. More fragmented habitats occur in areas of greater human development such as near major highways, large-scale cultivated areas, and high density natural gas development. Naturally fragmented habitats occur near forested areas, badlands, sand dunes and some salt desert shrub habitats.

Most of the occupied sage-grouse habitats in the SWGCA are public lands, primarily managed by the Bureau of Land Management (BLM). Approximately 75 percent of known leks (strutting grounds) are found on public land; the remaining 25 percent are found on private and state lands.

Sagebrush habitat is essential for sage-grouse survival. Suitable habitat consists of plant communities dominated by sagebrush and a diverse native grass and forb (flowering herbaceous plants) understory. The composition of shrubs, grasses and forbs varies with the subspecies of sagebrush, the condition of the habitat at any given location, and range site potential. Seasonal habitats must occur in a patchwork or mosaic across the landscape. Both quantity and quality of the sagebrush environment determines suitability for, and productivity of sage-grouse.

Providing for all habitat needs on the scale required by sage-grouse might be the most challenging element of managing the landscape in the context of other existing land uses. There is also a need to identify structure and cover components. These challenges are greatest in breeding (pre-nesting, nesting and early brood-rearing) habitats. Winter range is increasingly being recognized as a critical component of sage-grouse habitat.

As of 2013 there were 313 known occupied leks in the SWGCA. Monitoring male attendance on leks provides a reasonable index of relative change in abundance in response to prevailing

environmental conditions over time. The average number of males counted/lek decreased during the latter half of the 1900's to an all time low in 1995. This figure rose markedly from 1996-2006 demonstrating a generally increasing population over the short-mid- term. The increase is believed to be primarily due to timely spring precipitation in several years in spite of generally droughty conditions. Since 2007 the average lek attendance has declined. Weather conditions have not been favorable to sage-grouse over this period. In addition, there is evidence that grouse populations are cyclic. If that is the case, the current population should be near the cyclic low. Average lek attendance remains above what was observed during the mid-1990s.

### Conservation Strategy

The SWLWG has identified energy development, water development, invasive plants, urbanization, recreation, vegetation management, livestock grazing, utility corridors, roads and travel management and wildfire as high priority factors with both the most influence on the sage-grouse population and as those factors that might most effectively be addressed to provide the greatest benefit for sage-grouse conservation in the SWSGCA. Medium priority issues included wildlife management, wild horse management, minerals/mining, parasites and diseases, predation, weather and farming. Low ranking priorities were contaminants/pesticides and hunting.

Based on these priorities the SWLWG developed conservation goals of:

- 1) Habitat: Maintain, enhance, and/or restore quality habitat for sage-grouse in southwest Wyoming.
- 2) Population: Maintain and enhance sage-grouse populations in southwest Wyoming.
- 3) Monitoring, Research & Education: Better understand the dynamics of sage-grouse populations and their habitats through monitoring, research and education.

Actions and recommended management practices to achieve goals and objectives are listed in the plan. Since 2005 the Working Group has allocated approximately \$450,000 to 31 sage-grouse conservation projects in the SWCPA and across the state.

The SWLWG will continue to meet at least annually to evaluate population and habitat monitoring results, research results, plan implementation status, and potential for new conservation projects as long as project funding remains available via Wyoming General Fund budget as provided by the Governor and legislature.

The public was provided opportunity to comment throughout the process. The official comment period on the draft plan was October 1-31, 2013. One comment letter was received and considered during completion of this plan.

# CONSERVATION STRATEGY FOR SAGE-GROUSE IN SOUTHWEST WYOMING - 2013

## **Introduction**

The Wyoming Sage-grouse Management Plan was finalized in 2003 after which the State's eight local working groups developed their respective plans. The Southwest Local Working Group (SWLWG) was established in the spring of 2004 for the task of developing a local conservation plan, which was finalized in 2007. Since that time a significant amount of information has been gathered through research, conservation projects have been completed, and new regulatory mechanisms have been developed. This document updates the 2007 Southwest Conservation Plan with the latest information, focusing on identified threats and conservation actions designed to address those threats.

The Southwest Wyoming Sage-grouse Conservation Plan provides specific goals, sub-goals and actions designed to improve sagebrush habitats and sage-grouse populations. We also offer Recommended Management Practices (RMPs) to address or mitigate possible limiting factors.

## **Background**

From before the beginning of recorded history, sage-grouse have been part of Wyoming and the Wyoming way of life. Native American dances often mimicked grouse courtship displays, early travelers wrote about them in their journals, pioneers subsisted on them and other wild game. Modern residents and visitors to Wyoming view grouse courtship displays in the spring and hunt them in the fall for enjoyment and recreation.

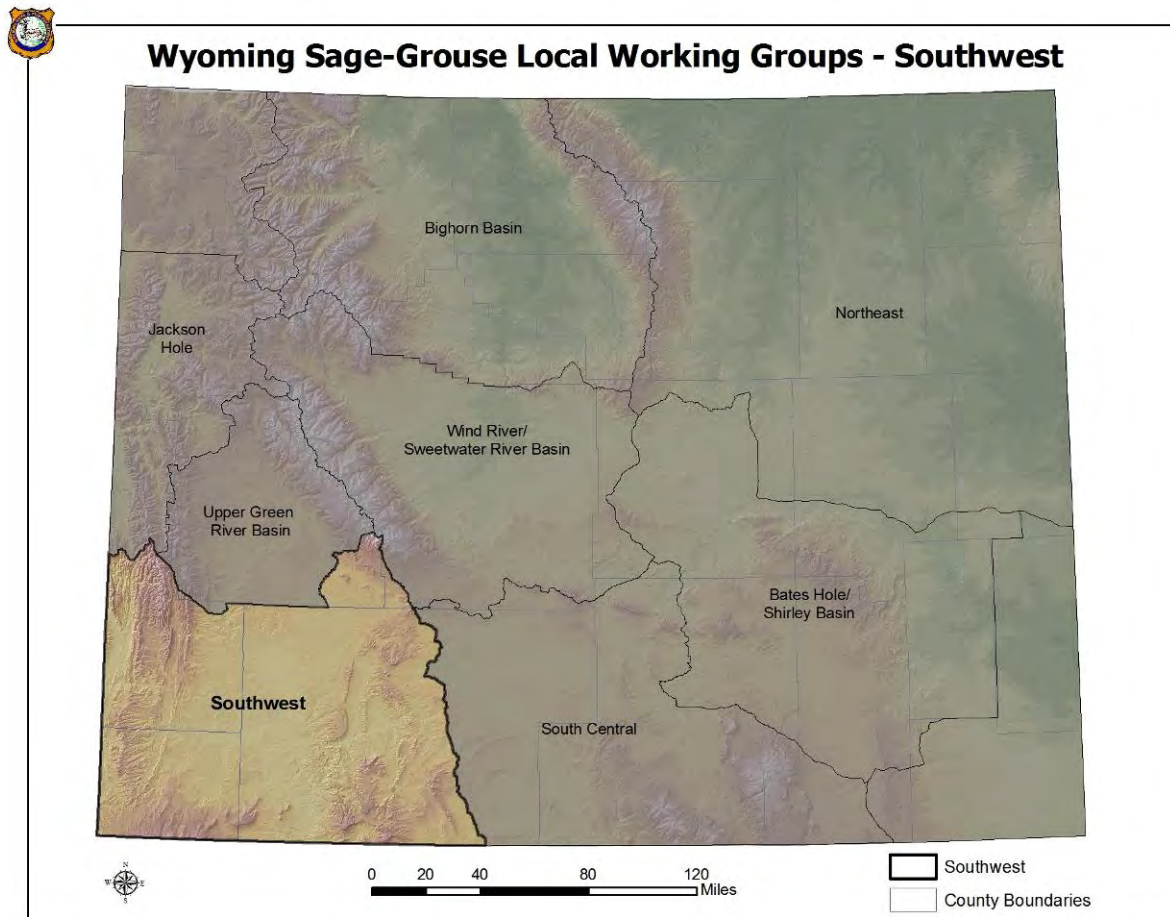
The Greater Sage-grouse (*Centrocercus urophasianus*) is a large, gallinaceous (chicken-like), upland game bird. Sage-grouse are dependant on sagebrush habitats nesting on the ground under sagebrush and feeding on sagebrush, broad-leafed flowering plants (forbs) and insects. Although still considered common in Wyoming, available data and anecdotal accounts indicate Wyoming'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 (USFWS) determined the Greater Sage-grouse was not warranted for such protection but urged the recent rangewide conservation emphasis be continued. The USFWS was subsequently sued and a federal judge remanded the decision back to the USFWS which in 2010 determined the bird was warranted for listing but precluded due to the number of other species at greater risk.

# CONSERVATION ASSESSMENT FOR SAGE-GROUSE THE SWSGCA

## Conservation Plan Area

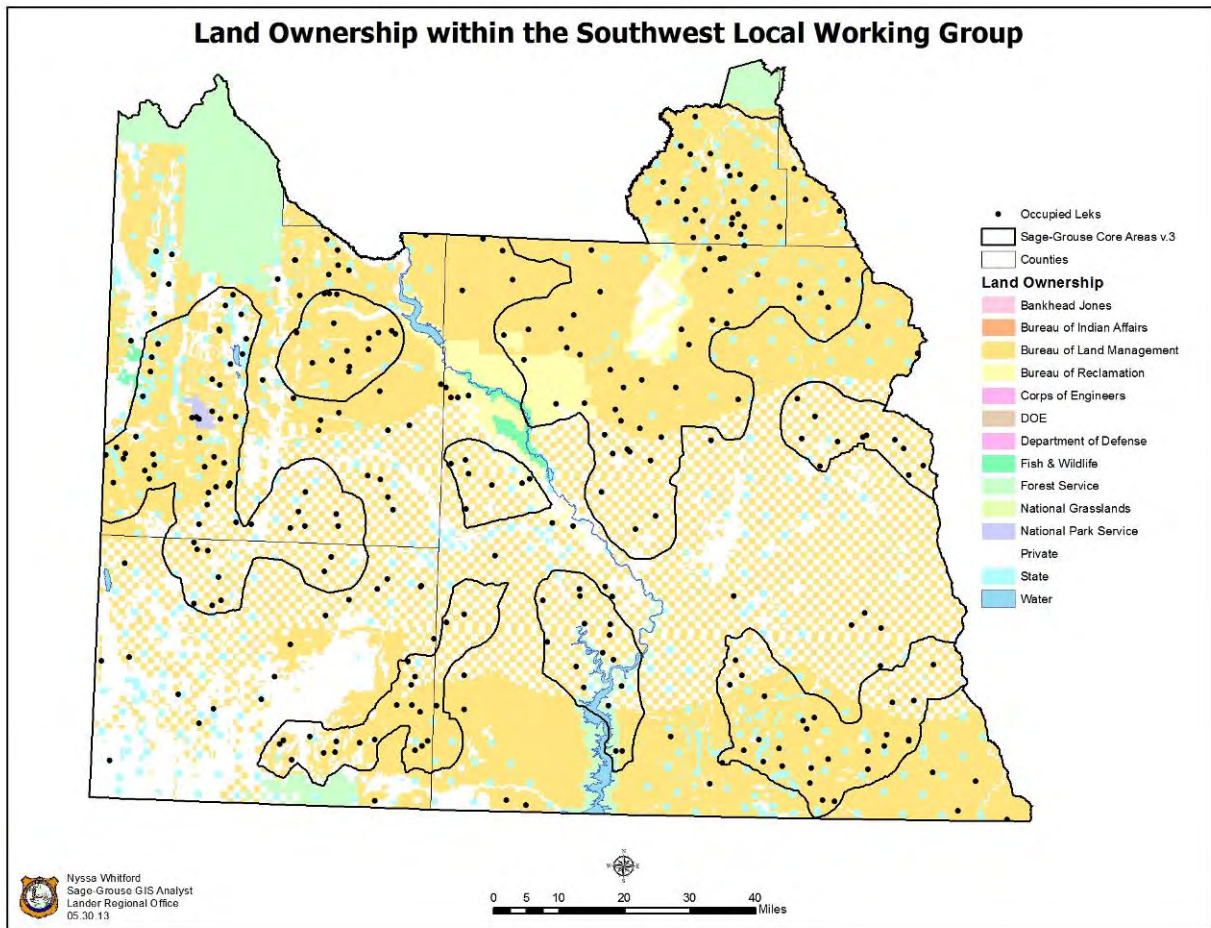
The SWSGCA lays in southwest Wyoming west of the Continental Divide and south of the Big Sandy River and LaBarge Creek (Figure 1). Political jurisdictions within the SWSGCA include portions of Sweetwater, Sublette, Lincoln, Fremont and Uinta counties. Most occupied habitat for sage-grouse within Southwest Wyoming is in public ownership (Figure 2, Tables 1 and 2). The area is managed by the Bureau of Land Management (BLM), private landowners, U.S. Forest Service (USFS, mostly non-sage-grouse habitat), State of Wyoming, Bureau of Reclamation (BOR), U.S. Fish and Wildlife Service (USFWS – Seedskaadee and Cokeville Meadows National Wildlife Refuges) and the National Park Service (NPS – Fossil Butte National Monument).

**Figure 1.** The Southwest Sage-grouse Conservation Area (SWSGCA).





**Figure 2.** Landownership within the SWSGCA.



**Table 1.** Land ownership jurisdiction, surface area, and proportions of surface area and sage-grouse leks.

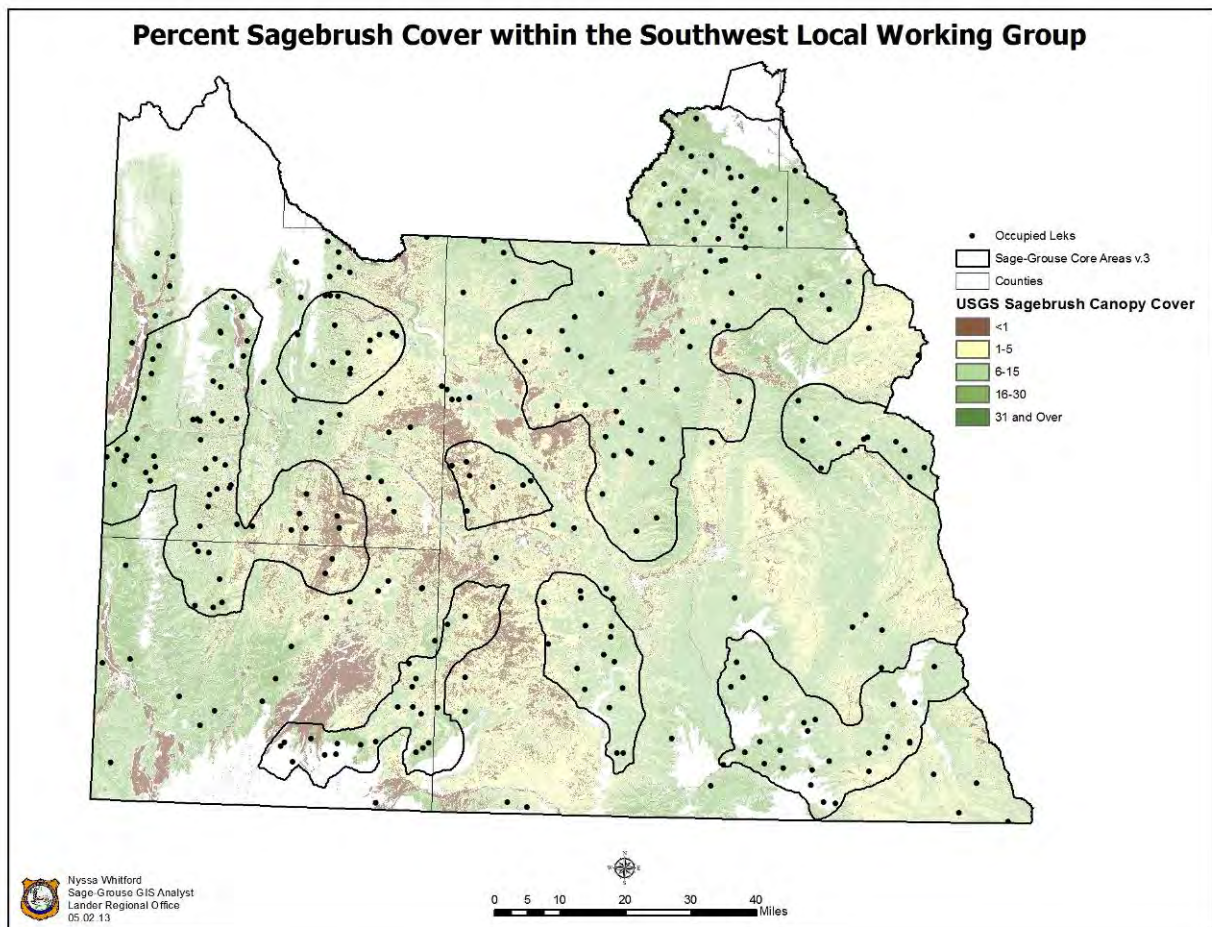
| <b>Jurisdiction</b> | <b>Square Miles Land Surface</b> | <b>% of Total Land Surface</b> | <b>% of Total Sage-grouse Leaks</b> |
|---------------------|----------------------------------|--------------------------------|-------------------------------------|
| BLM + BOR           | 7,231                            | 59%                            | 75.3%                               |
| Private             | 3,807                            | 31%                            | 21.7%                               |
| USFS                | 598                              | 5%                             | 0.2%                                |
| State of WY         | 488                              | 4%                             | 2.3%                                |
| USFWS               | 26                               | 0.2%                           | 0%                                  |
| NPS                 | 13                               | 0.1%                           | 0.5%                                |

**Table 2.** Greater Sage-grouse lek characteristics within the SWSGCA.

| <b>Table 2. Southwest Sage-grouse Conservation Area<br/>2013 Lek Characteristics</b> |                      |                       |
|--|----------------------|-----------------------|
| <b><u>SG Working Group</u></b>   | <b><u>Number</u></b> | <b><u>Percent</u></b> |
| Southwest  | 433                  | 100.0%                |
| <b><u>WGFD Region</u></b>  | <b><u>Number</u></b> | <b><u>Percent</u></b> |
| Green River  | 381                  | 88%                   |
| Pinedale   | 52                   | 12%                   |
| <b><u>Classification</u></b>   | <b><u>Number</u></b> | <b><u>Percent</u></b> |
| Occupied   | 313                  | 73.3%                 |
| Unknown  | 18                   | 4.2%                  |
| Unoccupied   | 102                  | 23.6%                 |
| <b><u>BLM Office</u></b>   | <b><u>Number</u></b> | <b><u>Percent</u></b> |
| Kemmerer   | 187                  | 43.2%                 |
| Pinedale   | 12                   | 2.8%                  |
| Rawlins  | 2                    | 0.5%                  |
| Rock Springs   | 232                  | 53.6%                 |
| <b><u>County</u></b>   | <b><u>Number</u></b> | <b><u>Percent</u></b> |
| Fremont  | 3                    | 0.7%                  |
| Lincoln  | 136                  | 31.4%                 |
| Sublette   | 23                   | 5.3%                  |
| Sweetwater   | 201                  | 46.4%                 |
| Uinta  | 70                   | 16.2%                 |
| <b><u>Land Status</u></b>  | <b><u>Number</u></b> | <b><u>Percent</u></b> |
| BLM  | 326                  | 75.3%                 |
| NPS  | 2                    | 0.5%                  |
| Private  | 94                   | 21.7%                 |
| State  | 10                   | 2.3%                  |
| USFS   | 1                    | 0.2%                  |

Major habitat types within the plan area include: sagebrush/grassland, salt desert shrub, mixed mountain shrub, grasslands, mixed forests (conifers and aspen), juniper woodlands, agricultural crops, riparian corridors, and urban areas. Sage-grouse are found throughout the sagebrush habitats of southwest Wyoming (Figure 4). Occupied habitat is fairly contiguous throughout much of the area. More fragmented habitats occur in areas of greater human development such as near major highways, large-scale cultivated areas, and high density natural gas development. Naturally fragmented habitats occur near wooded or forested areas (juniper, pine, fir) and badland, sand dune and some salt desert shrub habitats.

**Figure 4.** Percent sagebrush cover within the SWSGCA.



### **General Sage-Grouse Biology**

The Greater Sage-grouse (*Centrocercus urophasianus*) is the largest species of grouse in North America. Sage-grouse depend on sagebrush (*Artemisia* spp.) for much of their annual food and cover. This dependence makes them a sagebrush “obligate”. The close relationship is reflected in the distribution of sage-grouse, which is aligned with that of sagebrush. Herbaceous plants (grasses and forbs) provide both food and cover during the nesting and early brood-rearing seasons.

Sage-grouse are considered a “landscape species”, meaning they use widespread areas of sagebrush habitats. Sage-grouse are often migratory, with movements up to 100 miles, but usually less than 20, between winter and summer ranges. Despite this mobility, sage-grouse display strong fidelity (loyalty) to seasonal ranges from one year to the next.

During the spring breeding season, males gather together to perform courtship displays on areas called “leks”. The peak of breeding in Wyoming is usually in early April. A very small number of dominant males account for a majority of breeding on each lek. After being bred, females typically select a nest site under sagebrush cover and lay from 7-9 eggs that hatch after 25-27 days of incubation. Hens rear their broods in the vicinity of the nest for the first few weeks. Forbs (broad-leafed, flowering plants) and insects are required food items at this time. As summer progresses hens with chicks move to wetter areas where green forbs are still present. During winter the birds feed solely on sagebrush that must be exposed above snow.

Sage-grouse demonstrate relatively low productivity but high survival compared to most other upland game birds. Sage-grouse typically live between 1 and 4 years. Individuals up to 10 years old have been recorded in the wild. Because they are a food source for other animals, predation accounts for most sage-grouse deaths. Chick survival during the first two weeks of life usually determines whether or not the population grows. Over-winter mortality is usually low unless deep snow covers sagebrush for extended periods.

For more detailed discussions of sage-grouse biology see Chapters 3 and 4 in Knick and Connelly (2011).

### **Sage-grouse Habitat Requirements**

Sagebrush habitats are essential for sage-grouse survival. Suitable habitat consists of plant communities dominated by sagebrush and a diverse native grass and forb understory. The composition of shrubs, grasses and forbs varies with the subspecies of sagebrush, the condition of the habitat at any given location, and range site potential. Seasonal habitats must occur in a patchwork or mosaic across the landscape.

#### **Breeding Habitat (Leks) - Early Spring**

Breeding occurs on strutting grounds (leks) during late March and April. Leks are generally situated on sites with minimal sagebrush, broad ridge tops, grassy openings, and disturbed sites such as burns, abandoned well locations, airstrips or roads. Sage-grouse select spots with lower plant heights and less shrub cover than surrounding areas as lek sites (Figure 5). Leks are generally next to nesting habitat. Individual sage-grouse usually return to the same lek from year to year. As populations decrease, leks can be abandoned; however as populations increase and expand, leks can become active again.

During the breeding season, sage-grouse use the sagebrush habitat surrounding a lek for feeding, resting and protection from weather and predators. Plant composition in early spring habitat contributes to nesting success. At green-up, forbs are more nutritious than sagebrush. Sage-grouse hens need these protein, calcium, and phosphorus rich foods to support nest initiation, increase clutch size, and improve hatch success as well as early chick survival. Low growing leafy forbs, especially milky-stemmed composites (e.g. dandelion), represent potential food forbs. However, sage-grouse will eat most forb species when they are young and succulent.

**Figure 5.** Typical lek habitat of open area with sparse shrub cover surrounded by heavier sagebrush cover used for foraging and cover.



### Nesting Habitat - Late Spring

Approximately two-thirds of hens nest within 3 miles of the lek where they were bred. The remainder of the birds usually nest within 15 miles of the lek.

Sage-grouse typically nest under sagebrush, but may use other large shrubs. Sage-grouse select mid-height, denser sagebrush stands for nesting (Figure 6). Studies conducted in southern and southwestern Wyoming indicate that nest bush heights in Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) ranged between 8 to 18 inches, but rangewide studies have shown individual plants (all subspecies of *Artemisia tridentata*) utilized by sage-grouse may reach 32 inches in height. Sagebrush canopy cover at nesting sites ranged between 6% and 40%, averaging 23%. Wyoming studies indicate that when a hen chooses a nest site, she selects for areas of greater total shrub and dead sagebrush canopy cover, and residual grass cover when compared to surrounding vegetation. These sagebrush stands should have sagebrush of varying heights with good residual grass under the sagebrush canopy, and the areas between the sagebrush should have good forb cover while maintaining some grass and litter cover. Residual grass is the standing dead grass remaining from the previous year. Live grass heights measured immediately after hatch ranged between 4 and 9 inches with residual grass heights of 2 to 6 inches.

**Figure 6.** Good nesting habitat has moderate sagebrush density (ave. 23% canopy cover) with measurably greater residual grass cover and height than non-nesting habitat.



In general, nest sites with dense residual grasses at least as tall as the bottom of the canopy on mid-height sagebrush plants improve hatching success. Areas that support a diverse forb understory should be close to these nesting sites for feeding during incubation and brood-rearing. Hatching success appears to improve with increased forb cover. The vegetative composition of an area depends upon site potential, successional stage or age, and past management.

#### Early Brood-Rearing Habitat - June to Mid-July

Early brood-rearing habitats are used during the brood's first month of life. Hens move their brood immediately upon hatching from the nest site to brood-rearing areas. Sites used during the first 10-14 days after hatching are typically within 1 1/2 miles of the nest. The vast majority of chick mortality (87% of total brood loss in four studies occurring in Wyoming) occurs during this period. After the first 10 days, broods may have dispersed five or more miles from the nest.

A highly diverse vegetation mosaic is essential to early brood-rearing. Early brood-rearing habitat is more open (10-15% sagebrush canopy cover and similar sagebrush height) with higher herbaceous cover than nesting habitat (Figure 7). Brood survival is tied to an abundance of insects and green vegetation, primarily forbs, in close proximity to denser patches of sagebrush that provide protection from weather and predators. Vegetation diversity increases insect diversity. Insects are crucial during the first ten days of a chick's life. Studies suggest insects such as ants, beetles and grasshoppers can make up to 75% of chick diets. Insects remain an important source of protein throughout the summer.

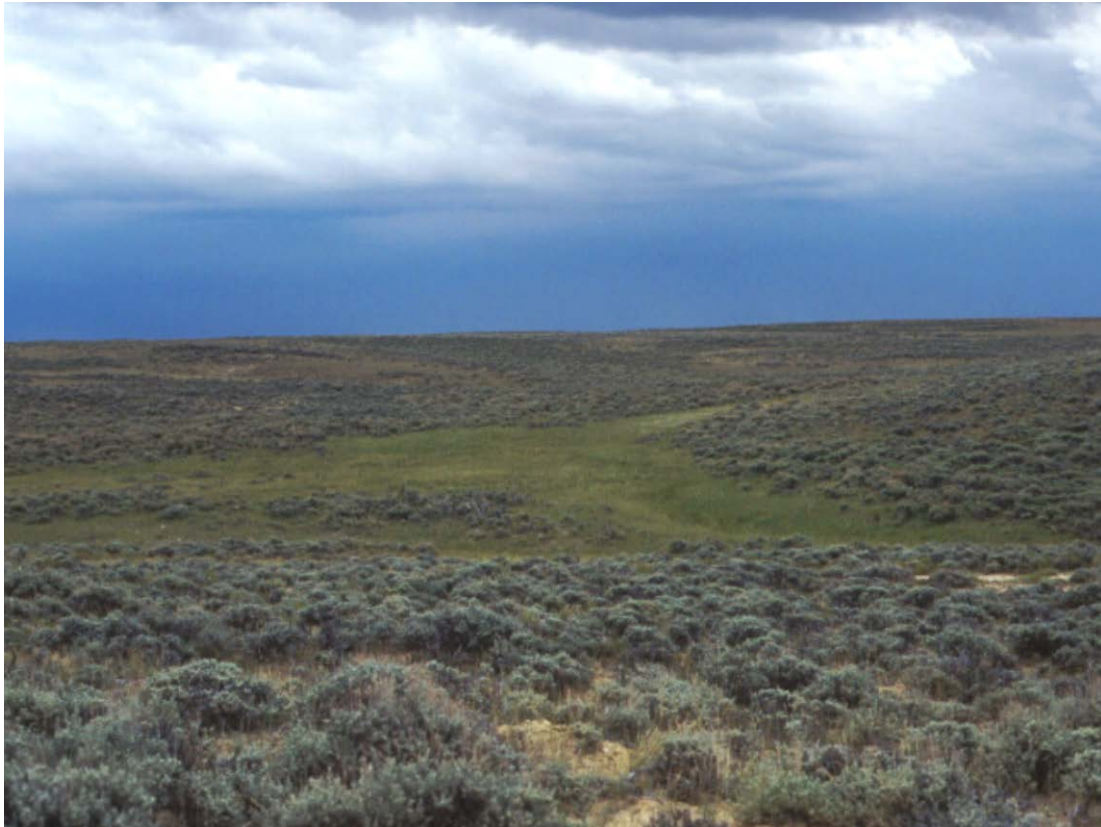
**Figure 7.** The highest quality brood-rearing habitat consists of more open sagebrush canopy (10-15%) with an abundance of forbs (flowering plants).



#### Late Brood-Rearing Habitat - Mid-July through Mid-September

As summer progresses and food plants mature and dry, sage-grouse move to areas still supporting succulent herbaceous vegetation. These areas may be lower elevation native (Figure 8) or irrigated meadows. Sage-grouse will also migrate to higher elevations, seeking habitats where succulent forbs are still available in sagebrush habitats or sites such as moist grassy areas, or upland meadows. A delay in maturing of forbs has a noticeable effect on bird movements. In years with above-normal summer precipitation, sage-grouse may find succulent forbs on upland sites all summer. In more arid areas, riparian meadows become more important to survival of broods in the late summer. From mid to late summer, wet meadows and riparian habitat along springs and streams are the primary sites that produce the forbs and insects necessary for juvenile birds. The drier the summer, the more sage-grouse are attracted to the remaining green areas. They continue to rely on adjacent sagebrush for protection from weather and predators, and for roosting and loafing.

**Figure 8.** Typical late brood-rearing habitat on native range.



#### Fall Habitat - Mid-September to First Major Snow

Time spent in fall habitat is highly dependent upon weather conditions. Sage-grouse normally move off late brood-rearing habitat onto transitional fall habitat before moving onto winter range. As fall precipitation increases and temperatures decrease, sage-grouse move into mixed sagebrush-grassland habitats in moist upland and mid-slope draws where fall green-up of cool-season grasses and some forbs occur. As the meadows dry and frost kills forbs, sagebrush consumption increases. Fall movements to winter ranges are slow and meandering from late August to December. With major snowfall accumulation, sage-grouse move onto winter range.

