Bates Hole/Shirley Basin Sage-grouse Conservation Plan

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PREPARED BY:

The Bates Hole/Shirley Basin Sage-grouse Working Group

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EXECUTIVE SUMMARY

The Bates Hole/Shirley Basin Sage-grouse Local Working Group (BHSBLWG) was established in 2004 to develop and facilitate voluntary implementation of a local conservation plan for the benefit of sage-grouse and, whenever feasible, other species that use sagebrush habitats. This conservation plan identifies strategies and commitments for the purpose of improving sage-grouse numbers and precluding the need for listing under the Endangered Species Act. The Working Group includes 11 members representing government agencies, industry, agriculture, and wildlife stakeholders. The Bates Hole/Shirley Basin Sage-grouse Conservation Plan encompasses Bates Hole, the Shirley Basin, the Rattlesnake Hills, the southern Bighorn Mountains, the Laramie Range, and isolated occupied habitats in southern Niobrara and Platte County.

Conservation Assessment

According to the recently completed range-wide Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats (Connelly et al. 2004), sage-grouse have declined across their range during the past 50 years, as has the quality and distribution of the bird's requisite sagebrush-steppe habitat.

Within the Bates Hole/Shirley Basin Conservation Area (BHSBCA), sage-grouse are found throughout the sagebrush/grassland habitats of Bates Hole, Shirley Basin, the Rattlesnake Hills, the south end of the Bighorn Mountains, foothills of the Laramie Range, and northern Platte County/southern Niobrara County. Occupied habitat is fairly contiguous throughout much of Bates Hole and the Shirley Basin. Habitats within the Rattlesnake Hills and the south end of the Big Horns are more fragmented by topography, changes in habitat type (i.e. curl-leaf mountain mahagony (*Cercocarpus ledifolius*) communities), and oil and gas development. Sage-grouse habitat in the Laramie Range is primarily limited to the west slope including portions of the Laramie Plains. Large, contiguous blocks of sagebrush/grassland communities east of the Laramie Range have generally been eliminated.

Occupied sage-grouse habitat within the BHSBCA is approximately evenly split between private and public ownership. Approximately 51% of known leks are found on private land with the remaining 49% found on Forest Service, Bureau of Land Management, Bureau of Reclamation, and Wyoming State Trust lands.

Sagebrush habitat is essential for sage-grouse survival. Suitable habitat consists of plant communities dominated by sagebrush and a diverse understory of native grasses and forbs (flowering herbaceous plants). The composition of shrubs, grasses, and forbs varies with the subspecies of sagebrush, the condition of the habitat at any given location, range site potential, and climatic conditions. Seasonal habitats typically occur in a patchwork or mosaic across the landscape with some overlap. 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 may be the most challenging element of managing the landscape in combination with other existing land uses. There is also a need to identify structure and cover components. Structure and cover requirements are most

pronounced in breeding (pre-nesting, nesting, and early brood-rearing) habitats. Winter range is increasingly being recognized as a critical component of sage-grouse habitat.

Weather, habitat fragmentation, natural and anthropogenic disturbance, and direct mortality are influences affecting sage-grouse. Weather is considered to have a substantial influence on sage-grouse. Although sage-grouse evolved with weather fluctuations for thousands of years, it remains a significant factor in determining the status and well being of their populations. Of the factors identified which may effectively be addressed to provide the greatest benefit to sage-grouse conservation within the BHSBCA, the Working Group identified vegetation management (including livestock grazing and invasive plants) as being the most influential. Oil and gas and mineral development was considered the second most significant, followed (in order of significance) by predation and diseases, residential development, hunting, and recreation.

Conservation Strategy

The goal of this conservation plan is to develop management strategies to:

1. Maintain, restore and/or enhance sage-grouse habitat.
2. Manage factors contributing to the direct mortality of sage-grouse.
3. Initiate and/or encourage sage-grouse research.
4. Monitor sage-grouse populations and habitat characteristics to determine current status and trends.
5. Increase public awareness, knowledge, and support of sage-grouse conservation.

Conservation commitments, proposed management actions, and recommended management practices to achieve goals and objectives are listed in the plan. These action items are based upon the general biology of the species, their seasonal habitat requirements specific to the area, and (potential and documented) impacts and issues associated with the long-term management of the species. The BHSBLWG has identified the following sage-grouse conservation actions as the primary goals of this Conservation Strategy:

- Prevent the need for species listing under the Endangered Species Act.
- Protect sage-grouse habitats within 3.4 miles of occupied leks.
- Request mitigation (on or off-site) where surface-disturbing impacts are unavoidable.
- Minimize surface disturbance when conducting natural resource development.
- Control the spread and distribution of invasive plants.
- Develop and implement livestock grazing strategies to promote healthy sagebrush communities with an emphasis on soil moisture retention, forb production, and a mosaic of differing seral stages of sagebrush stands.
- Develop and implement a rangeland monitoring protocol with an emphasis on sage-grouse habitats.
- Identify and map sage-grouse seasonal habitats.
- Continue to identify and implement sage-grouse habitat conservation projects.
- Manage other wildlife species to minimize competition with sage-grouse.
- When appropriate, consider predator management strategies.
- Minimize the footprint of residential development within sagebrush communities.

- Encourage research to enhance the body of knowledge of sage-grouse ecology.
- Continue to monitor sage-grouse population trends.
- Inform and educate agency personnel, landowners, and the general public on sage-grouse conservation issues.
- Solicit and fund conservation projects consistent with this conservation plan.
- Solicit and secure funding for future plan implementation.

Conservation actions presented in the Conservation Strategy section of the plan are in various phases of implementation including completed, ongoing, planning, and conceptual. The BHSBLWG will be soliciting additional conservation projects for evaluation and recommendation for financing as project funding becomes available. The BHSBLWG is responsible for prioritizing projects submitted to the group for funding through the Wyoming Governor's Sage-grouse Conservation Fund. This plan prioritizes conservation actions which provide for the highest perceived benefit to cost ratio while considering project feasibility, potential obstacles, and the availability of cooperative funding. A list of potential cooperative funding sources is included in Appendix I.

PREFACE

The Bates Hole/Shirley Basin Sage-grouse Local Working Group (BHSBLWG) was established in March 2004 with an organizational mission statement to "develop and implement strategies that maintain and improve sagebrush communities for sage-grouse and other species". The Wyoming Game and Fish Department established eight local working groups within the State in order to develop local conservation plans, design projects that benefit sage-grouse and other sagebrush obligate species, and to implement on-the-ground habitat and population-related projects for the species.

The group includes 11 members representing major interests within the Bates Hole/Shirley Basin Conservation Area (BHSBCA). Working Group representation includes the Wyoming Game and Fish Department (WGFD), the Department of Interior Bureau of Land Management (BLM), the USDA Natural Resources Conservation Service (NRCS), agriculture, mining, oil and gas/pipeline, conservation groups, and sportspersons. Working Group members represent their particular interests and provide liaison with the groups they represent.

Significant activities of the BHSBLWG during the first year included information gathering regarding sage-grouse populations, trends, habitat use, and current status; field trips to learn more about sagebrush grassland habitats; publication of an informational brochure; meetings with other affected interests; seminars to learn more about the potential for sage-grouse management within the BHSBCA; development and planning of a habitat improvement project in Shirley Basin; a proposal to the Legislature's Travel, Recreation, and Wildlife Committee to change the state bird from the meadowlark to the sage-grouse; and the endorsement of several ongoing Department projects including the Hat Six sage-grouse research project and the Bates Creek Watershed Restoration project. Working Group meetings are conducted about every month, typically last a day, and always include opportunity to hear public comment regarding the program.

The first major task of the Working Group was to develop a local conservation management plan for sage-grouse within BHSBCA. The results of the conservation planning effort serve as the basis for this report.

Bates Hole/Shirley Basin Sage-grouse Local Working Group Members

Stacey Scott, Chairman, Murie Audubon Society

Kristi Brown, Sportsperson

Sarah Bucklin-Comiskey, Bureau of Land Management

Dean Dick, Pipeline Industry

Barbara Dobos, Public at Large

Pete Garrett, Rancher

Ron Heward, Rancher

Jerry Jasmer, Natural Resources Conservation Service

Justin Binfet, Wyoming Game and Fish Department

- Daryl Lutz (Wyoming Game and Fish Department) served as the WGFD representative from September, 2004 through November, 2006.
- Stan Harter (Wyoming Game and Fish Department) served as the WGFD representative from working group initiation (March, 2004) through August, 2004.

Alison Lyon, Audubon Wyoming

Donna Wichers, Pathfinder Mines Corp.

Robin Kepple, Facilitator

CONSERVATION ASSESSMENT

Background

Sage-grouse are found throughout the sagebrush/grassland habitats of Bates Hole, Shirley Basin, the Rattlesnake Hills, the south end of the Bighorn Mountains, foothills of the Laramie Range, and in northern Platte/southern Niobrara Counties. Occupied habitat is fairly contiguous throughout much of Bates Hole and the Shirley Basin. Habitats within the Rattlesnake Hills and the south end of the Big Horns are more fragmented by changes in habitat type and oil and gas development. Sage-grouse habitat in the Laramie Range is primarily limited to the west slope including portions of the Laramie Plains. Large, contiguous blocks of sagebrush/grassland communities east of the Laramie Range have, for the most part, been eliminated.

Occupied habitat for sage-grouse within the BHSBCA is approximately evenly split between private and public ownership. Approximately 51% of the known leks are found on private land with the remaining 49% found on Forest Service, Bureau of Land Management, Bureau of Reclamation, and Wyoming State Trust lands.

Management data collected by the WGFD for sage-grouse have focused on lek counts and surveys, harvest statistics, and data derived from wings collected from harvested birds. Lek counts and surveys have been conducted within the BHSBCA since the 1950s. Lek counts are conducted in April and early May. Individual leks are counted 3 or more times at 7 – 10 day intervals. Lek counts are conducted to estimate trends in the population based on peak male attendance. Lek surveys are also conducted in the spring, but generally are only conducted one time per lek to determine general lek activity status (i.e., active/inactive). Some sage-grouse brood data has also been collected and documented, typically during August. These brood counts provide some indication of population trends, although their use is limited in estimating recruitment because the surveys are not conducted in a systematic or consistent manner and sample sizes are small. Emphasis on brood counts has decreased over the past few years because of their limited use as an indicator of recruitment and population trend. When available, wing data provide a much more reliable indicator of recruitment.

Past management of sage-grouse within the BHSBCA has focused mainly on the protection and/or enhancement of their habitats and protection of leks from surface disturbing activities during the breeding season. Protection efforts have primarily occurred through the project review process conducted by State and Federal agency personnel and more recently through the on-going revision of the BLM's Resource Management Plans in the Casper and Rawlins Field Offices. Sage-grouse have been given increasing consideration through the project review process with emphasis on minimizing disturbance during the breeding season within and around the lek sites and protections for sage-grouse nesting and early brood rearing habitats.

Most sage-grouse populations in Wyoming are hunted, though some portions of the state have been closed to sage-grouse hunting to protect particularly small, isolated populations (i.e., in the southeast and northwest portions of the state). That portion of the BHSBCA on the Laramie Plains is closed to hunting for this reason. Grouse numbers are very low and distribution is sporadic in this area because they exist on the fringe of sage-grouse range where sagebrush

communities, at best, provide small islands of suitable habitat isolated from the core sage-grouse habitats within the BHSBCA.

Historically, sage-grouse hunting seasons opened in early September. Research into the potential impact of hunting on sage-grouse indicated a late September opener had less negative impact on hen survival and may increase recruitment compared to an early September season (Braun and Beck 1996, Heath et al. 1997, Connelly et al. 2000). Sage-grouse seasons in Wyoming currently open in late September and close in early October. Since 1982, bag and possession limits have been 3/day and 6 in possession or 2/day with 4 in possession (the current limitations).

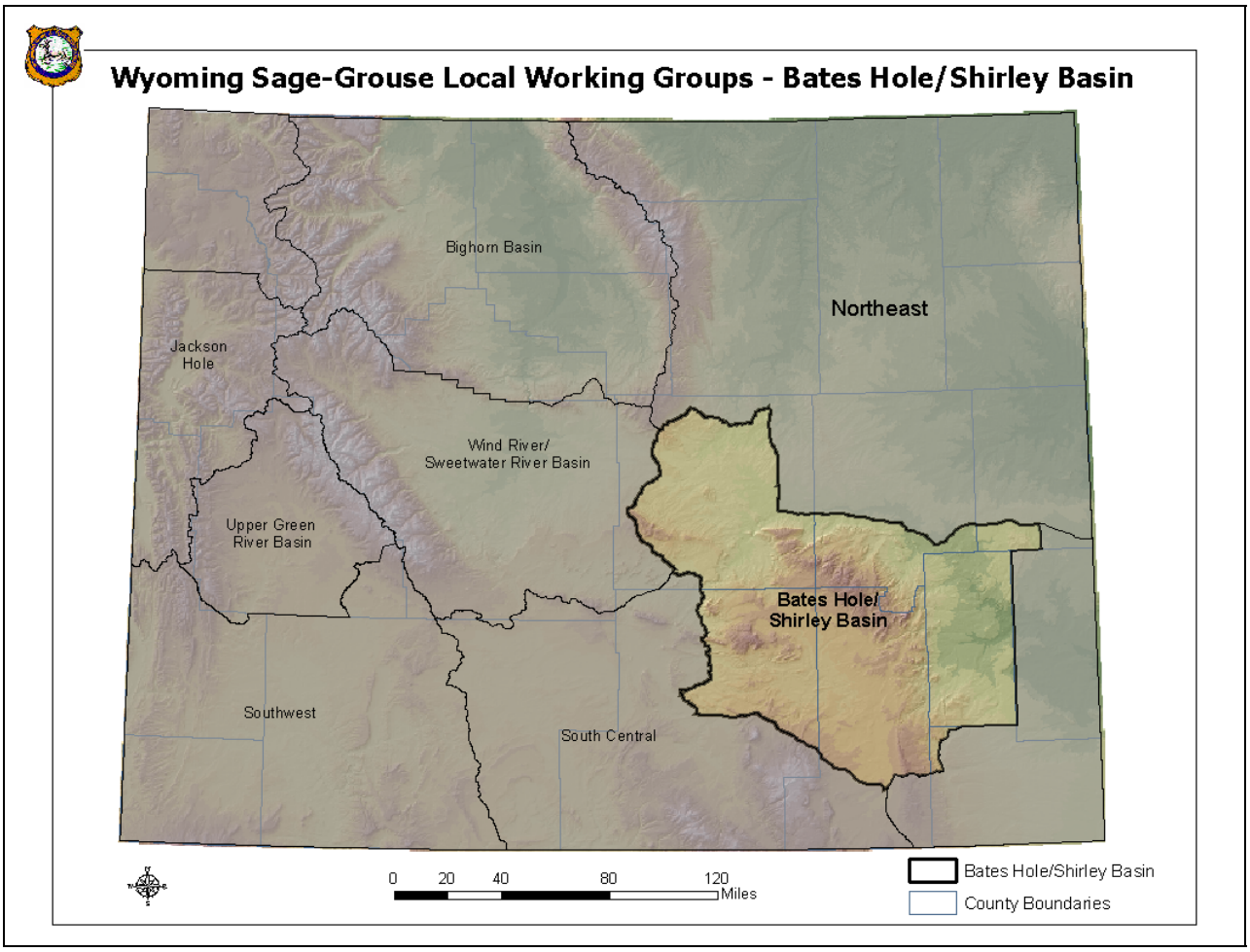
Working Group Purpose

The Bates Hole/Shirley Basin Local Working Group was organized in early 2004, to develop and implement a local conservation plan to benefit sage-grouse and other species that use sagebrush habitats. The goal of this conservation plan is to identify practical management practices to improve sage-grouse numbers and habitat to preclude the need for listing this species under the Endangered Species Act. The mission statement of the Bates Hole/Shirley Basin Sage-Grouse Working Group is to "develop and implement strategies that maintain and improve sagebrush communities for sage-grouse and other species".

Conservation Area

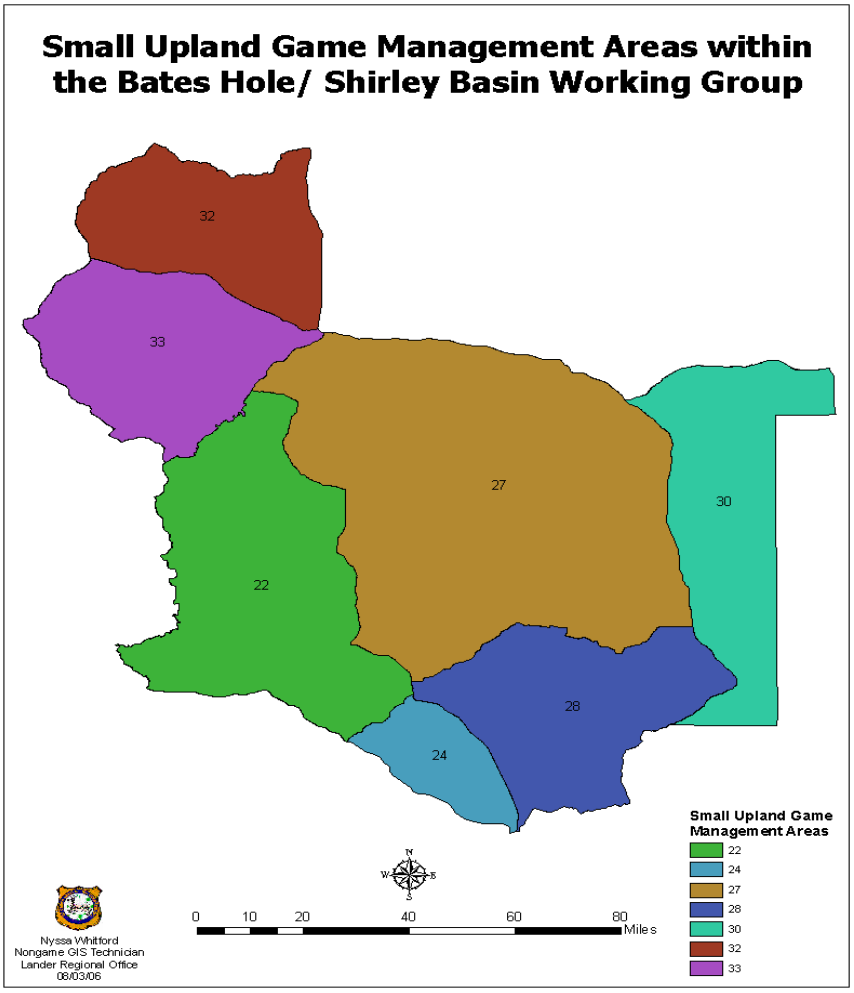
The BHSBCA includes Bates Hole, the Shirley Basin, the Rattlesnake Hills, the southern Bighorn Mountains, the Laramie Range, and isolated occupied habitats in southern Niobrara and Platte County (Figure 1). Political jurisdictions include Albany, Carbon, Converse, Laramie, Natrona, Niobrara, and Platte counties. This area is managed by: the Bureau of Land Management (primarily the Casper and Rawlins Field Offices), the Bureau of Reclamation, the USDA Forest Service (Medicine Bow National Forest), the State of Wyoming, and private landowners. Major habitat types within the plan area include: sagebrush/grassland, salt desert shrub, mixed mountain shrub, grasslands, mixed forests (conifers and aspen), agricultural crops, riparian corridors, and urban areas. Primary land uses in the BHSBCA include: oil and gas development, coal mining, wind energy complexes, livestock grazing, dry-land and irrigated crop production, urban expansion, and wildlife habitat.

Figure 1. The Bates Hole/Shirley Basin Conservation Area.



The BHSBCA encompasses all or a portion of WGFD Small/Upland Game Management Areas 22, 24, 27, 28, 30, 32, and 33 (Figure 2). The management areas do not correspond to sage-grouse population boundaries. Instead, management areas are used for general data collection and reporting for all small and upland game species. Further, the BHSBCA area is not aligned on the boundary for Area 24. Because harvest data is recorded by these management areas and not by the outlined Conservation Area, analyses/statistics reported include some information outside of the BHSBCA.