#### Winter Habitat

Movements to wintering areas vary widely ranging from a few miles to over 50 miles, depending on the area. Sage-grouse feed almost exclusively on sagebrush leaves and buds during winter. Suitable winter habitat requires sagebrush above snow (Figure 9). Sage-grouse tend to select wintering sites where sagebrush is 10-14 inches above the snow. Sagebrush canopy cover above the snow may range from 10 to 30 percent. Feeding areas tend to be gentle southwest facing slopes or on ridges where sagebrush height may be less than 10 inches but the snow is routinely blown clear by wind. Sage-grouse roost in open, low sagebrush sites on clear, calm nights. During windy periods or during snowstorms they seek taller shrubs with greater canopy cover.



Sage-grouse will also burrow in deep powdery snow to conserve energy. Under severe winter conditions grouse will often be restricted to tall stands of sagebrush often located on deeper soils in or near drainage basins. Under these conditions winter habitat may be limiting. During normal to severe winters, the amount of suitable available habitat is greatly reduced in much of Wyoming. But where suitable habitat exists, winter is not usually limiting to sage-grouse. In fact, sage-grouse typically gain weight over winter due to the high protein content of the sagebrush they consume.

**Figure 9.** Winter habitat must have adequate sagebrush exposed above the snow.



### Across the Landscape

Providing for all habitat needs on the scale required by sage-grouse may be the most challenging element of managing the landscape. The value of the various successional stages of sagebrush communities to sage-grouse is not well understood. Therefore there is debate about how they should be managed to maximize benefits to sage-grouse. There is also a need to identify structure and cover components. These challenges are greatest in breeding (pre-nesting, nesting and early brood-rearing) habitats. These habitats have to be in proximity to one another and constitute a small-grained mosaic of seral stages (age/succession) and vegetation structure (height and cover). All habitat types are important, and an overabundance of one type will not make up for a lack of another. For example, managing for a late-seral stage on a landscape scale will not necessarily provide for early brood-rearing habitat, and conversely managing for early seral sagebrush habitats on a large scale usually fails to provide the nesting and security cover needs of sage-grouse.

Because leks have been shown to be reliable indicators of nesting habitat, it is suggested that habitat assessment focus on nesting and early brood-rearing habitat associated with leks. Landscape scale is highly variable because the landscape may contain migratory or resident populations, or both.

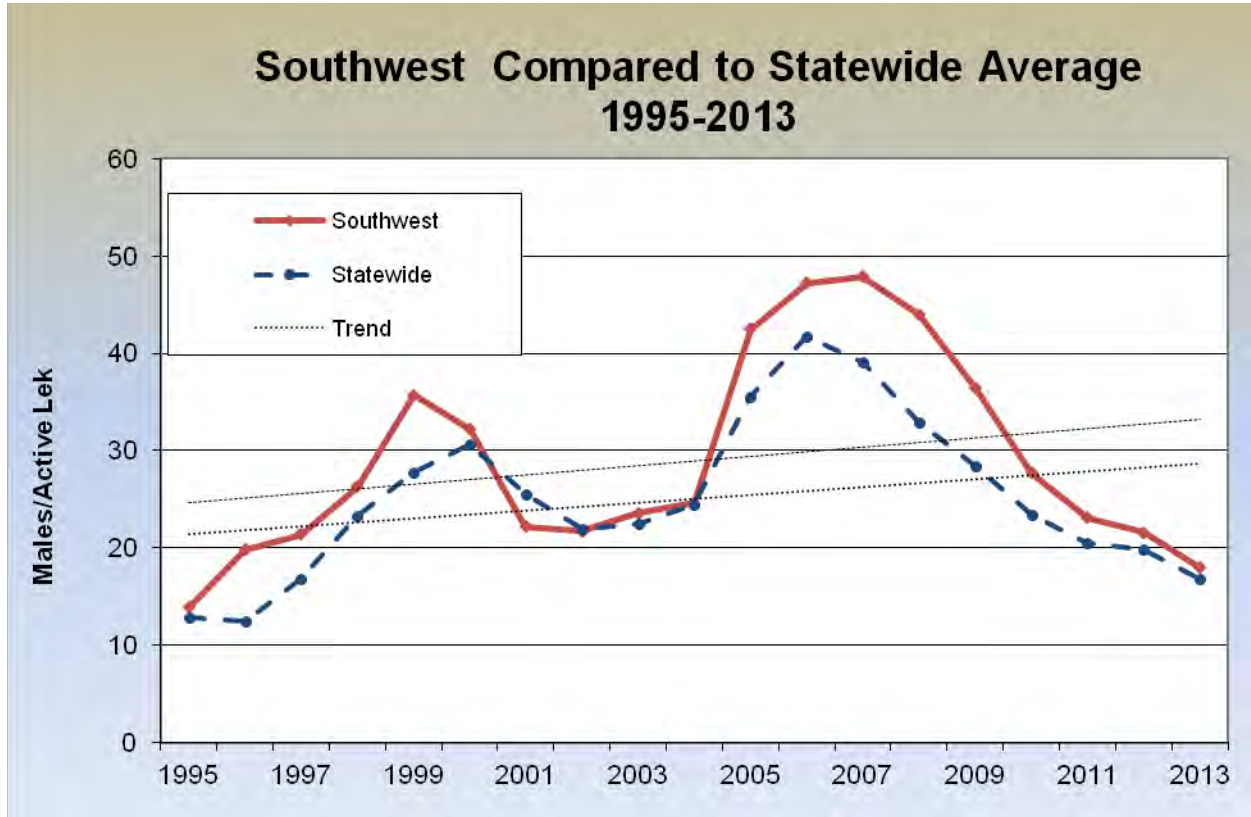
It is assumed that, if upland vegetation is managed at a variety of early, mid, and late seral stages at the landscape scale, the area will provide sage-grouse with the variety of habitats required annually. Issues relating to the landscape scale habitat needs of sage-grouse must consider seasonal habitat (pre-nesting, nesting, early brood-rearing, late brood-rearing, fall, and winter), juxtaposition, seral stages of vegetation, site potential, vegetative structure, and past and future management. The ideal or required percentages of each seasonal habitat and the juxtaposition of these habitats on the landscape are not well known.

### **Sage-Grouse Population Trend in the SWSGCA**

The population trend for the SWSGCA is shown in Figure 10. Recent analyses suggest grouse populations are cyclic. While weather and climate undoubtedly influence sage-grouse population cycles such influences have not been quantified and factors other than weather (predation, parasites) may also play a role. It is important to acknowledge and control for the cyclic nature of sage-grouse when conducting impact studies and monitoring grouse response to management.

Sage-grouse populations across Wyoming suffered in 2012 from the hottest and driest year in 118 years of weather records. Chick production, as monitored by hunter harvested wings, was very low (0.8 chicks:hen) in 2012. Preliminary 2013 lek monitoring results suggest that sage-grouse populations across the state declined in 2012 but are still above those documented in the mid-1990s when average lek size was at historic lows. For the latest sage-grouse population data pertinent to the SWSGCA (“Southwest Sage-Grouse Annual Job Completion Reports”) please visit the WGF D website at: <http://wgfd.wyo.gov/web2011/wildlife-1000496.aspx>

**Figure 10.** Greater Sage-grouse male lek attendance for the SWSGCA, 1995-2013



## Conservation Strategy

### The Wyoming Core Area Strategy

In July 2007 Wyoming Governor Freudenthal convened a sage-grouse summit and created an implementation team to develop a conservation strategy to manage sage-grouse to prevent listing under the Endangered Species Act and retain State authority in management decisions. The Wyoming Core Population Area Strategy (WCAS) was developed by the Wyoming Governor's Sage-grouse Implementation Team. The strategy identified the most important sage-grouse habitat in Wyoming using a lek density map which showed areas of the state which supported the highest densities of breeding activity from 2005 thru 2007. The initial mapping effort identified areas of "core" habitat which supported 80% of the state's breeding sage-grouse. This area amounted to approximately 15 million acres or about 24% of the state.

The Governor issued an Executive Order 2008-2 in August 2008 outlining the WCAS with 21 recommendations that conserve Wyoming's most important sage-grouse habitats while allowing for natural resource development outside core areas. Statewide, core areas accounted for approximately 34% of the current sage-grouse range while encompassing leks with 81% of the 2008 breeding birds.

Following the March 2010 listing decision of “warranted, but precluded” by the USFWS, Governor Freudenthal asked the Sage-grouse Implementation Team to revisit the WCAS. The group’s three tasks were to review core area boundaries, review development guidelines inside and outside core habitats, and identify connectivity areas to ensure movement corridors between populations to preserve genetic integrity. At the request of the Sage-grouse Implementation Team, the eight local working groups held meetings to review core area boundaries and make adjustments based on finer scale mapping of existing and planned development, unsuitable habitat, seasonal habitat data and connectivity between core areas. At present, the SWSGCA encompasses approximately 7.83 million acres, with approximately 7.48 million acres of occupied sage-grouse habitat (96% of the CA area), and 3.01 million acres of Core Area habitat (40% of the occupied sage-grouse habitat in the SWSGCA).

Following the core area revisions (Figure 11), Governor Freudenthal signed Executive Order 2010-4 which updated Wyoming’s core area strategy as the framework to guide Wyoming sage-grouse management.

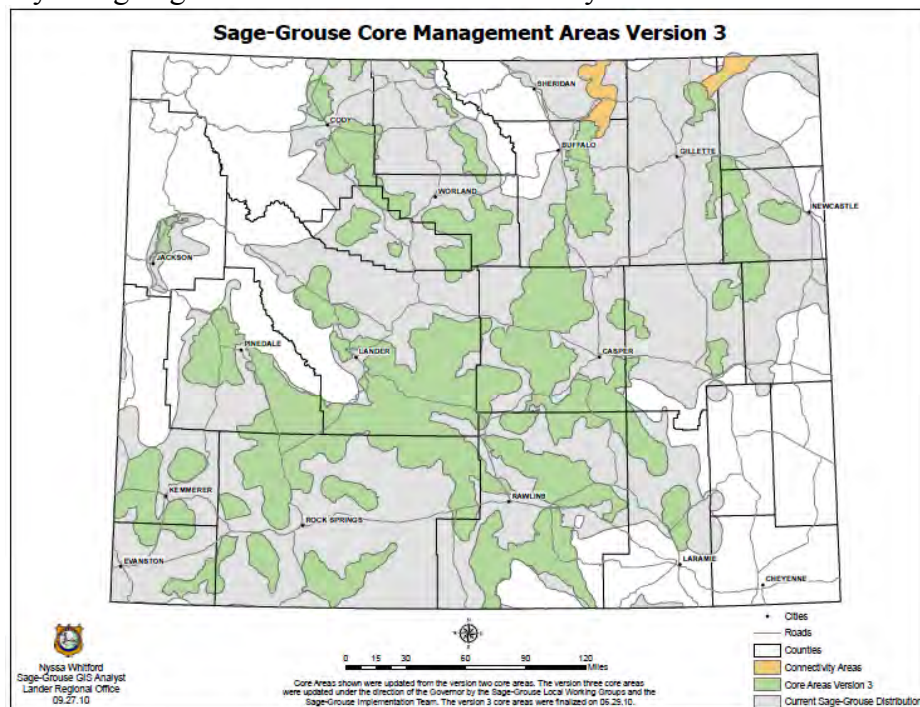
Subsequent to the 2010 gubernatorial election, Governor Mead signed a 2011 version of the Executive Order (2011-5), reiterating and clarifying WCAS. In June 2011 the USFWS wrote in a letter to Governor Mead, “In summary, the Service believes the Greater Sage-grouse Core Area Protection provides an excellent model for meaningful conservation of sage-grouse if fully supported and implemented. We believe that when fully realized, this effort could ameliorate many threats to the Greater Sage-grouse in Wyoming.”

The Bureau of Land Management (BLM) is working to adopt Wyoming’s Core Area Strategy into their local Resource Management Plans (BLM RMPs). The BLM’s process for accomplishing this is described below.

With this document the Southwest Local Working Group formally accepts and endorses the Wyoming Core Area Strategy and its adoption by managers and regulators as the primary mechanism by which the identified threats of habitat loss and fragmentation and the inadequacy of regulatory mechanisms should be addressed.

The current Executive Order and associated documents are too large to append to this document and subject to regular revision and further clarification. All of the documents associated with the Executive Order and WCAS can be viewed and downloaded from the Wyoming Game and Fish Department website: <http://wgfd.wyo.gov/web2011/wildlife-1000817.aspx> .

**Figure 11.** Wyoming Sage-Grouse Core and Connectivity Areas.



### **Prioritization of Issues**

Following various presentations and review of materials provided to the SWLWG during the preparation of this plan, the SWLWG identified and discussed each of the 14 management issues listed in the State Plan (WGFD 2003). The SWLWG separated Conflicting Wildlife Management Goals and Conflicting Wild Horse Management Goals as two distinct issues, separated Minerals and Mining Development from Energy Development, making them two separate issues and added wind energy to Energy Development. Three new issues were added: Wildfire, Transportation Corridors and Water Development/Management. Minor changes were made to the titles assigned in the State Plan (changed “Residential” to “Urbanization” and changed “Pesticides” to “Contaminants/Pesticides”).

On January 21, 2005, the group ranked all 18 issues on a high-medium-low ranking system. The rankings were reviewed and reaffirmed on April 27, 2007. In December 2012, the group again reviewed its rankings (Table 3). Changes made include moving wildfire from a low priority to a high priority, moving farming from a high priority to a medium priority and renaming “Transportation” to “Utility Corridors and Highways”. The issues are in no particular order within the columns. Priority ranking of each issue was established by the SWLWG to reflect group consensus based on information presented and long debate. Details, per each issue, are presented below. The group understands that some rankings may be contested and encourages comment and debate as well as continuous evaluation of the rankings over time.

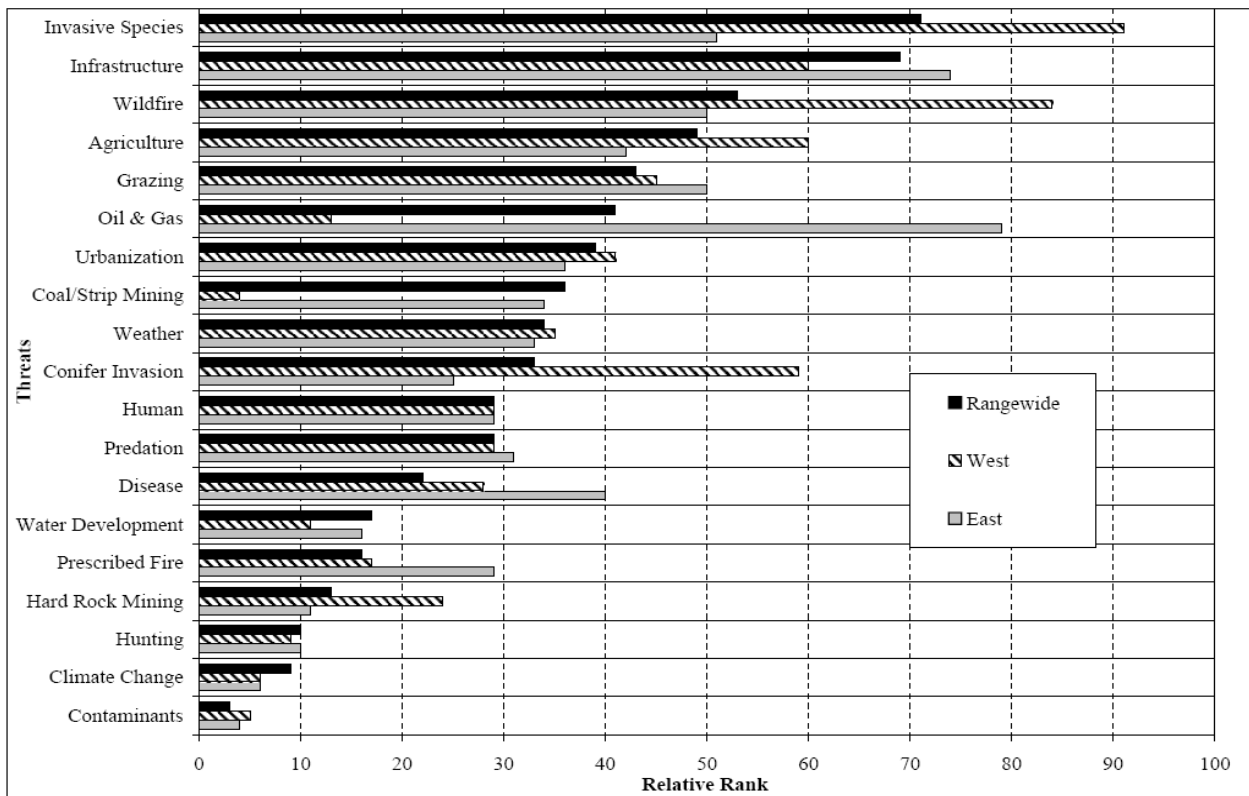
Included in the SWLWG deliberations was a review of a similar ranking of threats to sage-grouse developed by an expert panel convened by the USFWS in 2004 as the USFWS evaluated whether or not sage-grouse should be classified as threatened or endangered under the

Endangered Species Act. The panel consisted of experts in sage-grouse biology and ecology, sagebrush community ecology, and range ecology and management. One of the tasks of the panel was to identify threats to the species and its habitat (Figure 12). To better understand the impact of these threats they were ranked within each of three different geographical areas of sage-grouse range in the United States: eastern, western and rangewide. All of Wyoming was included in the eastern portion. While the rankings reflect the opinion of experts in sage-grouse and sagebrush ecology, they were identified at large scales. These rankings are not assumed to be applicable to every location. Therefore it is very important to use local information, as we have done, when planning conservation efforts. However, when the SWLWG priority rankings are compared to those of the “expert panel” for the eastern portion of sage-grouse range there is broad agreement. Of the SWLWG’s nine high priority issues, six were in the expert panel’s top nine. Of the SWLWG’s three low priority issues, two were also in the expert panel’s bottom three. Not all of the issues ranked were the same, for example vegetation management, wildlife and wild horses were not treated as individual issues by the expert panel as they were by the SWLWG. But in general the two rankings were similar. There was one exceptions of note: the SWLWG ranked water development as a high priority whereas the expert panel ranked it in their lower third. The rationales for the SWLWG rankings are outlined within the discussions of the issues below.

**Table 3.** SWLWG priority ranking of issues affecting sage-grouse in the SWSGCA.

| <b>HIGH PRIORITY</b>   | <b>MEDIUM PRIORITY</b>  | <b>LOW PRIORITY</b>                |
|--|---|------------------------------------|
| Energy Development<br>Water Development/Mgt<br>Invasive Plants<br>Urbanization<br>Recreation<br>Vegetation Management<br>Livestock Grazing<br>Utility Corridors<br>Roads and Travel Management<br>Wildfire | Wildlife Management<br>Wild Horse Management<br>Minerals/Mining<br>Parasites and Disease<br>Predation<br>Weather<br>Farming | Contaminants/Pesticides<br>Hunting |

**Figure 12.** Threats to sage-grouse as ranked by an expert panel convened by the U.S. Fish & Wildlife Service in 2004. The rationale for these rankings can be found in the final listing decision document (U.S. Fish & Wildlife Service, 2005).



**Key:**

- Wyoming is in the “east” portion of the range.
- Infrastructure includes fences, roads, powerlines, communication towers, and pipelines, developed for any purpose.
- Agriculture includes activities primarily associated with farming.
- Grazing includes all activities primarily associated with grazing.
- Weather refers to short time events, including but not limited to late season snowstorms, drought, etc. Climate change refers to long-term, permanent weather changes, usually occurring over a period of 100 years or more.
- Conifer invasion primarily refers to pinyon/juniper.
- Human refers to an increased human presence in sagebrush ecosystems from recreational, residential, and resource development activities.

**National Conservation Objectives Team (COT) Report 2013**

In December 2011, Wyoming Governor Matt Mead and Secretary of the Interior Ken Salazar co-hosted a meeting to address coordinated conservation of the Greater Sage-grouse (sage-grouse) across its range. Ten states within the range of the sage-grouse were represented, as were the U.S. Forest Service (FS), the Natural Resources Conservation Service (NRCS), BLM and USFWS. The primary outcome of the meeting was the creation of a Sage-Grouse Task Force (Task Force) chaired by Governors Mead (WY) and Hickenlooper (CO) and the Director of the BLM. The Task Force was directed to develop recommendations on how to best move forward

with a coordinated, multi-state, range-wide effort to conserve the sage-grouse, including the identification of conservation objectives to ensure the long-term viability of the species.

The USFWS was tasked by its Director with the development of conservation objectives for the sage-grouse. Recognizing that state wildlife agencies have management expertise and retain management authority for this species, the USFWS created a Conservation Objectives Team (COT) of state and USFWS representatives to accomplish this task. Each member was selected by his or her state or agency. Bob Budd was the Wyoming representative to the COT. The purpose of the COT was to develop conservation objectives by defining the degree to which the threats need to be reduced or ameliorated to conserve the sage-grouse so that it is no longer in danger of extinction or likely to become in danger of extinction.

In summary, the report prepared by the COT (U.S. Fish and Wildlife Service 2013) listed energy development, infrastructure, improper livestock and/or wildlife grazing practices and recreation as broadscale threats to sage-grouse in the Wyoming portions of the Wyoming Basin Management Zone with localized threats being sagebrush elimination, fire, conifer encroachment, weeds/annual grasses, mining, feral/wild horses, and urbanization. The report estimated a 10.7% probability of the subpopulation of breeding birds declining below 500 by 2107. This figure is the second lowest probability of a decline to this level for any population/sub-population across the range of Greater Sage-grouse. The Southwest planning area lies within this unit and this Conservation Plan as updated in 2013, and the WCAS (described below) has implemented management actions and projects designed to address the issues (Table 3).

The General Conservation Objectives identified by the COT are:

1. Stop population declines and habitat loss.
2. Implement targeted habitat management and restoration.
3. Develop and implement state and federal sage-grouse conservation strategies and associated incentive-based conservation actions and regulatory mechanisms.
4. Develop and implement proactive, voluntary conservation actions.
5. Develop and implement monitoring plans to track the success of state and federal conservation strategies and voluntary conservation actions.
6. Prioritize, fund and implement research to address existing uncertainties.

Additionally the report identified many Specific Conservation Objectives relative to identifying “Priority Areas for Conservation” (synonymous with Wyoming “Core Areas”) as well as threat reduction objectives and conservation measures to accomplish those reductions. The SWLWG has sought to make this conservation plan revision consistent with these general and specific objectives. The SWLWG encourages users of this plan and the WCAS also to review and use the COT Report.



## **Threat Summary**

After considering these threat rankings, the SWLWG developed three major conservation goals (below), numerous issue-oriented sub-goals and Recommended Management Practices (RMPs) and specific actions designed to meet the purpose and mission of the working group.

RMPs are those that are most appropriate in a certain set of conditions. The user determines the relevance and appropriateness of the RMP, which may require modification to meet site-specific conditions. **RMPs are not implied regulations although some are based on current regulation or policy.** The SWLWG does not have the authority to enforce implementation of RMPs but some may become future policy via established agency procedures outside the authority of the SWLWG.

Finally, the SWLWG recognizes that sage-grouse conservation efforts across the range, while unprecedented in terms of a broad scale conservation effort aimed at a single species, have been criticized in the past as being “a thousand random acts of conservation”. The SWLWG acknowledges this criticism and, with this document, hopes to better focus conservation efforts toward identified threats and programmatic management actions. Implementation of the WCAS, the BLM Resource Management Plan sage-grouse amendments, and the NRCS Sage-Grouse Initiative are efforts that directly address the issue at local, state, regional and rangewide scales. Additionally, the SWLWG is attempting to focus its funding toward on-the-ground projects consistent with the larger scale policies and applied research that has a high probability of producing results that meaningfully inform future policy, management decisions and conservation actions.

### **OVERALL CONSERVATION GOALS OF THE SOUTHWEST SAGE-GROUSE CONSERVATION PLAN:**

- 1. HABITAT: Maintain, enhance, and/or restore quality habitat for sage-grouse in southwest Wyoming.**
- 2. POPULATION: Maintain and enhance sage-grouse populations in southwest Wyoming.**
- 3. MONITORING, RESEARCH & EDUCATION: Better understand the dynamics of sage-grouse populations and their habitats through monitoring, research and education.**

The need for public education was identified as a sub-goal common to all of the issues discussed below. Rather than repeat the education sub-goals in each issue section they are listed here as “common to all”.

#### **Education Sub-Goals:**

1. Promote public education on sage-grouse issues. Educate elected officials and the public about the importance of wildlife and its habitat and about strategies that can be used to improve or maintain sage-grouse habitats.
2. Develop and distribute educational materials regarding sage-grouse to developers, planners, landowners and government officials.

## **Issues, Sub-Goals, Commitments, Recommended Actions and RMPs**

### **Issue: Energy Development (oil/gas/wind/solar)**

The discovery and development of oil, natural gas, coal bed natural gas and wind energy resources throughout the western United States has impacted habitat and has been identified as a potential causative agent in declining sage-grouse populations. There is increasing demand for energy resources from the Rocky Mountain West, specifically in areas dominated by sagebrush-steppe communities. For example, according to the U.S. Energy Information Administration, natural gas production in the U.S. is expected to increase by about one-third between 2011 and 2040 therefore impacts from these operations are expected to continue.

The Record of Decision for the Oil Shale/Tar Sands Environmental Impact Statement, which covers Wyoming, Colorado, and Utah, was issued in 2013. The decision included a provision that development in Wyoming would have to be consistent with the WCAS. At this time, there are no proposals for developments within the area covered by the SWLWG.

The various types of energy development operations are managed pursuant to a wide array of state and federal statutes and regulations, each with specific provisions that may or may not be flexible. No single set of BLM Best Management Practices (BMPs) for sage-grouse will work for all forms of energy development, therefore, flexibility and a familiarity with the applicable and appropriate controlling regulations are necessary to adapt these operations to provide for the needs of the grouse. Local working groups must work with energy development and transmission companies to devise appropriate local solutions. The selection and implementation of BMPs will also need to be approved by the surface management agency, and the state regulatory agency in order to be successful. BMPs should be divided into categories that may be considered for all types of energy development and transmission including those specific to oil and gas/coal bed methane, pipelines, roads, local power lines and storage facilities.

Some potential impacts of energy development to sage-grouse include: (1) direct habitat loss and fragmentation from well, road, pipeline, transmission and power line construction, (2) alteration of plant communities including the spread of invasive species, (3) increased human activity which could cause wildlife to avoid the area, (4) increased noise which could cause sage-grouse to avoid an area or reduce their breeding efficiency, (5) increased motorized access by the public leading to increased legal harvest of sage-grouse, as well as illegal harvest of sage-grouse (6) direct mortality associated with water evaporation ponds and production pits, and (7) reduced water tables resulting in the loss of herbaceous vegetation. Many of these impacts can be

minimized by mitigation, reclamation, and planning for sage-grouse needs. Some impacts are short-term related to specific periods of activity, and some may result in positive effects such as increased forb production, habitat diversity and additional water sources. Some impacts may be long-term (30 years or more); rehabilitation of impacted habitats may take many years to complete and may never be fully restored. Technological advances, such as directional or horizontal drilling, have the potential to reduce surface disturbance and impacts to sage-grouse, if applied.

Roads built to accommodate energy exploration and development activities often result in the establishment of permanent travel routes, improved public access, increased long-term traffic related disturbance, indirect noise impacts and direct mortality. Research suggests that road-related disturbances during the breeding season may cause sage-grouse leks to become inactive over time, reduce the number of hens bred on disturbed leks that initiate nests, and increase the distance from the lek hens will move to their nesting habitat. Dust from roads and other surface disturbances can adversely affect plants and animals. Local power line construction does not cause direct habitat loss, but sage-grouse tend to avoid areas associated with these lines (as they provide potential raptor perch sites), thus resulting in an indirect loss of habitat in the vicinity of overhead lines. The potential effects of noise on sage-grouse include masking sounds that influence courtship, mate selection, grouping, escape, etc. Research into these subjects is ongoing.

This projected increase in demand for energy resources is affecting the SWSGCA. According to the National Environmental Policy Act registers for the Rock Springs and Kemmerer Field Offices of the BLM, approximately 75% of individual actions for both offices in 2012 were energy related. Wind energy developments and large-scale natural gas projects are in progress throughout the region, with both BLM offices considering even larger proposed actions.

The Rock Springs Field Office (RSFO) has initiated the Hiawatha Regional Energy Development Environmental Impact Statement, a proposal for over 4,000 conventional natural gas wells and associated infrastructure in the southern portion of the Field Office area. The RSFO has received preliminary notification of pending proposals that may represent up to 600 additional wells throughout the area. Shallow gas (coalbed) potential is discussed below. The Kemmerer Field Office (KFO) is currently analyzing the 1,800 well Moxa Arch Infill Gas Development Project. The KFO is also reviewing exploratory proposals such as the Bear Canyon project, and monitoring existing development from the Fontenelle area south to Interstate 80.

Both offices continue to process numerous proposals for pipelines, transmission lines and access roads. BLM resource specialists in the KFO and RSFO are also reviewing alternatives in the preliminary draft of the West Wide Energy Corridor proposal, an action mandated by the 2005 Energy Act to designate corridors for electrical transmission and pipelines.

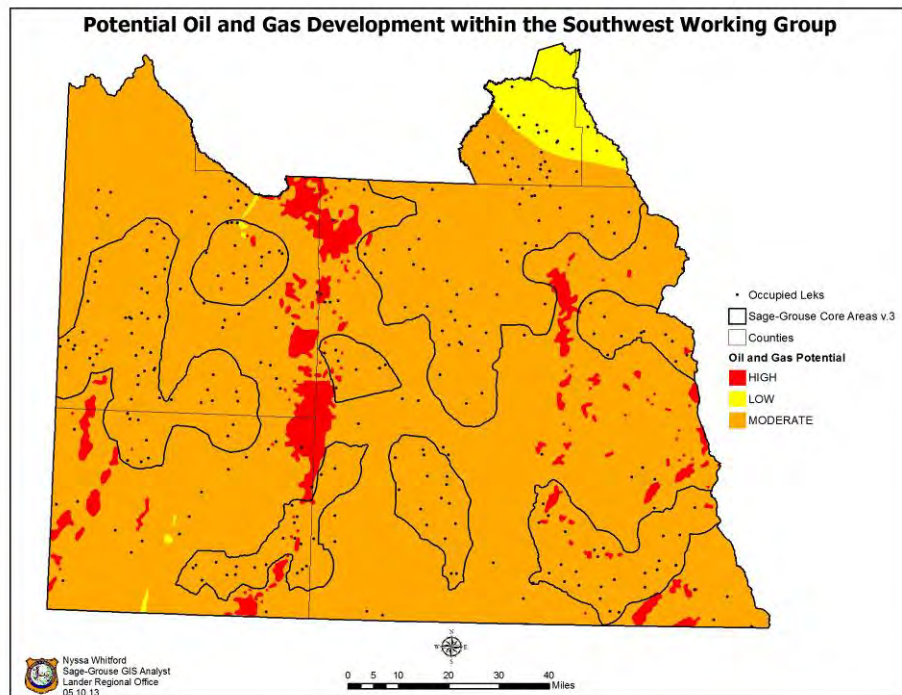
Presently, land use activities within the BLM's Rock Springs, Pinedale and Kemmerer Field Offices may be authorized with seasonal and/or distance restrictions for sensitive and crucial habitats. Currently, these three field offices have different timing limitation stipulations that cover the critical life stages of certain species during different times of the year. For sage-grouse,

the BLM Resource Management Plans provide timing and/or distance stipulations for various projects. On February 10, 2012, the Wyoming BLM State Office issued an instruction memorandum to guide sage-grouse management while the BLM RMPs are updated. This IM (WY-IM-2012-019) provides consistency and guidance for all Wyoming BLM field offices to follow for distance and timing restrictions for various projects. This IM follows the Wyoming Governor's Executive Order (EO 2011-5 and EO 2013-3) for protecting sage-grouse inside and outside of core habitats. Currently, the BLM is working on revising all Resource Management Plans across the west to provide greater protection measures and potentially avoid listing the species as threatened or endangered. The Environmental Impact Statement for the Wyoming Resource Management Plan revision is scheduled to be in draft and available for comments in the fall of 2013. The record of decision is scheduled to be released during the fall of 2015.

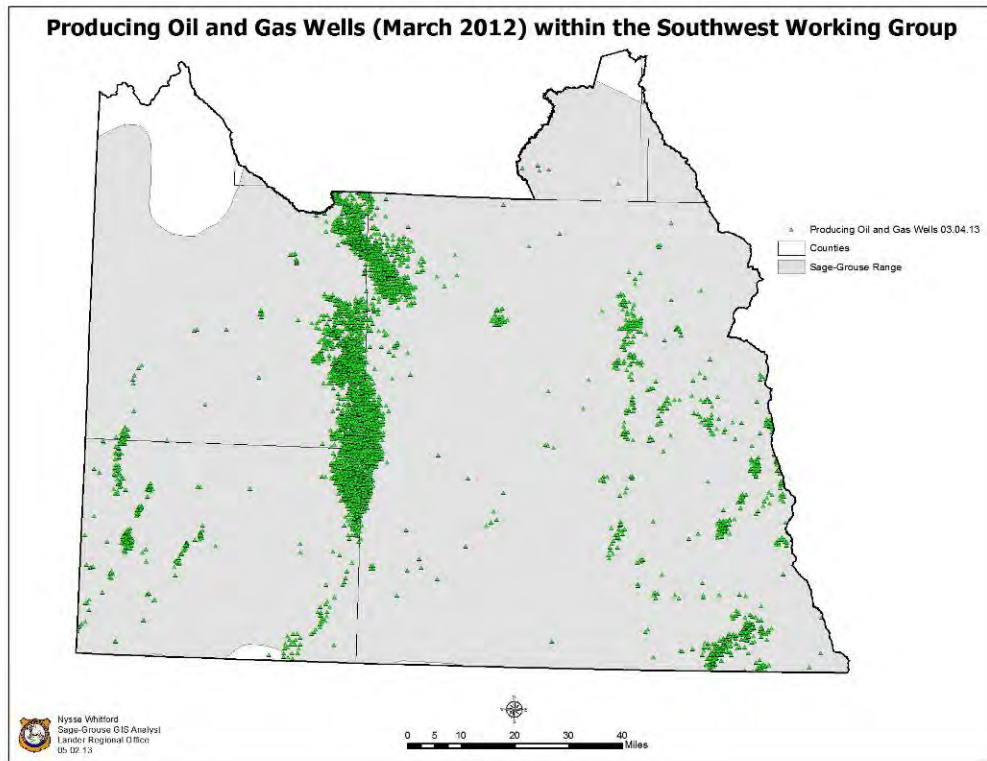
The current and future of coal bed natural gas drilling potential in the SWSGCA is currently low and appears to be tied to problems associated with high rates of water production, low rates of gas production, and water disposal issues. Very little interest in additional coal bed natural gas drilling is indicated by active operators in the SWSGCA. Although an increase in oil and gas prices and/or development of new technologies may increase interest in drilling for coalbed natural gas.

See Appendix III for a summary of research related to energy development impacts to sage-grouse.

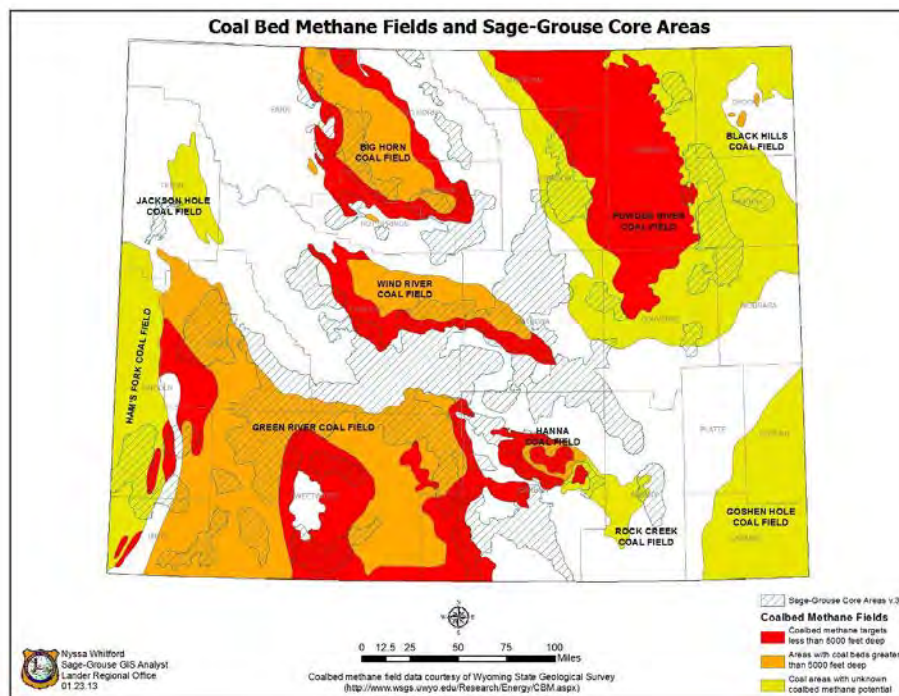
**Figure 13.** Potential oil and gas development within the SWSGCA.



**Figure 14.** Producing oil and gas wells within the SWSGCA (as of March 2012).



**Figure 15.** Coal bed methane potential and sage-grouse core areas in Wyoming.



## Wind Energy Development

Wind energy development, unlike drilling for oil & gas, has no “life-of-project”. The production impacts will continue indefinitely, with periodic disturbance to replace or upgrade turbines and towers and the maintenance of transmission facilities. Wind energy access roads will need to be retained indefinitely for maintenance, and periodically improved to allow access for activities described above. Surface disturbance is essentially permanent. In addition, more research is needed to determine impacts to sage-grouse.

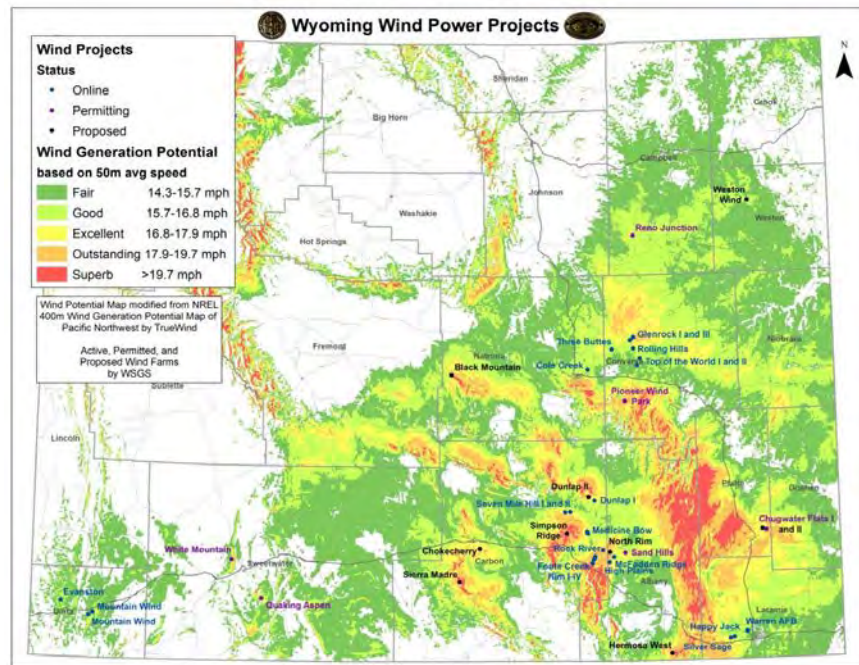
Numerous wind energy projects have been proposed throughout the SWSGCA. Most of these are in the permitting/evaluation stage. There are operational wind developments on private land within the checkerboard on the Bear River Divide northeast of Evanston and on Bigelow Bench between Evanston and the Bridger Valley.

Wyoming currently ranks tenth in the nation for overall installed wind capacity and has the eighth highest potential for wind energy resources (Figure 16). From 2000 to 2010, the amount of wind energy installed in Wyoming increased from 90 MW to 1,412 MW and wind energy now comprises over 5 percent of electricity generated in the state. The existing and proposed commercial wind farms within the Southwest Sage Grouse Working Group’s region are summarized in Table 4.

**Table 4.** Existing and proposed wind energy developments within the SWSGCA.

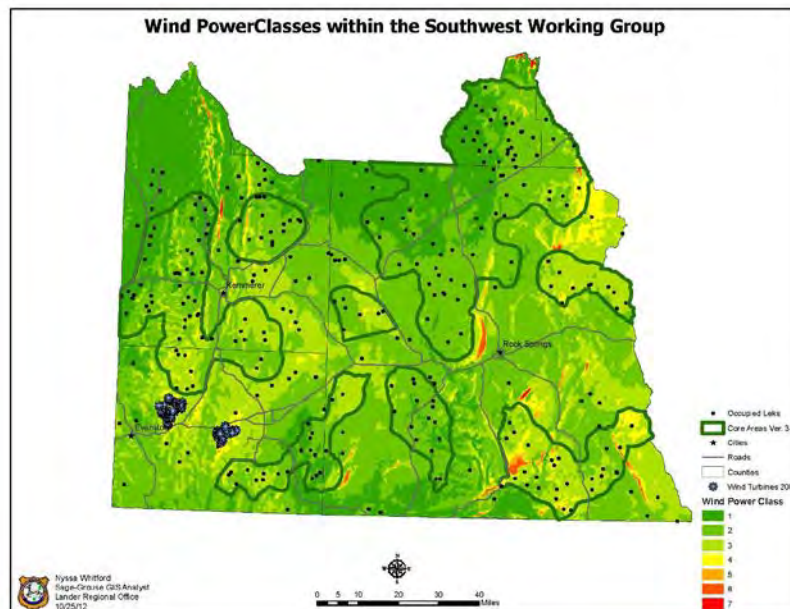
| Existing Wind Farms within the Southwest Wyoming Sage Grouse Working Group Area (Dec. 2011) |                          |               |                 |            |
|---|--------------------------|---------------|-----------------|------------|
| Name  | Owner                    | Capacity (MW) | No. of Turbines | County     |
| WY Wind Energy Center   | FPL Energy WY Wind LLC   | 144.0         | 80              | Uinta      |
| Mountain Wind   | Edison Mission Group     | 140.7         | 67              | Uinta      |
|   |                          |               |                 |            |
|   |                          |               |                 |            |
| Proposed Wind Farms within the Southwest Wyoming Sage Grouse Working Group Area (Dec. 2011) |                          |               |                 |            |
| Name  | Owner                    | Capacity (MW) | No. of Turbines | County     |
| Quaking Aspen   | Evergreen Wind Power LLC | 250.0         | 100             | Sweetwater |
| White Mountain Wind   | Tasco Engineering        | 360.0         | 240             | Sweetwater |
|   |                          |               |                 |            |
|   |                          |               |                 |            |
| Source of Table: Wyoming Geological Survey web site – October 2012                          |                          |               |                 |            |

**Figure 16.** Existing and proposed wind energy developments and wind potential in Wyoming.



While the SWSGCA does not represent the best wind resources in Wyoming, Figure 17 clearly shows existing developments and potential for additional development.

**Figure 17.** Wind power classes and existing wind turbines within the SWSGCA.



## **Wind Energy Policies and Regulations:**

Where proposed wind energy projects involve federal land ownership, the permitting of such projects are primarily coordinated through the National Environmental Policy Act with state and local governments participating as cooperating agencies.

In 2010, the State of Wyoming enacted Wyoming Statute 18-5-501 et seq. This statute requires all proposed wind energy facilities containing 30 or more turbines to obtain both county and Wyoming State and Industrial Siting Council permits; and, it requires proposed wind energy facilities containing fewer than 30 turbines to obtain county permits. When there are fewer than 30 proposed turbines, a county may refer the proposed wind energy facility application to the Industrial Siting Council for its review and approval. In all cases, regardless the number of turbines, proposed wind energy facilities must comply with Wyoming Statute 18-5-502(a), which states *“It is unlawful to locate, erect, construct, reconstruct or enlarge a wind energy facility without first obtaining a permit from the board of county commissioner in the county in which the facility is located.”*

In Lincoln and Uinta Counties, prior to construction, a commercial wind farm must first obtain a County permit that complies with state regulations and provides for health, safety and environmental protections. The wind energy regulations of these counties provide opportunities for each county to evaluate the impacts of a proposed commercial wind farm on wildlife and to require mitigating measures.

In regards to managing commercial wind farms in relationship to sage grouse core areas, Wyoming Governor’s EO-2011-5 states: “Wind Energy Development is not recommended in sage grouse core areas, but will be reevaluated on a continuous basis as new science, information and data emerges.” Sweetwater County’s regulations, approved in August 2013, prohibit wind energy development within sage-grouse core areas.

Outside of sage grouse core areas, EO-2011-5 does not discourage commercial wind energy facilities.

## **Solar Energy Development**

On August 30, 2012, a presidential executive order was signed. The Executive Order – “Accelerating Investment in Industrial Energy Efficiency” provides direction for the future of energy development in the United States. It provided a goal of deploying 40 gigawatts of new, cost effective industrial Combined Heat and Power (CHP) in the United States by the end of 2020. It also provided incentives to the deployment of CHP and other types of clean energy, such as set asides under emissions allowance trading program state implementation plans, grants and loans.

As part of the President’s energy strategy to expand domestic energy production, the Secretary of the Interior finalized a program for spurring development of solar energy on public lands in six western states on October 12, 2012. The Programmatic Environmental Impact Statement for solar energy development provides a blueprint for utility-scale solar energy permitting in



Arizona, California, Colorado, Nevada, New Mexico and Utah by establishing solar energy zones with access to existing or planned transmission, incentives for development within those zones, and a process through which to consider additional zones and solar projects. Wyoming is not currently within one of the established solar energy zones. If solar were to be permitted in southwest Wyoming, it could reduce sagebrush habitat.

### **Energy Development - Habitat Sub-Goals**

1. Minimize negative impacts of exploration and/or development of natural resources for energy development on sage-grouse habitats by adhering to WCAS as defined by Wyoming EO-2011-5 (as updated) and BLM planning documents.
2. Ensure timely and effective reclamation that restores or improves sage-grouse habitats.
3. Leave intact crucial habitats for sage-grouse with no development as consistent with the Wyoming Core Area Strategy.

### **Energy Development - Research Sub-Goals**

4. Determine cause and effect relationships between forage, drought, multiple uses and sage-grouse recruitment.
5. Further studies should be conducted to assess the impacts of wind energy that may or may not be disruptive to sage-grouse.
6. Reclamation projects should include research to identify/cultivate/make commercially available drought tolerant species, especially forbs.

### **Energy Development Recommended Management Practices**

1. Minimize roads and consolidate transportation corridors.
2. Implement effective timing and distance stipulations to protect sage-grouse from surface disturbing activities.
3. Combine tank batteries and other facilities.
4. Utilize directional drilling whenever feasible.
5. Apply offsite mitigation when necessary.
6. Utilize weed free seed mix with shrub and forb components for reclamation and treat invasive plants on disturbed areas.
7. Recommend interim reclamation to reduce long-term disturbance during production.
8. Utilize SCADA [Supervisory Control and Data Acquisition] remote well monitoring systems.
9. Leave crucial habitat intact.
10. Install anti-perch structures on any new or upgraded power lines or where appropriate.

11. Encourage compliance with conditions on federal leases and permits to promote conservation.
12. Increase enforcement of state and federal laws and regulations.
13. Emphasize wildlife protection with new employee orientation.
14. Require all equipment associated with energy development to be washed and weed free.
15. Develop water resources to benefit multiple uses (livestock/wildlife, etc.) when water is produced by the development of oil or gas wells.
16. Permanent met towers should be un-guyed and of mono pole construction.
17. Guy lines of lattice temporary met towers should have bird diverters installed in compliance with the recommendations of the WGFD or the BLM. The term limits for lattice temporary met towers should not exceed the WGFD or the BLM recommendations.
18. Developer's siting commercial wind energy facilities are encouraged to conform to the rules and regulations of all applicable governing agencies and the siting guidelines of the WGFD "Wildlife Protection Recommendations for Wind Energy Development in Wyoming," and the USFWS "Land-Based Wind Energy Guidelines."

### **Issue: Water and Riparian Resources**

Water is life. We cannot overstate the importance of water to all life, including sage-grouse. Healthy plant communities around ponds, springs, wet meadows and wetlands are especially important on southwest Wyoming because of the arid desert environments. Water developments for sage-grouse, or any animal life, can use water that is already available or harvest water that is otherwise unavailable such as with wells or catchments. Wildlife water developments, "guzzlers", are mapped in Figure 18. In many areas potential habitat is unoccupied by sage-grouse because of lack of water. Without water, we will have no sage-grouse habitat or sagebrush obligate species. However, recent research conducted in central Wyoming<sup>1</sup> suggested that man-made water improvements placed in nesting and early brood-rearing habitat were associated with high rates of nest and brood failure due to predation. The study authors suggested placing lower elevation water developments outside high quality nesting/early brood-rearing habitat.

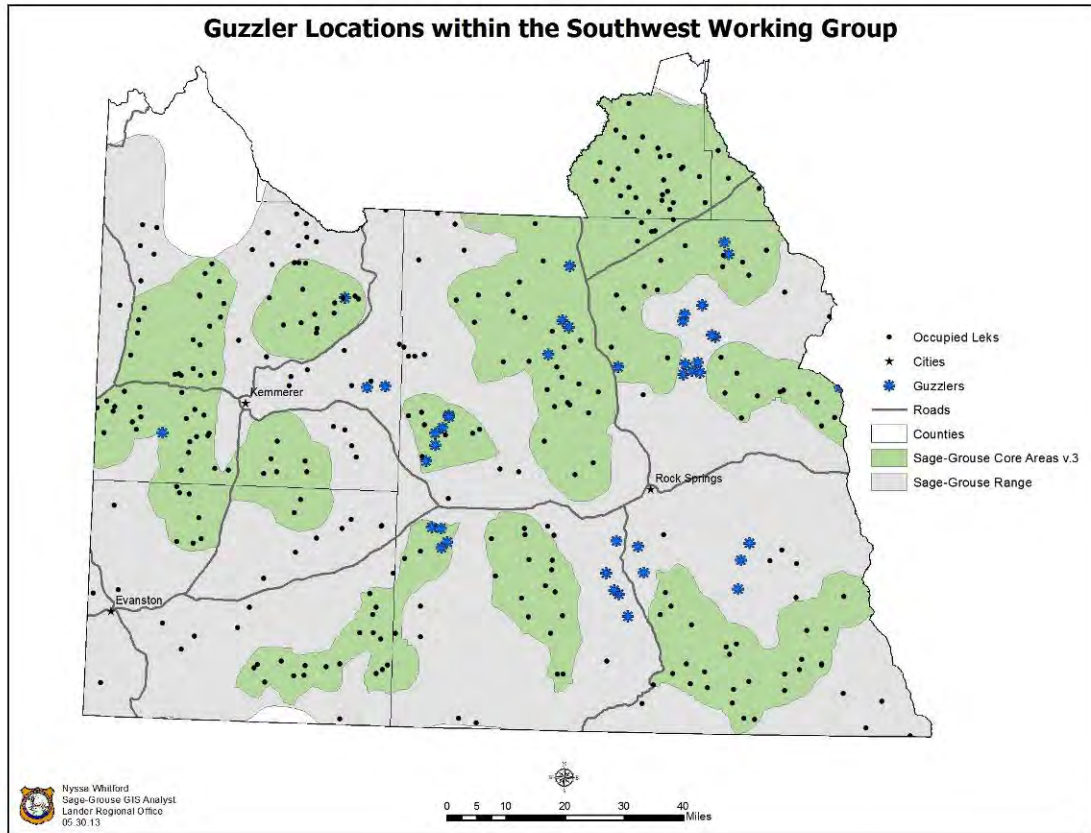
As the summer progresses and food plants mature and dry, sage-grouse move to areas still supporting succulent herbaceous vegetation. They continue to rely on adjacent sagebrush for protection from weather and predators, and for roosting and loafing. These areas may be lower elevation native or irrigated meadows where uplands lack green vegetation. Sage-grouse will also migrate to higher elevations, seeking habitats where succulent forbs are still available in sagebrush habitats or select sites such as moist grassy areas or upland meadows. A delay in maturing of forbs has a noticeable effect on bird movements. In years with above-normal summer precipitation, sage-grouse may find succulent forbs on upland sites all summer. In more arid areas, riparian meadows become more important to survival of broods in the late summer.

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<sup>1</sup> Dzialak, M.R., C.V. Olson, S.M. Harju, S.L. Webb, J.P. Mudd, J.B. Winstead, and L.D. Hayden-Wing. 2011. Identifying and prioritizing Greater Sage-grouse nesting and brood rearing habitat for conservation in human-modified landscapes. PLoS ONE 6(10): e26273.

From mid to late summer, wet meadows, springs and streams are the primary sites that produce the forbs and insects necessary for juvenile birds. The drier the summer, the more sage-grouse are attracted to the remaining green areas.

**Figure 18.** Wildlife guzzler locations within the SWSGCA.



**Water and Riparian Resources - Habitat Sub-Goal**

1. Work with private and governmental land managers to encourage water related habitat developments and assure these developments and associated management benefit sage-grouse.

**Water and Riparian Resources – Research Sub-Goal**

2. Research the effects of water development to sage-grouse and habitat.

**Water and Riparian Resources Recommended Management Practices**

1. Update and retrofit current water developments during routine maintenance to benefit sage-grouse. Ensure that new and existing livestock troughs and open water storage tanks

are fitted with ramps to facilitate the use of and escape from troughs by sage-grouse and other wildlife. Do not use floating boards or similar objects, as these are too unstable and are ineffective.

2. Identify new areas for water development where appropriate.
3. Encourage irrigation practices that create no net loss of wetlands and seeps in sage-grouse habitat. For example, converting flood irrigation to sprinkler and piping and lining ditches. All losses of wetlands and seeps should be mitigated in sage-grouse habitat and should specifically benefit the local sage-grouse population.
4. Develop water resources to benefit multiple uses (livestock/wildlife, etc.) when water is produced by the development of oil or gas wells.
5. Manage riparian habitats, wetlands, springs and water sources in close proximity to sagebrush for food forbs and insects while maintaining the integrity of the riparian system.
6. Consider creating water overflow on developed water sources and fencing spring sources and overflow areas to provide food forbs.
7. After evaluating the distribution and condition of natural water sources, avoid practices that degrade or destroy natural water flow or the vegetation in and around wetland habitats. Restore and enhance natural riparian and aquatic habitats wherever possible.
8. Protect and enhance the growth of native forbs around natural and constructed water developments.
9. Enhance water developments for grouse by placing them in known summer ranges and migration routes. Avoid water development in high quality nesting and early brood-rearing habitat which can increase predation risk.
10. Exclosures or non-fencing methods of controlling livestock around riparian habitats, seeps, springs, ponds and catchments will protect shoreline and wetland vegetation and benefit birds. Use fence design (such as pole-top) that minimizes bird mortalities.
11. Livestock water developments can decrease stock concentrations and distribute grazing more evenly across the range to prevent degradation. However, the tradeoff is that establishing new water developments can result in degradation of sites not previously grazed or only lightly grazed.
12. New spring developments in sage-grouse habitat should be designed to maintain or enhance the free-flowing characteristics of springs and wet meadows by the use of float valves on troughs or other features where feasible.

### **Issue: Invasive Plants**

The extent to which invasive plants, primarily non-natives, have historically affected sage-grouse in Wyoming is unknown. However, these undesirable plants are having a significant negative impact on native plant communities. Invasive plants are invading rangelands and riparian areas and replacing native vegetation critical for sage-grouse habitats. Primary species of concern in Southwest Wyoming sage-grouse habitats appear to be, but are not limited to, Russian knapweed, leafy spurge, cheatgrass, perennial pepperweed, hoary cress, salt cedar, black henbane, musk thistle, Canada thistle, toadflax, halogeton, juniper, and spotted knapweed. In riparian areas this list may be more expansive.

Of the species mentioned above, cheatgrass has had range-wide impacts to Greater Sage-grouse and is a major contributor to declines occurring in states west of Wyoming. Cheatgrass appears to have been formerly limited by altitude, but recent expansions of this species have been noted, some at elevations in excess of 10,000 feet in the Wind River Mountains of Wyoming.

Additionally, the species was considered limited in undisturbed habitats, or in fire disturbed habitats with good re-growth of native grasses. Increased invasion of this species has been noted in habitats south of Rock Springs (north of Little Mountain) despite good regeneration of natives in disturbed habitats, and into habitats that have not been disturbed. Cheatgrass tends to change the fire regime and limit the ability of managers to maintain shrublands (especially sagebrush habitats) for wildlife. Therefore, this plant likely represents the single greatest threat from this category and should be managed with the ultimate goal of eradication.

While not a significant threat to sage-grouse throughout Wyoming, invasion of deeper soils sagebrush habitats by juniper species is a local concern in southwest Wyoming, specifically in the area south of Rock Springs and on the Bear River Divide. Efforts to limit juniper invasion has occurred in these areas, but should be increased to limit this impact.

### **Invasive Plants - Habitat Sub-Goal**

1. Prevent the introduction or spread of invasive plants in sage-grouse habitat and promote coordinated control and reduction of infestations at the private, local, state and federal levels.
2. Encourage county weed and pest entities to consider the specific needs of and threats to Greater Sage-grouse during planning and implementation efforts.

### **Invasive Plants – Monitoring Sub-Goal**

3. Inventory invasive plant species distribution and abundance.
4. Monitor the effectiveness of invasive plant control.

### **Invasive Plants – Education Sub-Goal**

1. Increase education efforts with local and state decision makers concerning the threat this category represents for Greater Sage-grouse.
2. Increase education regarding ways to minimize the impacts, distribution, and spread of invasive species.

### **Invasive Plants Recommended Management Practices**

1. Improve/maintain inventory of existing infestations.
2. Respond to new infestations rapidly and aggressively.
3. Limit dispersal of weeds and seeds by using weed free hay, mulch, seed, gravel and borrow-pit materials, using clean equipment when possible.
4. Standardize a statewide policy for weed-free hay.
5. Require weed-free hay on all public lands.

6. Help fund and implement long-term monitoring plans through county weed and pest boards.
7. Recommend all varieties of cheatgrass be added to the noxious weed list.
8. Wash all wildlands fire equipment prior to working on any wildlands fire, regardless of jurisdiction. (refer to vegetative treatment section for issues associated with wildland fires and invasive plants.)
9. When restoring lost habitat, use weed-free seed mixes that include shrub and forb components that will enhance sage-grouse habitat.
10. Read and follow label instructions pertaining to chemical treatments as well as EPA Worker Protection Standards.
11. Limit ground disturbing activities in Greater Sage-grouse habitats where possible, including the grading of borrow ditches along county roads. Exceptionally wide graded borrow ditches are of particular concern in Sweetwater County.

### **Issue: Urbanization**

Little or no research is available that directly addresses the effects of residential development on sage-grouse (Figure 19), but some of the effects are obvious. Residential development can cause direct loss of lek sites and seasonal habitats and also fragment those habitats. Of special concern is the conversion of agricultural land to subdivisions and ranchettes. Other factors that may impact sage-grouse populations include increased roads, fencing, power lines, human activity, and a higher density of cats and dogs. In addition, new landfills/trash facilities may cause an increase in predator populations.

Research suggests that road-related disturbances during the breeding season may cause sage-grouse leks to become inactive over time, cause fewer hens bred on disturbed leks to initiate nests, and increase the distance from the lek that hens will move to selected nesting habitat. Dust from roads and other surface disturbances can adversely affect plants and animals. Dust suppression techniques can also affect sage-grouse habitats. Transmission and power line construction does not cause direct habitat loss, but sage-grouse tend to avoid areas associated with these lines (as they provide potential raptor perch sites), thus resulting in an indirect loss of habitat in the vicinity of overhead lines. The potential effects of noise on sage-grouse include masking sounds that influence courtship, mate selection, grouping, escape, etc.

Regarding this issue, increased involvement with county planning efforts and the use of Conservation Easements (CEs) with willing landowners may be the best opportunity to limit dispersed impacts to Greater Sage-grouse (Figures 20 and 21). While a significant portion of southwest Wyoming is under public ownership, land use of widely dispersed areas of private lands have the potential to have widely dispersed impacts to Greater Sage-grouse. Numerous easement options are available for private landowners interested in protecting their agricultural lifestyle, open space and wildlife habitats. These range from CEs held by WGFD, CEs through the Wyoming Stock Growers Association, various land trusts, and the Natural Resources Conservation Service's Sage Grouse Initiative.

Increased residential development also leads to increased use of areas surrounding that development for illegal dumping, shooting, automobile “maintenance”, etc. These impacts often occur outside the area analyzed by urban planners.

Wyoming statutes allow counties to regulate subdivision of lands from 35-140 acres. Additionally, counties may provide for conservation subdivisions that encourage the development of smaller lots that maintain open space within the subdivision.

Many communities within the SWSGCA are experiencing growth resulting from the expansion of the energy industry within the region. The following summarizes recommended modifications to the Urbanization Section of the 2007 plan.

#### Sweetwater County:

The population growth, of the Sweetwater County, has remained stable since 2007 with most of the growth occurring within the incorporated communities of Rock Springs and Green River and urbanizing lands surrounding these communities. But, as typical of boom and bust communities, if the price of gas rises, it may cause an increase in oil/gas employment and community population. Similarly, if there is an establishment or expansion of other industry, an increase in employment and population may result. If this growth is managed, in a manner that encourages infill into existing communities, community sprawl will be limited, and so will its potential effect on sage grouse habitat.

Within Sweetwater County private lands comprise approximately 26% of the total land area. On these private lands, which are zoned agriculture, there is an increasing demand for rural residential development especially through the use of the State of Wyoming’s Subdivision Law’s “Family Exemption”. This “Family Exemption” allowed land owners to deed parcels of their land to family members without the benefit of state and county subdivision regulations.