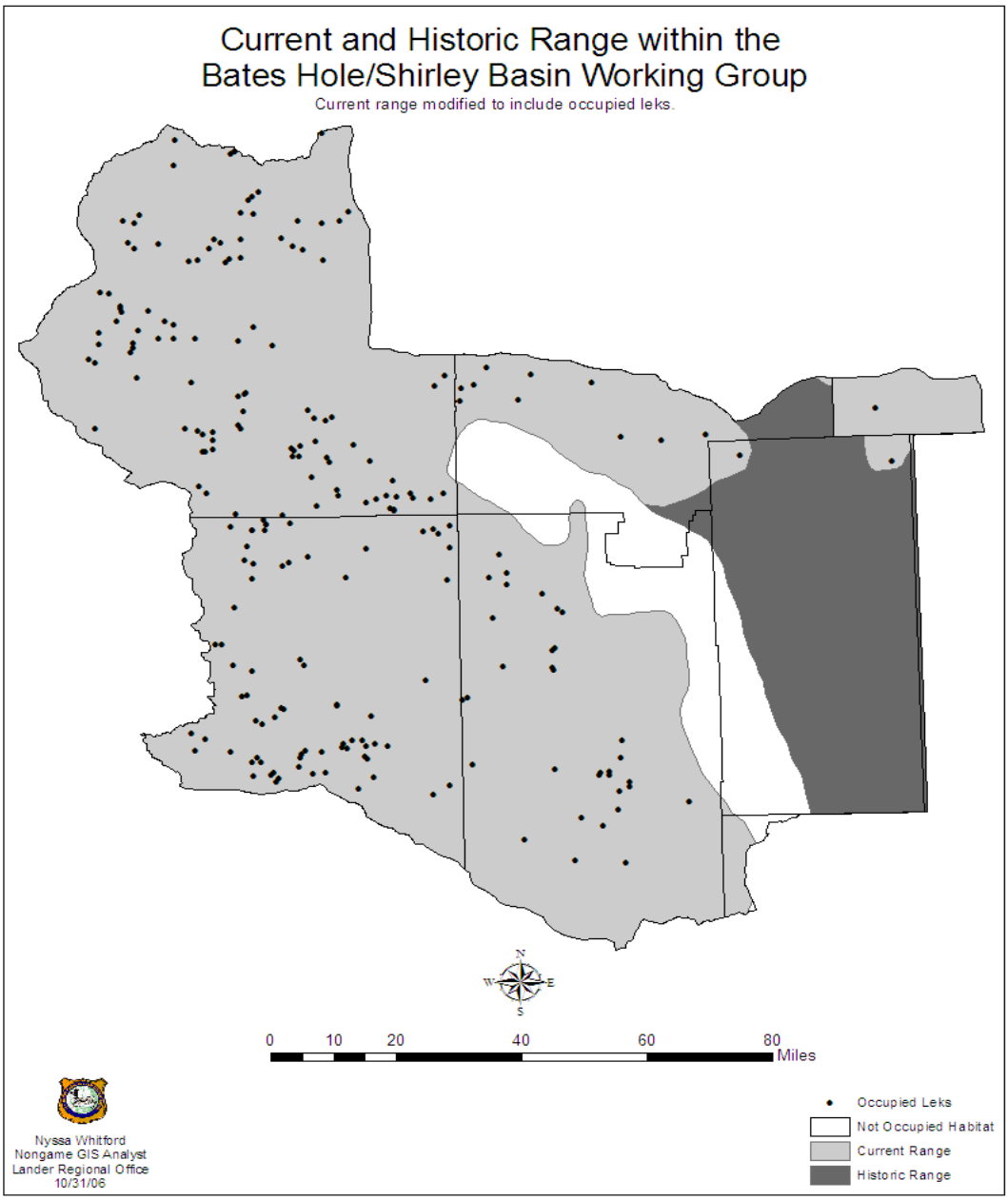
Figure 2. The Bates Hole/Shirley Basin Conservation Area and WGFD small and upland game management areas.



The Wyoming Game and Fish Department, federal agencies, and volunteers have conducted lek counts and surveys each spring within the BHSBCA for over forty years, providing the best long-term management data currently available for sage-grouse. Lek counts include those lek observations conducted three to four times each spring, about a week to 10 days apart. Lek counts are conducted to provide trends in the population based on the average peak male attendance. Lek surveys typically consist of only one spring visit and are intended to determine general lek status. Occupied lek and sage-grouse range distribution within the BHSBCA are represented in Figure 3.

Some sage-grouse brood data have been collected and documented during July and early August. Brood data provide some indication of population trend based on production. In some years, brood data are limited because of low sample size due to a low population or conflicting work schedule demands. When available, harvest wing data provide a much more reliable indicator of recruitment than do brood data. Four wing barrels placed in Bates Hole typically provide significant wing data due to relatively high numbers of sage-grouse hunters in the Casper area.

Figure 3. Current and historic range of sage-grouse and occupied leks within the Bates Hole/ Shirley Basin Conservation Area (Source: Wyoming Greater Sage-grouse Conservation Plan).



Sage-grouse Biology and Habitats

The following information on sage-grouse biology and habitats comes primarily from the Wyoming Greater Sage-grouse Conservation Plan (2003), which has summarized sage-grouse ecology based on a large volume of research.

Sagebrush habitat is essential for sage-grouse survival. Suitable habitat consists of plant communities dominated by sagebrush and a diverse understory of native grasses and forbs (flowering herbaceous plants). 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. Spatial arrangement, the amount of each seasonal habitat, and the vegetative condition determine the landscape's potential for sage-grouse. This arrangement is an important factor in determining if a population is migratory or non-migratory in nature. Both quantity and quality of the sagebrush environment determines suitability for and productivity of sage-grouse.

Winter Habitat

During winter, sage-grouse feed almost exclusively on sagebrush leaves and buds. Suitable winter habitat requires exposed sagebrush above snow. Sage-grouse tend to select wintering sites where sagebrush is 10-14 inches above the snow. Above-snow sagebrush canopy cover selected for by sage-grouse may range from 10 to 30 percent. Sage-grouse generally return to traditional wintering areas before heavy snowfall. Movements to wintering areas vary widely ranging from a few miles to over 50 miles, depending on the area and population. Foraging areas tend to be gentle southwest facing slopes and windswept ridges. Sage-grouse roost in open, low sagebrush sites on clear, calm nights. During windy periods or during snowstorms sage-grouse seek taller shrubs with greater canopy cover. Sage-grouse will fly considerable distances (>5 miles) and elevations (>1,000 feet) between winter feeding sites and suitable snow roosting sites. Sage-grouse will burrow in deep powdery snow to conserve energy.

During severe winters, the amount of suitable available habitat is greatly reduced. Severe winter habitat may be considered crucial habitat. Some severe winter habitat may be essential and extensively used during severe winters, while others may only be used occasionally.

Winter habitat is increasingly being recognized as an important sage-grouse habitat. Until recently, identifying winter habitat at the landscape scale has not been possible. Doherty et al. (2006) used spatial analysis of habitat components including vegetation and topography along with sage-grouse wintering locations to assess factors comprising winter habitat. Three factors were identified which contribute to suitable winter habitat; sagebrush, lack of conifer cover, and terrain. Sage-grouse select large flat areas of non-forested sagebrush habitat to winter. Currently, no sage-grouse winter habitat has been formally delineated within the BHSBCA, although a substantial amount of sage-grouse winter habitat appears to exist based on the winter habitat needs of sage-grouse.

Breeding Habitat (Leks) - Early Spring

Breeding occurs on strutting grounds (leks) between late March and early May. 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. Lek sites generally have lower herbaceous height and less shrub cover than surrounding areas, and are typically proximal to nesting habitat.

There are migratory and non-migratory populations of sage-grouse. In some areas both migratory and non-migratory birds may use the same lek. If all of the components of their seasonal habitat needs are available within one area, some sage-grouse may not migrate. For these non-migratory populations the lek may be an approximate center of their annual range. Migratory sage-grouse populations may move seasonally through hundreds of square miles of widely distributed habitats. There is evidence that sage-grouse hens exhibit fidelity to lek and nesting areas, and males return to leks where they have achieved stature in the breeding hierarchy. As populations decrease, leks can be abandoned. Conversely, as populations increase and expand, leks can become active again or new leks may be established.

Lek-Associated Habitat

Stands of sagebrush surrounding leks are used extensively by sage-grouse. During breeding, sage-grouse use the habitat surrounding a lek for foraging, loafing, and protection from weather and predators. Pre-nesting habitats should contain areas of early-to-mid seral stage vegetative communities at fine scales with relatively open sagebrush canopies and a robust, leafy forb understory. These areas should be interspersed throughout potential nesting habitats. A small-grained mosaic (meaning small interspersed patches of varying seral stage habitats should occur across the area) of early-to-late seral stages of sagebrush communities is desired.

Plant composition in early spring habitat contributes to nesting success. At green-up, forbs are more nutritious than sagebrush. Sage-grouse hens need foods rich in protein, calcium, and phosphorus 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. Commonly identified important food forb species include common dandelion (*Taraxacum officinale*), curlycup gumweed (*Grindelia squarrosa*), western salsify (*Tragopogon dubius*), western yarrow (*Achillea lanulosa*), prickly lettuce (*Lactuca serriola*), cudweed (*Gnaphalium palustre*), fleabane (*Erigeron spp.*), sweetclover (*Melilotus officinalis*), milkvetch (*Astragalus bisulcatus*), alfalfa (*Medicago sativa*), winterfat (*Eurotia lanata*) and fringed sagewort (*Artemisia frigida*). However, most forb species when they are young and succulent are eaten by sage-grouse.

Nesting Habitat - Late Spring

Approximately two-thirds of hens nest within three miles of the lek where they were bred (WGFD 2003). The remainder of the birds usually nest within 15 miles of the lek, but one radio-collared bird in western Wyoming ranged 60 miles.

Sage-grouse typically nest under sagebrush, but may use other large shrubs. Sage-grouse select mid-height, denser sagebrush stands for nesting. Studies conducted in southern and southwestern Wyoming indicate nest shrub heights for Wyoming big sage (*Artemisia tridentata wyomingensis*) ranged between 8 to 18 inches for sage-grouse, but individual plants (all subspecies of *Artemisia tridentata*) utilized range-wide by sage-grouse may reach 32 inches in height. Sagebrush canopy cover at nesting sites ranged between 6% and 40%.

Wyoming studies indicate greater total shrub and dead sagebrush canopy cover and residual grass cover are vegetative attributes sage-grouse choose in the nest selection process 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. Live grass heights measured immediately after hatch ranged between 4 and 9 inches with residual grass heights of 2 to 6 inches.

Herbaceous cover was quite variable and ranged between 1% and 85%. Although dead sagebrush canopy cover has been shown to be statistically significant in nest selection, it represented only 12% to 21% of the overall canopy cover in the stand. Dead sagebrush may provide screening cover while allowing for increased amounts of herbaceous understory.

Dense residual grasses at least as tall as the bottom of the canopy on mid-height sagebrush plants appear to positively influence hatching success at nesting sites. Areas that support a diverse forb understory should be in close proximity to these nesting sites for feeding during incubation and early brood-rearing. Hatching success appears to improve with increased forb cover. The vegetative composition of an area depends upon site potential, seral stage, and range management.

Early Brood-Rearing Habitat – Late May to Mid-July

Early brood-rearing habitats are used during the brood's first month of life. Immediately upon hatching, hens move their brood from the nest site to early brood-rearing areas. Sites used during the first 10-14 days after hatching are typically within 1.5 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 disperse 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. Brood survival is tied to an abundance of insects and green vegetation, primarily forbs, in close proximity to sagebrush cover that provides adequate protection from weather and predators. Food forb species important to chick survival are very similar to those listed as important for pre-laying hens. Vegetation diversity increases insect diversity, especially as forb diversity increases. Insects are crucial during the first ten days post-hatch and can comprise up to 75% of chick diets. Insects remain an important source of protein throughout the summer.

Late Brood-Rearing Habitat - Mid-July to Mid-September

As 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. Delayed

maturation 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, springs, and riparian areas are the primary sites for forb and insect production necessary for juvenile birds. In general, the drier the summer, the more sage-grouse are attracted to remaining green areas.

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 may occur. As meadows dry and frost kills forbs, sagebrush consumption increases. Fall movements to winter ranges are slow and meandering from late August to December. With significant snowfall accumulation, sage-grouse move onto winter range.

Landscape Context

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 and the effect of livestock grazing on sage-grouse habitats is not completely understood, although some generalizations may be made (Figure 4). Thus, there is debate about how sagebrush communities should be managed to maximize benefits to sage-grouse. However, 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 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 often fails to provide adequate nesting and security cover needs of sage-grouse.

Because leks have been shown to be reliable indicators of nesting habitat and sage-grouse chicks have limited mobility during the critical first two weeks post-hatch, habitat assessment should 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.

If upland vegetation is managed at a variety of early, mid, and late seral stages at the landscape scale, it is assumed the area will provide sage-grouse with the variety of habitats required annually. Issues relating to 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 understood.

Figure 4. Habitat check sheet for sage-grouse seasonal habitat requirements and associated livestock grazing recommendations (Roath in prep: *modified by BHSBLWG*).

Sage-grouse Seasonal Habitat Type	Approx. Dates	Relative Nutritional Requirement	Potentially Limiting Nutrient(s)	Vegetation to Meet Nutritional Requirements Within Sagebrush Communities	Appropriate Seral Phase/ State of Sagebrush Stands	Desired Vegetation Structure	Effect of Livestock Stocking Rate	Effect of Season of Livestock Use
Nesting	late April - early May	moderate	energy	grasses with overhead cover (shrubs, leaves, etc.)	mid seral	sagebrush overstory w/ dense grassses	moderate in fall	heavy fall use detrimental
Early Brood Rearing	late May - mid July	high	protein	lush grasses and young forbs and insects	lower mid-seral	open stands of sagebrush w/ good understory	moderate	light to moderate grazing can enhance availability of forbs; heavy use detrimental
Late Brood Rearing / Fledging	mid July - mid Sept.	moderate	energy	quality herbaceous riparian meadows	mid seral	riparian with forbs and grasses adjacent to sagebrush	moderate	light to moderate grazing can enhance availability of forbs; heavy use detrimental
Wintering	Nov. - March	low (site dependant)	energy	mature sagebrush	late seral	exposed sagebrush	low	little to moderate livestock affect

Sage-grouse in the Plan Area

Leks and Lek Complexes

The Wyoming Game and Fish Department summarizes lek survey data each year. As of spring 2006, there are 230 known occupied leks and 55 unoccupied leks. Fifty-three of the 55 unoccupied leks are abandoned leks, of which two have been destroyed. Undoubtedly, there are leks within the BHSBCA that have not yet been identified. Similarly, there are leks that have been abandoned or destroyed which are not known.

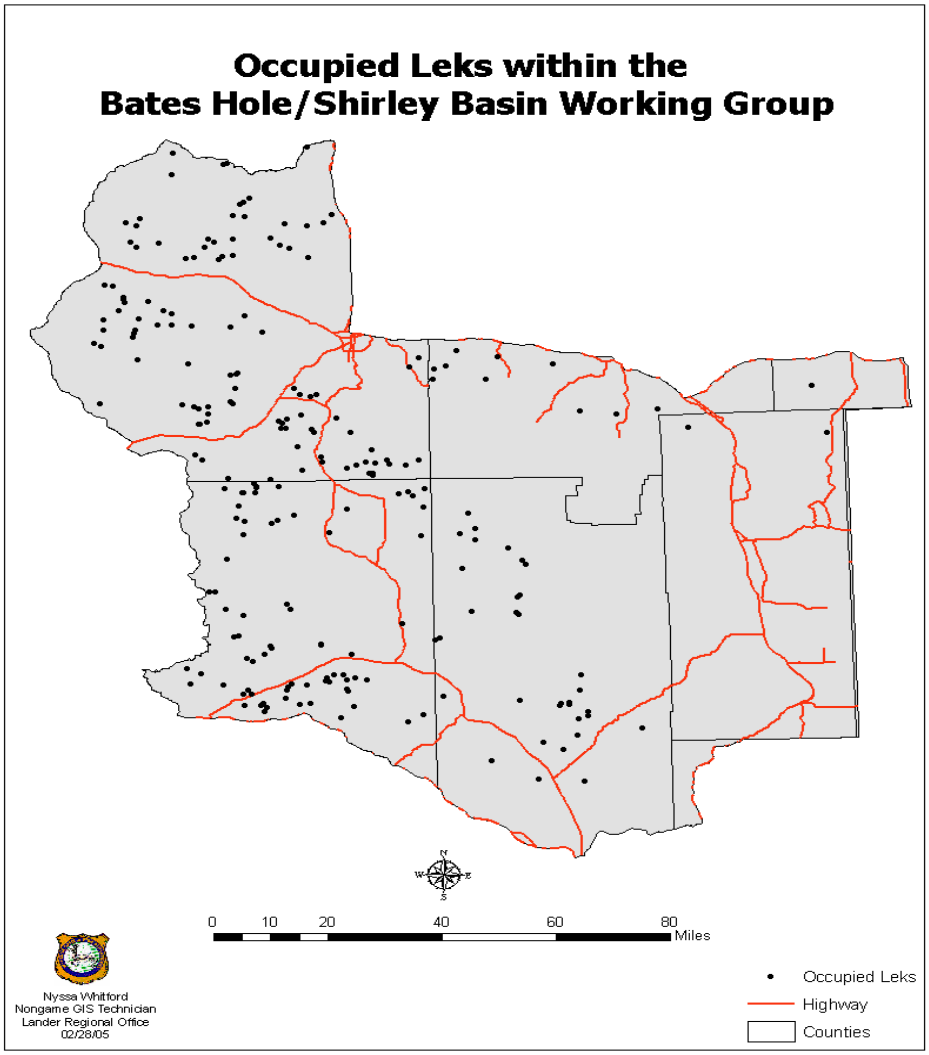
Figure 5 presents the demographics of sage-grouse leks within the BHSBCA as of May 2006. Sage-grouse lek sites in the BHSBCA are located within two WGFD regions (Laramie and Casper), four Biologist and ten Game Warden Districts, four BLM field offices, and seven counties. Locations of occupied sage-grouse leks within the plan area are shown in Figure 6. Sage-grouse are generally found throughout the BHSBCA with the exception of the more heavily forested/mountainous, agriculturally developed (i.e. Platte County), and urbanized areas.

Figure 5. Sage-grouse lek demographics by various categories within the Bates Hole/Shirley Basin Conservation Area.

General Category	Lek Count	Percent of Category
BHSB Area Total	307	100.0
Classification		
Occupied	230	74.6
Unoccupied	55	18.2
Unknown	22	7.2
(Abandoned)	53	--
(Destroyed)	2	--
Land Ownership		
BLM	115	37.5
BLM/Private	2	0.7
BOR	1	0.3
Undetermined	3	1.0
Private	159	51.8
State	24	7.8
County		
Albany	71	23.1
Carbon	110	35.8
Converse	10	3.3
Laramie	2	0.7
Natrona	106	34.5
Niobrara	1	0.3
Platte	7	2.3
BLM District		
Casper	122	39.7
Lander	1	0.3
Newcastle	1	0.3
Rawlins	183	59.6

Game & Fish Category	Lek Count	Percent of Category
G&F Region		
Casper	122	39.7
Laramie	185	60.3
Biologist District		
Casper	115	37.5
Douglas	7	2.3
Laramie	105	34.2
Wheatland	80	26.1
Game Warden		
Cheyenne	1	0.3
Douglas	2	0.7
East Casper	39	12.7
Elk Mountain	72	23.5
Glenrock	8	2.6
Lusk	1	0.3
Medicine Bow	68	22.1
North Laramie	37	12.1
West Casper	72	23.5
Wheatland	7	2.3
Management Area		
#22	117	38.1
#24	4	1.3
#27	79	25.7
#28	32	10.4
#30	3	1.0
#32	32	10.4
#33	40	13.0

Figure 6. Locations of occupied sage-grouse leks within the Bates Hole/Shirley Basin Conservation Area, May 2005.