To recognize the increasing demand to utilize this “Family Exemption” and to satisfy the general demand for more rural residential property, in 2011 and 2012, the County changed its agricultural district zoning regulations. This regulatory change allowed residential homes to be built on 5 acre lots for parcels created through the “Family Exemptions” and 10 acres lots proposed for general rural residential use. Previous to this change, residential homes on agriculturally zoned lands were only allowed on 35 acres parcels. This zoning regulation change may provide more opportunity to develop homes at higher density on agriculturally zones lands. Since it is the agriculturally zoned lands that predominantly contain the sage grouse habitat in Sweetwater County, this regulation change to allow higher residential densities on agriculture land may have an impact on sage grouse.

Due to the goal to achieve consolidated urban growth around Rock Springs and Green River, there is a continued need to strive to consolidate the public and private checkerboard land ownership pattern to prevent sprawl that is created by growth skipping over public sections to develop in open private sections. As referenced in the 2007 Plan, growth in this checkerboard region of Sweetwater County causes an inefficient and costly growth pattern that may cause urbanization to encroach into sage grouse habitat.

Lincoln County:

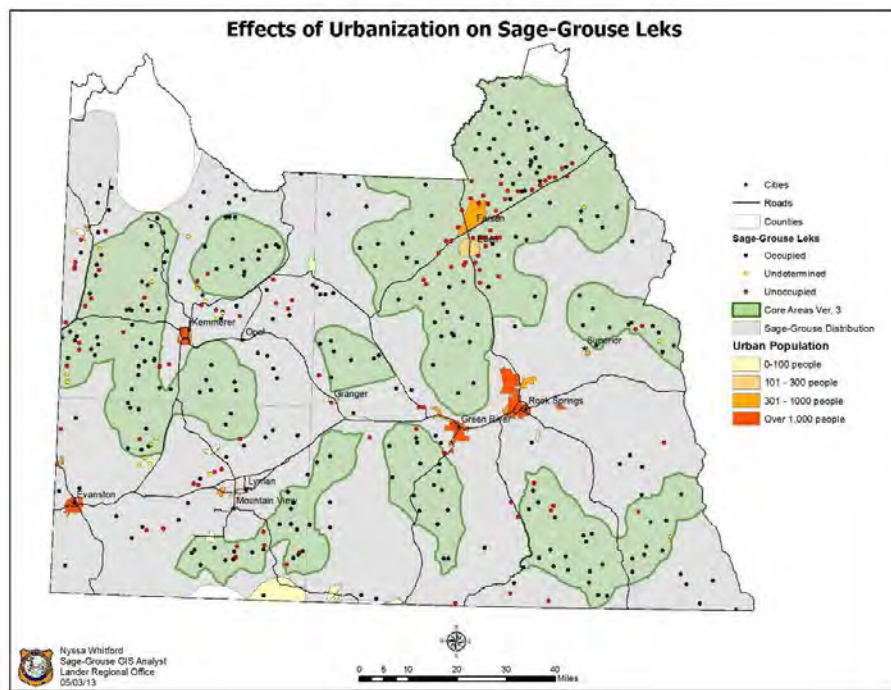
Only the southern portion of Lincoln County is located within the SWSGCA. This portion of Lincoln County includes the incorporated communities of Cokeville, Kemmerer, LaBarge, Diamondville and Opal, and these communities are experiencing moderate growth due to the energy industry. North of Kemmerer, south of Cokeville and south of LaBarge there is some ranchette development. At this time, the population growth of the southern portion of Lincoln is moderate, and there is only the occasional subdivision of agriculture land for rural residential purpose. If population increases, there may be more indirect impacts of growth on sage grouse habitat in southern Lincoln County.

Private land, where rural development is occurring comprises about 1/3 of Lincoln County.

Uinta County:

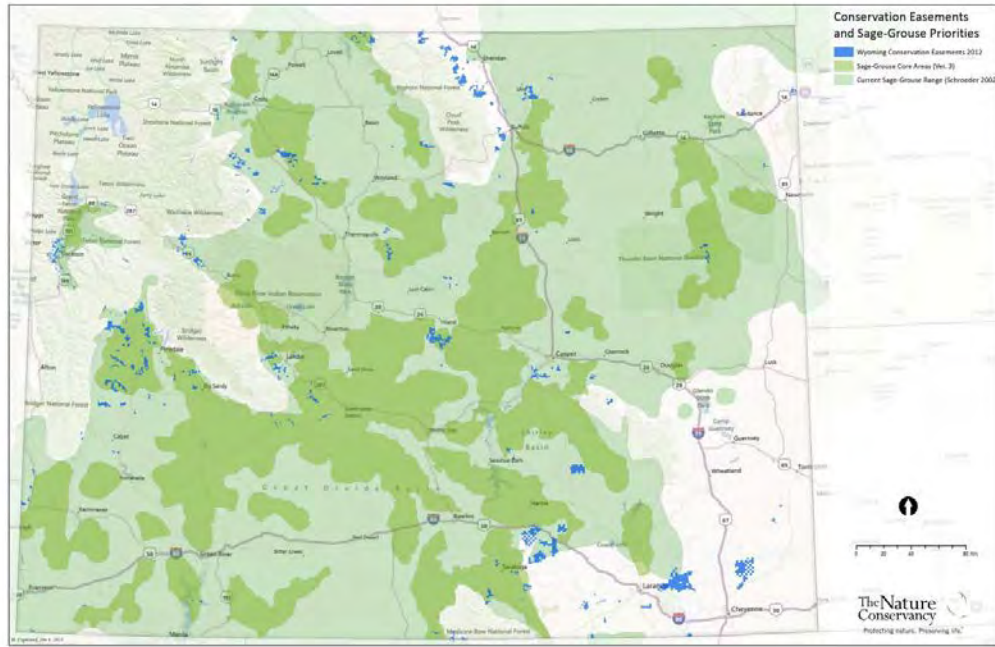
Uinta County is contained entirely within the SWSGCA, and is experiencing moderate growth due to energy development. This growth is mainly occurring within the city and towns of Evanston, Mountain View and Lyman. Outside of these communities, some rural residential/ranchette growth is expanding into agriculture lands and sage-grouse habitat. These expansion areas include: north of the City of Evanston where a water line has been extended allowing rural residential growth to expand into some range land areas, and within the unincorporated areas of Bridger Valley where some subdivision of ranch land is occurring. Private land, where rural development is occurring, comprises about 1/3 of the land ownership within Uinta County.

**Figure 19.** Urban centers sage-grouse leks and sage-grouse core areas within the SWSGCA.

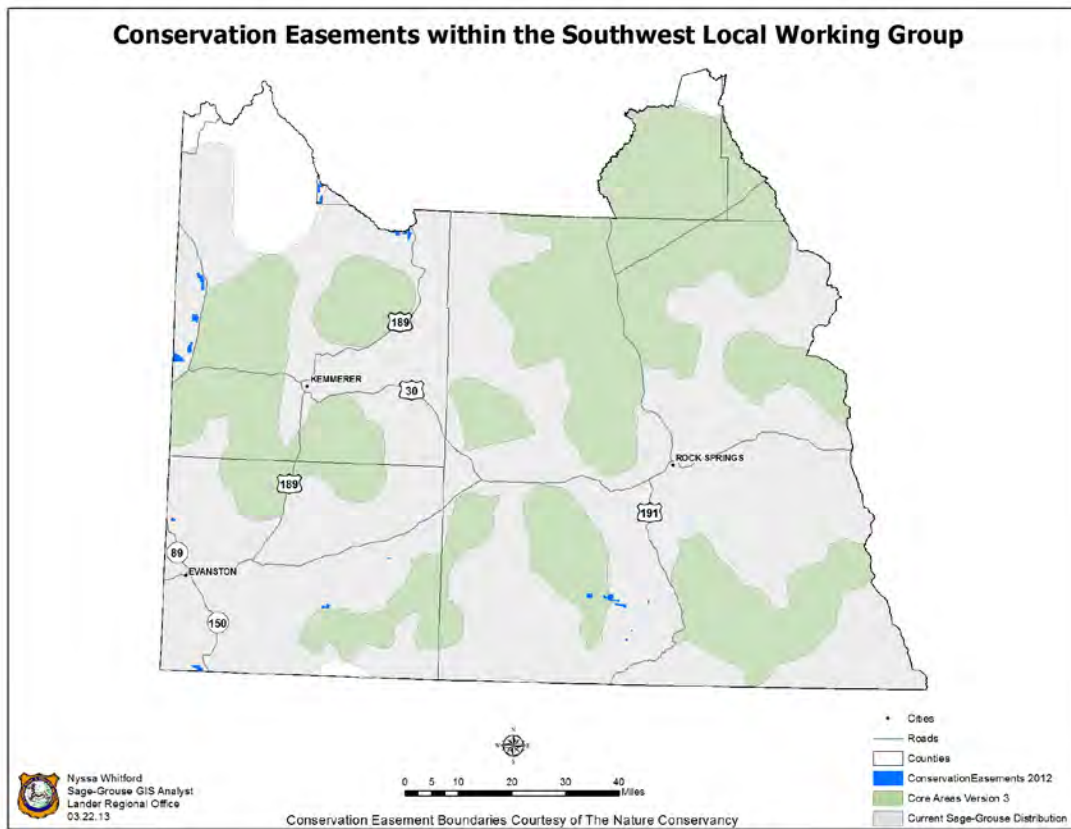




**Figure 20.** Wyoming Conservation Easements (courtesy of The Nature Conservancy).



**Figure 21.** Conservation easements within the SWSGCA.



This map represents a compilation of all known conservation easements in the state of Wyoming, with the exception of a few easements withheld for privacy reasons. The Nature Conservancy maintains this compiled dataset in cooperation with the Wyoming's land trusts.

### **Urbanization/Residential Development - Habitat Sub-Goal**

1. Minimize negative impacts of urbanization on sage-grouse habitats.
2. Pursue strategic conservation easements with willing landowners that specifically benefit Greater Sage-grouse.

### **Urbanization/Residential Development – Education Sub-Goal**

3. Educate local officials about all aspects of conservation easements including the actual impacts on the local tax base.
4. Educate landowners regarding proper garbage control to reduce the effects of predators, particularly ravens.

### **Urbanization/Residential Development Recommended Practices:**

1. Encourage counties to address wildlife and wildlife habitat goals in their land-use plans, regulations and local land use decisions.
2. In accordance with state and local laws, control all urban pets that pose a threat to sage-grouse. Plan urban growth areas to minimize impacts to sage-grouse habitats.
3. Limit the food supply and habitat for ravens created by the urban environment. This includes properly managing landfills and quickly disposing of road kills.
4. Identify and implement wildlife-friendly urban development techniques.
5. Encourage cluster development, road consolidation and common facilities that would have a reduced impact on sage-grouse.
6. Support legislation that provides incentives for landowners and developers to preserve open spaces and provide wildlife habitat.
7. Where possible protect habitat through conservation: identify potential land swaps/exchanges, leases, Conservation Reserve Program type programs and conservation easements. Educate public decision makers on the benefits of conservation easements and methods for implementing them.
8. Enforce or implement seasonal closures of critical habitat around suburban and rural developments.
9. Implement appropriate dust suppression practices.
10. Encourage enforcement of existing laws such as those prohibiting illegal shooting, dumping, etc. in subdivision development.
11. Promote coordination between private landowners and local, state and federal agencies for the purpose of identifying and protecting sagebrush and sage-grouse habitat within urban growth areas.
12. Support amendments that strengthen Wyoming statutes that grant counties the authority to regulate rural residential subdivisions that create parcels between 35-640 acres.

13. Support amendments to the Wyoming Statutes that grant the State and counties authority and incentives to implement wildlife management strategies within the plans and designs for communities, subdivision and other development.
14. In order to minimize the effects of the leapfrog growth pattern in checkerboard lands near Rock Springs, federal, state and local governments should research the potential of initiating land exchanges that would trade public sections adjacent to Rock Springs for private sections located elsewhere in the checkerboard. If feasible, making these trades would create more contiguous private land for planned community growth and consolidate public lands for open space and protection of sage-grouse habitat.
15. Do not permit new landfills in core sage-grouse habitat.

### **Issue: Recreation**

Recreational impacts to sage-grouse populations include potential disturbance of breeding and nesting activities, and habitat fragmentation due to road (Figure 29) and off-road usage. Research suggests that road-related disturbances during the breeding season may cause sage-grouse leks to become inactive over time, cause fewer hens bred on disturbed leks to initiate nests, and increases the distance from the lek hens will move to selected nesting habitat. Dust from roads and other surface disturbances can adversely affect plants and animals. Recreational viewing of leks can cause disruption of breeding activities, especially when it is conducted from too close a distance and/or on a long-term basis. The increased use of off-road vehicles and other outdoor recreational activities may result in greater disturbance of sage-grouse and degradation of habitats. These impacts are more likely to occur on public lands, or on leks adjacent to public roads. Summertime dispersed camping may also impact late brood-rearing habitat, as streamside riparian areas are attractive to campers. In 2011, a new regulation was implemented by the WGFD that prohibited antler gathering on federal lands west of the Continental Divide from January 1-April 30. From 2009-2010 a similar regulation was implemented by Lincoln County. In 2012, the State Land Board also implemented an antler gathering regulation. These regulations have reduced human presence on big game and sage-grouse winter ranges in the SWSGCA.

#### **Recreation – Habitat Sub-Goals**

1. Minimize negative impacts of recreation to sage-grouse and their habitats.
2. Encourage enforcement of existing Off-Road Vehicle (ORV) travel restrictions.

#### **Recreation Recommended Management Practices**

1. Restrict ORV use on sage-grouse habitat in Wyoming and enforce current ORV laws.
2. Within sage-grouse habitat, restrict large group recreation activities requiring a permit during March 15-July 15.
3. Develop travel management plans and enforce existing plans.

4. Recreational facilities and disruptive activities should be located at least two miles from lek sites and in areas that are not in crucial sage-grouse habitat.
5. Establish and maintain a small number of lek viewing sites and minimize viewing impacts on these sites. Viewing and or censusing sage-grouse on leks should be conducted so that disturbance to birds is minimized or preferably eliminated.
6. Agencies should not provide all lek locations to individuals simply interested in viewing birds.
7. Discourage dispersed camping within important riparian habitats occupied by sage-grouse during late summer.
8. Federal and state agencies need to enforce seasonal closures.
9. Continue to enforce the antler-gathering closure in sage-grouse habitat.
10. Dogs should not be allowed to go unchecked. Dogs must be under voice or leash control. Inform the public that dog training on sage-grouse outside the hunting season is wildlife harassment and illegal.
11. Law enforcement presence is sorely lacking in the SWSGCA. Increase the number and presence of law enforcement officers (city, county, state, BLM, USFS, USFWS) and encourage better interagency coordination and improve coordination with the judicial system.

### **Issue: Vegetation Management**

Historically, sagebrush communities evolved as dynamic landscapes with climatic and soil type variation driving changes in fire frequencies, and in adaptive development of different sagebrush species. These sagebrush communities occur commonly in tracts occupying hundreds or thousands of acres. The combination of active fire suppression, historic inappropriate livestock grazing, habitat conversion, sagebrush habitat treatments, and the introduction of invasive species have contributed to dense, old, monotypic stands of sagebrush, reduction of herbaceous understories, and simplification of community diversity.

Historic sagebrush communities were a mosaic of successional shrub age classes created and maintained by fire cycles ranging in frequency from 20 to greater than 100+ years depending on the sagebrush species and site. Patchy fires appear to have been the norm in most sagebrush communities, while larger fires at lower frequencies occurred in other areas, depending on climate, topography, plant composition, and aridity of the site.

Vegetation management can be achieved through biological, mechanical, or chemical treatments. Biological treatments include prescribed fire, designed domestic livestock grazing, and insect pathogens. Fire, floods, insects, mammal and bird herbivory, plant diseases and allelopathy (chemical inhibition) are also biological processes. Chemical treatments to manipulate, control, enhance or remove sagebrush include a variety of herbicides and fertilizer. Mechanical brush control treatments in sagebrush systems include mowing, roto-beating, chaining, disking, roller harrowing, railing, and blading. Reseeding and planting shrubs is also common. As a result of the increase in the distribution and abundance of cheatgrass, the use of fire and other treatments for improving habitat should be evaluated carefully prior to implementation.

Removal of large tracts of sagebrush is detrimental to sage-grouse populations. While some birds may be able to adjust by using adjacent sagebrush habitats, sage-grouse hens show fidelity for nesting in the same general area. Mosaic patches of sagebrush of different ages and structures benefit sage-grouse. Vegetation treatments influence the abundance and diversity of insects in sagebrush ecosystems. Use of vegetative treatments requires planning and understanding of the sagebrush ecosystem so that sufficient stands of desirable sagebrush remain (Figure 27). These stands should provide adequate cover and food for the appropriate seasonal habitat within the area being treated.

Research conducted in brood-rearing habitats indicates that sage-grouse tend to use untreated sagebrush habitat and adjacent treated areas or natural openings equally within 60 meters of the edge separating these two habitat types. The SWLWG is partially funding University of Wyoming research that is evaluating sage-grouse response to various habitat treatments.

In order to be consistent with EO-2011-5, the WGFD revised its habitat treatment protocol (WGFD 2011-Appendix IV) in 2011 for conducting treatments in sage-grouse habitats. The Wyoming BLM appended this document to its sage-grouse instruction memorandum (WY-2012-019).

**Figure 22.** Photo of treatment mosaic achieved on the Rock Creek prescribed burn project that was supported and partially funded by the SWLWG (Appendix II).



### **Vegetative Management – Habitat Sub-Goal**

1. Work with private and governmental land managers to ensure vegetation management and treatments benefit sage-grouse while considering ecological, economic and cumulative impacts.

### **Vegetation Management – Monitoring Sub-Goal**

2. Implement effective short-term and long-term monitoring plans to determine the effectiveness of vegetation treatments. Develop and maintain cumulative records and data analysis for all vegetation treatments to determine and evaluate site specific and cumulative impacts to sage-grouse habitats and identify best management practices for successful vegetation treatments.

### **Vegetation Management – Research Sub-Goal**

3. Further define the effects of habitat treatment to sage-grouse.

### **Vegetative Management Recommended Management Practices**

1. Use the WGFD habitat treatment protocol (Appendix IV) to plan and implement vegetation treatments in sage-grouse habitat.
2. Develop priorities and implement appropriate habitat enhancements in areas currently occupied by sage-grouse, historically occupied by sage-grouse and potentially occupied by sage-grouse.
3. Remove juniper and other conifers where they have invaded sagebrush sites important to sage-grouse.
4. Determine impacts of habitat treatments and threshold levels of habitat alteration that can occur without negatively impacting specific sage-grouse populations.

### **Issue: Livestock Grazing**

Domestic livestock grazing has been identified as a factor that may affect the suitability and extent of sage-grouse habitat across the western United States. Grazing and browsing can contribute to long-term changes in plant communities and can alter various habitat components that contribute to the health of sagebrush ecosystems and the sage-grouse habitat it supports.

Both positive and negative direct effects of livestock grazing on sage-grouse habitats have been identified. For example, short duration grazing in late spring and early summer has been reported to improve both quantity and quality of summer forage (forbs) for sage-grouse. Conversely, continuous heavy use by livestock and/or wild ungulates rarely leaves suitable residual cover for nesting or maintains the site potential for riparian areas in sage-grouse habitat.

However, there have been few research efforts made, and little direct experimental evidence linking specific livestock grazing practices to sage-grouse population levels.

A technical team of University of Wyoming and BLM range scientists and managers together with sage-grouse scientists and managers has developed grazing management options. These options help achieve desired vegetative conditions specific to sage-grouse seasonal habitats in the Wyoming Basins of central and western Wyoming and northern Colorado (see “*Greater Sage-grouse Habitat and Livestock Grazing Management with Emphasis on Nesting and Early Brood-Rearing*” Cagney et al. 2011). The SWLWG endorses the use of this document in planning and implementing livestock grazing management. The BLM has incorporated the use of this document into their planning decisions (WY-IM-2012-019 and WO-IM-2012-044).

In early February 2013 Governor Mead clarified EO-2011-5 relative to grazing by issuing supplemental EO-2013-3 stating that it is Wyoming’s premise that grazing activities are compatible with Greater Sage-grouse conservation and that the State of Wyoming will collaborate with appropriate federal agencies to determine if a causal relationship exists between grazing (any/all species) and sage-grouse where sage-grouse conservation objectives are not being achieved on federal land.

### **Candidate Conservation Agreement with Assurances (CCAA)**

The USFWS, together with the Wyoming Governor’s Office, NRCS, WGFD, Wyoming Department of Agriculture, Wyoming Association of Conservation Districts, Wyoming BLM, and the U.S. Forest Service, have released a draft *Greater Sage-grouse Umbrella Candidate Conservation Agreement with Assurances (CCAA) for Wyoming Ranch Management*. The purpose of this program is to encourage landowners to voluntarily implement conservation measures to conserve, restore, or enhance habitat for the Greater Sage-grouse on non-Federal lands in Wyoming. In return, participating landowners and land managers would receive regulatory assurances concerning land use restrictions that might otherwise apply to them should the Greater Sage-grouse become protected under the ESA. The Umbrella CCAA will be in effect for 40 years following its approval although landowners can withdraw from the agreement at any time.

Under the Umbrella CCAA, each participating landowner, with assistance from participating State and Federal agencies, would develop an individual CCAA, selecting conservation measures appropriate to their properties that are described in the Umbrella CCAA. Individual CCAs would be linked to the Umbrella CCAA. USFWS will issue an enhancement-of-survival permit to each enrolled landowner following approval of the individual CCAA. In the event the Greater Sage-grouse is listed under the ESA, the permit authorizes incidental take of the species that may result from general farming and ranching operations and recreation. The USFWS also will not impose commitments or restrictions of land, water, resources, or finances on the enrolled landowner beyond those agreed to in the individual CCAA. Individual CCAs and enhancement-of-survival permits will have duration of 20 years.

## **Natural Resources Conservation Service Sage-Grouse Initiative (SGI)**

In 2010, the Natural Resources Conservation Service (NRCS) launched the Sage-Grouse Initiative (SGI). Existing conservation programs (Environmental Quality Incentives Program [EQIP] and Wildlife Habitat Incentive Program [WHIP]) were adapted to improve habitat for grouse and improve sustainability of native rangelands. Practices such as sustainable grazing plans, conifer removal, fence removal or marking will be implemented on a landscape scale across a sage-grouse core area.

Several large-scale threats facing sage-grouse are identical to factors impacting the sustainability and productivity of grazing lands throughout the West. SGI aims to remove or reduce those threats common to sustainable ranching and sage-grouse conservation. Fragmentation of sagebrush habitats from a variety of sources is one of the primary causes of the decline in both sage-grouse populations and rangeland productivity. Exotic species invasions, unsustainable grazing systems, sod-busting, subdivision development, and conifer encroachment are other examples of mutual threats. Identifying the species' limiting factors at the level of the individual property owner is essential to ensure that the goals of the Conservation Practice Standard are met through SGI. SGI fosters coordination and implementation on a range-wide scale while ensuring local input and control. NRCS and USFWS came to an agreement in 2012 that is intended to provide "take protections" for producers/landowners that implement specific, approved conservation practices as part of SGI contracts.

### **Livestock Grazing Management – Habitat Sub-Goal**

1. Support livestock grazing practices that promote healthy sagebrush habitats on federal, state, and private land in Southwest Wyoming.

### **Livestock Grazing Management – Research Sub-Goals**

2. Determine grazing practices that have potential to benefit sage-grouse habitats.
3. Determine cause and effect relationships between forage, drought, multiple uses and sage-grouse recruitment.

### **Livestock Grazing Recommended Management Practices**

1. Use the publication "*Greater Sage-grouse Habitat and Livestock Grazing Management with Emphasis on Nesting and Early Brood-Rearing*" (Cagney et al. 2011) to plan and implement grazing management in sage-grouse habitat.
2. Ranchers should become familiar with the U.S. Fish & Wildlife Service's Candidate Conservation Agreement with Assurances (CCAA - private) and Candidate Conservation Agreement (CCA - federal) program and participate if appropriate for their operation.
3. Ranchers should become familiar with the NRCS Sage-Grouse Initiative (SGI) and participate if appropriate for their operation.



## Issue: Farming

In southwest Wyoming, “farming” is primarily harvest of native hay in meadows along some streams and rivers with farming in irrigated settings producing alfalfa, barley and oats. Farmed acreage (dry land and irrigated) in the SWSGCA totals 205,039 acres making up only about 2.6% of the land area (Figure 28). These figures have remained relatively stable for many years. Most farmland is privately owned, and the value of habitat and open space provided by the continued existence of farm operations should be recognized.

Many of the impacts that occurred from farming occurred following homesteading in Wyoming. Sagebrush habitats that had the best soils were converted to hay and pastureland. Today only limited areas are being converted from sagebrush habitats to farmlands that support hay and pastureland. Farms that raise alfalfa or native hay may be beneficial to sage-grouse. Some degree of habitat fragmentation may occur as a result of farming and associated infrastructure. Ecological and economic constraints limit the amount of land in Wyoming that can be converted to farmland.

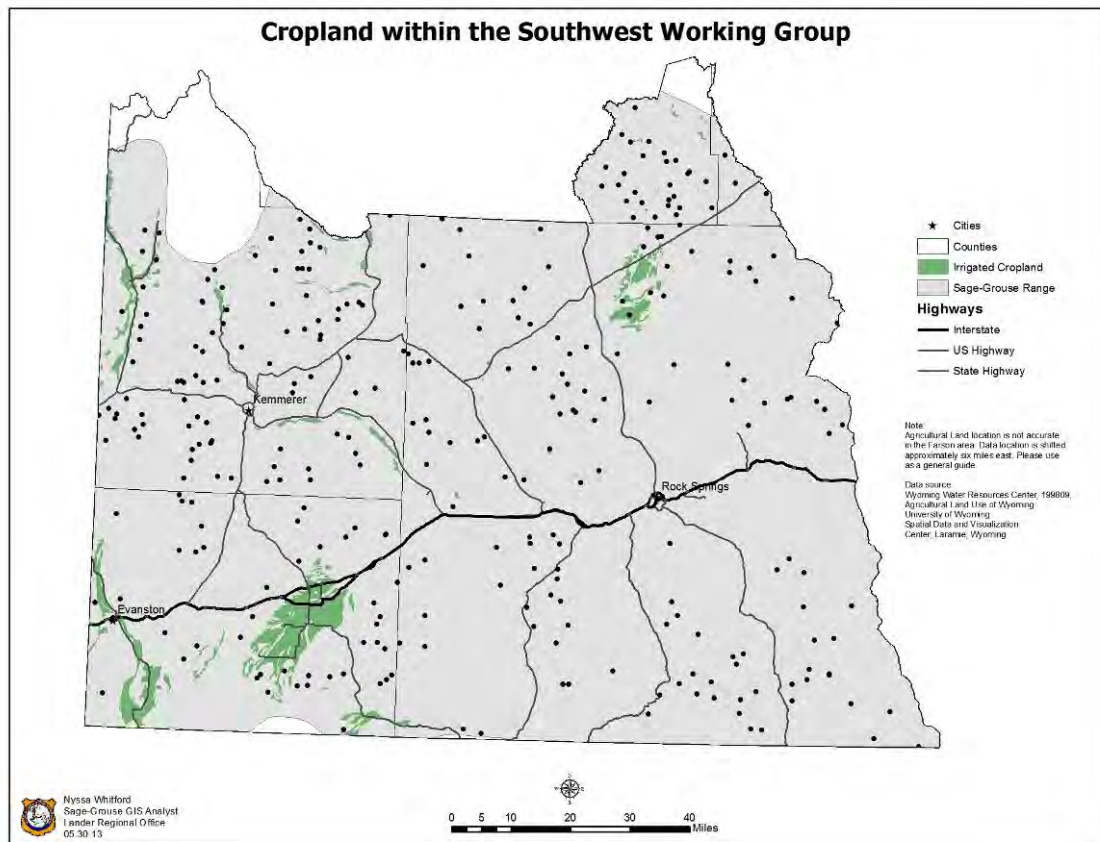
As noted above, in southwest Wyoming the areas that are farmed are associated with key riparian areas. This is significant because these areas hold the highest historical sage-grouse populations.

Farming can have many benefits to sage-grouse. Irrigation systems spread water out in very dry areas. Some types of irrigation create ponds and springs. Alfalfa is a preferred food source and grouse are commonly found in alfalfa fields.

With population growth and trends for people to want to live in a rural area, some of the larger farms and ranches have been broken up into smaller hobby farms. Over a landscape, these farms may eliminate use by sage-grouse.

The Colorado River Salinity Control Project is administrating the change from flood-irrigated fields to sprinkler systems and they are funding the lining or piping of irrigation ditches. This reduces potential grouse watering areas in flooded fields, ditches and leaks from ditches. Grouse use in the fields with sprinklers could be lower. It also has an effect on springs that are primarily fed by the higher water table that occurs because of flooded fields and leaking ditches. Some of these springs are many miles down country from the irrigation ditches.

**Figure 23.** Cropland within the SWSGCA. *Note: Ag land location is not accurate in the Farson area. Data location is shifted approximately 6 miles east. Please use as a general guide.*



### **Farming – Habitat Sub-Goal**

1. Assure farming operations are compatible with the maintenance and enhancement of sage-grouse habitat.

### **Farming Recommended Management Practices**

1. Identify the types of farming practices that are detrimental to sage-grouse.
2. Develop and provide information on funding options available to landowners who wish to improve sage-grouse habitat.
3. Provide resources and seek input from private landowners in an effort to identify best management practices for agriculture in sage-grouse habitats.
4. Manage water sources to benefit agriculture, sage-grouse and healthy riparian habitat.
5. Improve visibility (location) of fences where problems have been documented in sage-grouse habitats.

6. Acknowledge the importance of private lands to sage-grouse. Research and develop incentives that would recognize and benefit private landowners who maintain and enhance sage-grouse habitat.
7. Maintain sagebrush cover close to hay meadows or riparian areas.

### **Issue: Utility Corridors**

The fragmentation of sagebrush habitats has been cited as a primary cause of the decline of sage-grouse population since the species requires large expanses of contiguous sagebrush (USFWS 2005). Habitat fragmentation is occurring and is expected to continue at an increasing rate. Powerlines, pipelines, communication lines and towers, and associated roads are common to nearly every type of human habitat use. The impact from utility corridors includes direct habitat loss, direct mortality, migration barriers, increased predation and invasive species, noise disturbance in crucial habitats, dust, contamination from chemicals used on associated utility roads, increased human access and avoidance of suitable habitat adjacent to these roads.

An analysis was conducted of sage-grouse leks near the powerline that spans from Rock Springs to the Idaho border west of Cokeville (commonly referred to as the Bridger Powerline). Similar to impacts of travel corridors (see Roads and Travel Management, below) grouse appear to be negatively affected due to the presence of overhead lines. Grouse lek survey efforts were standardized in 2000, following increasing concern regarding sage-grouse population status. Along the above mentioned powerline, lek attendance/occupancy was analyzed from 2000-2013 at the 0-1 mile, 1-2 mile, and 2-4 mile band. Lek attendance has declined to one (of 8) in 0-1 mile band, to 7 (of 11) in the 1-2 mile band, and to 11 (of 12) in the 2-4 mile band. Avoidance of such overhead structures is well documented among sage-grouse, probably to avoid raptor perches.

#### **Utility Corridors - Habitat Sub-Goal**

1. Minimize negative impacts to sage-grouse, especially habitat fragmentation, caused by utility corridors (associated roads, power lines, pipelines, transmission lines, communication lines, railroads).
2. Carefully plan, assign, and co-locate all utility corridors to limit impacts of corridors on Greater Sage-grouse.
3. Use the Wyoming Governor's EO-2011-5 concerning Greater Sage-grouse core areas to locate future energy projects and associated corridors.

#### **Utility Corridors - Research Sub-Goal**

4. Continue to examine and assess the cumulative effects of the impact of all aspects of human land-use patterns on sage-grouse habitat.
5. Assess the effectiveness of anti-perch devices to reduce the impact of increased raptor distribution.

### **Utility Corridor and Highways Recommended Management Practices**

A. Above ground (transmission, power and communication lines):

1. Co-locate existing corridors where possible to minimize overall disturbance to the landscape.
2. Recommend avoidance areas for new corridors and power line construction as per the Wyoming Governor's EO-2011-5.
3. Encourage above ground utilities to be restricted to above ground corridors, and underground utilities be restricted to underground corridors.
4. Require effective raptor anti-perch structures on above ground lines in designated critical sage-grouse habitats.
5. Investigate/evaluate conflicts between raptor protection efforts and sage-grouse protection efforts.
6. Dismantle unused utility infrastructure and reclaim associated roads.
7. Work with utility operators to encourage project designs that would benefit sage-grouse.

B. Underground level (pipelines, communication lines):

1. Co-locate corridors where possible to minimize overall disturbance to the landscape.
2. Recommend avoidance areas for new corridors and power line construction as per the Wyoming Governor's EO-2011-5.
3. Encourage above ground utilities to be restricted to above ground corridors, and underground utilities be restricted to underground corridors.
4. Use seed mixes on reclaimed areas that benefit sage-grouse and other wildlife species.
5. Ensure reclamation is timely and appropriate to the soil type and vegetation prior to disturbance (one type seed mix does not work for all pipeline areas).
6. Avoid core sage-grouse habitat.
7. Apply seasonal stipulations to construction and maintenance activities to reduce impacts to sage-grouse.

**Issue: Roads and Travel Management**

Roads and off-road dispersed travel have had a significant impact on use of habitats by wildlife. Major highway corridors have permanently changed migration patterns of certain species (e.g. pronghorn migrations following construction of Interstate Highway 80), and minor ones impact migration and movements on a seasonal basis. All road types have the potential to impact wildlife directly or indirectly at varying levels (Figures 24-26). If wildlife are to be maintained in a manner consistent with the demands of the American and Wyoming publics, it is incumbent managers consider the needs of wildlife when designing travel systems, conduct careful travel planning efforts, and enforce laws and regulations.

The Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats (Connelly et al. 2004) examined the distribution of 804 leks within 62 miles (100 km) of I-80 across southern Wyoming and northeastern Utah. There were no leks within 1.2 miles (2 km) either side of the interstate and only 9 leks between 1.2 and 2.5 miles (2-4 km). An examination of long-term changes in population between 1970 and 2003 showed similar trends. The leks within 4.7 miles (7.5 km) of I-80 appeared to decline at a higher rate than leks 4.7-9.4 miles (7.5-15 km) from I-80.

A similar pattern exists on Wyoming Highway 28 near Farson where many of the leks Patterson (1952) documented near Highway 28 have become unoccupied (Figure 27). Some of these unoccupied leks were also within the Farson/Eden irrigation project area and many of these leks became unoccupied when sagebrush was converted to cropland.

Illegal ORV use is becoming more common in southwestern Wyoming and results in significant direct and indirect impacts to wildlife. Some areas within the work group's area of responsibility are very heavily roaded, to the point it is nearly impossible to be >0.25 miles from a road of some form, be it legal or illegal. This level of fragmentation typically has relatively severe impacts to most forms of local wildlife, and can lead to range abandonment or unacceptable population level declines. Numerous areas with redundant roads exist in this area, and new roads are illegally formed on an annual basis. Given the arid nature of this area and its inability to heal, one vehicle trip off-road can result in new road establishment.

Travel Management Plans are currently being developed in the Kemmerer, Pinedale and Rock Springs BLM Field Offices (FO) to define areas of permissible vehicle use, and those where use is restricted to foot or horseback travel. Results of planning efforts will only be effective in the face of adequate enforcement, which has traditionally been a concern in this portion of Wyoming due to the limited number of personnel available to enforce laws and regulations.

Winter vehicle closures have been established in certain winter range complexes on BLM lands in the Pinedale and Kemmerer FOs that specifically benefit wintering wildlife, and there have been increased education and enforcement efforts. The Rock Springs FO is also considering alternatives during their current RMP revision that include similar protections on important winter range complexes.

### **Roads and Travel Management - Habitat Sub-Goal**

1. Minimize negative impacts to sage-grouse, especially habitat fragmentation, caused by roads and railroads, including associated livestock fencing.
2. Consider the needs of sage-grouse and other wildlife when planning, designing and building new roads and associated fencing. Recommend roads remain unfenced whenever possible, and that top wires be marked.
3. Complete and enforce travel management plans in all appropriate BLM FOs.
4. Evaluate, identify, reclaim, and eliminate ALL redundant roads in the SWSGCA.
5. Encourage partnerships with industry and Non-Governmental Organizations (NGOs) to accomplish road reclamation needs.

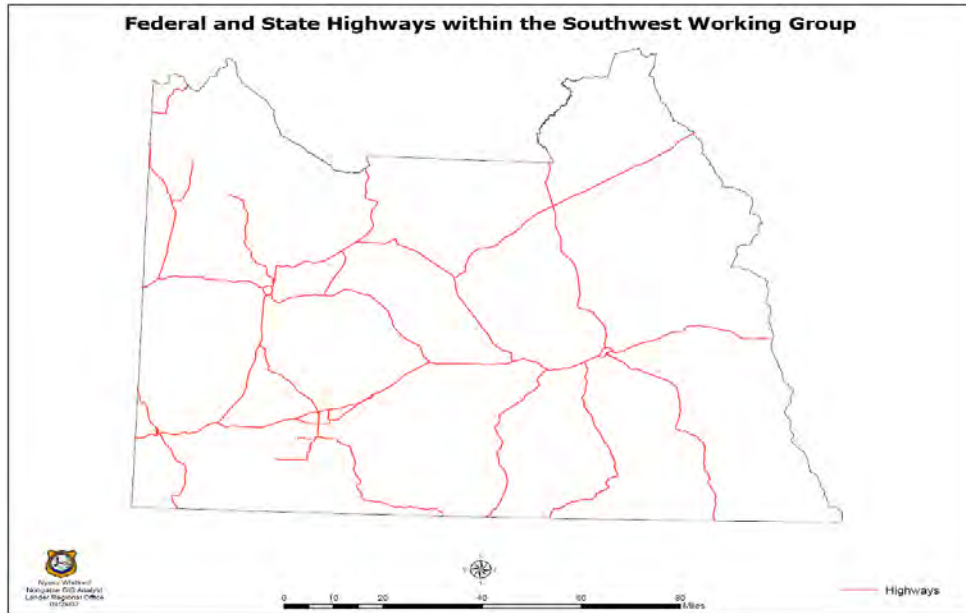
### **Roads and Travel Management - Education Sub-Goal**

6. Continue to educate the public about the need for travel management and the impacts of roads to wildlife.

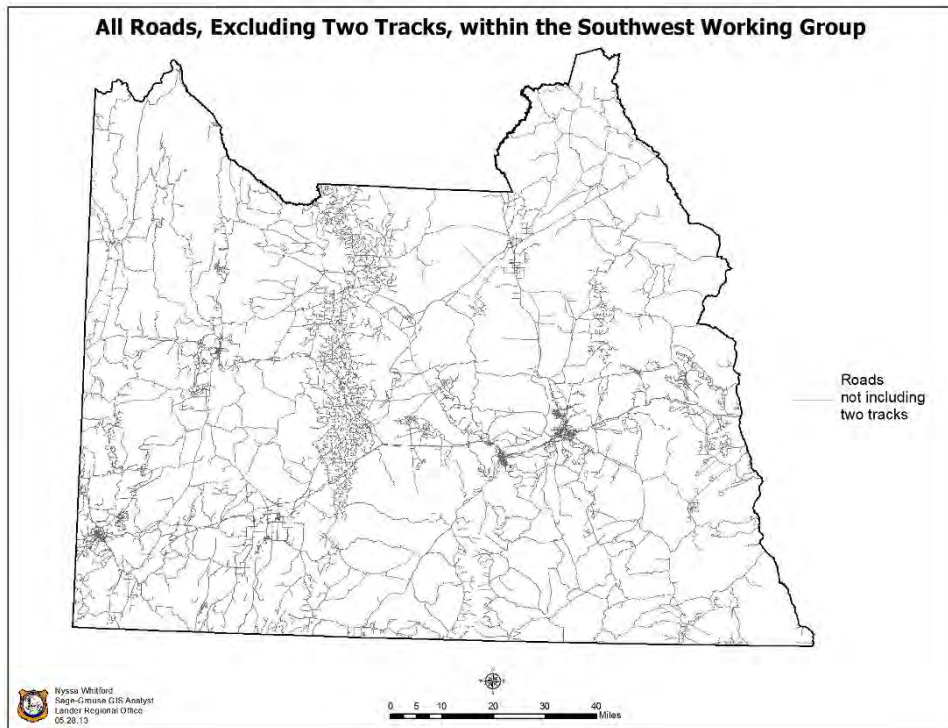
### **Roads and Travel Management Recommended Management Practices**

1. Discourage new road construction through crucial sage-grouse habitat, especially riparian zones.
2. Close and reclaim unauthorized, nonessential roads and railways.
3. Strictly enforce Travel Management Plans.
4. Enforce seasonal road area closures and encourage use of signs to reduce illegal use of roads.
5. In areas where new roads or railways must be constructed, all roads and railways should be designed and constructed to minimize impacts to sage-grouse habitat.
6. Discourage fenced rights of way on new roads where it is appropriate.
7. Require development companies to share roads and maintain rights of way. Prohibit parallel redundant roads.
8. Recommend reduced speed limits in areas of sage-grouse use, especially during critical time periods (e.g. reproduction).
9. Require dust abatement measures on high use roads.
10. Use seed mixes on reclaimed areas that benefit sage-grouse and other wildlife species. However, consider potential mortality when selecting seed mixes adjacent to roads.
11. Use common and existing road corridors where possible to minimize overall disturbance to the landscape.
12. Ensure that reclamation is timely and appropriate to the soil type and vegetation prior to disturbance (one type seed mix does not work for all disturbed areas).
13. Apply seasonal stipulations to construction and maintenance activities to reduce impacts to sage-grouse.

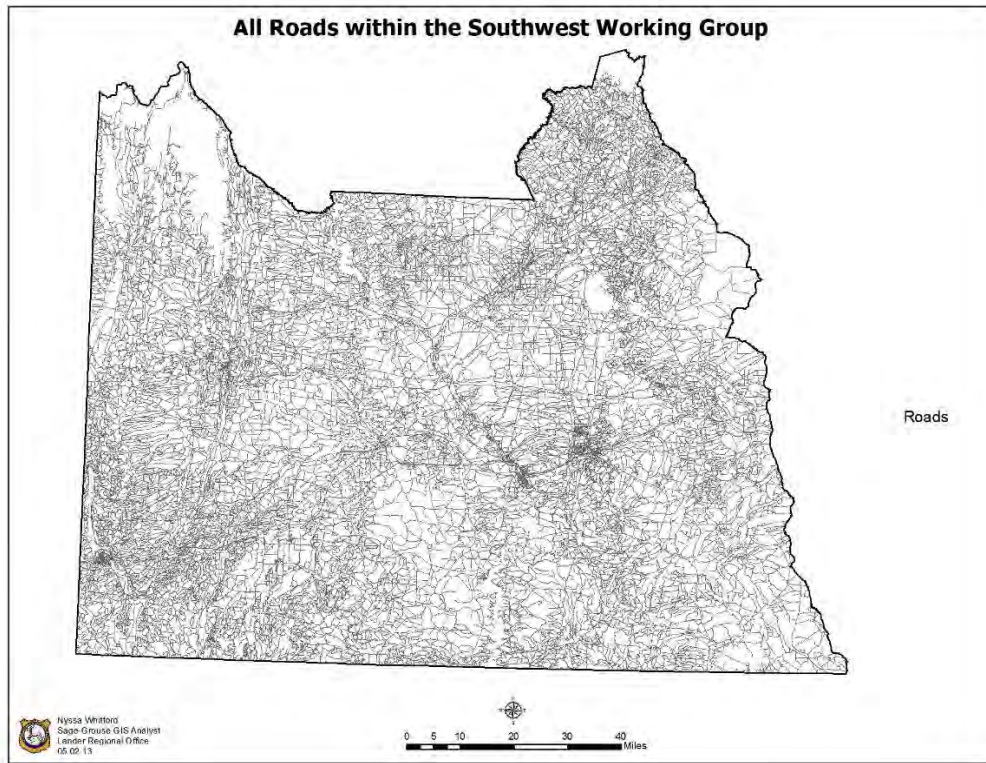
**Figure 24.** Federal and state highways within the SWSGCA.



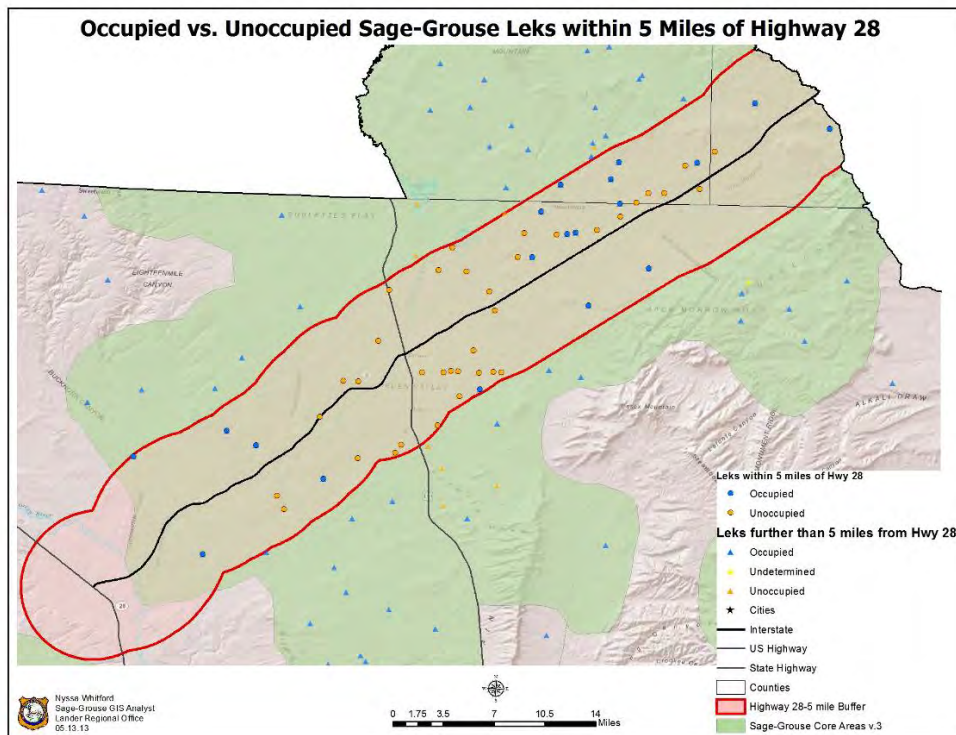
**Figure 25.** Major roads in the SWSGCA as provided by the Kemmerer and Rock Springs BLM FOs (includes all roads excluding two-tracks (energy development roads, county roads, state and federal highways, etc.)).



**Figure 26.** All roads within the SWSGCA including two-tracks



**Figure 27.** Distribution of occupied and unoccupied leks relative to Wyoming Highway 28.





### **Issue: Conflicting Wildlife Management**

The management of sage-grouse habitat via the WCAS prioritizes the management of sage-grouse in core areas. The WCAS has the potential to modify management of other species, e.g. potentially limiting the scope and scale of habitat treatments that may be desired for some large ungulate species. However, the regulatory protections offered by the WCAS provide all species with increased protection from habitat loss and disturbance.

Managing a single sagebrush site for all wildlife species that may inhabit sagebrush communities is impractical or not possible because practices that benefit some species can be detrimental to others. Approximately 100 bird species, 70 mammal species, and several reptiles are found in sagebrush habitats including many sagebrush obligates or near-obligates such as the sage-grouse, sage sparrow, Brewer's sparrow, sage thrasher, pygmy rabbit, sagebrush vole, sagebrush lizard, and pronghorn. A number of other priority or sensitive wildlife species are dependent upon or inhabit the sagebrush ecosystem including white-tailed prairie dog, ferruginous hawk, mountain plover, midget-faded rattlesnake, Columbian sharp-tailed grouse, and swift fox among others. Each has specific micro-site habitat requirements that often conflict with the seasonal habitat requirements of sage-grouse. On a landscape scale, with a mosaic of seral stages and vegetation types, the specific seasonal habitat requirements of the various wildlife species that inhabit sagebrush ecosystems can be accommodated.

Elk, mule deer and pronghorn are the primary wild ungulates that occur within occupied sage-grouse habitat. Grazing and browsing can contribute to long-term changes in plant communities and can alter various habitat components that contribute to the health of sagebrush ecosystems and the sage-grouse habitat it supports. As with livestock these grazing/browsing effects may be positive, negative or neutral depending on site-specific conditions. Areas of concern may be where there is annual heavy sagebrush browsing by large winter concentrations of mule deer or pronghorn or where high densities of wintering elk reduce residual grasses in nesting habitat. Wildlife populations should be managed according to WGFD objectives.

Federal and state laws, rules and regulations have been enacted that limit management options for various wildlife or plants. Some may conflict with sage-grouse management goals. Some threatened, endangered or candidate species have habitat requirements or other needs that directly conflict with sage-grouse habitat requirements or preferences.

#### **Wildlife Management – Habitat Sub-Goal**

1. Consider impacts to sage-grouse habitat when developing management goals and strategies for other wildlife species.

#### **Wildlife Management – Monitoring Sub-Goal**

2. Evaluate effects to sage-grouse when managing for other wildlife species.

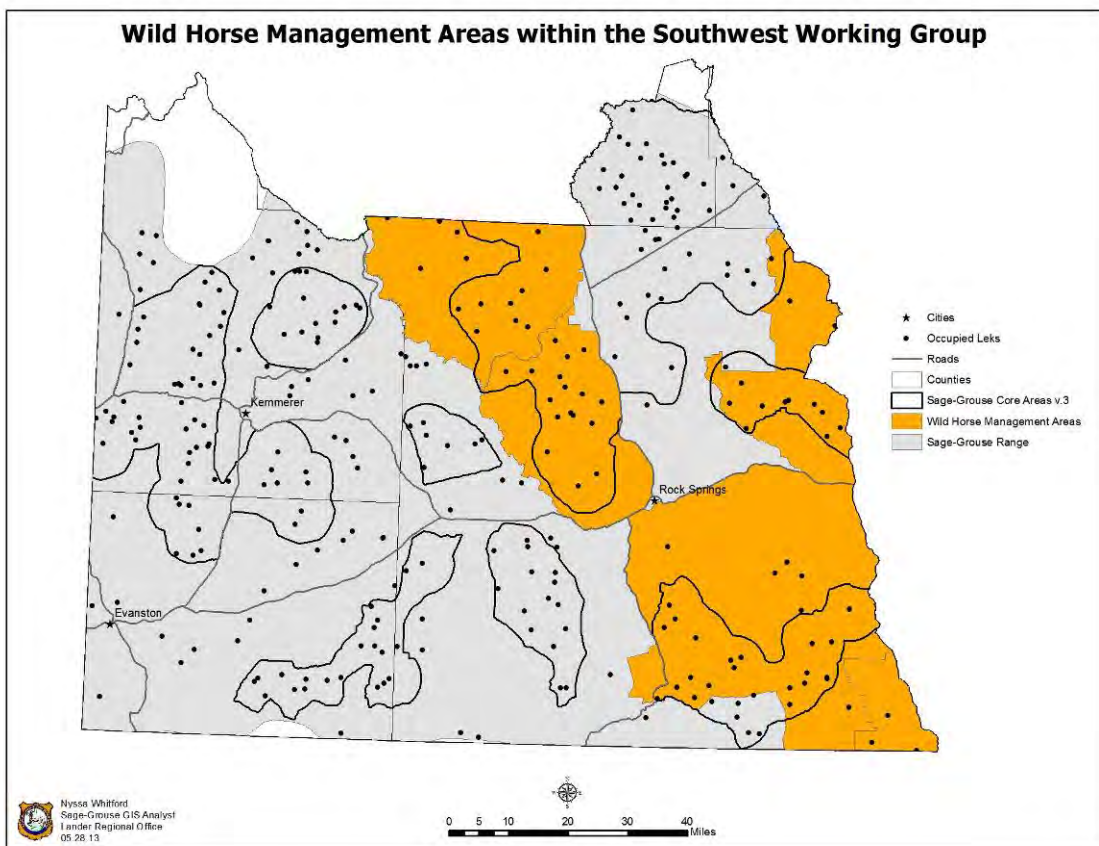
## **Conflicting Wildlife Management Recommended Management Practices**

1. Assess how proposed habitat improvement projects for other species could impact sage-grouse.
2. When planning mitigation projects, avoid negative impacts to sage-grouse.
3. Manage big game as necessary to improve habitat conditions for sage-grouse.
4. Incorporate sage-grouse needs into management plans for all wildlife.

### **Issue: Wild Horse Management**

Improper management of wild horses results in degradation of sage-grouse habitat. Grazing and browsing can contribute to long-term changes in plant communities and can alter various habitat components that contribute to the health of sagebrush ecosystems and the sage-grouse habitat it supports. Wild horses have a significant impact on riparian and spring (water) sources. The BLM is charged with management of wild horses. The BLM Wild Horse Management Areas (HMAs) and Appropriate Management Levels (AMLs) are shown in Figure 28 and Table 5.

**Figure 28.** Designated wild horse management areas within the SWSGCA.



**Table 5.** Wild Horse Management Areas (HMAs) and Appropriate Management Level (AML).

| <b>Wild Horse Management Area (HMA)</b> | <b>AML</b> | <b>Contained within SWSGCA</b> |
|---|------------|--------------------------------|
| White Mountain                          | 205-300    | Yes                            |
| Great Divide Basin                      | 415-600    | No, also in South-Central SGCA |
| Salt Wells Creek                        | 251-365    | No, also in South-Central SGCA |
| Little Colorado                         | 69-100     | No, also in Upper Green SGCA   |
| Adobe Town                              | 165-235*   | No, also in South-Central SGCA |

\* - AML for BLM’s Rock Springs FO portion of Adobe Town HMA.

**Wild Horse Management – Habitat Sub-Goal**

1. Reduce wild horse populations if sage-grouse habitats are being negatively impacted.
2. Evaluate impacts to sage-grouse habitat when considering management goals (AMLs) and strategies for wild horses.

**Wild Horse Management – Monitoring Sub-Goal**

3. Evaluate effects to sage-grouse when managing for wild horses.

**Wild Horse Recommended Management Practices**

1. Encourage the use of improved estimation techniques to determine wild horse numbers per HMA.
2. Work with BLM to ensure designated wild horse populations are maintained at acceptable carrying capacities to minimize impacts on sage-grouse and other wildlife.
3. Review federal Appropriate Management Levels (AML) for wild horses as they relate to habitat conditions for sage-grouse. Until such review is complete, maintain wild horse numbers at or below AML.
4. Keep the BLM’s Wild Horse Program involved in sage-grouse conservation efforts.
5. Identify the BLM, under the 1971 Wild Horse and Burro Act, as the agency responsible for keeping wild horse herd numbers at target levels.
6. Support BLM in exploration of alternative outlets for captured wild horses after they have been removed from public lands.

**Issue: Mineral Development**

The discovery and development of coal, uranium, trona, bentonite, gypsum, decorative rock, metals, precious stones, sand, gravel, zeolite, phosphate, diamond, gold, fossils, salt, perlite, lithium and construction materials throughout the western United States has impacted habitat and has been identified as a potential causative agent in declining sage-grouse populations but impacts have not been adequately quantified. There is increasing demand for goods and services

supported by the minerals industry. Lithium was recently discovered near Superior and development of this resource may have sage-grouse impacts. However, it is too early to know if the resource will be developed and any significance such development would have to sage-grouse.

Significant mines/mining activity in the SWSGCA include:

- Open-pit strip coal mines (Figure 33):
  - Westmoreland near Kemmerer,
  - Black Butte, southeast of Point of Rocks
  - Jim Bridger mine northeast of Point of Rocks (surface and underground).
  - Haystack mine near Kemmerer (new in 2011). This new mine is currently inactive.
  - Coal potential is shown in Figure 34.
- Trona mines (Figure 33):
  - FMC Granger and Westvaco, Solvay, OCI, Tata/Church & Dwight. Trona mining is conducted underground but large processing plants and associated infrastructure (roads, evaporation ponds, powerlines, etc.) occupy the surface.
- Industrial Gravel pits:
  - Large industrial gravel operations near Wyoming Highway 372 and at Natural Corrals are associated with sage-grouse habitat. Additional small temporary gravel operations are common in this area, but have limited impacts.

While the impacts of these mining activities to sage-grouse have not been quantified in the SWSGCA, all of the mine sites are within sage-grouse habitats and some historical leks in and near heavily impacted areas have been destroyed or become unoccupied.

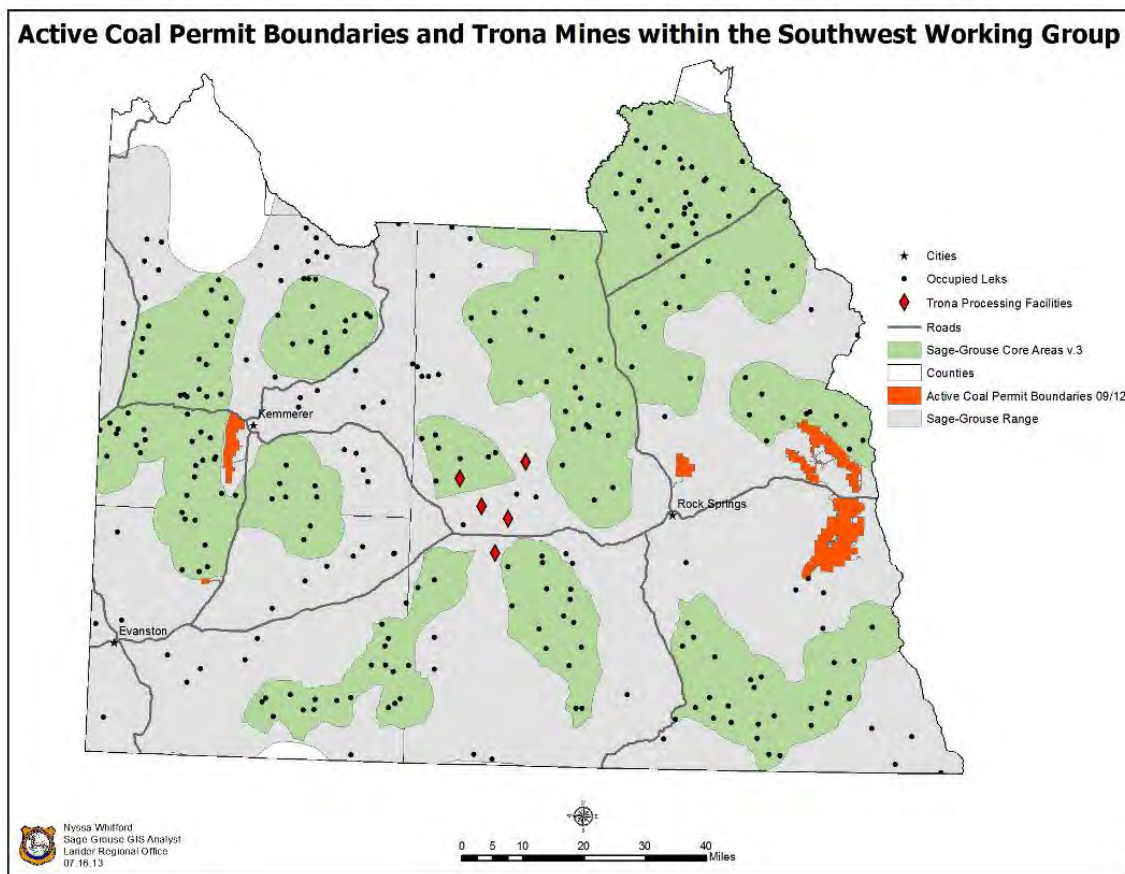
Many of the impacts from mineral development are similar to impacts associated with energy development. Some potential impacts of mineral development to sage-grouse include: (1) direct habitat loss and fragmentation from mine, well, road, pipeline, transmission and power line construction, (2) alteration of plant and animal communities, (3) increased human activity which could cause animals to avoid the area, (4) increased noise which could cause animals to avoid an area or reduce their breeding efficiency, (5) increased motorized access by the public leading to legal harvest, illegal harvest, and vehicle mortality, and (6) reduced water tables resulting in the loss of herbaceous vegetation. Many of these impacts can be minimized by mitigation, reclamation, and planning for sage-grouse needs. Some of these impacts are short-term related to specific periods of activity, and some may result in positive effects such as increased forb production, habitat diversity and additional water sources. Impacts may be long-term (30 years or more), and rehabilitation of impacted habitats may take many years to complete.