Lek counts and lek surveys have been conducted within the area since the late 1950's, although only on a few leks. Since 1998, lek monitoring effort has expanded significantly, resulting in consistent data sets over the last nine years. In 2006, personnel checked 268 of the known 307 (87%) leks in the BHSBCA. Of the 230 occupied leks identified, personnel checked 217 (94%) in 2006. Of those checked in 2006, 64 were counted and 153 were surveyed. Of the leks checked and where status was confirmed, 149 (96%) were active and 6 (4%) were inactive. It is important to note the high percentage of active leks is biased since personnel concentrate searches on leks known or thought to be active.

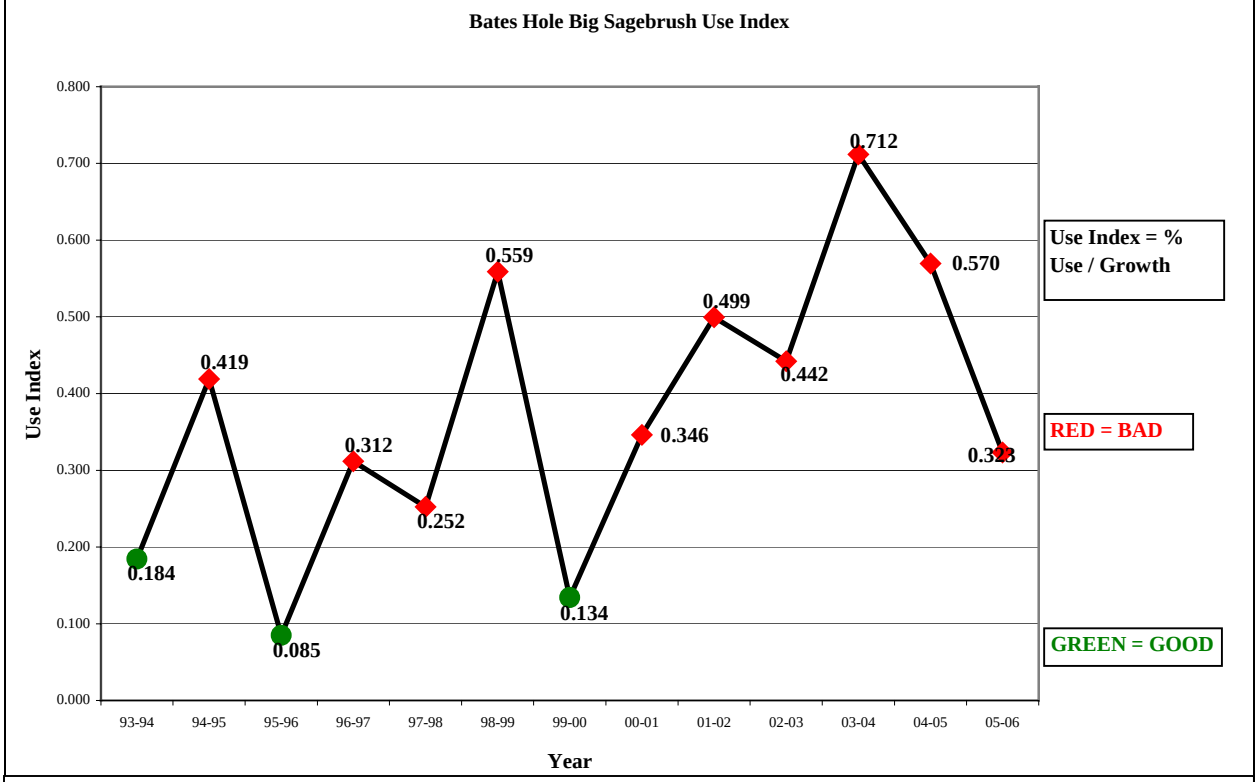
Habitat

There is little doubt sage-grouse habitat quality throughout the BHSBCA has declined over the past several decades. Increased human-caused disturbance (i.e., oil/gas, coal, wind energy, and improper grazing by livestock and wildlife) combined with sagebrush eradication programs and drought has negatively impacted sage-grouse and their habitats. As the level of concern for sage-

grouse has risen, some habitat improvement projects have been planned and/or implemented throughout the BHSBCA. In addition, remote sensing designed to map changes in vegetative communities throughout most of the BHSBCA is underway.

Department personnel monitor productivity and utilization of key sagebrush communities in the Laramie Range, Shirley Basin, Bates Hole and the Rattlesnake Hills. Annual growth has been very low due to plant age and vigor and ongoing drought. In many portions of the BHSBCA in recent years, such as in Bates Hole, measured utilization versus productivity rates (of current year's leader growth) have exceeded the threshold (35%) to sustain long-term plant productivity and health (Figure 7) (Winward 2004). The majority of this utilization has been attributed to big game, particularly pronghorn (*Antilocapra americana*), although domestic livestock utilization of sagebrush is significant in some areas. Continued long-term over-utilization of these sagebrush stands can lead to sagebrush mortality and an overall decline in stand health. Where sagebrush communities remain in the BHSBCA, this ongoing trend is a primary concern and focus for both Department managers and the BHSBLWG.

Figure 7. Sagebrush utilization and productivity in the Bates Hole portion of the Bates Hole/ Shirley Basin Conservation Area, 1993–2006 (Use index greater than 0.213 is excessive).



Use Index = % Leaders Browsed (ocular estimate) / Current Years Growth (annual growth). The use index was derived by dividing 35 percent, the level where percent leaders browsed is considered excessive, by the highest current year's growth observed. The use index indicates the amount of annual growth used during the winter and early spring.

Population Trend

Monitoring male attendance on leks appears to provide a reasonable index of relative change in sage-grouse abundance in response to prevailing environmental conditions over time. Nevertheless, this data must be viewed and interpreted with caution for several reasons described in the Wyoming Greater Sage-grouse Conservation Plan, 2003. Fluctuations over time in the number of grouse observed on leks are not exclusively due to changes in grouse numbers. These data also reflect changes in lek survey effort.

Lek counts and/or surveys have been conducted within the BHSBCA since the late 1950s. However, the most consistent data collected started in 1998. The number of leks counted within the BHSBCA has increased markedly since 1958. Concurrent with increased monitoring effort, the number of observed grouse (males) has also increased (Figure 8). The average number of males per count lek was substantially higher in the 1950's and 1960's than it is today. However, these data are not presented here as they are based on extremely small sample sizes (less than three leks per year in many years) and should be considered with caution. Since intensive lek monitoring began in 1998, the average number of males observed per count lek increased from 27.8 in 1998 to 58.5 in 2006, comprising a 110% increase over the last nine years (Figure 9). 2006 marked the fifth consecutive year in which observed number of males per count lek has increased in the BHSBCA. While this trend is encouraging, the average number of birds observed per active lek in the last six years, and presumably the minimum sage-grouse population, may be smaller than that of the late 1960's through the mid-1970's (Figure 10). It is important to note the average male lek attendance figures in Figure 10 are based on all leks checked and was not limited to more intensive lek counts. As previously mentioned, lek count sample sizes are too small prior to 1998 for reasonable data analyses. However, lek check data constitutes the best long-term data set available relative to sage-grouse population trends within the BHSBCA and should be considered. Certainly, since data collection was standardized in 1996, and monitoring effort was elevated in 1998, the number of male grouse counted on leks has increased within the BHSBCA.

Figure 8. Total number of count leks and males observed on count leks by decade within the Bates Hole/Shirley Basin Conservation Area, 1958 – 2006.

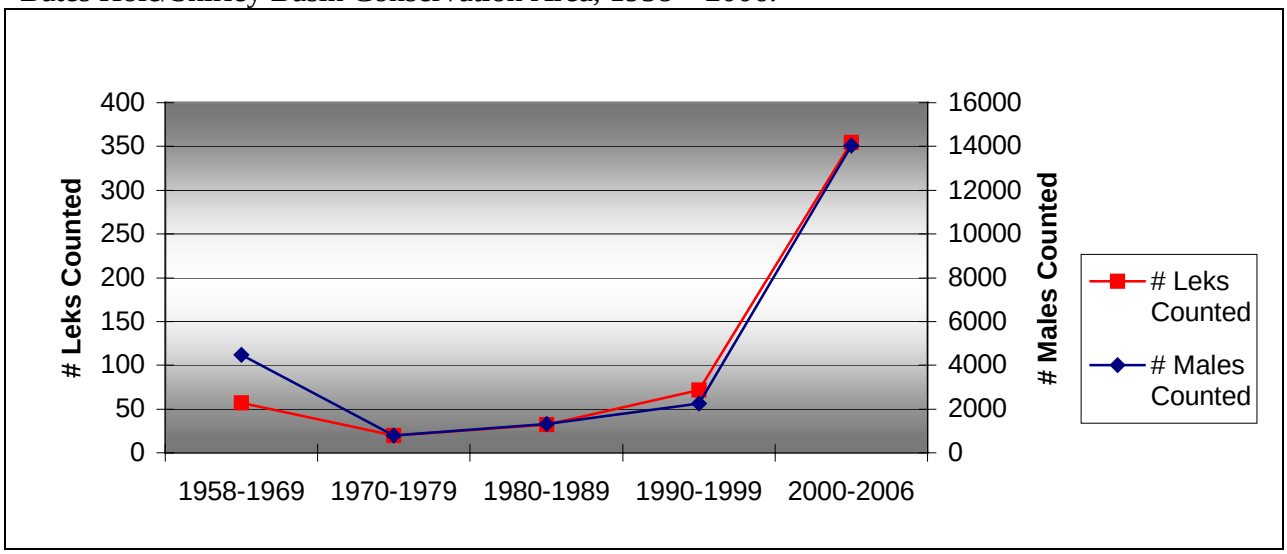


Figure 9. Average number of males/lek observed during lek counts within the Bates Hole/Shirley Basin Conservation Area, 1998 – 2006.

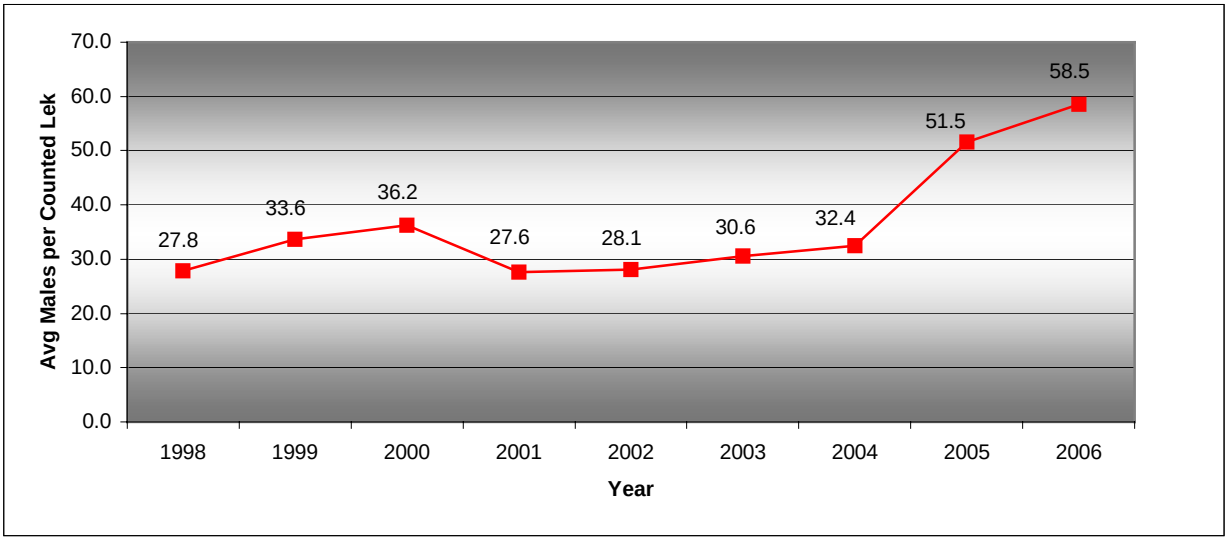
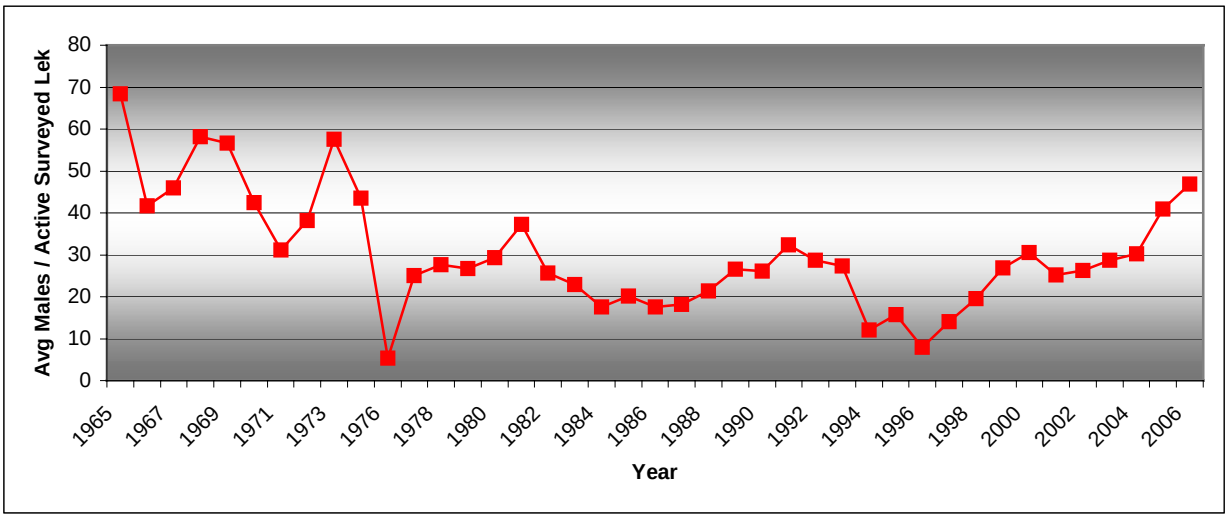


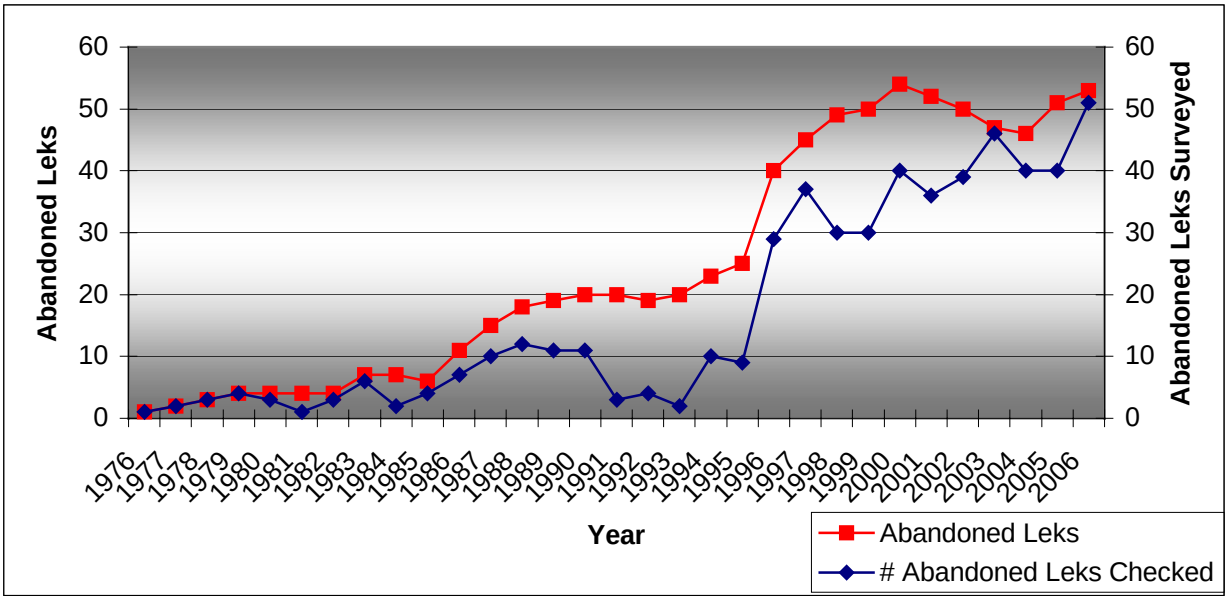
Figure 10. Average number of males per active lek observed during lek surveys within the Bates Hole/Shirley Basin Conservation Area, 1965 – 2006.



Within the BHSBCA, 53 leks have been documented as being abandoned. The number of leks documented/confirmed to be abandoned has increased dramatically since more intensive monitoring and data analyses began in 1996 (Figure 11). The timing in which these leks were abandoned is often difficult to determine due to gaps in data collection, although the recent increase in designations of abandonment was due to more rigorous data collection and analysis over the last ten years. Reasons for abandonment are unknown for most historic leks. It is unclear whether the high number of abandoned leks within the BHSBCA stems from sage-grouse population fluctuations over time, which are a function of weather, habitat conditions, etc., or from anthropogenic disturbances such as natural resource development, hunting, or recreation. Since 1996, most abandoned leks have been monitored, resulting in a few leks again becoming active. This renewed activity may be due to a number of variables such as increased effort in

locating the lek, lek movements, and upward trending populations resulting in marginally attended leks again becoming active.

Figure 11. Cumulative number and monitoring of abandoned leks across years within the Bates Hole/Shirley Basin Conservation Area, 1976 – 2006.



Productivity

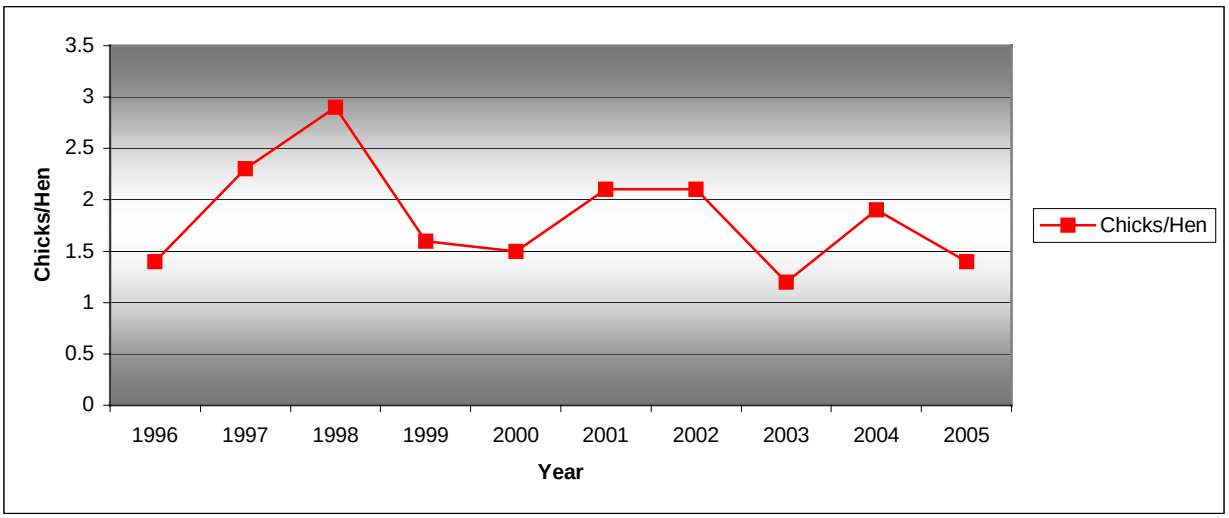
Observations of late summer broods can yield information on population productivity. Historically, brood counts have not been regularly conducted under a set protocol throughout the BHSBCA. Beginning in 2003, the WGFD Casper Region portion of the BHSBCA standardized brood count methodology and began to dedicate more effort to collecting these data. Sage-grouse observations in July and August of 2003 yielded an average brood size of 2.8 chicks per hen within the WGFD Casper Region (Figure 12). These data include all barren hen groups observed in addition to hens with broods. In 2004 and 2005, average productivity for all sage-grouse broods observed was 3.8 and 2.2 chicks per hen, respectively. Based on these data, brood productivity and/or chick survival increased by 36% from 2003 to 2004 and then decreased by 58% from 2004 to 2005. Although these data provide some insight into trends in chick production/survival across years, they must be analyzed with caution given a lack of statistical adequacy.