Roads built to accommodate mineral exploration and development activities often result in the establishment of permanent travel routes, improved public access, increased long-term traffic related disturbance, indirect noise impacts, and direct mortality. Research suggests that road-related disturbances during the breeding season may cause sage-grouse leks to become inactive over time, reduce the number of hens bred on disturbed leks that initiate nests, and increases the distance from the lek hens will move to selected nesting habitat. Dust from roads and other surface disturbances can adversely affect plants and animals. Transmission and power line

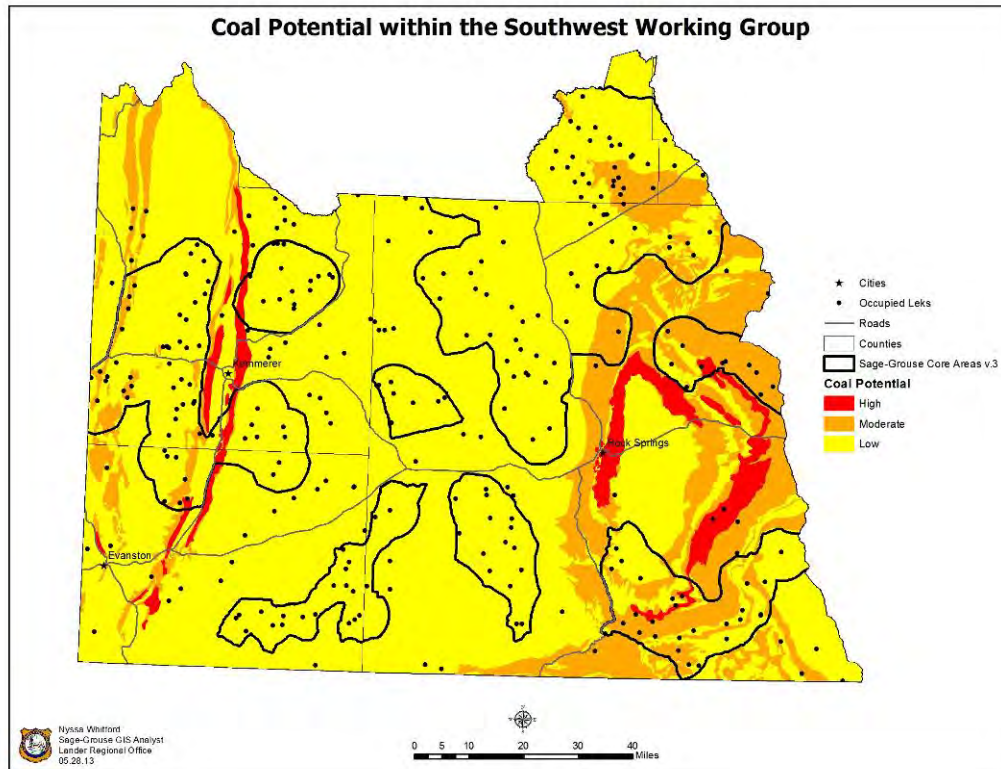
construction does not cause direct habitat loss, but sage-grouse tend to avoid areas associated with these lines (as they provide potential raptor perch sites), thus resulting in an indirect loss of habitat in the vicinity of overhead lines. The potential effects of noise on sage-grouse include masking sounds that influence courtship, mate selection, grouping, escape, etc. Research into these subjects is ongoing.

The various types of mineral operations are managed pursuant to a wide array of state and federal statutes and regulations, each with specific provisions that may or may not be flexible. The WCAS and associated federal documents address mineral development activities in sage-grouse habitat.

**Figure 29.** Active coal permits and trona mines within the SWSGCA.



**Figure 30.** Known coal potential within the SWSGCA.



### **Mineral Development – Habitat Sub-Goal**

1. Assure that mineral development and mining operators conduct business in a manner compatible with maintenance and enhancement of sage-grouse populations and habitat through compliance with applicable regulations.

### **Mineral Development – Research Sub-Goal**

2. Reclamation projects should include research to identify/cultivate/make commercially available drought tolerant species, especially forbs.
3. Support research to determine impacts to sage-grouse habitats associated with mineral development.
4. Encourage and support research that promotes successful reclamation in southwestern Wyoming.

### **Mineral Development Recommended Management Practices**

1. As per the Wyoming Governor’s EO-2011-5, evaluate and address the needs of sage-grouse when placing well sites, mines, pits, infrastructure and industrial sites/plants.

2. Where mineral development and industrial sites/plants occur in sage-grouse habitat tailor reclamation to restore, replace or augment needed habitat types.
3. Where necessary to build or maintain fences, evaluate whether increased visibility, alternate location, or different fence design will reduce hazards to flying grouse.
4. Avoid construction of overhead lines and other perch sites in occupied sage-grouse habitat. Where these structures must be built, or presently exist, bury the lines, locate along existing utility corridors or modify the structures to prevent perching by raptors, where possible.
5. Reduce noise from industrial development or traffic especially in breeding and brood-rearing habitats.
6. Manage water production to enhance or maintain sage-grouse habitat.
7. Avoid surface and subsurface water depletion that impacts sage-grouse habitats.
8. Utilize weed free seed mix with shrub and forb components for reclamation and treat invasive plants on disturbed areas.
9. Control dust from roads and other surface disturbances within the population's seasonal habitats.
10. Continue research efforts to determine the effects of mineral development on sage-grouse populations.
11. Consider off-site mitigation as an alternative mitigation for mineral development impacts on known sage-grouse habitat. Work with mineral entities to develop and implement acceptable offsite mitigation measures for enhancing sage-grouse habitat, as needed, to offset impacts of surface disturbing activities.
12. Regulate new or existing sand and gravel, exploration and mining activities in core sage-grouse habitat, during important seasonal activities. (lekking, nesting, brood rearing, and wintering).
13. Encourage the development of new technologies that would reduce total surface disturbance within occupied sage-grouse habitat.
14. Implement provisions of the Wyoming Core Area Strategy.

### **Issue: Parasites and Diseases**

Sage-grouse are known to harbor a number of different parasites and diseases. Most diseases and parasites have evolved with sage-grouse over time. Many of these afflictions are often not a serious concern unless the sage-grouse are stressed. Diseases and parasites that affect sage-grouse include various bacteria, protozoa, worms and ecto-parasites. Many of the common parasites and diseases carried by sage-grouse appear to be non-pathogenic, but may increase the vulnerability of infected birds that are stressed or concentrated. Coccidiosis is one disease that has been identified as a cause of sage-grouse mortality. Diseases and parasites may potentially become an issue if sage-grouse come into contact with captive raised birds released into the wild. In general, it is not believed that diseases and parasites are a major issue in sage-grouse declines.

West Nile Virus (WNV) has been demonstrated to be highly lethal to sage-grouse (Naugle et al. 2004) especially at the lower elevations (<6,000 ft.) of sage-grouse range. Lower altitudes typically have warmer temperatures that favor the development of the disease in the mosquito vector. However, in 2006, 5 radio-collared grouse from a Colorado study being conducted

immediately adjacent to the SWSGCA were reported to have died from WNV at altitudes above 6,000 feet. One of these grouse died in Wyoming near Pine Mountain, south of Rock Springs. This report was referred to in the 2007 plan. However, Colorado Parks and Wildlife now reports that 4 of the 5 results were false positives. Therefore, the elevational temperature barrier appears to remain valid.

### **Parasites and Disease – Habitat Sub-Goal**

1. Maintain habitat quality that discourages parasites and diseases.

### **Parasites and Diseases – Monitoring Sub-Goal**

2. Monitor and evaluate the impacts of disease (Coccidiosis, Avian Influenza [Bird Flu], WNV) on sage-grouse populations and solicit public reporting of bird mortalities.

### **Parasites and Diseases – Population Sub-Goal**

3. Minimize impacts of parasites or disease on sage-grouse.

### **Parasites and Diseases Recommended Management Practices**

1. Investigate and record deaths that could be attributed to parasites or disease.
2. Develop and implement strategies to deal with disease and outbreaks where appropriate.

### **Issue: Predation**

Predation is and has always been a cause of sage-grouse mortality. Predation, during nesting and early brood-rearing, influences sage-grouse populations. Nest predators identified in Wyoming studies include badgers, red foxes, ravens and ground squirrels. In addition, golden eagles, red foxes, ravens, coyotes, various hawks, bobcats, and weasels prey on sage-grouse throughout the year.

Humans have altered the landscape and influenced predator-prey relationships that evolved between sage-grouse and native predators. These activities have led to a change in the number, distribution and type of predators that prey on sage-grouse. As habitats are altered, and/or where predators dramatically increase in number or in type, impacts of predation may be magnified. “Newcomer” predators such as red fox, raccoons, skunks and feral cats have expanded their range into sage-grouse habitats where they were not previously a factor. These newcomers and traditional predators have increased in numbers largely as a result of readily available food associated with human activities. Migratory bird protection has also allowed avian predator populations, particularly ravens, to expand. While some raptor populations have rebounded over the past half century, they have simply returned to something closer to pre-poison/control distribution and numbers. In fact, there is documentation that some raptors, including golden eagles, have declined in recent years (although Wyoming appears to remain a stronghold for



golden eagles). Ravens on the other hand, seem to have actually increased their range and numbers compared to historic levels.

As referenced in literature from the USFWS and others: The raven is a sage-grouse predator that has greatly increased its population within the intermountain west due to human actions. Historically ravens were uncommon in the sagebrush landscape, but due to human development, their abundance has increased as much as 1,500% in some areas of western North America since the 1960's. Human-made structures in the environment have increased the effect of raven predation, particularly in low canopy cover areas, by providing ravens with perches. The reduction in patch size and diversity of sagebrush habitat, as well as the construction of fences, power lines, and other infrastructure, has encouraged the presence of ravens. Landfills, garbage containers, litter, road-kill and dead livestock are major food sources that have also allowed raven populations to expand their range and grow in size.

It has been shown that removal of ravens or other predators sometimes produces short-term gains that may benefit fall sage-grouse populations but not breeding population sizes. Predator removal may have greater benefits in areas with low habitat quality, but predator numbers quickly rebound without continual control.

Current land-use practices, in the intermountain west, favor high predator (in particular, raven) abundance relative to historical numbers.

Predators could already be limiting sage-grouse populations in southwestern Wyoming and northeastern Nevada.

Based on the above information, the USFWS 2010 listing decision concluded sage-grouse mortality due to nest predation by ravens and other human-subsidized predators is increasing in some areas, specifically southwest Wyoming, but did not find sufficient range-wide information to suggest the threat was significant enough to warrant listing Greater Sage-grouse as threatened or endangered.

Lethal predator control to increase production and recruitment in bird populations has only been shown to be effective on small, intensively managed areas where efforts are continual. Management of predators may be necessary in localized situations to maintain a sage-grouse population. Predator management may mean lethal control, but may also include removing key elements that attract predators (e.g. perches, food sources) and/or increasing the quality of habitat for sage-grouse.

In 2012, the USFWS approved an application by the USDA Wildlife Services, at the request of the WGFD, to add sage-grouse conservation as a reason to conduct lethal raven control in southwest Wyoming. Prior to this such control was only allowed for purposes of site specific livestock protection and human health and safety. The change allowed Wildlife Services to use the corvid toxicant DC1339 to conduct control operations at landfill locations where ravens feed. In February 2013, Wildlife Services began lethal control of ravens at 7 landfills in Fremont, Sweetwater, Sublette and Lincoln counties. This action will likely result in several hundred more ravens being removed annually across the SWSGCA. In addition, the WGFD, in

cooperation with the Upper Green River Basin LWG, has been permitted by the USFWS to remove raven nests, eggs and nestlings from human structures in Sublette County since 2011. A portion of Sublette County is within the SWSGCA and 1-2 nests have been taken annually for the last three years in this area. Whether these control actions result in measureable benefit to sage-grouse is unknown but monitoring efforts to determine the impacts are being pursued via research conducted by Utah State University with the funding assistance of the SWLWG and others.

As with many issues surrounding sage-grouse management, predator-prey relationships are complex and difficult to quantify. It is important to identify potential unintended consequences of predator control as it relates to sage-grouse. Where predation is demonstrated to be of significant concern, localized predator management should be considered.

#### **Predation – Habitat Sub-Goal**

1. Maintain habitat quality that discourages predation.

#### **Predation – Monitoring Sub-Goal**

2. Monitor the effectiveness of any predator control efforts that are implemented.

#### **Predation – Research Sub-Goal**

3. Better quantify and qualify the role of predation on sage-grouse in Southwest Wyoming.

#### **Predator Recommended Management Practices**

1. Where appropriate, local working groups should consider supporting predator control to maintain or enhance local sage-grouse populations when they determine there is a demonstrated need.
2. Develop and distribute educational materials regarding human practices that may allow establishment/expansion of predator populations. Examples of these activities include landfills and other garbage waste disposal that may provide artificial food sources for a variety of predators, and buildings/structures that provide nesting/roosting habitat for ravens/raptors.
3. Avoid construction of overhead lines and other perch sites in occupied sage-grouse habitat. Where these structures must be built or presently exist, bury the lines, locate along existing utility corridors or modify the structures in key areas.
4. Predator control to enhance sage-grouse survival should be targeted only to predators identified as impacting the sage-grouse population.
5. Discourage the establishment, and bring into balance artificially high populations of newcomer predators in sage-grouse habitat.
6. Request the USFWS to do a species assessment on the raven. Encourage the USFWS to include ravens in 50CFR21.43 “Control of Depredating Birds”.
7. Implement Wyoming’s Core Area Strategy to minimize artificial raven nesting and foraging opportunities.

8. Refer also to “Vegetation Management” RMPs since adequate shrub and grass cover provides protection from predation.

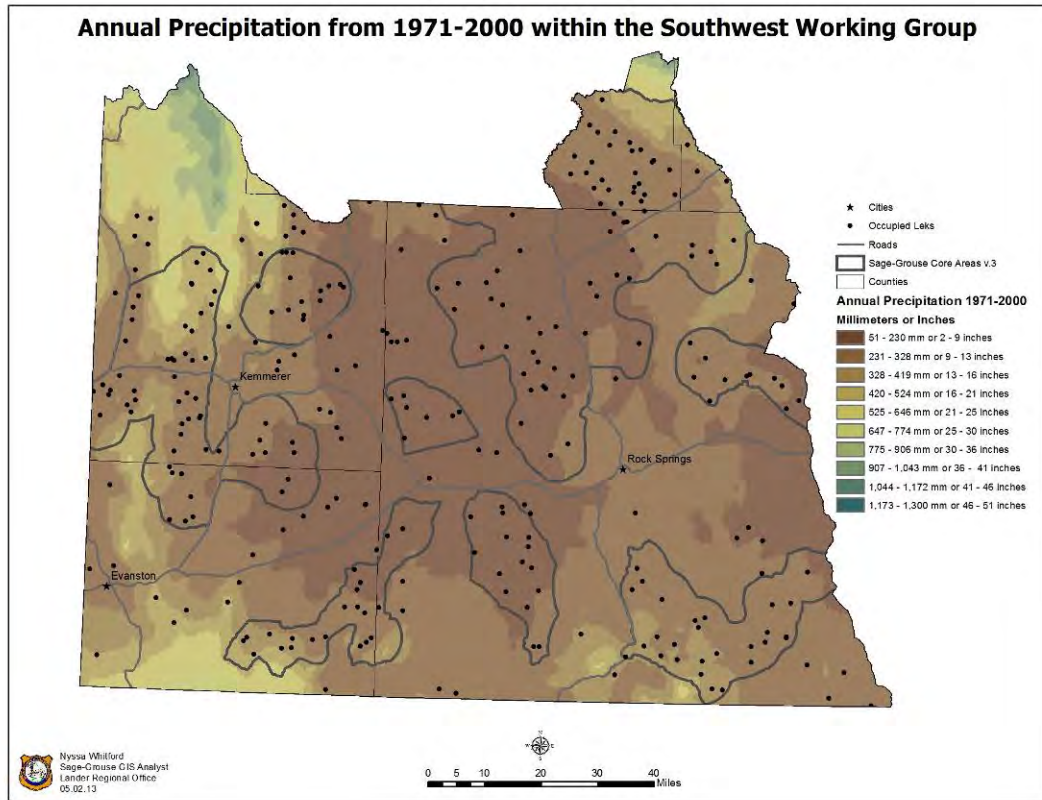
### **Issue: Weather**

Sage-grouse evolved with long term climatic change, and survived multiple ice-ages and droughts. Annual weather fluctuations, multi-year weather events, and long term climatic change all influence sage-grouse populations by physically stressing them and by modifying their habitats. Annual variations in precipitation and temperature can affect annual sage-grouse production and can be very site-specific. Cold, wet weather during early-brood-rearing can physically stress and kill young chicks and have adverse affects on insect populations. However, cool, wet springs can be advantageous to sage-grouse by promoting herbaceous growth, especially forbs. Extremely hot-dry conditions during the early summer concentrate sage-grouse on the few riparian areas that remain well hydrated, and thereby increase the potential for predation and the risk of disease.

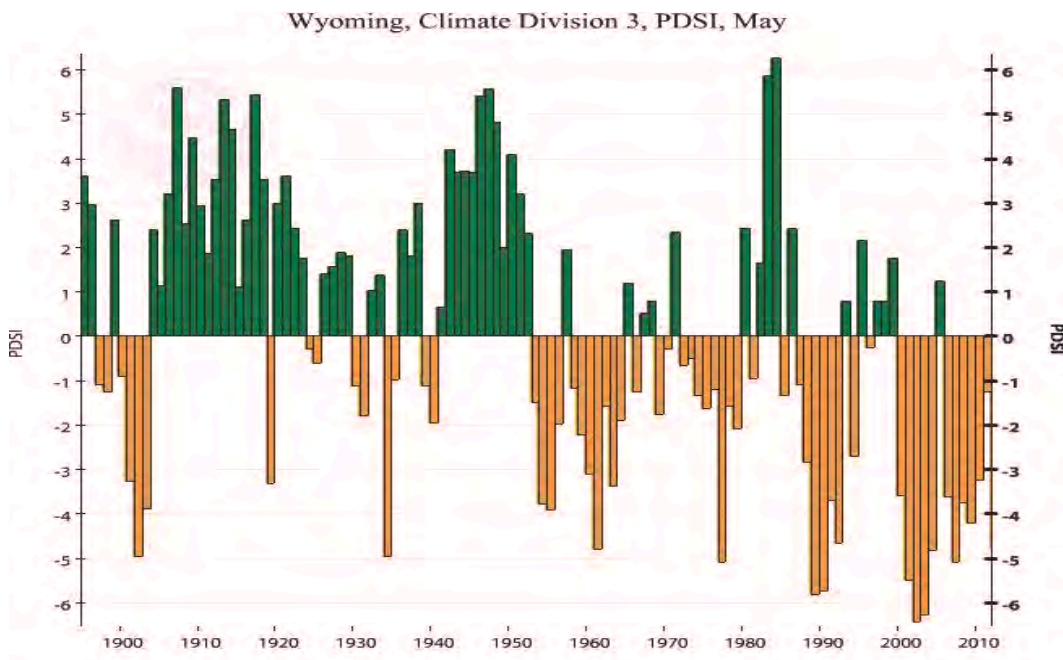
Short-term climatic cycles affect the length of the growing season and influence plant succession and the abundance and duration of herbaceous cover and forb availability. Typically, wet cycles benefit sage-grouse while dry cycles or drought may reduce the amount of grass and forb production to levels that are inadequate for sage-grouse survival. Periodic weather events such as extreme winters can increase snow depths to levels that cover most of the sagebrush and limit areas available for foraging and cover. Long term and/or extreme drought can cause changes in vegetative communities that decrease the effectiveness of sage-grouse habitats for long periods, and result in reductions in productivity that culminate in population declines. A multi-year weather cycle of above normal precipitation can enhance sage-grouse populations, due to the positive influence moisture has on vegetative communities. Multi-year weather events usually occur on a larger geographical scale than annual fluctuations, and influence sage-grouse populations at the regional level.

Although sage-grouse have evolved with weather fluctuations for thousands of years, weather remains a significant factor in determining the status and well being of their populations. Weather can have either a positive or negative effect upon sage-grouse populations, and wildlife managers must understand these effects in order to correctly assess the extent to which they are limiting a population or contributing to its decline. The short-term role that weather plays and long-term climate change effects on sage-grouse populations must be considered when management practices for sage-grouse are selected. Long-term precipitation and drought data for the SWSGCA are shown in Figures 31 and 32, and in Figure 33 for Wyoming. A majority of sage-grouse habitats within the SWSGCA receive less than 10 inches of annual precipitation and, generally speaking, grouse populations have trended downward during periods of drought (areas below the mid-line on Figure 32). Drought was the norm during the latter half of the 1900s while wetter than normal conditions prevailed during the first half of the 1900s.

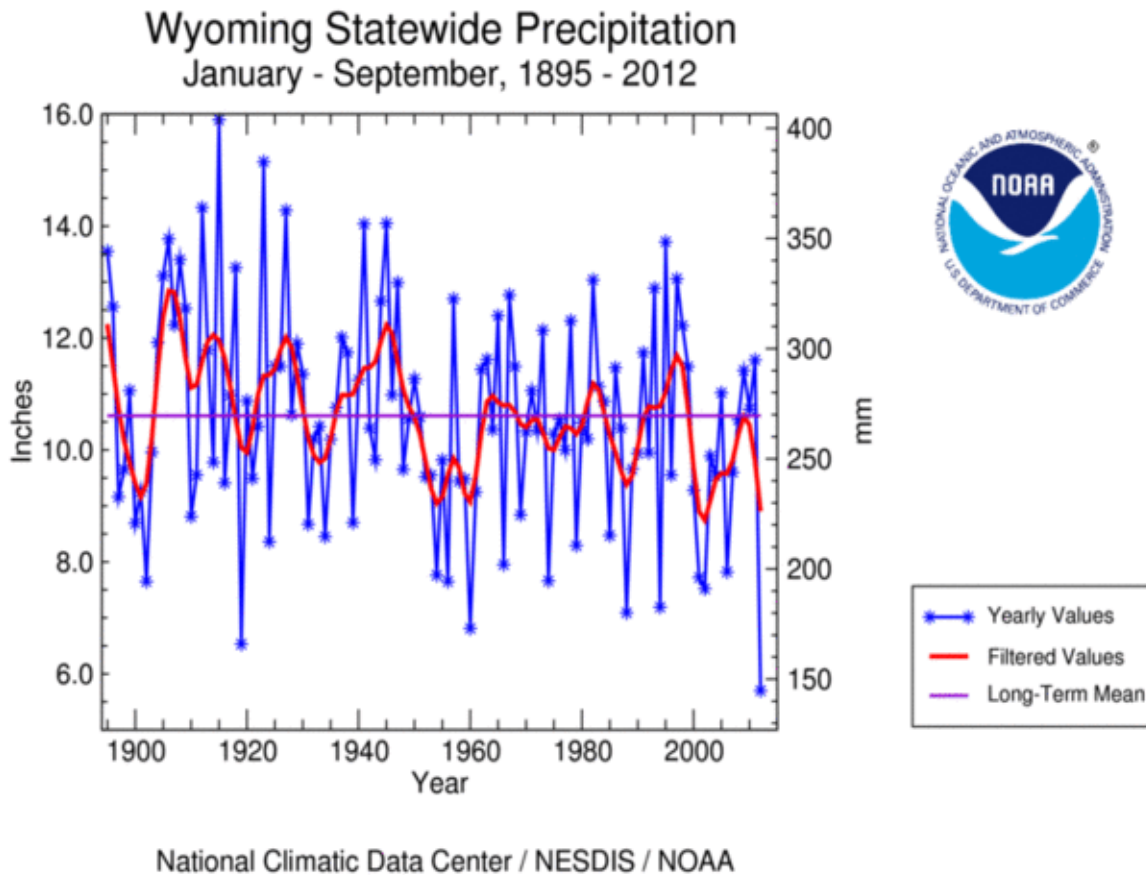
**Figure 31.** Average annual precipitation within the SWSGCA, 1971-2000



**Figure 32.** Palmer Drought Severity Index for the SWSGCA, 1895-2012.



**Figure 33.** Wyoming statewide average precipitation and trend, 1895 – 2012.



Sage-grouse nest success and chick survival have been linked to habitat condition, specifically shrub height and cover, live and residual (remaining from the previous year) grass height and cover, and forb cover. The shrubs (primarily sagebrush) and grasses provide screening cover from predators and weather while the forbs provide food in the form of the plant material itself and in insects that use the forbs for habitat. Spring precipitation is an important determinant of the quantity and quality of these vegetation characteristics. Residual grass height and cover depend on the previous year’s growing conditions and grazing pressure while live grass and forb cover are largely dependent on the current year’s precipitation.

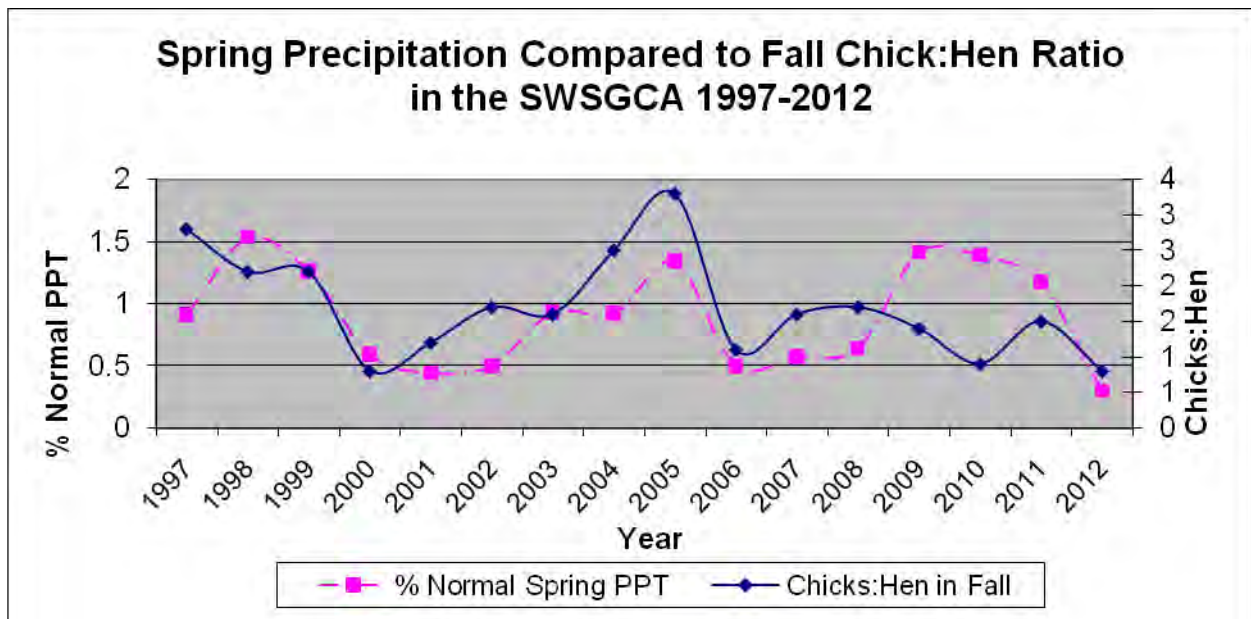
The spring (March-June) precipitation and fall chick:hen ratios (as determined by hunter harvested wings) are shown in Table 6 and Figure 34. A comparison of these variables is suggestive of a positive relationship between them. Generally speaking, spring precipitation that was normal or above normal (90%+) resulted in above average fall chick:hen ratios and years of spring drought resulted in below average chick production. The 1997-2005 average chick:hen ratio was 2.0. The average chick:hen ratio of those years with greater than 90% of normal spring precipitation was 2.4 while the average chick:hen ratio in the drought years of 2000-2002 was 1.2. In turn, years of high chick production generally resulted in increased numbers of birds observed during the subsequent year’s lek checks. A more thorough statistical analysis of these

and other weather effects is recommended especially as additional years of data are collected. Wing data collected and analyzed prior to 1997 are not reliable indicators of chick production due to inconsistent observers using outdated techniques.

**Table 6.** Spring precipitation compared to fall chick:hen ratios in SWSGCA 1997-2012. Precipitation data source: <http://wrcc.dri.edu/index.html>.

| Year | % of Average March-June Precipitation | Chicks:Hen |
|------|---------------------------------------|------------|
| 1997 | 91%                                   | 2.8        |
| 1998 | 153%                                  | 2.2        |
| 1999 | 126%                                  | 2.2        |
| 2000 | 59%                                   | 0.8        |
| 2001 | 44%                                   | 1.2        |
| 2002 | 50%                                   | 1.7        |
| 2003 | 93%                                   | 1.6        |
| 2004 | 92%                                   | 2.2        |
| 2005 | 134%                                  | 3.2        |
| 2006 | 50%                                   | 1.1        |
| 2007 | 57%                                   | 1.8        |
| 2008 | 64%                                   | 2.1        |
| 2009 | 141%                                  | 1.4        |
| 2010 | 139%                                  | 0.9        |
| 2011 | 117%                                  | 1.5        |
| 2012 | 30%                                   | 0.8        |

**Figure 34.** Greater sage-grouse chicks per hen (as determined by fall wing data) compared to spring precipitation within the SWSGCA, 1997 – 2012.



Winter weather has not been shown to be limiting to sage-grouse except in areas of persistent deep snow cover resulting in limited sagebrush availability. This is rarely the case within the SWSGCA.

### **Weather – Habitat Sub-Goal**

1. Encourage management practices that mitigate adverse impacts of weather on sage-grouse habitats.

### **Weather – Research Sub-Goals**

2. Better define weather and climate related effects on sage-grouse populations and their interactions with other limiting factors, in order to correctly understand and assess fluctuations in sage-grouse populations.
3. Determine cause and effect relationships between forage, drought, multiple uses and sage-grouse recruitment.

### **Weather Recommended Management Practices**

1. Manage habitat for drought continually. Where drought has been documented for two (2) consecutive years, consider implementation of Recommended Management Practices in year three (3) that may include drought management of livestock and wildlife grazing, protection of core sage-grouse habitats from wildlife and prescribed fire, reduced bag limits during sage-grouse hunting seasons, predator management programs to enhance nesting and early brood rearing success of impacted populations, water hauling and protection of water sources from evaporation, installation of guzzlers, snow fences and fencing of water source overflows, ensure bird ladders are in place on existing water sources and other appropriate management options developed by local sage-grouse working groups.
2. Correlate, on a local level, historical and present weather and climate data, with historical and present sage-grouse population data to determine weather and climate impacts to sage-grouse populations and habitat.
3. Land and natural resource managers must remain flexible in other areas to accommodate varying precipitation patterns and adjust management practices according to climate and weather conditions.
4. Increase water developments, including riparian/spring protection, to alleviate impacts during drought conditions.
5. Strategically locate and protect water developments to maximize benefits during a drought.

### **Issue: Contaminants/Pesticides**

Pesticides (herbicides, insecticides and rodenticides) are used for a variety of purposes and have been identified as a possible influence on sage-grouse. However, it is not believed that

pesticides are currently a major issue for sage-grouse under existing application practices. No direct research on the effects of the field applications of currently used pesticides on sage-grouse has been conducted in Wyoming. Toxicity under laboratory conditions does not equate well to wildlife hazards under field conditions. Sage-grouse exposure and potential risk are dependent on numerous factors, such as application rate, pesticide formulation, and timing of treatment.

Pesticide impacts on sage-grouse in the field are difficult to quantify. This is exacerbated by the fact that these effects are believed to be sublethal, such as predisposing animals to predation or reducing reproductive success. Elimination of insects, or reduction of forbs has been documented and may be locally significant, but not widespread. Loss of sagebrush to large-scale chemical treatments can eliminate sage-grouse habitat.