Figure 12. Estimated average brood size for sage-grouse using two sampling methodologies within the Bates Hole/Shirley Basin Conservation Area, 1996 – 2005.

	Year									
Method	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Brood Surveys	--	--	--	--	--	--	--	2.8	3.8	2.2
Sample size (hens and chicks)	--	--	--	--	--	--	--	*499*	*145*	*180*
Wing Data	1.4	2.3	2.9	1.6	1.5	2.1	2.1	1.2	1.9	1.4
Sample size (hens and chicks)	*119*	*582*	*563*	*275*	*201*	*506*	*596*	*175*	*262*	*296*

Analysis of wings from harvested sage-grouse may provide a more accurate estimate of sage-grouse productivity due to increased sample sizes (Figures 12 and 13) and more standardized data collection, although they again lack statistical adequacy. Wing analysis comes from harvested birds, which occur in mixed groups during fall hunting seasons and includes both barren hens and brood-rearing hens, which minimizes sampling bias (many broods are observed along riparian areas in the summer and may misrepresent the number of barren hens, thus biasing the actual chick:hen ratio). In addition, wing data is collected during the same time frame every year while brood surveys are conducted over a two month period every summer. By standardizing and narrowing this window of data collection, more accurate comparisons can be made when analyzing trends across years. Based on wing analysis data, chick productivity was estimated to be 1.4 chicks per hen in 2005, which is 0.5 chicks/hen lower than in 2004 and 0.3 chicks/hen lower than the 5-year average (1.7 chicks/hen). Since 1996, productivity has fluctuated from 1.2 chicks/hen to 2.9.

Figure 13. Productivity rates for sage-grouse within the Bates Hole/Shirley Basin Conservation Area based on wing data analysis, 1996 – 2005.



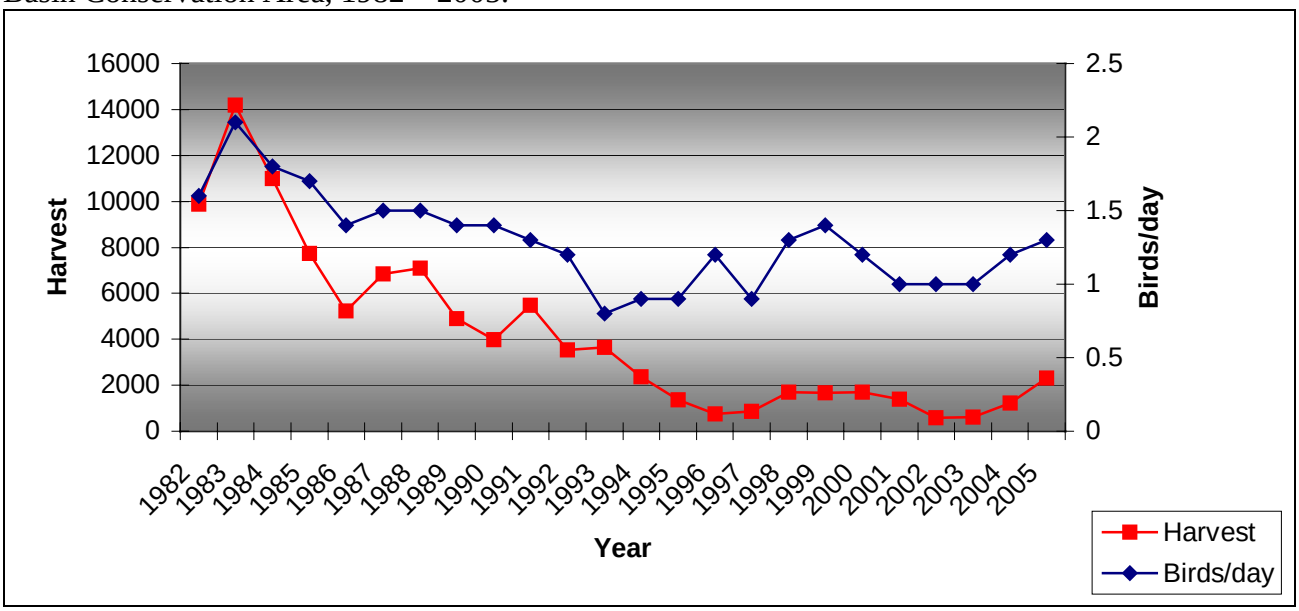
Harvest

Hunter and harvest statistics provide some insight into the status or trends in wildlife populations. Typical of upland game bird populations, there is usually a direct correlation between sage-grouse numbers and hunter effort/harvest. As sage-grouse numbers decrease, hunter harvest declines as well. Harvest data specific to the BHSBCA was obtainable starting in 1982. Prior to 1982, harvest data was recorded by county and not by the current small/upland game management areas. Harvest data for sage-grouse in the BHSBCA show similar trends as those parameters described above. Since 1982, annual harvest has averaged 3,088 grouse. Harvest peaked in 1983 at 14,180 birds and subsequently declined to a low of 588 in 2002. Since then, harvest has increased to a high of 2,304 in 2005. Hunter effort (days/bird) and birds/hunter have not changed significantly since 1998 (Figure 14). Harvest figures for the 2006 hunting season are not yet available.

Hunter participation and harvest declined dramatically when the Wyoming Game and Fish Commission reduced the bag limit and shortened the hunting season in 2002. A similar

reduction occurred in 1995 when the season was moved later into September. This decline occurred in spite of a concurrent population increase (based on males/lek), demonstrating the effects of increasingly conservative hunting seasons over the last ten years to hunter numbers and harvest. When consistent hunting seasons are maintained from year to year, total harvest is strongly correlated with population trends. Managers are not currently able to quantify any population effects resulting from reduced harvest levels. Although some positive population response is suspected to result, any effect at a population level is likely insignificant when compared to the impacts of weather and habitat condition.

Figure 14. Total sage-grouse harvested per year and birds per day within the Bates Hole/Shirley Basin Conservation Area, 1982 – 2005.



Weather

The climatic regime in the BHSBCA can largely be characterized by a continuing long-term drought with generally warmer than normal temperatures and mild winter conditions over the last six years. Despite the continuing severe drought since 2001, weather conditions have been generally favorable for sage-grouse over the last six years (Figures 15 – 19). Although early spring growing season precipitation has been generally poor within the BHSBCA over the last six years, resulting in relatively poor herbaceous vegetation and sagebrush production and nesting cover, periods between late May/early June, along with winters, have been generally mild. Mild climatic conditions during early brood rearing periods generally result in increased chick survival. During this period, cold wet weather can cause significant mortality on newly hatched sage-grouse chicks. However, substantial spring precipitation received in 2003 and 2005 helped ameliorate the impact of the drought on sage-grouse habitats for two of the six years by improving range conditions.

With decreased annual precipitation and extremely poor spring moisture, near normal summer temperatures, and a relatively warm, mild winter, it is difficult to determine how weather conditions in biological year 2005 (June, 2005 – May, 2006) affected sage-grouse. Although above average snowfall in February and March of 2006 covered much of the sagebrush in

Shirley Basin for extended periods, such winter conditions likely had little to no impact on sage-grouse populations based on 2006 lek attendance figures. Given the nearly complete lack of moisture received in the late spring and summer of 2006 within the BHSBCA, there was very poor forb production during the 2006 growing season and will likely be poor residual grass cover remaining for the beginning of the 2007 nesting season.

Figure 15. Average monthly maximum temperatures for the 2005 biological year and the 30-year average for all weather stations within the Bates Hole/Shirley Basin Conservation Area. (Source: http://www.wrcc.dri.edu/summary/climsmwy.html).

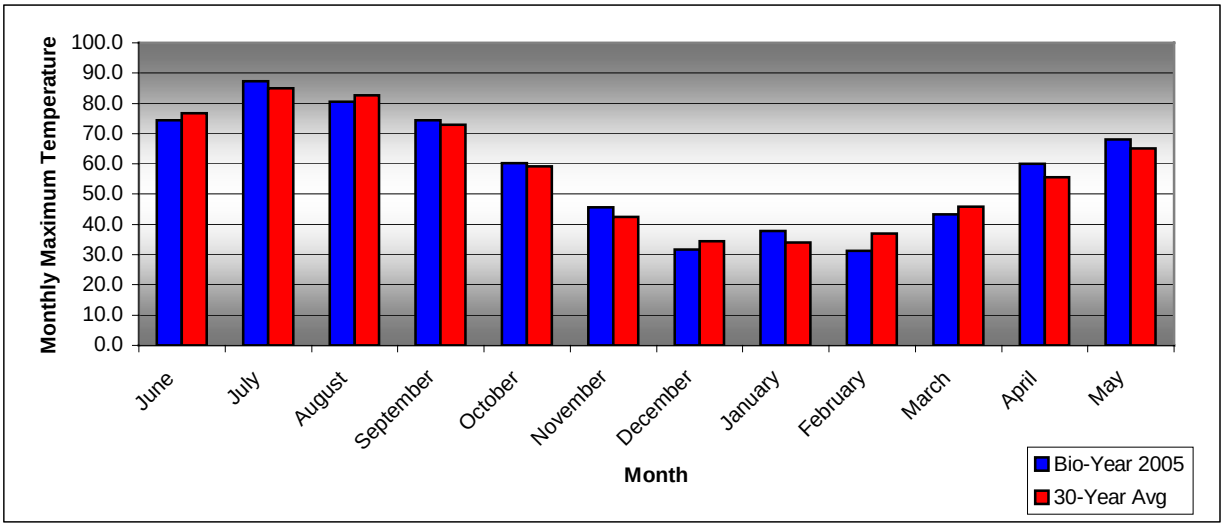


Figure 16. Average monthly precipitation for the 2005 biological year and the 30-year average for all weather stations within the Bates Hole/Shirley Basin Conservation Area. (Source: http://www.wrcc.dri.edu/summary/climsmwy.html).

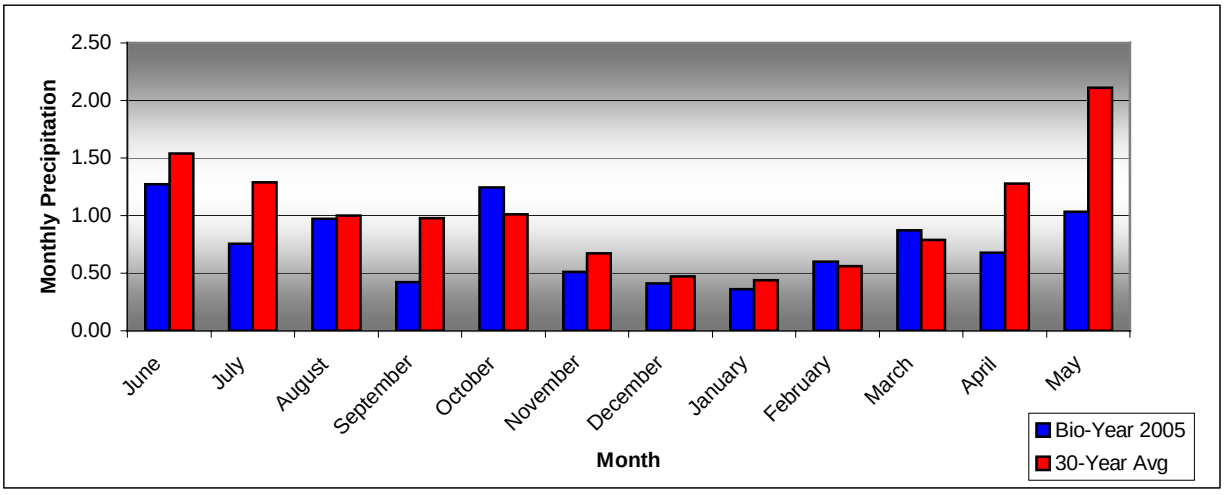


Figure 17. Spring (April/May/June) precipitation for all weather stations within the Bates Hole/Shirley Basin Conservation Area from 2001 – 2006 and averaged over the last 30 years. (Source: http://www.wrcc.dri.edu/summary/climsmwy.html).

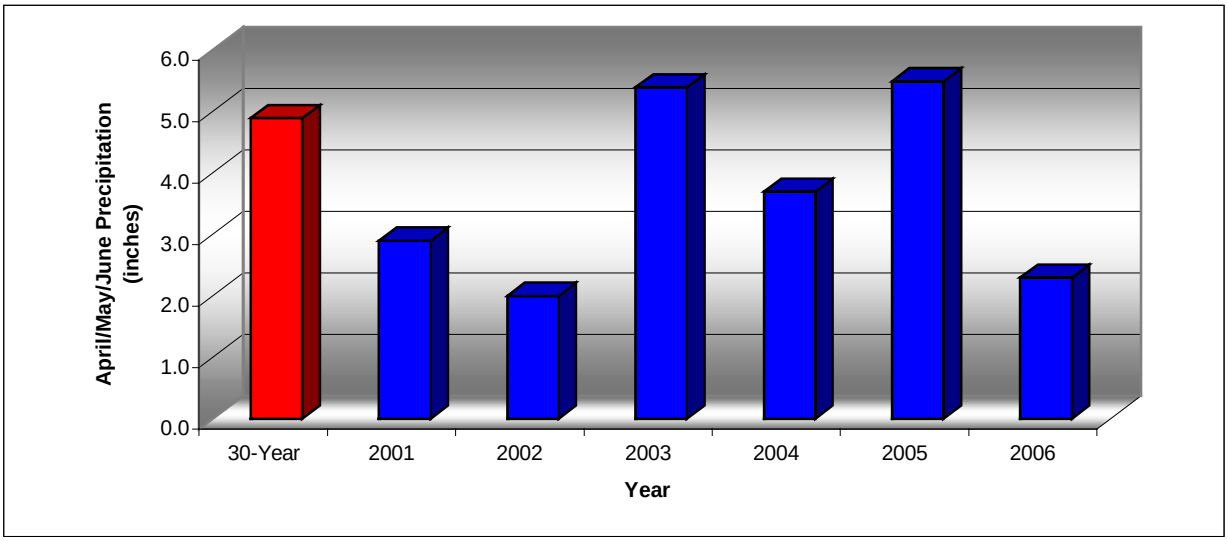


Figure 18. Average monthly maximum temperatures from 2001 – 2005 and the 30-year average for all weather stations within the Bates Hole/Shirley Basin Conservation Area. (Source: http://www.wrcc.dri.edu/summary/climsmwy.html).

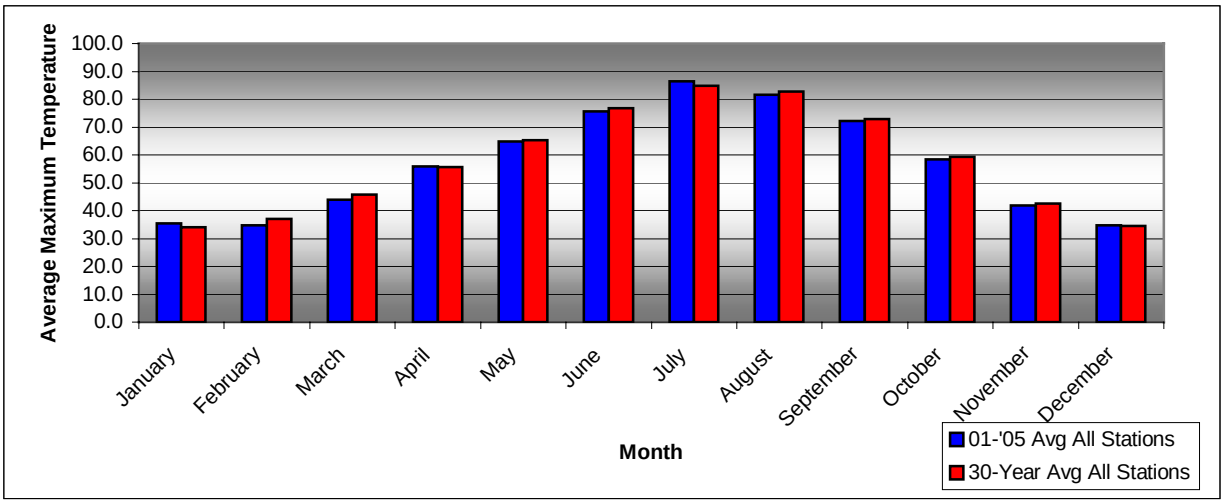
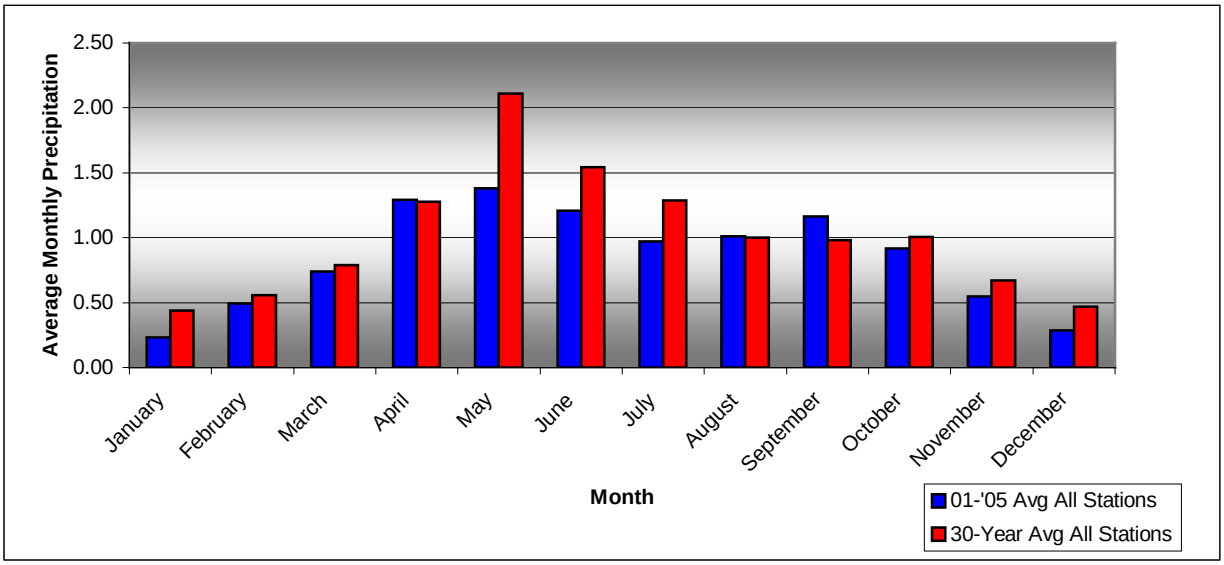


Figure 19. Average monthly precipitation from 2001 – 2005 and the 30-year average for all weather stations within the Bates Hole/Shirley Basin Conservation Area.
(Source: http://www.wrcc.dri.edu/summary/climsmwy.html).



Factors Affecting Sage-grouse Populations and Habitats

Sage-grouse are influenced by many factors, both individually and cumulatively. Habitat loss and fragmentation, direct mortality, weather, range conditions, and disturbance are examples of various factors affecting sage-grouse populations. Factors presented in the Wyoming Greater Sage-grouse Conservation Plan (WGFD 2003) are presented below with the addition of some information specific to the BHSBCA. Within the BHSBCA, the BHSBLWG identified those factors believed to be the most influential on sage-grouse, as well as those factors which might most effectively be addressed to provide the greatest benefit for sage-grouse conservation. Of those factors identified to be the most influential to sage-grouse, the working group felt weather and vegetation management (including both livestock grazing and invasive plant management) were the two most significant factors within the working group area. Natural resource development (oil and gas, coal, wind, and uranium) was considered to be the next most influential, followed by predation and parasites/diseases. Conflicting wildlife management (including wild horses), hunting, and residential development were identified as being the third most influential, while recreation-related impacts were considered to be the least significant of those factors considered to influence sage-grouse within the BHSBCA. In the opinion of the working group, conservation actions targeting vegetation management, such as habitat treatments and/or grazing management, and to mitigate for impacts related to energy development were identified as the highest priority.

1. Conflicting Wildlife Management

Management goals for other wildlife species utilizing sagebrush ecosystems can conflict with sage-grouse population and habitat management goals. Managing a single sagebrush site for all wildlife species that may inhabit sagebrush communities is impractical and often undesirable because practices benefiting some species can be detrimental to others. Approximately 100 bird species, 70 mammalian 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, sagebrush vole, sagebrush lizard, and pronghorn. A number of other priority or sensitive wildlife species are dependent upon or inhabit the sagebrush ecosystem including the black-tailed prairie dog, white-tailed prairie dog, ferruginous hawk, mountain plover, and swift fox. 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 inhabiting sagebrush ecosystems can be accommodated.

Mule deer and pronghorn are the primary wild ungulates occurring 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 and pronghorn.

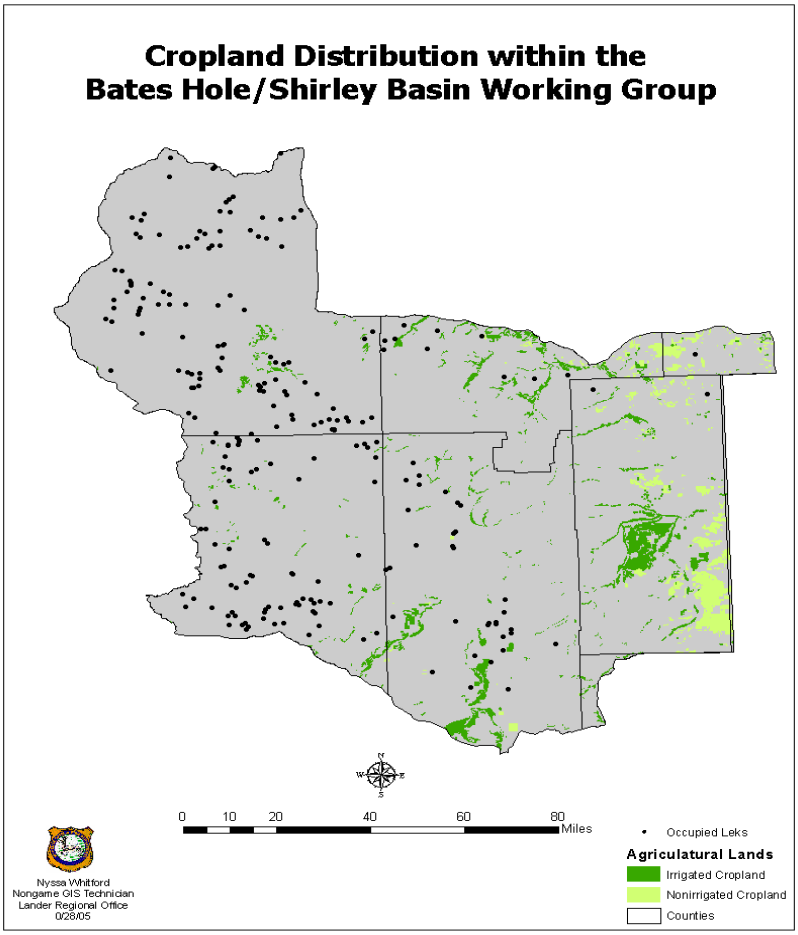
Federal and state laws, rules and regulations have been enacted that limit management options for various wildlife and plants, such as the prohibition to aerially spray Plateau® Herbicide on BLM lands to control cheatgrass infestations. Some may conflict with sage-grouse management goals. Some threatened, endangered or candidate species have habitat requirements or other needs that directly conflict with sage-grouse habitat requirements or preferences.

2. Farming

Various forms of crop production occur throughout the BHSBCA. Farming includes production of perennial grasses and/or alfalfa hay, as well as production of annually planted crops for grain, silage, or hay. Winter wheat and other small grains comprise the bulk of the dry-land croplands. Most grain and row crop farming occurs east of the Laramie Range. Irrigated hay production occurs throughout the BHSBCA along perennial rivers and streams. Production of alfalfa and grass hay may be beneficial to sage-grouse by providing a source of green forage (with flowering to attract insects) to sage-grouse in the summer and fall. Sage-grouse have been observed moving considerable distances to utilize these habitats. Contrary to other gallinaceous bird species, sage-grouse are not found nesting in hayfields due to the absence of sagebrush and other shrubs. Destruction of nests by haying equipment has not been documented. However, conversion of sagebrush to irrigated crop/hay production can be locally significant. In the Rattlesnake Mountains area, sagebrush communities are being converted to irrigated cropland via circle pivot irrigation and dryland wheat cultivation, which is impacting traditional sage-grouse habitat. Such conversions also reduce landscape habitat quality by fragmentation and increased human related traffic and disturbance.

Ecological and economic constraints limit the amount of land in Wyoming that can be converted to farmland. While federal farm programs historically provided economic incentives for such conversion, the USDA has generally discouraged conversion of native grasslands and shrublands to farmland beginning with the 1985 Farm Bill. Several popular programs have since been successful at protecting and restoring native plant communities that had previously been tilled or hayed.

Figure 20. Cropland distribution within the Bates Hole/Shirley Basin Conservation Area. (Source: http://www.wygisc.uwyo.edu/clearinghouse/index.html).



3. Hunting

Sage-grouse hunting in Wyoming is a traditional recreation activity in modern times and was one means of human subsistence prehistorically. 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. Native Americans traditionally hunt male sage-grouse in the spring. This practice continues at minimal levels on the Wind River Indian Reservation.

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 sage-grouse conservation needs are addressed. However, concern has been expressed about the impacts of recreational hunting to sage-grouse populations in Wyoming.

It appears hunting harvest of adult hens may have a detrimental impact on a sage-grouse population. For many years it was traditional in Wyoming to hunt sage-grouse in late August or

early September. However, data indicates hunting at this time makes adult hens more susceptible to harvest, because hens with chicks are still concentrated on late brood-rearing habitats. Sage-grouse are relatively long-lived with lower reproductive rates and lower annual turnover than other game 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 order to relieve harvest pressure on adult hens, hunting seasons have been 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 season dates were changed in 1995. Overall harvest declined as well due to a dramatic decrease in hunter participation since other hunting seasons, especially pronghorn within the BHSBCA, begin in mid-September.

Complete closure of hunting seasons has not been documented to result in subsequent increases in breeding populations (WGFD 2003). However, two areas in Wyoming have been closed to hunting, southeast Wyoming and northwest Wyoming. Sage-grouse habitat and numbers are limited in these areas; and while Wyoming has chosen a conservative approach to hunting in these areas, it is not anticipated the closures will result in increasing populations.

Research to document the impact of closing hunting seasons on local bird populations was recently conducted in Idaho (Connelly 2003). The results of this research suggests 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.

Sage-grouse hunting seasons for management areas within the BHSBCA are managed concurrently with other open areas in the state. Until 1995, the statewide hunting season opened September 1 and closed September 30. Concerns with decreasing sage-grouse populations and the impact of hunting adult hens in early September initiated changes to more conservative hunting seasons. Beginning in 1995, the opening date was moved to the third Saturday in September with hunting seasons lasting 14 – 17 days. Bag and possession limits were 3 birds per day and 6 birds in possession. More conservative hunting seasons were enacted in 2002 when the opening day was moved to the fourth Saturday in September and the closing date to the first Sunday in October resulting in an approximate season length of 9 days. The bag and possession limits were reduced to 2 and 4 birds, respectively. A Wyoming Game and Fish Commission Emergency Order was approved in 2003 to close the hunting season in Sheridan, Johnson and Campbell Counties due to documented loss of sage-grouse to West Nile Virus. Such an emergency order may again be implemented should significant mortality again result from West Nile Virus.

Wyoming also offers a falconry hunting season for sage-grouse. Sage-grouse are a challenging quarry for falcons because of their size and speed. In 2005-06, the season was open September 1st through March 1st with a bag limit of 1 grouse per day and 2 grouse in possession. The Wyoming Game and Fish Department 2005-2006 falconry harvest survey estimates falconers in Wyoming (both resident and nonresident) harvested 145 sage-grouse. Falconers spent 859 days in the field, averaging 5.9 days/grouse harvested.

No studies have shown sage-grouse population declines are caused by hunting alone (Connelly et al. 2004). However, because sage-grouse have low productivity rates, high over-winter survival, and are long-lived, managers should strive for low harvest rates. Low harvest provides for population increases when weather is favorable and habitat quality is not a limiting factor. Acceptable harvest rates can vary by geographical area and population depending on habitat quality and productivity of the population. Recommended harvest rates should be $\leq$10% of the fall population (Connelly et al. 2000). However, determining fall population size for a given area can be difficult considering the uncertainty of determining breeding population estimates as well as annual production.

Hunting season data (harvest, hunter numbers, hunter success, and hunter effort) provide insight into fall sage-grouse population status which would otherwise be difficult to obtain. Furthermore, sage-grouse wings collected from hunter-harvested grouse have been used to assess nesting success and test for exposure to West Nile Virus.

4. Invasive Plants

The extent to which invasive plants, primarily non-natives, have historically affected sage-grouse in central Wyoming is unknown. However, as more terrain in the BHSBCA is disturbed by activities such as pipeline and powerline installation, seismic activities, natural mineral resources exploration and development, and subdivision development, the potential for significant negative impact from invasive plants increases. Invasive plants along roadways and right-of-ways can spread to surrounding rangelands and riparian areas and replace native vegetation critical in sagebrush communities.

Little information exists on the effects invasive plants have on sage-grouse populations. County weed and pest districts have determined which species are most pervasive and which are most difficult to control, and often have some information on area extent. Various Coordinated Resource Management groups have been formed within the BHSBCA to identify and target treatment areas to control noxious weeds. Unfortunately, there is no region wide comprehensive mapping effort to track rates of infestations or spreading, which somewhat limits a range-wide strategic approach to control invasive plants.

Mechanical, chemical, and biological/grazing treatments may be applied to control the spread of invasive plants. Prevention though proper grazing management, treatment of pioneering plants, and reclamation practices favoring native plants are necessary to control the proliferation of undesirable invasive plants. Mechanical treatments such as repeated mowing or pulling can remove invasive plants from native rangelands. Insect release is a form of biologic control which can target specific invasive species. Chemical spot treatments can also effectively control and prevent the spread of invasive plants in targeted areas. However, chemical treatments should be conducted with caution to ensure the appropriate invasive plants are targeted while mortality of desired forbs and shrubs associated with sagebrush communities is minimized. Regardless of treatment methods, education and cooperation among landowners, grazing permittees, and outdoor recreationists is essential to curb future proliferation of invasive species in native

vegetative communities. Simple steps such as washing of equipment before transportation or using certified weed-free hay can help minimize the spread of undesirable invasive plants.

Primary species of concern in sage-grouse habitats appear to be cheatgrass (*Bromus tectorum*), leafy spurge (*Euphorbia escula*), spotted knapweed (*Centaurea maculosa*), Russian olive (*Elaeagnus angustifolia* L.), Russian knapweed (*Acroptilon repens*) and Japanese brome (*Bromus japonicus)*. In riparian areas, Canada thistle (*Cirsium arvense*), burdock (*Arctium minus*) and salt cedar (*Tamarix pentandra)* compete with native plant communities that provide brood rearing habitat.

5. Livestock Grazing

Domestic livestock grazing has been identified as a major factor affecting 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.

The majority of the livestock industry within the BHSBCA is comprised of sheep and cattle production. Both cattle and sheep producers generally sell the current year's production while maintaining the producing herd. Most ranching operations within this area include Federal or State grazing lands.

Precipitation and livestock forage utilization levels during the growing season determine the amount of forage remaining after the grazing season. Agricultural economics, including commitments to lending institutions, are a contributing factor ranchers consider when formulating stocking rates and grazing programs. The amount of residual forage remaining from the prior year's growing season is a contributing factor influencing sage-grouse nest success. Sage-grouse nest sites in Bates Hole tended to have increased residual grass height and non-food forb cover compared to available nesting locations (Holloran 1999). Several additional studies have shown sage-grouse nesting success to be higher where grass height and density is greater than at random sites (Wakkinen 1990, Gregg 1991).

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 (WGFD 2003). Conversely, continuous heavy use by livestock and/or wild ungulates rarely leaves suitable residual cover for nesting and often results in degradation of the functioning condition of riparian areas in sage-grouse habitats. However, there have been few research efforts made, and therefore little direct experimental evidence, linking specific livestock grazing practices to sage-grouse population levels.

The sagebrush ecosystem evolved with grazing by a variety of wildlife species. The timing, duration, location, and intensity of historical wildlife herbivory is not quantified. The introduction of livestock grazing into the sagebrush landscape presented a shift from a mixture of migrating, free ranging wildlife grazers and browsers toward managed domestic sheep and cattle. Since that time, there have been changes over the landscape in terms of the location and

confinement (via fencing) of domestic livestock, class and season of use, grazing management systems, and total numbers of domestic and wild herbivores on the range, both large and small. A focus on "improving range condition", defined by public policy over the last 70 years as growing more grass, coupled with a shift from sheep to cattle also have affected sage-grouse habitats, although these impacts are not well documented.

Active management aimed toward opening the canopy in decadent sagebrush stands and creating and maintaining a diversity of desirable micro-sites is beneficial to sage-grouse. Forb diversity and forb-associated insects are important to pre-nesting condition of hens and early brood-rearing nutritional requirements of chicks. In four independent Wyoming research studies, the vast majority of chick mortality (87% of total brood loss combined) occurred during the critical early brood rearing period (WGFD 2003). There is some evidence that there has been a reduction of these important habitat components as a result of current and historic grazing and fire management policies in some areas (WGFD 2003). The interaction between fire and grazing may be important to habitat diversity, but is not well understood.

A grazing system designed to benefit sage-grouse should increase the abundance and diversity of forbs. Forbs generally require more soil moisture than grasses, so grazing practices designed to increase water retention are important. Standing grass (which is also necessary for good nesting habitat) and ground litter promote water retention by minimizing soil exposure to sun, and therefore soil temperatures and water evaporation. On Wyoming rangelands, managed grazing often stimulates grass growth, although allowing adequate rest for plant recovery is essential to ensure sufficient grass re-growth and ground cover is available to promote soil moisture retention.

A healthy sagebrush ecosystem provides the diverse age groups and vegetative seral stage classes necessary to sustain and increase sage-grouse populations while providing for other wildlife and multiple uses of the area, including livestock grazing. Unfortunately, many sagebrush communities throughout the BHSBCA are late-seral, decadent communities with little sagebrush regeneration/age diversity. Such ecosystems not providing this diversity need long-term management strategies to allow recovery. These management changes should be analyzed to ensure those made on behalf of sage-grouse do not inadvertently cause unacceptable harm to other species.

6. Energy/Mineral Resources Development

Energy development impacts on sage-grouse are being recognized and increasingly quantified. Some potential impacts of energy development to sage-grouse include: (1) direct loss and fragmentation of habitat from construction of mines, wells, roads (including from seismic exploration), pipelines, and transmission and power lines; (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 increased disturbance and legal/illegal harvest and incidental mortality from vehicle collisions; (6) direct mortality associated with water evaporation ponds and production pits; and (7) increased predation. Many of these impacts can be minimized by proper planning (i.e. centralization of development), mitigation,

and reclamation for sage-grouse needs. Some of these impacts are short-term related to specific periods of activity while some impacts may be long-term (30 years or more), and rehabilitation of impacted habitats may take many years to complete.

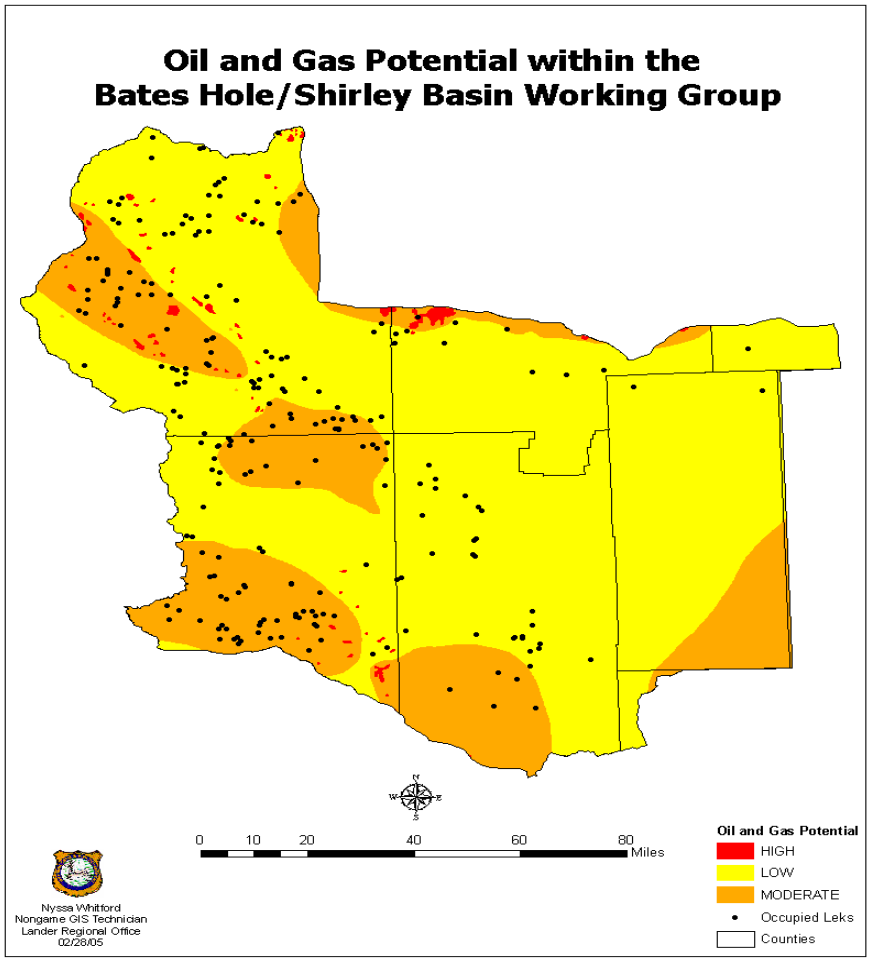
Roads built to accommodate energy exploration and development activities often result in the establishment of permanent travel routes, improved public access, increased long-term traffic-related disturbance, indirect noise impacts, and direct mortality to sage-grouse. Research suggests that road-related disturbances during the breeding season may cause sage-grouse leks to become inactive over time, reduce the number of nest-initiating hens which are bred on disturbed leks, and increases the distance from the lek hens will move to selected nesting habitat (WGFD 2003). 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 on-going.

Oil and Gas and Coalbed Natural Gas

The discovery and development of natural gas, oil, and coalbed methane throughout the western United States has impacted habitat and has been identified as a potential causative agent in declining sage-grouse populations (WGFD 2003). There is increasing demand for fuels and energy sources provided by the energy industry. For example, according to the American Gas Association (WGFD 2003), natural gas consumption in the U.S. is expected to increase at least 40% by the year 2015, therefore impacts from these operations are expected to continue. The various types of energy 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.