An infestation of grasshoppers and/or Mormon crickets may occur in Wyoming (although rare in southwest Wyoming). The Animal and Plant Health Inspection Service (APHIS) and cooperating agencies conduct treatments to suppress grasshopper infestations above economic threshold levels. The goal of the proposed suppression program is to reduce grasshopper populations to acceptable levels in order to protect rangeland ecosystems and/or cropland adjacent to rangeland.

The Reduced Agent-Area Treatments (RAATs) technique is a grasshopper suppression method in which the rate of insecticide is reduced from conventional levels, and treated swaths are alternated with untreated swaths. The RAATs strategy relies on the effects of an insecticide to suppress grasshoppers within treated swaths while conserving grasshopper predators and parasites in swaths not directly treated. The insect growth regulator Diflubenzuron (Dimilin®) is non-toxic to birds but other more toxic chemicals (carbaryl and malathion) may be used.

### **Pesticides – Habitat and Population Sub-Goal**

1. Assure that pesticide application efforts are compatible with sage-grouse health and habitat needs.

### **Pesticide Recommended Management Practices**

1. Where possible, adjust alfalfa harvest timing instead of applying pesticides to control weevils.
2. Make use of current laboratory analysis procedures where sage-grouse mortality is observed. Report where pesticides have caused mortality in sage-grouse.
3. Work with county Weed and Pest Districts to identify low-toxicity alternatives to pesticides classified as a medium to very high risk to game birds.
4. Encourage simple, standardized record-keeping formats for all Weed and Pest Districts, that would allow access to pesticide use information in their counties and statewide.
5. Address grasshopper issues using the growth regulator Diflubenzuron (Dimilin®) in the RAATs approach.
6. Herbicide application should be timed to minimize reduction in beneficial forb species.



## Issue: Wildland Fire Management

Historically wildfire in southwest Wyoming played a role in shaping the vegetation communities over time. These wildfires helped maintain a mosaic of vegetation types and different age classes over the landscape. This mosaic pattern was the result of varying fire intensities that occurred at different times of the year with different conditions leaving unburned vegetation interspersed with burned areas. The amounts and types of vegetation were controlled by fire as well as herbivory and climate. These factors combined and interacted to produce a diverse vegetative component including the sagebrush-grass type on the landscape. The historic fire return interval or frequency of fire was dependant on the species of sagebrush and other vegetation present at that specific site. There is scientific debate about fire return intervals in sagebrush systems but in general more frequent fire return intervals of less than 100 years, often 40-60 years, are likely to have occurred on sites supporting Mountain big sagebrush, mountain shrubs such as serviceberry, and/or aspen. On sites supporting Wyoming, low or early sagebrush, fire return intervals were longer, usually exceeding 100 years.

Over the past 100 years, fire exclusion in the area has caused the general buildup of vegetative fuels and deadwood in some vegetative communities. In addition, drought conditions in recent years have caused vegetation to be less resistant to fire. Historic fire suppression in the planning area has altered composition of vegetation communities and altered natural fire regimes. For example, fire suppression has allowed sagebrush and juniper communities to dominate some sites causing a reduction in grass and forb production which has resulted in a less diverse plant community.

Management challenges related to wildland fire include:

- the ability to control the spread of invasive non-native species;
- the ability to control fire;
- use of wildland fire for the benefit of resources when it does not threaten life or property;
- managing natural fire regimes and fire return intervals;
- potential unintended impacts of fire on visibility and public health;
- the use of fire as a resource management tool;
- fire management in the wildland/urban interface;
- linking fire management activities and resource management goals and objectives;
- consideration of natural fire regimes, fire return intervals, and desired future vegetative types;
- determining the effects of fire to wildlife habitat, special status species of plants and animals
- post-fire livestock grazing management and deferment.

Wildland fire management strategies must recognize the role of wildland fire as an essential ecologic process. At the same time, these strategies must also consider firefighter and public safety, suppression costs, the resource values to be protected, and be consistent with resource program objectives. While protection of human life is the single overriding priority in fire management decisions, community infrastructure, private property, natural and cultural resources, and social, economic, and political factors should also be considered.

Under existing planning, fire suppression is used to protect resource values and areas. Examples of resources or areas protected from wildland fire include:

- Core/Priority sage-grouse habitats
- Communities
- Campgrounds and other developed recreational areas
- Rock art, cultural sites, and historic structures
- Commercial timber where hazardous fuels exist
- Oil and gas fields and related facilities, utilities and road rights-of-way
- Lands with intermingled federal, state, and private ownership where there are currently no agreements for using wildland fire as a resource management tool
- Other areas as identified through continued public involvement in the fire management planning effort

### **Wildland Fire Management – Habitat Sub-Goals**

1. Protect human health and safety and at-risk resource values.
2. Reduce, or modify, hazardous fuel accumulations.
3. Where appropriate consider natural fire regimes and frequency while protecting sage-grouse core/priority habitats.

### **Wildland Fire Recommended Management Practices**

1. Wildland fire can be used to achieve identified resource objectives and reduce dangerous accumulations of fuels.
2. Use of heavy equipment for fire management should be minimized and vehicle tracks, fire lines, and emergency access routes should be rehabilitated to prevent erosion and continued use.
3. Promote public education regarding fire management, including restrictions on the use of fire on public lands.
4. Wildland fires should be managed in all vegetation types to maintain or improve biological diversity and health of the public lands.
5. Burned areas should be monitored for the control of noxious weeds. Follow up management actions should be used as needed to prevent the spread of noxious weeds.
6. Burned areas should be assessed for Burned Area Emergency Stabilization and Rehabilitation needs.
7. Use of fire suppression chemicals, including foaming agents and surfactants should not be used within 200 feet of live water.
8. In areas with a high concentration of cheatgrass or other invasive non-native weeds, fire should be suppressed to protect remaining habitat and not allow type conversion of habitat to non-native weeds.
9. Following wildland fire, the area should be rested from livestock for a minimum of two growing seasons to allow vegetation to become reestablished.

10. Develop and implement wildfire suppression guidelines and appropriate management response addressing sage-grouse habitat health. Evaluate all wildfires in occupied sage-grouse habitat to determine if stabilization or rehabilitation of the burned area is needed, with emphasis placed on habitat that would be susceptible to invasion by annual grasses. Use appropriate mixtures of sagebrush, native grasses and forbs that permit burned areas to recover to a sagebrush-perennial grass habitat.

### **Issue: Hunting**

Sage-grouse hunting in southwest Wyoming has been a traditional recreation activity. Sage-grouse have been hunted annually under regulation of the WGFD since 1948. From 1937 to 1947 the hunting season was closed because of concern over low populations of grouse.

Sage-grouse hunting provides recreational, cultural and economic values. The biological data the harvested birds provide via harvest surveys and wing collections serve as important indicators of population status. In addition, hunting creates a constituency of sage-grouse advocates who are interested in seeing the needs of grouse are met. However, concern has been expressed about the impacts of recreational hunting to sage-grouse populations in Wyoming.

It appears that harvest of adult hens may have a detrimental impact on population. For many years it was traditional in Wyoming to hunt sage-grouse in late August or early September. Sage-grouse are relatively long lived with lower reproductive rates and lower annual turnover than other gallinaceous birds. Adult female grouse are more successful hatching clutches and raising chicks than are yearling hens. Thus, maintaining a higher proportion of adult hens in the population allows the population to grow faster under favorable habitat conditions. In 1995, in order to relieve harvest pressure on adult hens, hunting seasons were moved to late September when typically cooler, wetter weather, along with the fact that chicks are more independent, results in dispersal of these family groups. This dispersal makes adult hens less vulnerable to harvest since they are more scattered across their habitat and mixed with barren hens and males. Harvest rates of successfully nesting hens have declined since the hunting seasons dates were changed. Overall harvest declined as well due to a dramatic decrease in hunter participation since other hunting seasons, especially big game in western Wyoming, begin in mid-September.

Research to document the impact of closing hunting seasons on local bird populations was completed in Idaho. The results of these efforts suggest hunting seasons as currently structured in Wyoming are conservative and do not harm sage-grouse populations nor prevent their ability to increase under favorable conditions.

While sage-grouse are now a candidate (warranted but precluded) for listing, hunting was not viewed as a threat contributing to this decision. Members of the SWLWG recommend the reader refer to Christiansen (2010) *Hunting and Sage-grouse: A technical review of harvest management on a species of concern in Wyoming*<sup>2</sup> for additional details on this issue in Wyoming.

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<sup>2</sup> Christiansen, T. 2010. Hunting and Sage-grouse: A technical review of harvest management on a species of concern in Wyoming. Unpublished report. Wyoming Game & Fish Department, Cheyenne, WY. 21pp.

### **Hunting – Monitoring Sub-Goal**

1. Continue to collect hunter harvest data via hunter surveys and wing barrels to determine the effects of hunting on sage-grouse populations. Wing barrel data also provides valuable population demographics (e.g. chicks per hen and recruitment) necessary to manage this species.

### **Hunting – Population Sub-Goals**

2. Regulate hunting of sage-grouse in a manner that does not negatively impact sage-grouse populations.

### **Hunting Recommended Management Practices**

1. Recommend the Wyoming Game and Fish Commission maximize hunting opportunity when populations are stable or increasing.
2. If populations are declining, implement more conservative regulations that might include: reduced bag limits, adjusted season dates, limited quota seasons or closed seasons.
3. Prohibit hunting of sage-grouse before September 15.

# IMPLEMENTATION STRATEGY

## FUNDING

Since 2005, the Wyoming Legislature has appropriated approximately \$7.6 million to fund sage-grouse conservation efforts in Wyoming. The bulk of these funds (~\$4.7 million) have been made available to local sage-grouse working groups to implement conservation projects consistent with local conservation plans. The projects supported by the SWLWG are shown in Appendix II. Since 2005, the SWLWG has allocated approximately \$450,000 to 31 sage-grouse conservation projects in the SWCPA and across the state. While mandatory budget cuts in recent years have reduced the amount of funding there is still about \$500,000 of project dollars being allocated annually across the state, usually in partnership with other funds.

The SWLWG recognizes that sage-grouse conservation efforts across the range, while unprecedented in terms of a broad scale conservation effort aimed at a single species, have been criticized in the past as being “a thousand random acts of conservation”. The SWLWG acknowledges this criticism and, with this document, hopes to better focus conservation efforts toward identified threats and programmatic management actions. Implementation of the WCAS, the BLM RMP sage-grouse amendments, and the NRCS SGI are efforts that directly address the issue at local, state, regional and rangewide scales. Additionally, the SWLWG is attempting to focus its funding toward on-the-ground projects consistent with the larger scale policies and toward applied research that has a high probability of producing results that meaningfully inform future policy, management decisions and conservation actions.

The SWLWG funding decision matrix is shown in Figure 35.

Figure 35. Funding decision matrix for the SWSGCA.



## **MONITORING AND ADAPTIVE MANAGEMENT STRATEGY**

The distribution, trend and abundance of sage-grouse populations are the ultimate indicators of success of the conservation strategies presented in this document. Therefore reliable and comparable methods of estimating populations are critical to evaluate effectiveness of conservation actions implemented across the landscape. Consistent monitoring of sage-grouse populations and sage-grouse habitats will provide the data needed to measure the long-term success of this plan as well as provide the basis adapting management to take advantage of newly acquired information.

Techniques currently used for monitoring sage-grouse populations in Southwest Wyoming are consistent with those recommended by the Western Association of Fish and Wildlife Agencies' Sage-grouse and Columbian Sharp-Tailed Grouse Technical Committee. The current protocol can be found in the Wildlife Management Techniques Manual of the WGFD.

In 2010, the BLM published its Sage-Grouse Habitat Assessment Framework that provided appropriate methods for assessing and monitoring sagebrush habitats at multiple scales. These methods, properly adapted to local conditions, are the means by which sagebrush habitats should be monitored across the range including the SWSGCA.

Adaptive management incorporates monitoring and research into land use planning and implementation. It integrates project implementation with monitoring and research to test project planning assumptions. This kind of management assumes projects will be changed if monitoring or research data indicate future conditions were wrongly predicted. Quantitative (measurable, not subjective) data must be collected for adaptive management to succeed.

The SWLWG will continue to meet at least annually to evaluate population and habitat monitoring results, research results, plan implementation status, and potential for new conservation projects or commitments. Results of these meetings will be incorporated as necessary into future addendums/updates to this plan.

## **Glossary**

**Avoid.** The term “avoid” in this document means that there is flexibility to allow an activity consistent with goals and objectives of this plan.

**Degraded habitat.** Habitat that is reduced in quality as a result of fragmentation, invasive plants, overgrazing/browsing and/or shrub decadence or lack of understory due to advanced succession.

**Drought.** A prolonged chronic shortage of water, as compared to the norm, often associated with high temperatures and winds during spring, summer and fall or a period without precipitation during which the soil water content is reduced to such an extent that plants suffer from lack of water. (Society for Range Management)

**Forb.** Any broad-leaved herbaceous plant, other than grasses, sedges and rushes. These are generally flowering plants with tap roots, broad leaves, netlike veins and solid non-joint stems.

**Habitat fragmentation.** The emergence of discontinuities (fragmentation) in an animal’s preferred environment (habitat). Habitat fragmentation can be caused by geological processes that slowly alter the layout of the physical environment or by human activity such as land conversion, which can alter the environment on a much faster time scale.

**Herbaceous.** Refers to a plant that has a non-woody stem and which dies back at the end of the growing season.

**Invasive plants.** A species that is 1) primarily a non-native to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

**Landscape.** The exact boundaries or scale of a landscape are established according to the objectives of a study or discussion. The area included may be as small as a pond or as large as several counties or states, but in all cases, ecologists recognize that energy, water, nutrients and organisms move back and forth across whatever boundaries are established (Knight 1994).

**Mitigation.** To make less severe, reduce impacts of, or to compensate for an action.

**Monitor.** To systematically and repeatedly watch, observe or measure environmental conditions to track changes.

**Mosaic.** A landscape composed of patches of discrete ecological sites and/or seral stages in a variety of sizes and shapes.

**“Newcomer” predator.** Predators that did not occur or have expanded their range in Wyoming in recent times as the result of changes in management practices and other human activities (e.g. red fox, raccoon, etc.). “Newcomer” predators may also apply to native species such as ravens which have increased in number (as opposed to range) due to human activity.

**Off-Road Vehicle.** Any motorized vehicle capable of, or designated for, travel on or immediately over land, water, or other natural terrain, excluding: (1) any nonamphibious registered motorboat; (2) any military, fire, emergency, or law enforcement vehicle while being used for emergency purposes; (3) any vehicle whose use is expressly authorized by the authorized officer, or otherwise officially approved; (4) vehicles in official use; and (5) any combat or combat support vehicle when used in times of national defense emergencies (43 CFR 8340.0-5(a)).

**Residual vegetation.** Vegetation remaining on a site from the previous growing season.

**Riparian.** Relating to or located along the edge of a waterway, usually refers to a vegetation community.

**Sagebrush Obligate.** Species dependent on sagebrush habitat for all or part of its life and is therefore considered to serve as an indicator of the condition and trend of this habitat type.

**Seral Stage.** The relatively transitory communities that develop under plant succession generally described as early, mid and late seral stages. The mix of seral or successional stages on the landscape can be the result of disturbances, topography and soil, climate, uses of the land, management prescriptions, vegetation classification categories and evaluation procedures.

**Site Potential.** The potential plant community that a particular area (ecological site) is capable of producing as a climax plant community.

**Small-grained mosaic.** Relatively small patches of different seral stages or plant communities on a landscape scale.

**Succession.** An orderly, predictable process of plant species change over time.

**Ungulate.** Hoofed mammals, e.g. deer, elk, cattle and sheep.

**Vegetation community.** A group of plant species that usually occur together.

**The following definitions have been adopted by the WGFD and BLM for the purposes of collecting and reporting sage-grouse data:**

- **Lek** - A traditional courtship display area attended by male sage-grouse in or adjacent to sagebrush dominated habitat. A lek is designated based on observation of two or more male sage-grouse engaged in courtship displays. Before a suspected lek is added to the database, it must be confirmed by a survey conducted during the appropriate time of day, during the strutting season. Sign of strutting activity (tracks, droppings, feathers) can also be used to confirm a suspected lek. Sub-dominant males may display on itinerant (temporary) strutting areas during years when populations peak. Such areas usually fail to become established leks. Therefore, a site with small numbers of strutting males (<5) should be confirmed active for two years before the site is added to the lek database.



- **Satellite Lek** – A relatively small lek (usually less than 15 males) within about 500 meters of a large lek often documented during years of relatively high grouse numbers. Locations of satellite leks should be encompassed within lek perimeter boundaries. Birds counted on satellite leks should be added to those counted on the primary lek for reporting purposes.
  - **Lek Perimeter** – The outer perimeter of a lek and associated satellite leks (if present). Perimeters of all leks should be mapped by experienced observers using accepted protocols (Section 1.b.v below); larger leks should receive higher priority. Perimeters may vary over time as population levels or habitat and weather conditions fluctuate. However, mapped perimeters should not be adjusted unless grouse use consistently (2+ years) demonstrates the existing perimeter is inaccurate. The lek location must be identified and recorded as a specific point **within** the lek perimeter. This point may be the geographic center of the perimeter polygon calculated through a GIS exercise, or a GPS waypoint recorded in the field, which represents the center of breeding activity typically observed on the lek.
  - **Lek Complex** - A cluster of leks within 2.5 km (1.5 mi) of each other, between which male sage-grouse may interchange from day to day.
  - **Lek Count** - A census technique that documents the number of male sage-grouse observed attending a particular lek, lek complex, or leks along a lek route based on repeated observation.
  - **Lek Count Route** – A lek route is a group of leks in relatively close proximity that represent part or all of a discrete breeding population/sub-population. Leks should be counted on routes to facilitate replication by other observers, increase the likelihood of recording satellite leks, and account for shifts in distribution of breeding birds. Lek routes should be set up so an observer following criteria described under “Lek Count” can count all leks within 1.5 hours.
  - **Lek Survey** - A monitoring technique designed primarily to determine whether leks are active or inactive. Obtaining accurate counts of males attending is secondary.
- ***ANNUAL STATUS*** – *Lek status is assessed annually based on the following definitions.*
- **Active** – Any lek that has been attended by male sage-grouse during the strutting season. Acceptable documentation of grouse presence includes observation of birds using the site or signs of strutting activity.
  - **Inactive** – Any lek where sufficient data indicates no strutting activity took place throughout a strutting season. Absence of strutting grouse during a single visit is not sufficient documentation to establish a lek is inactive. This designation requires documentation no birds were present on the lek during at least 2 ground surveys separated by at least 7 days. The surveys must be conducted under ideal conditions (site visits between April 1 and May 7, no precipitation, light or no wind, ½ hour before to 1 hour after sunrise) **or** a ground check of the

exact lek location late in the strutting season (after 4/15) during which sign (droppings/feathers) of strutting activity is not found. Data collected by aerial surveys cannot be used to designate inactive status.

- **Unknown** – Leks for which active/inactive status has not been documented during the course of a strutting season. Excepting leks not scheduled to be checked in a particular year, the “unknown” status designation should be applied only in rare instances. Each lek should be checked enough times to determine whether it is active or not. It is preferable to conduct two good field checks every other year and confirm the lek is "inactive" rather than check it once every year and have it remain in “unknown” status.
- *Based on its annual status, a lek may be assigned to one of the following categories for management purposes:*
- **Occupied lek** – A lek that has been active during at least one strutting season within the prior ten years. Occupied leks are protected through prescribed management actions during surface disturbing activities (see Section V).
  - **Unoccupied lek** – Two classifications of unoccupied leks are “destroyed” and “abandoned” (defined below). Unoccupied leks are not protected during surface disturbing activities.
  - **Destroyed lek** – A formerly active lek site and surrounding sagebrush habitat that has been destroyed and is no longer suitable for sage grouse breeding. A lek site that has been strip-mined, paved, converted to cropland or undergone other long-term habitat type conversion is considered destroyed. Destroyed leks are not monitored unless the site has been reclaimed to suitable sage-grouse habitat.
  - **Abandoned lek** – A lek in otherwise suitable habitat that has not been active during a period of 10 consecutive years. To be designated abandoned, a lek must be “inactive” (see above criteria) in at least four non-consecutive strutting seasons spanning the ten years. The site of an “abandoned” lek should be surveyed at least once every ten years to determine whether it has been re-occupied by sage-grouse.
  - **Undetermined lek** – Any lek that has not been documented as active in the last ten years, but survey information is insufficient to designate the lek as unoccupied. Undetermined lek sites are not protected through prescribed management actions during surface disturbing activities until sufficient documentation is obtained to confirm the lek is occupied. This status should be applied only in rare instances (also see “unknown” above).
  - **Winter Concentration Areas** - Specific areas persistently occupied by large numbers of sage-grouse between December 1 and March 14. Delineation of concentration areas is based on presence of winter habitat characteristics and is confirmed by repeated observations and sign of large numbers of sage-grouse. The definition of “large” is relative to the overall population size. In most core population areas, frequent observations of groups of  $\geq 50$  sage-grouse meet the definition, whereas smaller group sizes of  $\geq 25$  may indicate winter concentration areas in marginal habitats.

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Wyoming Game and Fish Department. 2011. Protocols for treating sagebrush to be consistent with Wyoming Executive Order 2011-5; Greater Sage-grouse Core Area Protection. Unpublished document. Wyoming Game and Fish Department, Cheyenne.

**APPENDIX I.** Abstracts from sage-grouse research conducted in the SWSGCA.

**Heath, B.J., R. Straw, S.H. Anderson, J. Lawson. 1997. Sage-grouse productivity, survival, and seasonal habitat use near Farson, Wyoming. Completion Report. Wyoming Game & Fish Dept., Cheyenne.**

ABSTRACT

We investigated sage-grouse productivity, survival, and seasonal habitat use northwest of Farson, Wyoming. From 1994-96, we captured and radio-collared 95 female sage-grouse on and near leks. Nest effort and success varied between 83% - 89% and 19% - 48%, respectively. Nest fate was influenced by the distance from leks and the height and coverage of residual grass. Successful sage-grouse nests were located farther from leks of capture than unsuccessful nests ( $p < 0.05$ ). Moreover, successful sage-grouse nests contained taller (9.3 vs 7.3 cm,  $p = 0.052$ ) and greater cover (3.2 vs 1.9%,  $p = 0.017$ ) of residual grass than unsuccessful nests. Throughout the study areas, nests were located in areas with greater sagebrush density and cover, taller grass, and greater grass cover than at either dependent or independent random sites ( $p < 0.05$ ).

Productivity varied among years and increased throughout the study. The number of chicks per radioed hen on 15 August averaged 0.35 in 1994, 0.77 in 1995, and 1.65 in 1996, respectively. During the early brood-rearing period, sites used by radioed hens did not differ from random locations. However, sites used during late brood-rearing provided hens and their broods with greater visual obstruction and greater forb and litter cover than was available at random locations ( $p < 0.05$ ).

Average annual survival of radioed hens for the 3 year period averaged 64% and yearly survival estimates ranged between 50-80%. Annual survival of hens that nested successfully averaged 49% and yearly survival estimates ranged between 14-72%. Most mortality occurred during September for all radioed hens and hens that nested successfully. The majority of females were lost to hunting and predation by raptors.

Management practices that maintain or enhance residual herbaceous cover are needed to enhance sage-grouse nest success and survival. The improvement of herbaceous vegetation throughout the sagebrush uplands will increase chick survival and improve sage-grouse production. Hunting seasons that commence during mid-September are suggested to allow hens with broods to disperse from mesic areas to reduce the harvest on hens.

**Patterson, R. L., 1952. The sage-grouse in Wyoming. Wyoming Game and Fish Commission. Sage Books, Inc. Denver, CO.**

ABSTRACT (extracted from the book's preface)

*The Sage-grouse in Wyoming* is the product of research sponsored by the Wyoming Game and Fish Commission. This work was initiated in 1940 with Federal Aid to Wildlife Restoration funds under Pittman-Robertson Project Number 28-R.

The present study has been concerned primarily with year-round sage-grouse investigations conducted on an intimately known area of land. Part I is devoted to a discussion of the environmental

factors affecting sage-grouse abundance, including a detailed account of the restoration of the species in recent years. Natural history aspects and general behavior of grouse populations were thoroughly examined, and these findings appear in Part II. The effects of man's various land-use activities on sage-grouse numbers merited comprehensive study, and Part III is comprised mainly of an evaluation of these factors. This treatise on the sage-grouse concludes with a summary of management recommendations, including a forecast of the bird's future.

**Slater, S. J. 2003. Sage-grouse (*Centrocercus urophasianus*) use of different-aged burns and the effects of coyote control in southwestern Wyoming. Thesis, University of Wyoming, Laramie.**

#### ABSTRACT

Sage-grouse have declined throughout their range and in Wyoming since the turn of the 20<sup>th</sup> century and may have declined as much as 45-80% since the 1950's. Historic and recent declines are believed to be linked to human caused habitat and environmental changes. Because of continued concern over the fate of the species, I investigated sage-grouse use of different-aged burns and the effects of coyote control in southwestern Wyoming.

There is considerable disagreement as to the appropriateness of the use of fire in sage-grouse habitats. I found that sage-grouse were willing to make use of 2 prescribed burns and 2 wildfires present in the Collett Creek study area. The burns were used by 22% of nesting, 47% of brood rearing, and 33% of summering female sage-grouse in 2000-2002. Nest sites from within and outside the burns were structurally similar. Female sage-grouse movements suggest that the burns may have provided attractive brood rearing and summer habitat. Observations of male and female burn use throughout the spring and summer revealed that feeding and loafing sage-grouse were rarely found more than 60 m from the burned/unburned edge. Vegetative comparisons of the individual burns to the habitat outside the burns were complicated by differences in the amount of each burn actually treated and the type of burn (fall prescriptions vs. summer wildfires).

Coyote control is currently conducted on many rangelands also used by sage-grouse although little is known about the effects of this type of predator control on the species. I found that the Collett Creek study area (coyote control) had fewer coyotes, but more badgers than the Salt Creek study area (no organized control) in 2001-2002. Despite these differences, the importance of the various nest predator species was similar in both areas. Overall, the badger was the primary nest predator during the study and accounted for 33-55% of all nest predation. The coyote accounted for little nest predation in either area. Sage-grouse nest success and predation rates and productivity were similar in both study areas. Nest site vegetation may have indirectly influenced nest success during this study.

**Slater, S. S., and J. P. Smith. 2010. Effectiveness of raptor perch deterrents on an electrical transmission line in southwestern Wyoming. *Journal of Wildlife Management* 74(5):1080-1088.**

#### ABSTRACT

In sagebrush–steppe and other open habitats, power lines can provide perches for raptors and other birds in areas where few natural perches previously existed, with potential negative impacts for nearby prey species, such as Greater Sage-grouse (*Centrocercus urophasianus*). Between September 2006 and August 2007, we used driving surveys, behavioral-observation surveys, and prey-remains surveys to assess the ability of perch-deterrent devices to minimize raptor and common raven (*Corvus corax*) activity on a recently constructed transmission line in southwestern Wyoming. All survey methods demonstrated that activity was significantly lower on the deterrent line compared with a nearby control line; however, deterrent devices did not entirely prevent perching. Considering use of cross-arms or pole-tops alone, we sighted 42 raptors and ravens on the deterrent line and 551 on the control line during 192 driving surveys of each line. Golden eagles (*Aquila chrysaetos*) and ravens were the species most commonly observed successfully overcoming deterrent devices. Smaller rough-legged hawks (*Buteo lagopus*) regularly avoided deterrents by perching on conductors (i.e., wires). We documented much off-line activity near both survey lines and suggest that fewer birds near the deterrent line likely reflected reduced availability of nearby alternate perches. There was a pronounced winter peak in on-line perch use, with the effect more evident on the control line. Behavior surveys corroborated our driving-survey results but were otherwise unproductive. During 549 prey-remains surveys of each line, we found 9 single and 60 grouped prey items near deterrent-line poles, compared with 277 single and 467 grouped items near control-line poles. We observed few sage-grouse in the study area but did witness a likely power line–related, raptor-caused sage-grouse mortality. Overall, our results suggest that perch-deterrent devices can reduce raptor and raven activity on power-line structures, but to determine their utility on entire power-line segments, we suggest managers consider 1) what level of reduction in perch activity is worth the cost, and 2) the availability of alternate perches in the surrounding landscape.

**Conover, M. R., J. S. Borgo, R. E. Dritz, J. B. Dinkins and D. K. Dahlgren. 2010. Greater Sage-grouse select nest sites to avoid visual predators but not olfactory predators. *The Condor* 112(2):331-336.**

#### ABSTRACT

Birds can hide from visual predators by locating nests where there is cover and from olfactory predators where habitat features create updrafts, high winds, and atmospheric turbulence, but sites optimal for hiding from visual and olfactory predators often differ. We examined how Greater Sage-grouse (*Centrocercus urophasianus*) balance the dual needs of hiding from both visual and olfactory predators on Parker Mountain, Utah, where the Common Raven (*Corvus corax*) is the main visual predator and the striped skunk (*Mephitis mephitis*) and American badger (*Taxidea taxus*) are the main olfactory predators. By comparing nest sites to random sites during 2005 and 2006, we found that sage-grouse nest at sites where their nests were obscured from visual predators but were exposed to olfactory predators. To validate these findings, we replicated the study in southwest Wyoming during 2008. Again, we found that visual obscurity at nest sites was greater than at control sites but olfactory

obscurity was less. Our results indicate that Greater Sage-grouse select nest sites where they will be concealed from visual predators but at the cost of locating nests where they are exposed to olfactory predators. In southwest Wyoming, we found that olfactory predators (mammals) and visual predators (birds) depredated an equal number of nests. By selecting nest sites with visual obscurity, Greater Sage-grouse have reduced the threat from visual predators to where it was similar to the threat posed by olfactory predators.

**Dinkins, J. B., M. R. Conover, C. P. Kirol, and J. L. Beck. 2012. Greater Sage-grouse (*Centrocercus urophasianus*) select nest-sites and brood-sites away from avian predators. *Auk* 129:600–610.**

#### ABSTRACT

Greater Sage-grouse (*Centrocercus urophasianus*) have declined in distribution and abundance in western North America over the past century. Depredation of nests and predation of chicks can be two of the most influential factors limiting their productivity. Prey species utilize antipredation behaviors, such as predator avoidance, to reduce the risk of predation. Birds in general balance the dual necessity of selecting cover to hide from visual and olfactory predators to enhance prospects of survival and reproductive success, which may also be achieved by selecting habitat with relatively fewer predators. We compared avian predator densities at Greater Sage-grouse nests and brood locations with those at random locations within available sagegrouse habitat in Wyoming. This comparison allowed us to assess the species' ability to avoid avian predators during nesting and early brood rearing. During 2008–2010, we conducted 10-min point-count surveys at 218 nests, 249 brood locations from 83 broods, and 496 random locations. We found that random locations had higher densities of avian predators compared with nest and brood locations. Greater Sage-grouse nested in areas where there were lower densities of Common Ravens (*Corvus corax*), Black-billed Magpies (*Pica hudsonia*), Golden Eagles (*Aquila chrysaetos*), and hawks (*Buteo* spp.) compared with random locations. Additionally, they selected brood-rearing locations with lower densities of those same avian predators and of American Kestrels (*Falco sparverius*), compared with random locations. By selecting nest and brood-rearing locations with lower avian predator densities, Greater Sage-grouse may reduce the risk of nest depredation and predation on eggs, chicks, and hens.