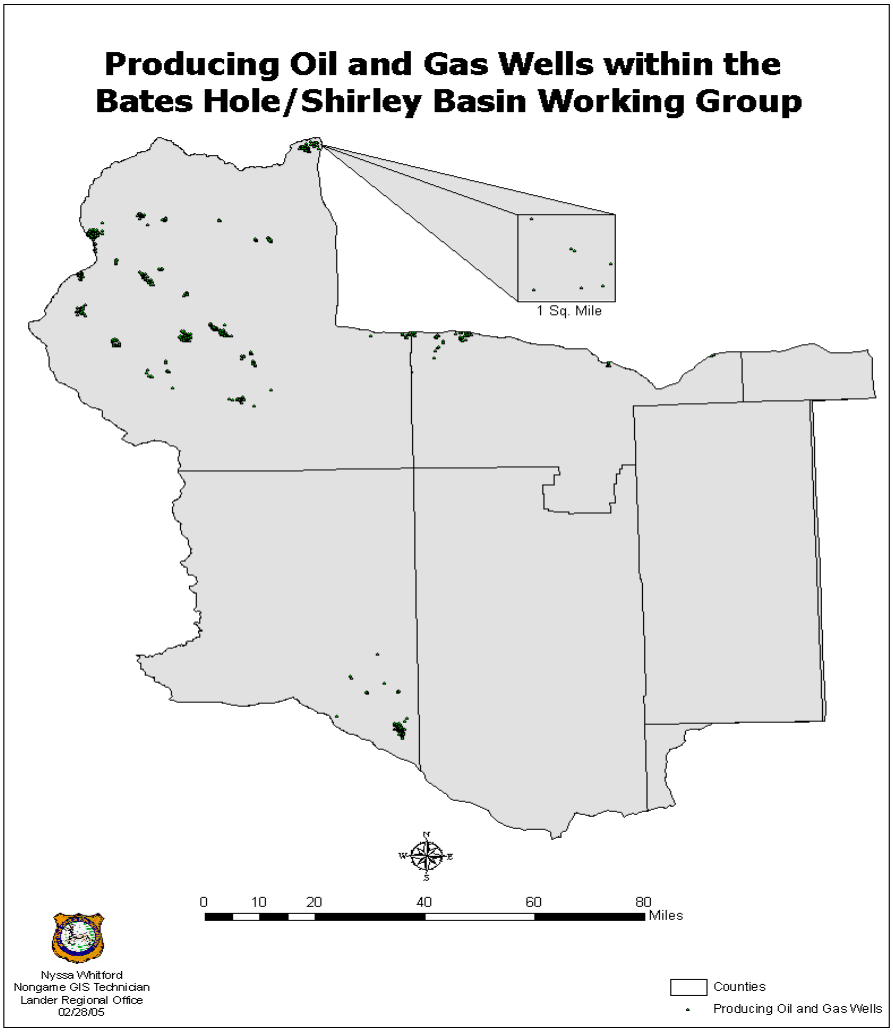
Significant portions of the BHSBCA hold vast energy resources, including oil, natural gas, and coalbed natural gas (CBNG) (Figure 21). The majority of natural gas development within the BHSBCA consists of natural gas extraction in the Cave Gulch and Waltman Fields in western Natrona County. Oil fields are scattered throughout the Casper BLM Field Office, such as the Lost Dome, Notches Dome, Poison Spider, Big Muddy, and Glenrock fields. The primary potential for coalbed natural gas (CBNG) development within the BHSBCA occurs in the southwestern portion near Hanna and Seminoe Reservoir within the Rawlins BLM Field Office. Currently, CBNG development is occurring in this area. Within the Casper BLM Field Office, there are three primary coal formations in the Wind River Basin; the Mesaverde Coalbed, Meeteetse Coalbed, and the Fort Union Coalbed. Because these coal deposits exist, there is a possibility CBNG development may take place in the future, although the development potential is currently low. The Shirley Basin/Bates Hole area has no known potential for CBNG development.

Figure 21. Oil and Gas Potential within the Bates Hole/Shirley Basin Conservation Area. (Source: http://www.wygisc.uwyo.edu/clearinghouse/mineral.html)



As of November 2005, there were 648 producing oil and gas wells within the BHSBCA (Figure 22). Oil and gas development is increasing in central Wyoming due to increased demand and is expected to continue to do so over the near term. The discovery of new resources or a long-term increase in oil prices typically results in increased development activity.

Figure 22. Oil and natural gas development within the Bates Hole/Shirley Basin Conservation Area (Source: http://wogcc.state.wy.us).



Recently completed research (Holloran 2005) in and adjacent to the Pinedale Anticline and Jonah gas fields in western Wyoming documented negative impacts to sage-grouse populations from conventional natural gas development. Holloran found minimal levels of development within 1.9 miles of leks influenced breeding behavior. Lek attendance was directly influenced by distance to wells, densities of wells, associated traffic volume, and distance to roads. Gas field-related noise sources at distances of three miles from leks had negative effects on breeding birds. Young nesting females avoided gas fields with high well densities, as did brooding females. Data suggested long-term response of nesting sage-grouse is avoidance of areas of natural gas development and increased mortality to those sage-grouse remaining within the development. An increase in avian nest predation was also documented in association with natural gas development, suggesting gas development attracts corvids (i.e. ravens, crows, magpies, jays, etc.) due to increased food or perch availability. Holloran concluded current development stipulations are inadequate to maintain sage-grouse breeding populations affected by high levels of gas development. He suggested management of adjacent habitats to increase

sage-grouse carrying capacity could benefit population segments supplemented by grouse dispersing from nearby gas fields.

Naugle et. al. (2006) also reported preliminary analysis results suggesting sage-grouse in the Powder River Basin are impacted by intensive CBNG development based on lek monitoring data from 2000 to 2005. Leks within CBNG development had lower population indices than leks outside CBNG development. Furthermore, leks along the edge of CBNG development had higher population indices than those further away, suggesting sage-grouse avoid intensive CBNG development and disperse to adjacent unaffected habitats. This finding is supported by the fact that active leks and leks with moderate to large numbers of males were often found adjacent to CBNG fields. Inactive leks and leks with lower male counts were usually found within CBNG development. Leks within CBNG fields surveyed during the 2004 and 2005 breeding seasons had 20 males or less while leks adjacent to CBNG tended to have >20 males. Additional analysis of wells, powerlines and leks showed that active leks were twice as far from wells and were 1.5 times as far from power lines when compared to inactive leks. Areas with active leks had one-third the density of wells, one-half the density of power lines, and generally have fewer wells and power lines within 2.0 miles of the lek complex than inactive leks. Given CBNG development in the southwest portion of the BHSBCA, it is likely similar impacts to sage-grouse will result from these developments where they occur within sage-grouse habitats.

CBNG-produced water can provide benefits to sage-grouse, but also creates habitat for mosquito species that carry West Nile Virus. Sage-grouse are extremely susceptible to West Nile Virus. Montana State University research (Doherty and Johnson 2005) found that "mature" ponds holding discharged water provide excellent habitat for the mosquitoes that carry West Nile Virus. Mature ponds are defined as ponds at least four years old with more than 50% of the shoreline vegetated. Mosquito larva are produced at both the pond shoreline and the pond outlet, with pond outlets or seeps below earthen dams producing greater numbers of larva per sample. Ponds with flooded shoreline vegetation provide excellent breeding habitat. Properly constructed CBNG ponds and an effective mosquito larva control program could play a role in reducing the prevalence of mosquitoes and resulting West Nile Virus.

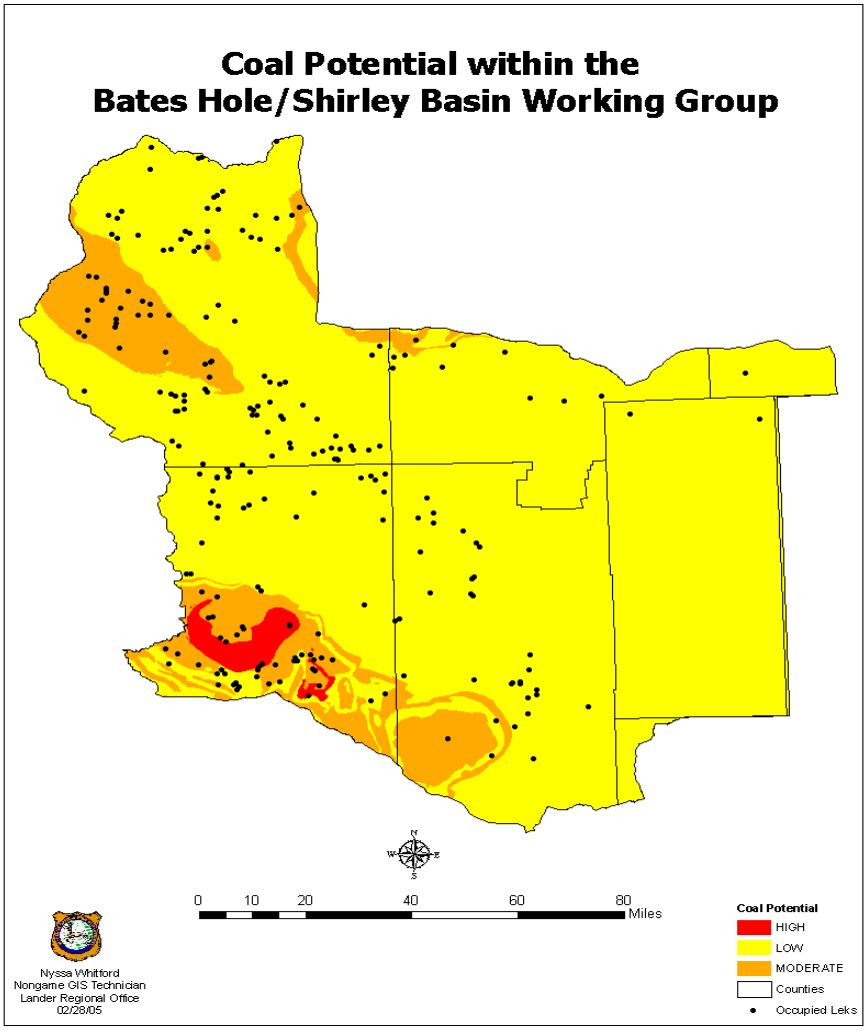
Mineral Development and Wind Power

Mineral exploration, development, and production within the BHSBCA occurs primarily for coal, uranium, bentonite, and sand and gravel. Mining methods may vary for these products but generally involve a process whereby mining and reclamation occur contemporaneously (simultaneously) within the lease hold or mineral reserve area. The duration of the mining process can vary from a few months to many years. Disturbance levels vary by the size and duration of the mining activity, which depends on the quantity and quality of the mineral resource reserve. The Wyoming Department of Environmental Quality Land Quality Division (WDEQ/LQD) permits all mines, quarries, and gravel pits, with the exception of Wyoming Department of Transportion pits, which are regulated by BLM. For federal minerals, such operations are subject to BLM stipulations. For private minerals, operations are subject to WDEQ/LQD regulations.

Coal

Coal resources are extensive in the southwest portion of the BHSBCA, primarily in Carbon County (Figure 23). The Carbon County coal mines are located near the town of Hanna where the coal seams occur at or near the ground surface. The few known coal resources within the rest of the BHSBCA (i.e. Wind River Basin within the Casper BLM Field Office) currently have limited to no development potential due to relatively poor coal seam quality, thickness, and depth considerations. There are no known coal resources within the Bates Hole/Shirley Basin area. As economic conditions change, the development potential for these lower priority resources may increase.

Figure 23. Occupied sage-grouse leks and coal resources within the Bates Hole/Shirley Basin Conservation Area (Source: http://www.wygisc.uwyo.edu/ clearinghouse/mineral.html).

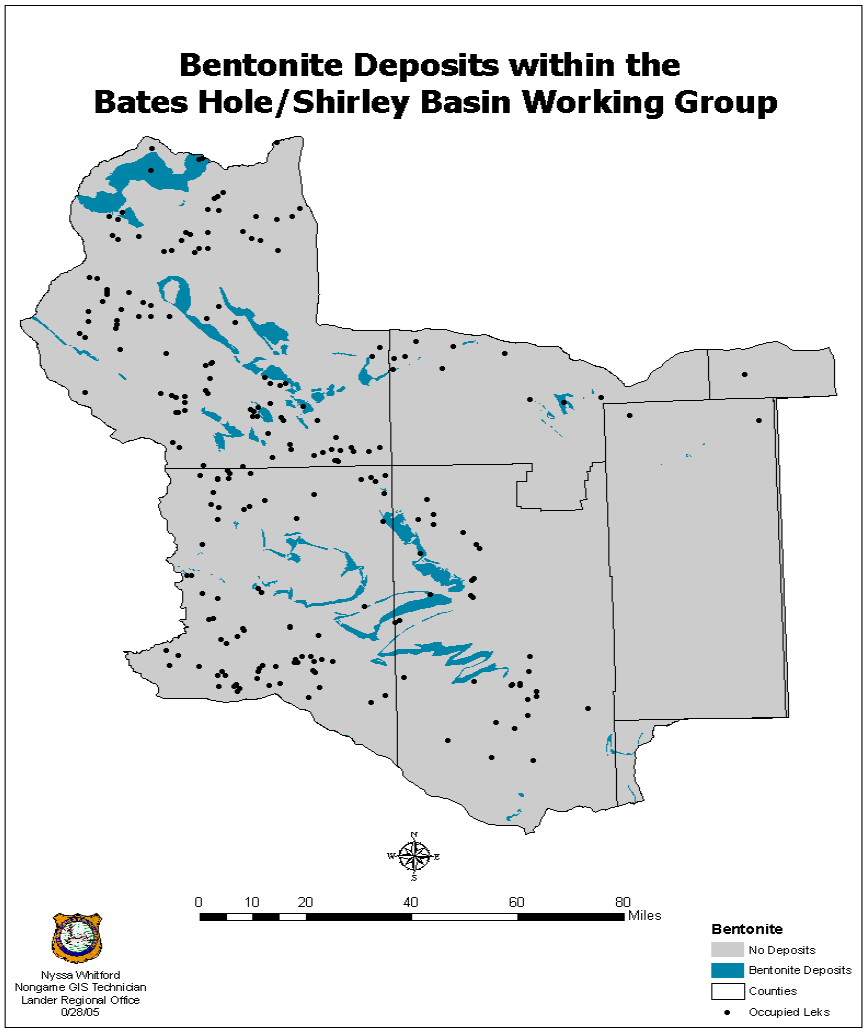


Bentonite

Bentonite is another mineable resource in central Wyoming, although its extent is limited and its effects on sage-grouse are similarly limited. However, bentonite mining has significantly increased since 2001 due to the substantial increase of oil and gas, CBNG, and uranium development which is occurring throughout Wyoming. These industries require bentonite for

drilling mud. This increased demand will likely continue given the current expansion of natural resource extraction in Wyoming. Within the BHSBCA, significant deposits of bentonite resources are found in east-central Carbon County, west-central Albany County, and throughout Natrona County (Figure 24). Most bentonite extraction occurs in the Benton Basin, Casper Arch area, and southern Bighorns. Areas with bentonite generally feature sparse vegetation because of the physical characteristics of the mineral. These open areas can serve as leks if adequate nesting cover is nearby. Bentonite rights-of-way are typically administered by BLM.

Figure 24. Occupied sage-grouse leks and bentonite resources within the Bates Hole/Shirley Basin Conservation Area (Source: http://www.wygisc.uwyo.edu/ clearinghouse/mineral.html).

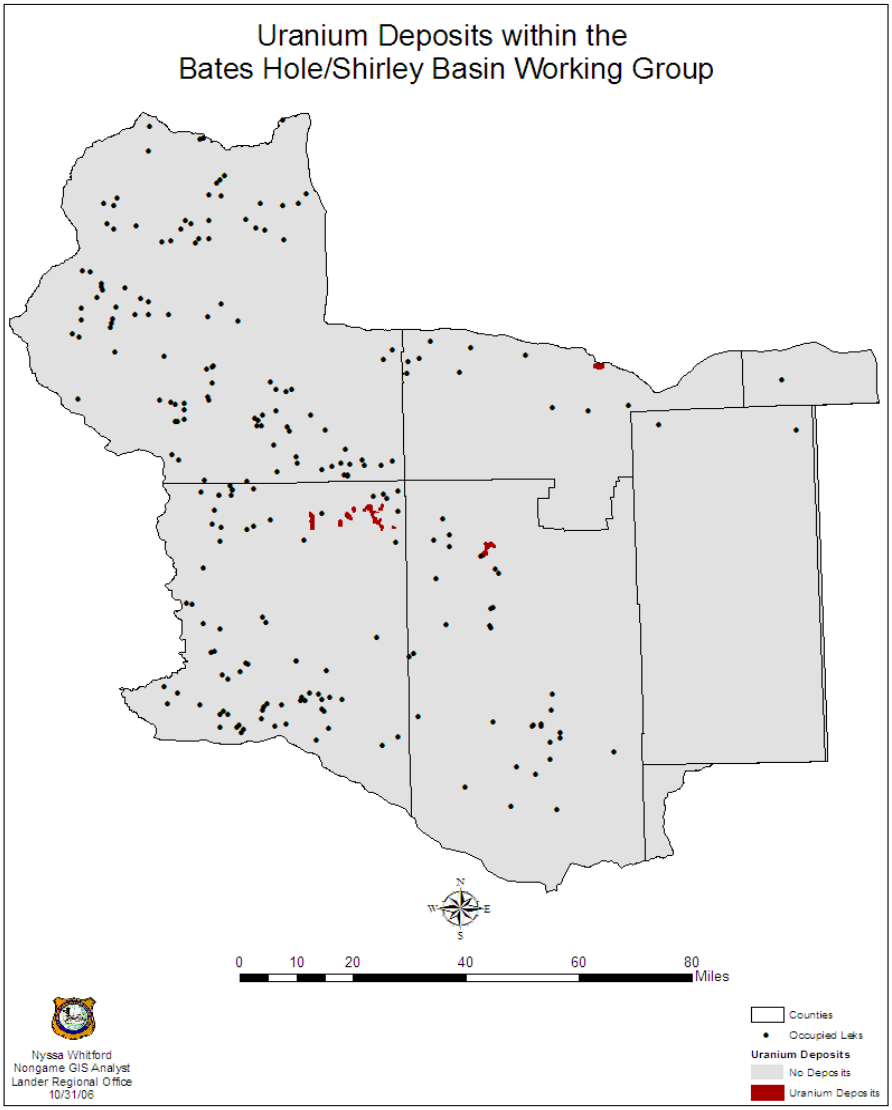


Uranium

Uranium has also been mined from portions of the BHSBCA. Uranium resources are rather limited within this portion of Wyoming but do occur in sagebrush habitats and could potentially impact some sage-grouse leks (Figure 25). Significant amounts of uranium have been mined from the northwest portion of Shirley Basin, and the potential exists for additional uranium resources to be developed there in the future. There is currently one Plan of Operations filed for exploratory uranium drilling within this area, although this plan has not been completed. Within

the Rawlins BLM Field Office, several uranium claims exist throughout the area, although none are currently active. Demand for uranium production is market driven and is again becoming a profitable industry in Wyoming, which will likely result in increased development in the future. Impacts to sage-grouse associated with uranium development would be increased human presence, roads, vehicular traffic, and direct habitat loss. Although once established, in-situ (solution) uranium mining may have less of an impact than open pit mining as less surface is disturbed. However, in-situ mining may occur over a larger area, thus affecting more total surface area.

Figure 25. Occupied sage-grouse leks and uranium resources within the Bates Hole/Shirley Basin Conservation Area (Source: http://www.wygisc.uwyo.edu/ clearinghouse/mineral.html).

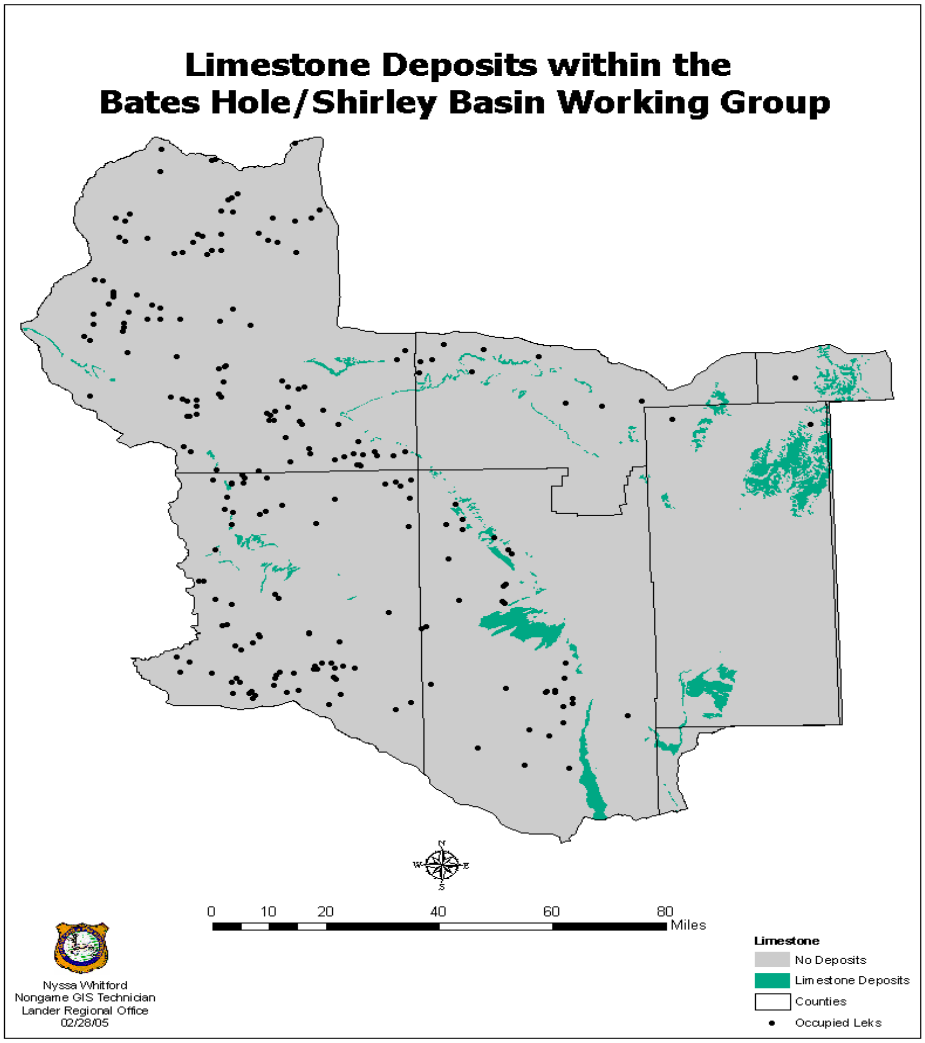


Limestone/Gravel Quarry

Significant limestone deposits occur within the BHSBCA but are typically not located in sage-grouse habitat (Figure 26). There are numerous mining operations for various construction and road surfacing materials within the BHSBCA including sand, gravel, and rock. Mining

operations can be small, with limited permitting requirements, or large, requiring significant permitting and compliance activities. Most limestone quarrying within the Casper BLM Field Office occurs in the lower limestone members of the Casper Formation and its equivalent near Glendo Reservoir, the dolomites of the Hartville Formation, the Alcova Limestone Member of the Chugwater Group, and along the northern end of the Laramie Range between Douglas and Casper. Within the Rawlins Field Office, some limestone quarrying occurs in outcrops of the Madison Formation on the flanks of Shirley Mountain. BLM and WDEQ/LQD work together under a Memorandum of Understanding to regulate extraction activities for quarrying activities. The WDEQ/LQD regulates/registers all mining permits with the exception of Wyoming Department of Transportation (WYODOT) road surfacing quarries. When registered pits are comprised of federal minerals, BLM administers stipulations to protect sage-grouse where appropriate. Where mining operations do not fall under the 10-acre exemption, the WGFD provides information on whether sage-grouse will be affected by the operation.

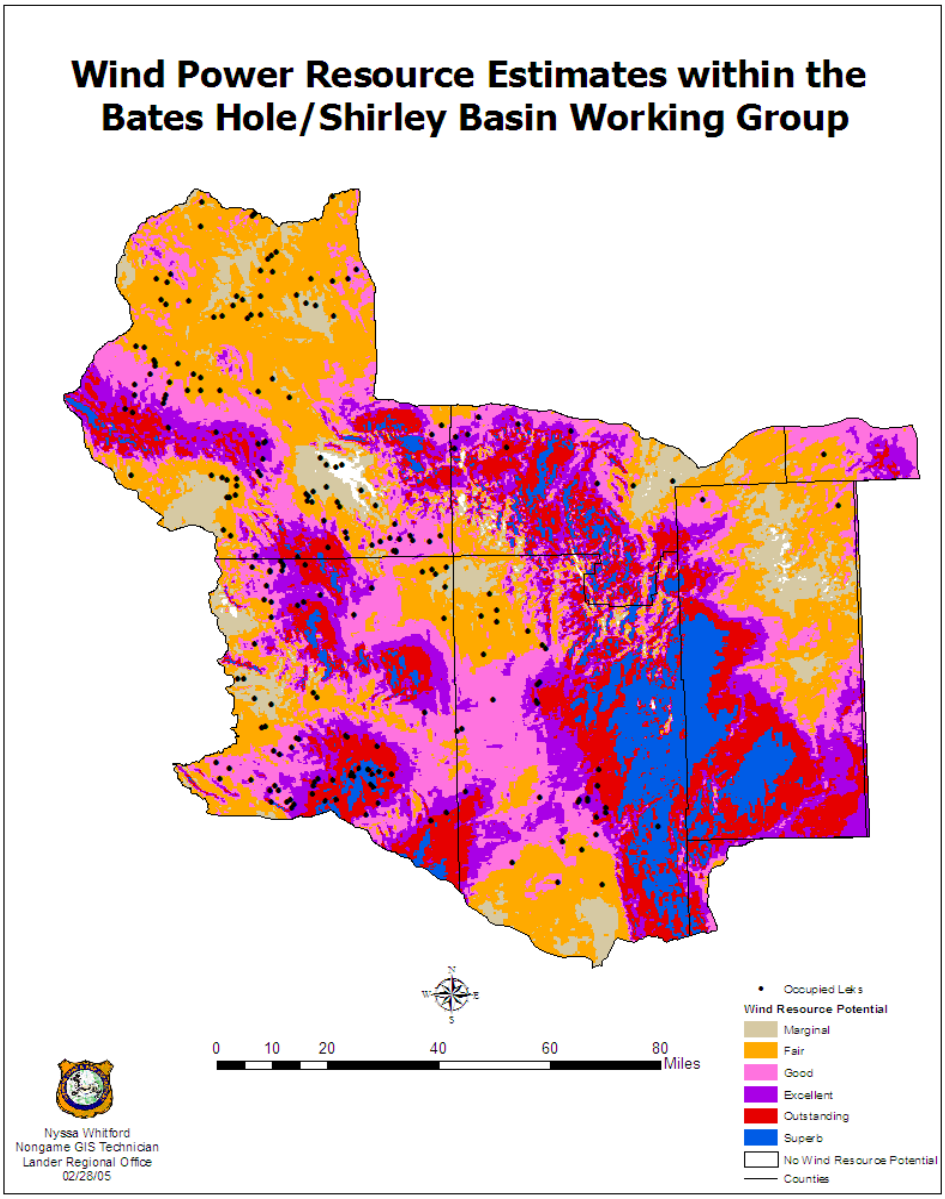
Figure 26. Occupied sage-grouse leks and limestone resources within the Bates Hole/Shirley Basin Conservation Area (Source: http://www.wygisc.uwyo.edu/ clearinghouse/mineral.html).



Wind Power

There is substantial potential for wind power development throughout much of the BHSBCA (Figure 27). The only large wind power project within the BHSBCA occurs on Foot Creek Rim between the towns of Arlington and Medicine Bow. Plans for additional development on Simpson Ridge (between Arlington and Rawlins) are being developed. In the future, there is significant potential for wind power development to occur on the Laramie Plains and in the Bates Hole/Shirley Basin areas. Potential impacts to sage-grouse are direct habitat loss, noise associated with turbine power generation, and associated power poles which may provide perches for avian predators.

Figure 27. Occupied sage-grouse leks and wind power potential within the Bates Hole/Shirley Basin Conservation Area (Source: http://www.wygisc.uwyo.edu/ clearinghouse/mineral.html).



7. 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 and are not a serious concern unless 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 which are stressed or concentrated. The implications of diseases and parasites with respect to sage-grouse populations at a range-wide level are unknown (Connelly et al. 2004). There is also potential for diseases and parasites to become an issue if sage-grouse come into contact with captive-raised birds released into the wild.

Coccidiosis is an infectious protozoal disease which has been identified as a cause of sage-grouse mortality. Coccidiosis is also important to cattle producers in the conservation plan area as it can increase calf mortality.

The potential effects of the newly emergent West Nile Virus on sage-grouse are not fully understood at this time. West Nile Virus has been identified as a cause of significant mortality at a local scale (Naugle 2005). In 2003, the disease was shown to have a serious impact on a local sage-grouse sub-population near Recluse in northeastern Wyoming (Walker et. al. 2004). Fourteen sage-grouse were confirmed positive with the disease that year. One of the birds had died in 2002 and had been collected and frozen for later analysis. In 2004 and 2005, four and two additional mortalities were confirmed positive for West Nile Virus, respectively. In 2006, five sage-grouse mortalities in the Powder River Basin were attributed to West Nile Virus, while test results from six additional dead sage-grouse are still pending. The summer of 2003 was one of the hottest on record which likely contributed to higher mosquito populations and increased West Nile Virus activity. Naugle et. al. (2004) found that West Nile Virus contributed to a 25% decline in the survival of four populations of marked sage-grouse in 2003. In the Recluse Wyoming sub-population, Walker et. al. (2004) determined survival of marked sage-grouse was only 25%. In 2004, late summer female survival was found to be 10% lower in four populations with confirmed West Nile Virus than in eight populations without confirmed West Nile Virus (Naugle 2005).

The mosquito *Culex tarsalus* is believed to be the primary vector for West Nile Virus transmission. Such transmission may be exacerbated by further proliferation of reservoirs and water impoundments associated with both traditional and coalbed natural gas development, which may serve as breeding grounds for *Culex tarsalus* and other mosquito species known to harbor West Nile Virus.

No evidence of survival by sage-grouse exposed to the West Nile Virus was found until 2005. Six female sage-grouse captured in the Powder River Basin in fall 2004 and spring 2005 had antibodies indicating they survived exposure (Walker 2005). However, the full impact of this disease has yet to be understood and more research is needed to monitor sage-grouse exposure and survival, identify species that serve as reservoir hosts, and identify options to mitigate the effects of the disease.

8. Pesticides

Pesticides (herbicides, insecticides and rodenticides) are used in Wyoming for a variety of purposes and have been identified as a possible influence on sage-grouse (WGFD 2003). However, pesticides are not considered to be a major issue for sage-grouse under existing application practices. No direct research on the effects of current pesticide applications 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. The difficulty in quantifying such impacts is further exacerbated by the notion that these effects are believed to be sub-lethal, such as predisposing animals to predation or reducing reproductive success.

Herbicides have generally been tested to ensure their direct impacts to animals are insignificant. However, some treatment techniques for invasive plants such as leafy spurge involve spraying sagebrush to make the leafy spurge more available to biological controls. Although this treatment may be effective for the invasive plant, the elimination of sagebrush has negative impacts for sage-grouse. Other herbicide treatments can result in a reduction of forbs and may be locally significant, but not widespread. Sagebrush treatments to promote forage for livestock are less common today than in the past when large acreages were treated, although remain a concern for sage-grouse management.

9. Predation

Predation is the major cause of direct sage-grouse mortality (WGFD 2003). Predation during nesting and early brood-rearing has long been though to have the greatest direct influence on sage-grouse populations. However, recent research has suggested adult female survival may have a significant influence on sage-grouse populations (Johnson and Braun 1999). Nest predators identified in Wyoming studies include badgers (*Taxidea taxus*), red foxes (*Vulpes vulpes*), ravens (Corvus corax) and ground squirrels (*Spermophilus spp.*). In addition, golden eagles (*Aquila chrysaetos*), red foxes, ravens, coyotes (*Canis latrans*), various hawks (*Buteo spp.*), bobcats (*Felis rufus*), striped skunk (*Mephitis mephitis*), and weasels (*Mustela spp.*) all 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.

Sage-grouse face predation pressures from many sources. Within the BHSBCA, large numbers of hawks and eagles migrate to the area during winter. Ravens, whose populations are increasing throughout much of Wyoming, are known sage-grouse nest predators. “Newcomer” predators such as red fox and raccoons are well established. Landfills and litter along roadways provide supplemental forage to support these species. Some expanding rural subdivisions bring domestic pets such as cats to areas in or adjacent to sage-grouse habitat. Likewise, expanding energy development brings powerlines and other infrastructure which may serve as raptor perches. Predator control efforts could be helpful in reducing the impact of non-native predators by eliminating feral animals, uncontrolled landfills, and roadside litter.

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 and raccoons have expanded their range into sage-grouse habitats and may represent an additive source of predation where they were not previously a factor. In some areas, these newcomer and traditional sage-grouse predators have increased in numbers due to human activities such as newly available food sources or travel corridors. Migratory bird protection has also allowed avian predator populations to expand. 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 (WGFD 2003). Management of predators may be necessary in localized situations to maintain and/or improve a sage-grouse population.

Predator management may mean lethal control, but may also include removing key elements which attract predators (e.g. perches, food sources) and/or increasing the quality of habitat for sage-grouse. 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, such as the potential for cascade effect (i.e. coyote control resulting in increased red fox populations). Large-scale predator removal is not indicated as a statewide objective. Where predation is proven to be of significant concern in select areas, planning groups should consider site-specific localized predator management.

10. Recreation

Recreational impacts to sage-grouse populations include potential disturbance of breeding and nesting activities, and habitat fragmentation due to road usage. Research suggests road-related disturbances during the breeding season may cause sage-grouse leks to become inactive over time, cause fewer hens which do breed on disturbed leks to initiate nests, and increase the distance from the lek hens will move to selected nesting habitat (WGFD 2003). Dust from roads and other surface disturbances can adversely affect plants and animals. Recreational viewing of leks can disrupt breeding activities, especially when conducted from close proximity, outside of a vehicle, 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.

11. Residential Development

Little or no research is available directly addressing the effects of residential development on sage-grouse, although some effects are obvious. Residential development can cause direct loss of lek sites and seasonal habitats or fragment those habitats. Increased roads, fencing, power lines, human activity, landfills/garbage facilities (which may increase predator populations), and density of cats and dogs are additional factors which may impact sage-grouse populations. Unlike impacts associated with many forms of energy/natural resource development, most impacts from residential development are permanent and cannot be reclaimed.

Research suggests 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 (WGFD 2003). Dust from roads and other surface disturbances can adversely affect plants and animals. Transmission and power line construction often results in indirect habitat loss because sage-grouse tend to avoid areas associated with these lines due to potential perching by avian predators. The potential effects of human-generated noise on sage-grouse include masking sounds that influence courtship/lek attendance, mate selection, grouping, and escape from predators.

Casper, Laramie, Douglas, and Wheatland are the primary population centers within the BHSBCA. These towns are experiencing relatively significant residential development outside of city limits due to an influx of people in recent years due to work force demands of the energy industry as well as people generally moving to the western United States. Much of this urban sprawl occurs because of people's desire to live outside of town to distance themselves from neighbors and/or have enough property for animals. Intense herbivory from domestic livestock associated with ranchette developments/rural subdivisions is a major concern within the BHSBCA due to the scale at which they occur across the landscape and the potential for invasive species establishment as native vegetation is often completely denuded, especially with horse properties. Because subdivisions greater than 35 acres, such as in the Pedro Mountains, are not regulated by Wyoming's subdivision law, county governments vary in their regulation of subdivisions depending on local zoning laws or lack thereof. The combined effects of energy development, recreation, and local residential land use are similar and synergistic. Careful consideration should be given to ways in which the effects of these activities can be managed and mitigated.

Substantial residential and commercial development has occurred in all directions from Casper. Of particular concern to sage-grouse is the ongoing and proposed residential and commercial development southeast of Casper in the Hat Six area. There are two leks off the Hat Six Road which are of particular importance to the public as they are heavily viewed during the breeding season. Given the relatively small size of the sage-grouse population in the Hat Six area and the likelihood of encroaching development, WGFD (with support from the BHSBLWG) initiated a radio-telemetry study to identify seasonal sage-grouse habitats selected by sage-grouse in the Hat Six area (a project proposal/description is provided in Appendix II). It is the intention of the working group to utilize data from this study to approach developers and city/county planning authorities to consider the needs of these sage-grouse when planning development in this area and to mitigate development-related impacts to these sage-grouse.

12. Vegetation Management

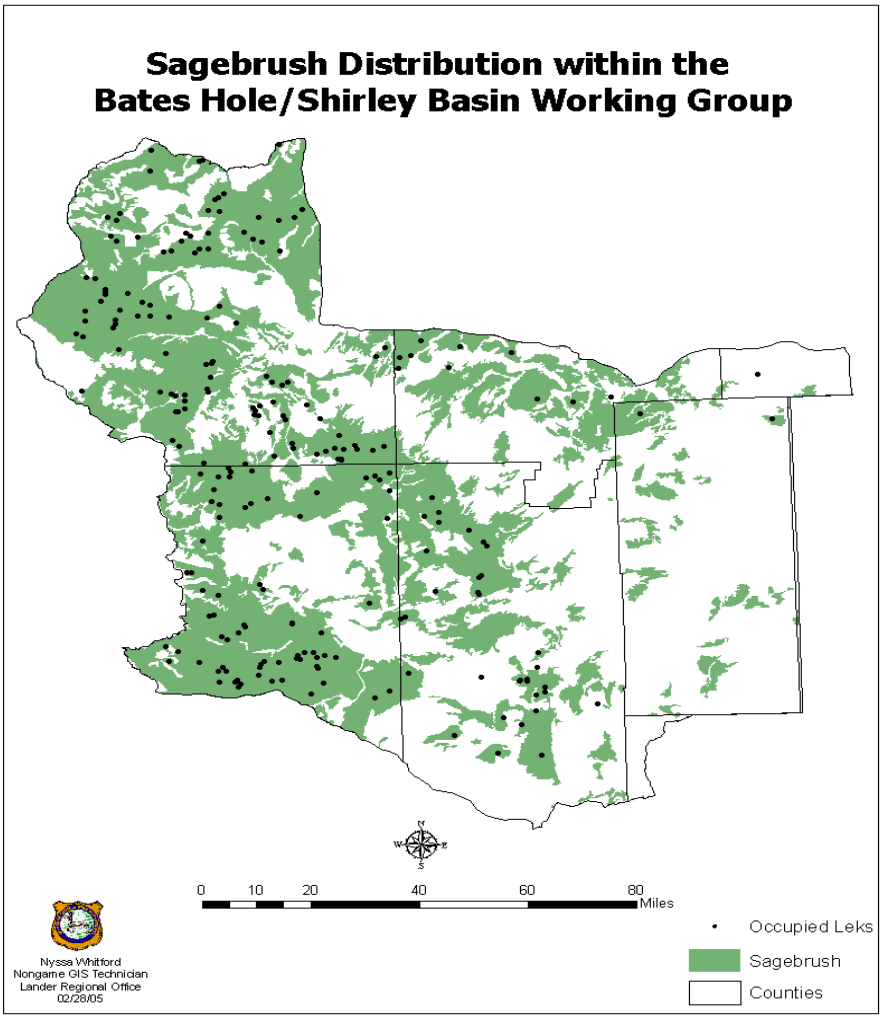
Sage-grouse are dependent on sagebrush habitat. Sagebrush communities occur throughout the BHSBCA with the exception of the Laramie Range, Seminoe and Shirley Mountains, the Laramie Plains, and the majority of Platte County. Figure 28 depicts BLM data based on a refined Wyoming GAP Analysis Land Cover Map showing sagebrush occurring at 5% or greater canopy cover in sagebrush/grassland habitat. Sagebrush habitats are estimated to occur on 43% of the BHSBCA. The amount of sagebrush habitat within the BHSBCA that has been altered or

lost due to environmental variables or human-caused disturbance is unknown, but may be significant in localized areas.