**Dinkins, J. B. 2013. Common Raven Density and Greater Sage-grouse Nesting Success in Southwest Wyoming: Potential Conservation and Management Implications. Dissertation. Utah State University, Logan.**

#### ABSTRACT

My research was focused on Greater Sage-grouse (*Centrocercus urophasianus*; hereafter “sage-grouse”) nest-site selection, nest success, and hen survival in relation to avian predators. The trade-off between using habitat and avoiding predators is a common decision for prey species such as sage-grouse. In Chapter 2, I compared avian predator densities at sage-grouse nests and brood locations to available habitat. I found that random locations had higher densities of small, medium, and large avian predators compared to sage-grouse nest and brood locations.



The effects of anthropogenic and landscape features on habitat selection of sage-grouse hens have not been evaluated in the context of avian predator abundance. In Chapter 3, I compared anthropogenic and landscape features and densities of avian predators among sage-grouse locations (nest, early-brood, late-brood) and available habitat. I found sage-grouse hens primarily chose locations with lower densities of avian predators compared to random locations in sagebrush habitat, and secondarily selected locations farther away from anthropogenic and landscape features.

Depredation of sage-grouse nests can be an influential factor limiting their productivity, and most failed sage-grouse nests are depredated by predators. Predator removal has been simultaneously proposed and criticized as a potential mitigation measure for low reproductive rates of sage-grouse. I hypothesized that sage-grouse nest success would be greater in areas where USDA/APHIS/Wildlife Services (WS) lowered the abundance of common ravens (*Corvus corax*; hereafter “raven”). In addition, the effects of anthropogenic and landscape features on sage-grouse nest success have not been evaluated in the context of raven and black-billed magpie (*Pica hudsonia*) densities. In Chapters 4 and 5, I found that WS decreased raven density over time, sage-grouse nest success was negatively impacted by ravens, and sage-grouse nest success was positively correlated with rugged habitat.

Survival of breeding-age birds is the most important demographic parameter driving sage-grouse abundance. In Chapter 6, I evaluated the effect of raptor densities, proximity to anthropogenic and landscape features, and hen behavior on survival of sage-grouse hens. I found that sage-grouse hen survival was negatively correlated with golden eagle (*Aquila chrysaetos*) density, proximity to anthropogenic and landscape features, and hen parental investment (nesting and brood-rearing).

**APPENDIX II.** Table of completed or ongoing conservation projects within the SWSGCA funded in part through the Wyoming Sage-grouse Conservation Fund.

| <b>SW LWG Sage-Grouse Projects Supported with 2005-2014 General Fund Budgets</b> |                        |                            |                   |  |   |  |               |
|--|------------------------|----------------------------|-------------------|--|---|--|---------------|
| <b>Project Name</b>  | <b>Budget Biennium</b> | <b>Local Working Group</b> | <b>Total Cost</b> | <b>SG \$</b>                                 | <b>Project Description</b>  | <b>Partners</b>                                | <b>Status</b> |
| 12 - SG & Sagebrush Conservation I&E   | 2005-06                | Southwest                  | \$2,600           | \$2,600 requested/approved; \$2,597.00 spent | Educational displays including taxidermy mounts and restaurant activity placemats for youth.  | WGFD   | Complete      |
| 13 - South LaBarge Weed Control  | 2005-06                | Southwest                  | \$15,000          | \$5,000 requested/approved/spent             | Invasive/noxious weed control.  | BLM, USFS, GR Basin Cooperative Weed Mgt Area. | Complete      |
| 14 - Rock Creek Prescribed Burn  | 2005-06                | Southwest                  | \$150,000         | \$20,000 requested; \$6,200 approved/spent   | Prescribed burning of aspen, mountain shrub and mountain big sagebrush to improve habitat conditions for all wildlife including sg. | BLM, RMEF, WGFD                                | Complete      |
| 15 - Winter Closure Signs (see also #63)   | 2005-06                | Southwest                  | \$4,000           | \$2,000 requested/approved; \$1,674.75 spent | Improve effectiveness of existing public land big game and sage grouse winter range closures via new signing.                       | BLM, WGFD                                      | Complete      |
| 39 - Exclosure & Guzzler maintenance   | 2007-08                | Southwest                  | \$42,000          | \$20,000 requested/approved/spent            | Monitoring and maintenance of 35 range exclosures and 11 guzzlers on BLM.   | BLM  | Complete      |
| 40 - Belle Butte Water Development   | 2007-08                | Southwest                  | \$132,000         | \$34,500 requested/approved/spent            | Attach 7 wildlife guzzlers to new livestock watering pipeline.  | BLM, numerous grazing permittees               | Complete      |
| 41 - Hiawatha Aerial Surveys   | 2007-08                | Southwest                  | \$29,100          | \$10,000 requested/approved; \$2,262 spent   | Conduct aerial surveys to document grouse distribution esp. winter  | BLM, Questar, WGFD                             | Complete      |

| <b>SW LWG Sage-Grouse Projects Supported with 2005-2014 General Fund Budgets</b>                          |                        |   |                          |   |  |  |               |
|---|------------------------|---|--------------------------|---|--|--|---------------|
| <b>Project Name</b>   | <b>Budget Biennium</b> | <b>Local Working Group</b>                | <b>Total Cost</b>        | <b>SG \$</b>  | <b>Project Description</b>   | <b>Partners</b>  | <b>Status</b> |
|   |                        |   |                          |   | and leks.  |  |               |
| 42 - Red Canyon/<br>Elk Mtn Rx Burn   | 2007-08                | Southwest                                 | \$300,000                | \$30,000<br>requested/approved/spent                      | Prescribed fire to improve<br>upland plant communities.  | BLM, RMEF,<br>WGFD   | Complete      |
| 47 - Water trough<br>escape ramps,<br>spring protection<br>and fence markers<br>(see also #99 and<br>128) | 2007-08                | Statewide                                 | \$192,000                | \$36,000<br>requested/approved/spent                      | Provide pre-fab wildlife<br>escape ramps, fence<br>collision deterrents and<br>spring protection fencing<br>to private landowners<br>throughout the state. | WY Natural<br>Resources<br>Trust,<br>Landowners,<br>WGFD         | Complete      |
| 51 - Hiawatha SG<br>Habitat Mapping   | 2007-08                | Southwest                                 | \$417,120<br>(multiyear) | \$30,000<br>requested/approved,<br>\$29,634.35 spent      | Develop high-resolution<br>seasonal sg habitat maps<br>to help determine energy<br>development influence.  | Questar,<br>Colorado<br>Division of<br>Wildlife                  | Complete      |
| 52 - Peterson<br>Spring Protection<br>(see also #94)  | 2007-08                | Southwest                                 | \$24,480                 | \$17,280 requested,<br>\$8,500 approved, \$8,194<br>spent | Develop and protect 3<br>springs to provide wildlife<br>and livestock water but<br>protect the source from<br>livestock degradation                        | Owen<br>Peterson   | Complete      |
| 63 - Winter Range<br>Signs (see also<br>#15)  | 2007-08                | Upper Green<br>River Basin &<br>Southwest | \$6,000                  | \$3,000<br>requested/approved/spent                       | Improve effectiveness of<br>existing public land big<br>game and sage grouse<br>winter range closures via<br>new signing.                                  | BLM, WGFD  | Complete      |
| 94 - Petersen<br>Ranch Project<br>Phase II (see #52)  | 2009-10                | Southwest                                 | \$19,500                 | \$9,000 requested, \$3,500<br>approved/spent              | Spring protection and<br>water development   | Landowner  | Complete      |
| 98 - Seasonal<br>Habitat Mapping  | 2009-10                | Statewide                                 | \$352,000<br>(multiyear) | \$155,000 requested,<br>\$141,000 approved/spent          | Use predictive habitat<br>models to produce sage-<br>grouse seasonal habitat<br>maps   | U.S. Fish &<br>Wildlife<br>Service,<br>BLM,<br>Various<br>energy | On-going      |

| <b>SW LWG Sage-Grouse Projects Supported with 2005-2014 General Fund Budgets</b> |                        |   |                           |  |  |  |               |
|--|------------------------|---|---------------------------|--|--|--|---------------|
| <b>Project Name</b>  | <b>Budget Biennium</b> | <b>Local Working Group</b>  | <b>Total Cost</b>         | <b>SG \$</b>                                     | <b>Project Description</b>   | <b>Partners</b>  | <b>Status</b> |
|  |                        |   |                           |  |  | development companies  |               |
| 99 - Fence markers and spring protection fencing (see also #47 and 128)          | 2009-10                | Statewide   | \$130,000                 | \$64,800 requested/approved; \$62,628 spent      | Purchase fence markers and Steel Jack spring protection for statewide distribution                     | Niobrara Conservation District, numerous private landowners, BLM, The Nature Conservancy | On-going      |
| 102 - Albert Creek Grazing Mgt   | 2011-12                | Southwest   | \$25,000                  | \$12,500 requested/approved/spent                | Grazing management and infrastructure  | Horseshoe Spear Cattle Co., BLM, WGFD  | Complete      |
| 110 - Fence marking in SW Wyoming  | 2011-12                | Southwest   | \$18,091                  | \$10,000 requested/approved \$8,948.12 spent     | Volunteer construction and placement of fence markers to prevent/mitigate sage-grouse fence collisions | BLM, Utah's Hogle Zoo  | Complete      |
| 111 - Impacts of Ravens on SG nests in southern WY (see also #143)               | 2011-12                | South-Central & Southwest   | not provided by applicant | \$102,892 requested/approved; \$100,664.20 spent | Research to determine raven impacts and raven control to sage-grouse                                   | Utah State University  | Complete      |
| 117 - Response of SG to sagebrush treatments (see also #146)                     | 2011-12                | Wind River/Sweetwater, South-Central, Southwest, Bates Hole/Shirley Basin | \$539,800 (multiyear)     | \$189,800 requested/approved/spent               | Research to determine sage-grouse demographic and habitat use response to sagebrush treatments         | Univ. of Wyoming Coop Unit, WGFD   | On-going      |

| <b>SW LWG Sage-Grouse Projects Supported with 2005-2014 General Fund Budgets</b>           |                        |   |                   |  |  |  |               |
|--|------------------------|---|-------------------|--|--|--|---------------|
| <b>Project Name</b>  | <b>Budget Biennium</b> | <b>Local Working Group</b>  | <b>Total Cost</b> | <b>SG \$</b>                               | <b>Project Description</b>   | <b>Partners</b>  | <b>Status</b> |
| 118 - Estimating noise impacts for habitat selection modeling (see also #17, 46, 77 & 145) | 2011-12                | Wind River/Sweetwater, South-Central, Southwest, Bates Hole/Shirley Basin, Northeast, Upper Green River Basin | \$69,415          | \$49,335 requested/approved/spent          | Research to develop a noise model and determine noise exposure thresholds.                             | Univ. California-Davis   | On-going      |
| 120 - SG core areas as umbrella for non-game species                                       | 2011-12                | Southwest & Wind River/Sweetwater   | \$249,724         | \$30,000 requested; \$8,000 approved/spent | Research to determine the conservation effectiveness of sage-grouse core areas for non-game species    | Univ. of Wyoming Coop Unit   | On-going      |
| 124 - Seven Mile Gulch Exclosure   | 2011-12                | Southwest   | \$29,800          | \$21,600 requested/approved                | Spring and associated habitat protection fencing   | Unita Development Co., WGFD, volunteers                            | Complete      |
| 125 - Buckhorn Flowing well fencing  | 2011-12                | Southwest   | \$19,000          | \$5,000 requested/approved/spent           | Flowing well and associated habitat protection fencing   | WY Landscape Conservation Initiative, BLM                          | Complete      |
| 126 - Cheatgrass mapping & control - Sublette Co. Phase II (see also #100 & 144)           | 2011-12                | Upper Green River Basin & Southwest   | \$92,719          | \$92,719 requested/approved/spent          | Cheatgrass mapping and spot control  | Sublette Co. Weed & Pest/GR Basin Coordinated Weed Mgt Association | Complete      |
| 129 - Fence collision markers  | 2011-12                | South-central, Upper Green River Basin, Southwest   | \$100,000         | \$42,000 requested/approved                | Volunteer construction and placement of fence markers to prevent/mitigate sage-grouse fence collisions | Medicine Bow Conservation District, WGFD,                          | On-going      |

| <b>SW LWG Sage-Grouse Projects Supported with 2005-2014 General Fund Budgets</b>     |                        |  |                           |  |   |   |               |
|--|------------------------|--|---------------------------|--|---|---|---------------|
| <b>Project Name</b>  | <b>Budget Biennium</b> | <b>Local Working Group</b>                                       | <b>Total Cost</b>         | <b>SG \$</b>                           | <b>Project Description</b>  | <b>Partners</b>   | <b>Status</b> |
|  |                        |  |                           |  |   | private landowners, BLM   |               |
| 143 - Raven/raptor density effects to lek count (see also #111)                      | 2013-14                | Southwest, South-Central   | not provided by applicant | \$100,000 requested; \$70,000 approved | Research to determine impacts of raven control to sage-grouse   | Utah State University   | On-going      |
| 144 - Cheatgrass mapping and control in Sublette Co. phase III (see also #100 & 126) | 2013-14                | Upper Green River Basin, Southwest                               | \$137,142                 | \$62,142 requested/approved            | Cheatgrass mapping and spot control   | Sublette County Weed & Pest, Green River Basin Coordinated Weed Mgt Assoc.; WLCI                    | On-going      |
| 145 - Impacts of noise on sage-grouse (see also # 17, 46, 77 & 118)                  | 2013-14                | Wind River-Sweetwater River, Northeast, South-Central, Southwest | \$63,388                  | \$41,626 requested/approved            | Continuing research examining the effects of noise resulting from energy exploration and development      | University of California-Davis, BLM   | On-going      |
| 146 - Response of SG to sagebrush treatments Phase II (see also #117)                | 2013-14                | Wind River-Sweetwater River, South-Central, Southwest            | \$956,593 (multi-year)    | \$99,841 requested/approved            | Continuing research to determine sage-grouse demographic and habitat use response to sagebrush treatments | University of Wyoming, Kelly Ornith. Research Fund, BLM, WY Reclamation & Restoration Center, WWNRT | On-going      |

| <b>SW LWG Sage-Grouse Projects Supported with 2005-2014 General Fund Budgets</b> |                        |  |                          |                              |   |  |               |
|--|------------------------|--|--------------------------|------------------------------|---|--|---------------|
| <b>Project Name</b>  | <b>Budget Biennium</b> | <b>Local Working Group</b>                         | <b>Total Cost</b>        | <b>SG \$</b>                 | <b>Project Description</b>  | <b>Partners</b>  | <b>Status</b> |
| 147 – Impacts of wind energy development on sage-grouse (see also #84 and 115)   | 2013-14                | Bates Hole-Shirley Basin, South-Central, Southwest | \$1,023,250 (multi-year) | \$105,000 requested/approved | Continuing research to determine sage-grouse demographic and habitat use response to wind energy development. | National Wind Coordinating Collab., Iberdrola Renewables, Pacificorp, EnXco, Wyoming Wildlife Foundation, UW, W.E.S.T. Inc., Wyoming Wildlife Consultants, LLC | On-going      |
| 148 – Effects of sagebrush treatment on nutritional quality of sagebrush         | 2013-14                | Wind River/Sweetwater River, Southwest             | \$29,061                 | \$14,531 requested/approved  | Determining the effects of sagebrush mowing and herbicide treatment to the nutritional quality of sagebrush   | Boise State University, University of Wyoming,   | Approved      |

### **APPENDIX III. Oil and Gas Development – Synthesis of Research Results**

Oil and gas development is an issue for sage-grouse conservation in Wyoming and across the Intermountain West because development has accelerated rapidly since 1990 and areas being intensively developed contain large sage-grouse populations (Copeland et al. 2009). The bulk of studies researching the impact of oil and gas development to sage-grouse have been conducted in Wyoming but most of the peer-reviewed papers resulting from this research were published after Wyoming's local conservation plans were completed in 2007 and 2008.

Sage-grouse populations are impacted at oil and gas well densities commonly permitted in Wyoming (Naugle et al. 2011, Hess and Beck 2012, Kirol 2012). Impacts have not been detected at well densities less than about 1 well/mi<sup>2</sup>, but above this threshold, losses of leks have been 2-5 times greater inside than outside of development, and numbers of grouse at remaining leks decline by 32 to 77% (Doherty et al. 2010). The magnitude of loss has varied from one field to another, but impacts are always negative and typically severe (Harju et al. 2010). High site fidelity (loyalty) of adult males to leks and adult females to nesting habitat and lower survival of adult sage-grouse combine with lek avoidance by younger birds (Holloran et al. 2010) to result in time lags of 2-10 years between when development began and the loss of local sage-grouse leks (Holloran 2005, Walker et al. 2007a, Harju et al. 2010). Energy development also impacts sage-grouse habitats and vital rates outside the breeding season away from leks. Vital rates are measures such as nest success, hatching success and survival (Taylor et al. 2012). The risk of chick death has been shown to be 1.5 times higher for each additional well site visible within 0.6 mi of brood locations compared to random locations (Aldridge and Boyce 2007), and sage-grouse avoid otherwise suitable winter habitat disturbed by energy development (Doherty et al. 2008, Carpenter et al. 2010, Dzailak et al. 2012, 2013).

The specific mechanisms that lead to avoidance and decreased fitness have not been empirically tested but rather suggested from multiple correlative and observational studies. For example, abandonment may increase if leks are repeatedly disturbed by raptors perching on power lines near leks (Ellis 1984), by vehicle traffic on nearby roads (Lyon and Anderson 2003), or by noise and human activity associated with energy development during the breeding season (Remington and Braun 1991, Holloran 2005, Kaiser 2006, Blickley and Patricelli 2012). However, recently completed research in Wyoming (Blickley et al. 2012), experimentally demonstrated that noise from natural gas drilling and roads resulted in a decline of 29% and 73% respectively in male peak attendance at leks relative to paired controls; declines were immediate and sustained throughout the experiment. Collisions with nearby power lines and vehicles and increased predation by raptors may also increase mortality of birds at leks (Connelly et al. 2000a). Alternatively, roads and power lines may indirectly affect lek persistence by altering productivity of local populations or survival at other times of the year. For example, sage-grouse deaths associated with power lines and roads occurs year-round (Beck et al. 2006, Aldridge and Boyce 2007), and ponds created by coal bed natural gas development may increase the risk of West Nile virus mortality in late summer (Walker et al. 2004, Zou et al. 2006, Walker et al. 2007b). Anthropogenic developments (e.g. produced water features and distance to wells) appear to facilitate depredation (Dzialak et al. 2011, Webb et al. 2012). Loss and degradation of sagebrush habitat can also reduce carrying capacity of local breeding populations (Swenson et al. 1987, Connelly et al. 2000a, 2000b, Crawford et al. 2004). Birds may avoid otherwise suitable habitat as the density of roads, power lines, or energy development increases (Lyon and Anderson 2003,



Holloran 2005, Kaiser 2006, Doherty et al. 2008, Carpenter et al. 2010, Hess and Beck 2012, Kiroi 2012).

Long-term studies in the Pinedale Anticline Project Area in southwest Wyoming present the most complete picture of impacts over time. Early in development, nest sites were farther from disturbed than undisturbed leks, the rate of nest initiation from disturbed leks was 24 percent lower than for birds breeding on undisturbed leks, and 26 percent fewer females from disturbed leks initiated nests in consecutive years (Lyon and Anderson 2003). As development progressed, adult females remained in traditional nesting areas regardless of increasing levels of development, but yearlings that had not yet imprinted on habitats inside the gas field avoided development by nesting farther from roads (Holloran 2005). The most recent study confirmed that yearling females avoided gas field infrastructure when selecting nest sites, and yearling males avoided leks inside of development and were displaced to the periphery of the gas field (Holloran et al. 2010). Recruitment of males to leks also declined as distance within the external limit of development increased, indicating a high likelihood of lek loss near the center of developed oil and gas fields (Kaiser 2006). The Pinedale work also showed that population level sage-grouse declines are explained in part by lower annual survival of female sage-grouse. (Holloran 2005).

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## **APPENDIX IV.** Wyoming Game and Fish Department Protocols for Treating Sagebrush to be Consistent with Wyoming Executive Order 2011-5; Greater Sage-Grouse Core Area Protection (7/8/2011)

Sagebrush treatments have been implemented or proposed with the assumption of benefiting sage-grouse. Research, monitoring and anecdotal observations suggest that treatments can result in beneficial, benign or harmful impacts to sage-grouse habitat depending on many known and unknown factors.

These protocols are to be used to guide the development of Wyoming Game and Fish Department (WGFD) sponsored or supported sagebrush treatments. The purpose of these protocols is to provide a framework for WGFD projects to ensure that they are consistent with sage-grouse core area and non-core area stipulations. This framework will not answer all questions associated with treatments. It is assumed that these protocols may be revisited as new science becomes available. Communication with the WGFD Director's Office or sage-grouse coordinator will be necessary for many situations.

### Core Area Treatments:

The following sagebrush treatment protocols are designed to ensure future habitat treatments conform to the provisions of Executive Order 2011-5, to conserve sage-grouse and prevent population declines in core habitat areas. Treatments that will NOT reduce sagebrush canopy cover to less than 15% are NOT subject to the Density/Disturbance Calculation Tool (DDCT) step prescribed below. However, such treatment proposals should still follow the other steps outlined in order to determine and document purpose and need, appropriately apply stipulations and monitor results. In northeast Wyoming core areas (Figure 1), treatments that will result in sagebrush canopy cover being reduced to less than 15% should not be conducted.

1. Determine and document the purpose and need for the treatment (adapted from Wyoming Interagency Vegetation Committee 2002):
  - A. Evaluate the juxtaposition, extent, importance and value of the sagebrush patch in the landscape (is this the only patch of sagebrush in the landscape?).
  - B. Identify the sagebrush species/subspecies/variety and assess the ecological site potential and treatment effects.
  - C. Determine the associated vegetation composition and condition (e.g. composition of desirable and non-desirable species and their response to treatment) and their contribution to wildlife habitat.
  - D. Assess site potential and resilience of the site to recover.
  - E. Assess other existing site influences (e.g., current grazing use, presence of noxious/exotic plant infestations, cumulative impacts, etc.).
  - F. Evaluate past management history of the site.
  - G. Establish post-treatment vegetation management objectives tiered to the management plan for the site.
  - H. Create a baseline for short-term/long-term post-treatment monitoring of the site.

2. If there is justified purpose and need, then utilize the Density/Disturbance Calculation Tool (DDCT) outlined in Executive Order 2011-5 and conduct the prescribed analysis.
  - A. If the cumulative disturbance, including the proposed treatment, is less than 5% of suitable sage-grouse habitat as defined in the Executive Order, the project may proceed.
    - i. Recognize any treatment reducing sagebrush canopy cover to less than 15% will be considered disturbance for future disturbance calculations (adapted from Connelly et al. 2000a, Stiver et al. 2010).
    - ii. A project plan must be developed that considers, evaluates and appropriately applies the following stipulations:
      1. No treatment should occur within 0.6-mile of any occupied lek that results in less than 15% sagebrush canopy cover unless:
        - a. The proposed treatment is necessary to maintain the viability of the lek such as removing conifers or sagebrush encroaching on the lek site.
      2. Treatment implementation should not occur within 4-miles of any occupied lek from March 15 – June 30 (Wyoming Game and Fish Dept. 2010).
      3. Treatment implementation should not occur in designated and/or mapped sage-grouse winter concentration areas from November 15 – March 14 (Wyoming Game and Fish Dept. 2010).
      4. Avoid the use of fire to treat sagebrush in less than 12-inch precipitation zones (Beck et al 2009, Connelly et al 2000b, WAFWA, 2009).
      5. Control and monitor noxious and/or invasive vegetation post-treatment.
      6. Rest the treated area from grazing for two full growing seasons unless vegetation recovery dictates otherwise.
  - B. If the cumulative disturbance, including the proposed treatment, within the DDCT boundary, is greater than 5% of the suitable sage-grouse habitat and the goal of the treatment is to reduce sagebrush canopy cover to less than 15%, the project shall NOT proceed except when:
    - i. Acreage of treatment is reduced so cumulative disturbance does not exceed 5% of suitable habitat.
    - ii. The treatment is configured such that all treated habitat is within 60 meters of sagebrush habitat (adapted from Danvir 2002, Slater 2003, Wyoming Game and Fish Department 2003, Dahlgren et al. 2006) with 10% or greater canopy cover (Connelly et al. 2000a) and no more than 20% of suitable sage-grouse habitat in the DDCT boundary is treated in this manner (adapted from Connelly et al. 2000a).

3. Refer to the BLM/WAFWA Sage-grouse Habitat Assessment Framework (HAF) when conducting habitat evaluations to determine the need to treat sagebrush to enhance sage-grouse habitat and when devising standardized monitoring protocols to assess the effectiveness of treatments (Stiver et al. 2010).
4. In stands with less than 15% sagebrush cover pretreatment, any proposed treatment should be designed to maintain or improve sagebrush habitat (within the limits of the ecological site).

#### Non-Core Area Treatments:

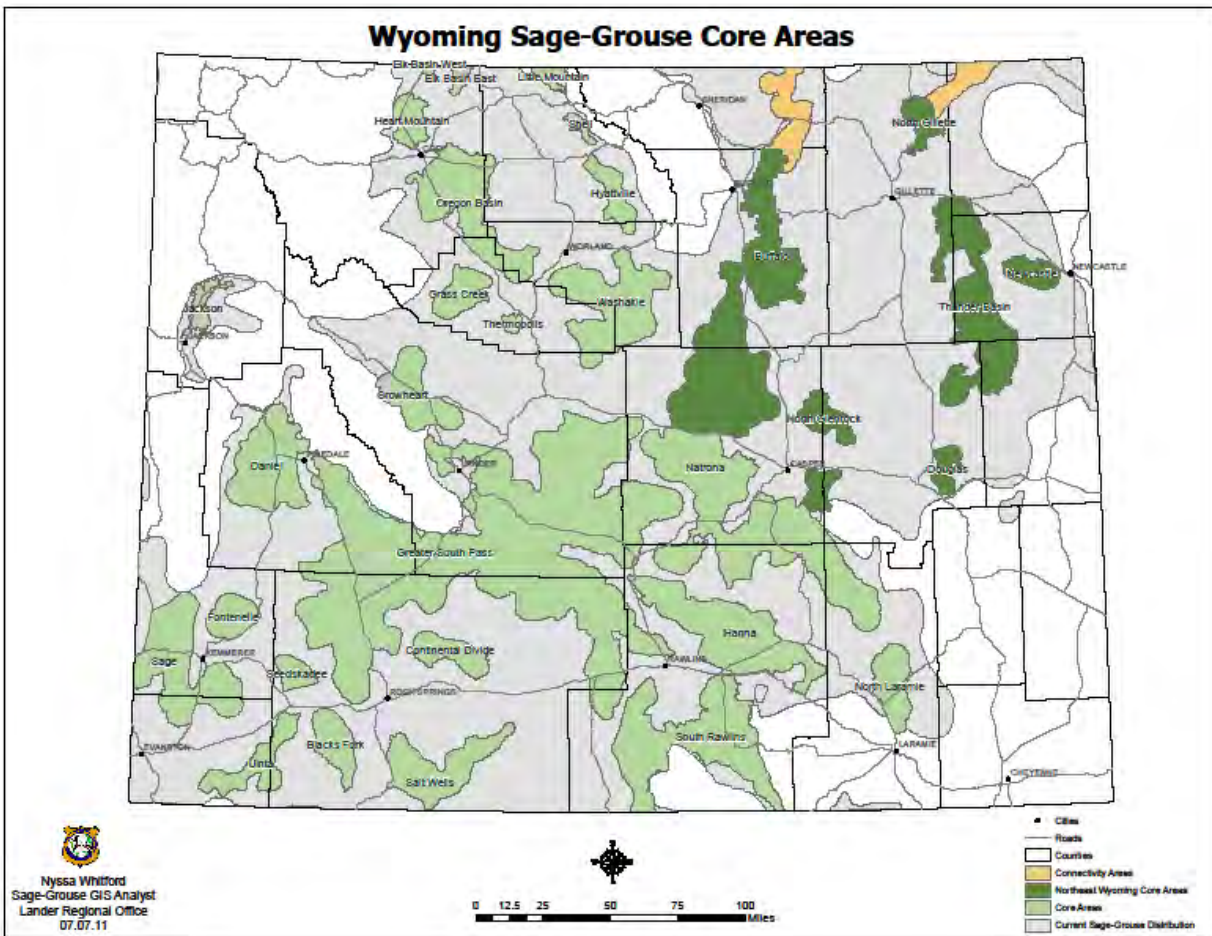
As is the case with industrial development outside of Core Areas, there will be greater flexibility to conduct sagebrush treatments outside of Core Areas. There can be more emphasis placed upon the habitat needs of species other than sage-grouse.

1. Determine and document the purpose and need for the treatment (adapted from Wyoming Interagency Vegetation Committee 2002):
  - A. Evaluate the juxtaposition, extent, importance and value of this sagebrush patch in the landscape (is this the only patch of sagebrush in the landscape?).
  - B. Identify the sagebrush species/subspecies/variety and understand the ecology and treatment effects.
  - C. Determine the associated vegetation composition and condition (e.g. composition of desirable and non-desirable species and their response to treatment) and their effects on wildlife habitat.
  - D. Consider site potential and resilience of the site to recover.
  - E. Assess the existence of other potential site influences (e.g., current grazing use, presence of noxious/exotic plant infestations, cumulative impacts, etc.).
  - F. Evaluate past management history of the site.
  - G. Establish post-treatment vegetation management objectives tiered to the future management plan.
  - H. Create a baseline for short-term/long-term post-treatment monitoring of the site.
2. Conduct the treatment.
3. Rest the treated area from grazing for two full growing seasons unless vegetation recovery dictates otherwise.
4. Monitor post treatment habitat conditions and grazing/browsing by ungulates to determine success.
5. Monitor and control noxious and/or invasive vegetation post-treatment.

#### Protocol Exceptions:

Exceptions for treatments in Core Areas will be considered only if it can be demonstrated by previous research the activity will not cause declines in sage-grouse populations. The demonstration must be based on monitoring data collected and analyzed with accepted scientific based techniques.

**Figure 1.** Wyoming sage-grouse core areas with northeast core areas distinguished.



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