The close association between sage-grouse and sagebrush is reflected by the lek locations in Figure 28. The primary sagebrush subspecies of significant importance to sage-grouse found in the majority of the BHSBCA are Wyoming big sagebrush (*Artemisia tridentata subsp. Wyomingensis*) and mountain big sagebrush (*Artemisia tridentata subsp. Vaseyana*). Wyoming big sagebrush is found throughout the BHSBCA. Mountain big sagebrush occurs throughout much of Shirley Basin and at higher elevations in the Rattlesnake Hills, southern Bighorn Mountains, and in the foothills of the Laramie Range. Mountain big sagebrush communities within the BHSBCA are often utilized during the summer when local sage-grouse often move to higher elevations. Silver sagebrush (*Artemisia cana subsp. Cana*) is also found in much of the BHSBCA and is of particular importance to sage-grouse where it is the predominant sagebrush type, such as in northern Platte County and southern Niobrara County.

Sagebrush communities evolved as dynamic landscapes with climatic and soil-type variation. Such variation drives changes in fire frequencies and adaptive development of different sagebrush species. These sagebrush communities commonly occur in tracts occupying hundreds or thousands of acres. Historic Wyoming big sagebrush communities were a mosaic of successional shrub age classes created and maintained by fire cycles ranging in frequency from 100 to 240 years depending on the ecological site (Baker 2006). 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. The combination of active fire suppression and inappropriate livestock grazing practices are believed to have contributed to dense, old, monotypic stands of sagebrush, reduction of herbaceous understories, and simplification of community diversity. Habitat conversion, sagebrush habitat treatments, and the introduction of invasive species have also affected these sagebrush communities. Drought and grasshopper infestations have also been reported to change the dynamics of sagebrush communities in Wyoming (Allred 1924).

Figure 28. Sagebrush habitats and occupied leks in the Bates Hole/Shirley Basin Conservation Area (Source: BLM; based largely on Wyoming GAP Analysis Land Cover Map).



Desired vegetative communities benefiting sage-grouse can be achieved through vegetation management. Vegetation management tools include biological/natural, mechanical, or chemical treatments. Treatments include prescribed fire, designed domestic livestock grazing systems, mechanical, and insect (biologic) control. Fire, floods, insects, mammal and bird herbivory, and plant diseases and allelopathy (chemical inhibition) are also biological/natural 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, aeration, railing, and blading.

Removal of large tracts of sagebrush is detrimental to sage-grouse populations. Spraying and burning are the most common treatments in Wyoming. Limited spraying occurs today, but was used extensively in the past. Many large stands of sagebrush were converted to grassland by spraying. Some sagebrush spraying still occurs within the BHSBCA such as in southern Converse County. While some birds may be able to adjust by using adjacent sagebrush habitats, areas of extensive treatment no longer support sage-grouse. However, sage-grouse habitats can

be improved through sagebrush thinning or control when stands become over-mature and decadent. Spike® 20P Herbicide effectively thins sagebrush and can be used at differential application rates to control the degree to which a sagebrush stand is thinned, an attribute which can be beneficial when designing management prescription.

Burning is now more popular than other methods of sagebrush eradication because it is generally less expensive and federal financial assistance for chemical control is less available. Burning is also preferable from a wildlife/sage-grouse standpoint because it promotes forb growth and generally produces a patchy treatment pattern. However, it is recognized that fires are more easily carried in preferred sage-grouse habitats with fine fuel accumulation (i.e. nesting habitat), and such areas may not require treatment. Mosaic patches of sagebrush of different ages and structures benefit sage-grouse. Vegetation treatments also influence the abundance and diversity of insects in sagebrush ecosystems. Use of vegetative treatments requires planning and understanding of the sagebrush ecosystem and sage-grouse habitat use to ensure sufficient stands of desirable sagebrush remain. When trying to improve sage-grouse habitats, threshold levels of habitat alteration that can occur without negatively impacting specific sage-grouse populations should be determined. As a general rule, no more than 20% of any seasonal habitat type should be treated until results are evaluated.

13. Wyoming State Lands Management

The Wyoming Office of State Lands and Investments administers State lands and manages the surface, mineral, and forest resources under the jurisdiction of the State Board of Land Commissioners. The agency functions to optimize revenue for the beneficiaries of the state including the public schools and other designated state institutions. State land management is based on traditional trust principles: (1) long-term growth in value, and (2) optimum, sustainable revenue production. The Office of State Lands and Investments negotiates the terms and conditions of land use.

To date, there has been limited consideration given to minimizing impacts to sage-grouse from natural resource development on State lands. The Office has begun to apply protections to key wildlife habitats, including sage-grouse habitats, in some parts of Wyoming, although none have been applied within the BHSBCA to date. The Office is willing to work with the appropriate resource agencies to provide adequate resource protection after careful analysis on a project-by-project, case-by-case basis on State lands. Protection of breeding areas and consideration of nesting and winter habitat would be valuable actions in the effort to effectively manage habitat within the BHSBCA.

State lands within the BHSBCA hold many resources including forage, minerals, non-leasable minerals, timber, wildlife, and recreational opportunity. State lands provide habitat for wildlife and access for hunting and other recreation activities. Some State lands provide important habitat for sage-grouse, with over 7% of leks within the BHSBCA occurring on State lands.

Throughout the BHSBCA, State lands receive substantial public use throughout most of the year. OHV recreation is becoming increasingly popular and can represent a significant source of disturbance to sage-grouse. During fall hunting seasons, these State lands are widely utilized by

both big game and small/upland game hunters, which dramatically increases OHV use and resulting disturbance in the area. Prairie dog shooting is also common on many parcels of State land within the BHSBCA. These sources of human-caused disturbances, coupled with energy and residential development in many areas can have cumulative deleterious impacts to sage-grouse populations. Given the threats to sage-grouse populations occurring on State lands, the BHSBLWG strongly encourages the State Land Board to consider sage-grouse needs when permitting public use, including livestock grazing/stocking rates and motorized vehicular access, on State lands in Wyoming. The BHSBLWG recommends the State Land Board consult appropriate Proposed Management Actions and Recommended Management Practices outlined under the Conservation Strategy portion of this plan to ensure permitted uses are compatible with sage-grouse requirements.

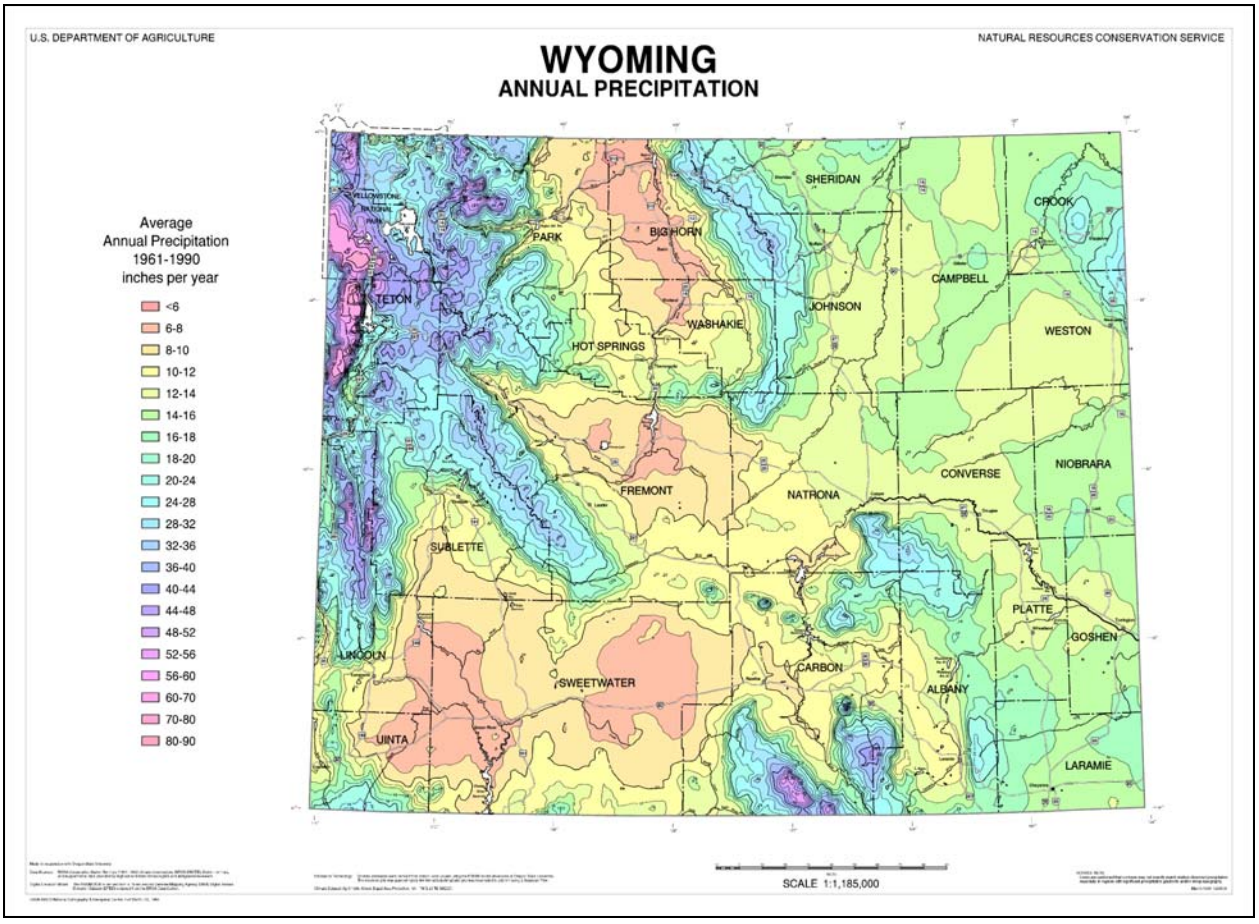
State lands associated with the Hat Six sage-grouse population are of particular concern especially considering the aforementioned development pressure on surrounding areas and the amount of public recreation occurring in the area due to close proximity to Casper. The Hat Six lek occurs on State land, and the nearby Altmann lek occurs on adjacent private land. Sagebrush habitat, and therefore sage-grouse distribution, is confined to a relatively small area around Hat Six. Mountains comprise a barrier to the south and west, the North Platte River and Interstate 25 present a break in contiguous habitat to the north, while habitats to the east are dominated by black sagebrush (*Artemisia nova A. Nels*), which constitutes relatively poor sage-grouse habitat. Although the Hat Six sage-grouse population is relatively small, these birds represent a valuable source of wildlife recreation. The Hat Six lek is extensively viewed by the public due to its proximity to Casper and easy public access via well-maintained roads. WGFD installed an interpretive sign on the county road where vehicular viewing occurs to encourage proper viewing etiquette. The BHSBLWG recommends the State Land Board place additional management emphasis on State lands within the Hat Six area to ensure sage-grouse needs are met.

14. Weather

Climatic conditions vary throughout the BHSBCA due to geographical variation over the large area of landmass encompassed. Nevertheless, a general description of weather within the BHSBCA is provided. Much of the occupied sage-grouse habitat within the BHSBCA receives 6 – 15 inches of annual precipitation, with some higher elevation areas (of occupied habitat) receiving up to 20 inches (Figure 29). Mean annual snowfall over the area ranges from 41-78 inches (Source: http://www.wrcc.dri.edu/summary/climsmwy.html). The mean annual temperature in the BHSBCA ranges from 38 – 47 degrees Fahrenheit.

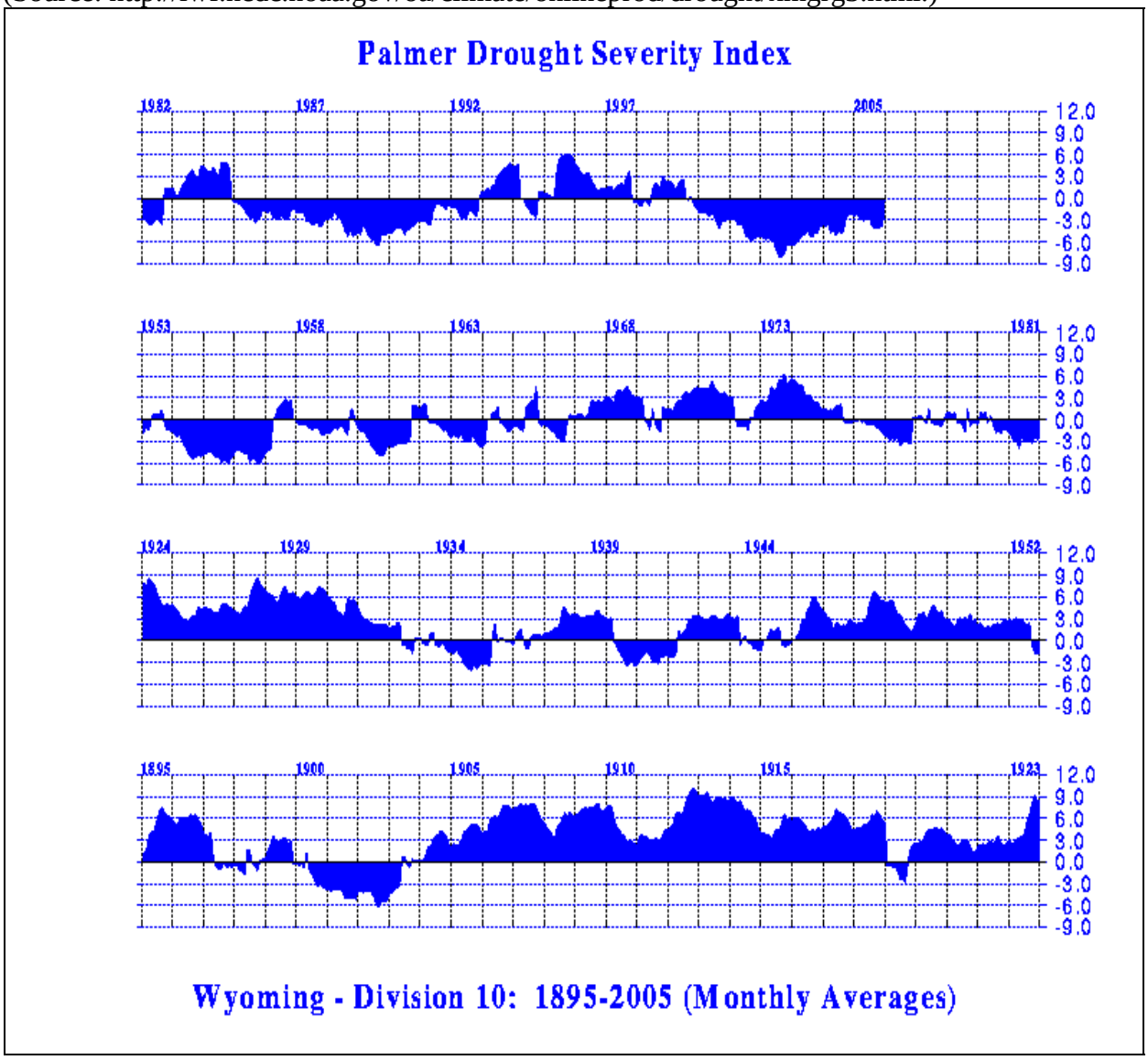
Wyoming is an arid state and droughts are common. The Palmer Drought Severity Index quantifies drought severity by measuring duration and intensity of the long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns plus the cumulative patterns of previous months. Figure 30 shows the index for the upper North Platte River drainage from 1895 – 2005, which encompasses the bulk of the BHSBCA. Drought periods lasting three years or longer have been more frequent and more severe in the last one-half of the 20th century.

Figure 29. Average annual precipitation in Wyoming, 1961 – 1990 (USDA).



Sage-grouse evolved with variable weather and 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 through physical stress and by modification of habitats. Annual variations in precipitation and temperature can affect annual sage-grouse production and may be 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 concentrates sage-grouse on the few riparian areas that remain well hydrated, and thereby increase the potential for predation and the risk of disease. Typically, wet years are good for sage-grouse production and dry years can inhibit production.

Figure 30. Palmer Drought Severity Index (1895-2005) for the Upper North Platte River drainage of south central Wyoming. Periods with negative index values correspond to drought conditions. Increasingly negative values equate to increasing drought severity. (Source: http://lwf.ncdc.noaa.gov/oa/climate/onlineprod/drought/xmgrg3.html.)



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

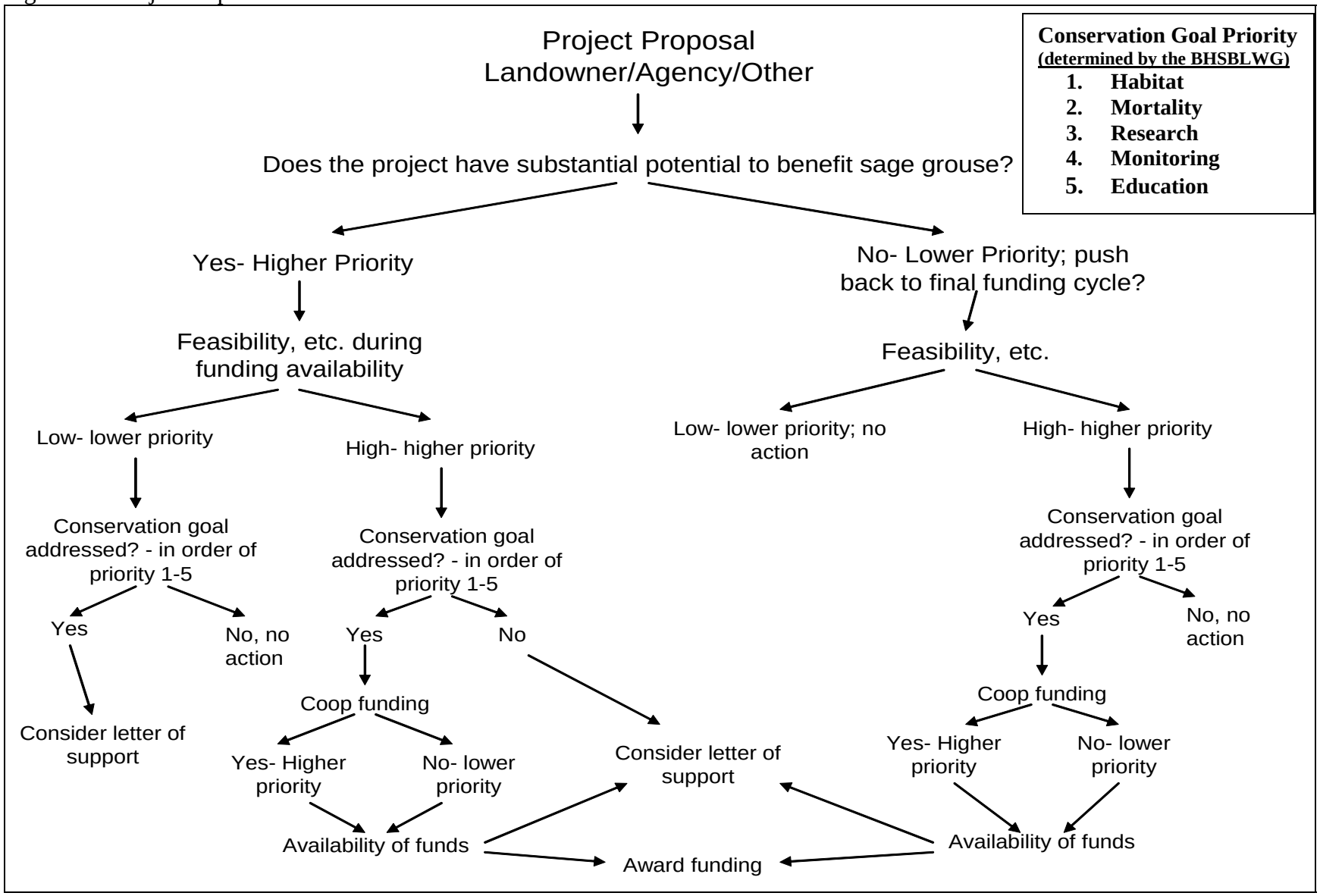
occur on a larger geographical scale than annual fluctuations, and influence sage-grouse populations at the regional level.

Although sage-grouse have evolved with weather fluctuations for thousands of years, it remains a significant factor in determining the status and well being of their populations. Weather can have either a positive or negative influence upon sage-grouse populations. 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 of weather and long-term role of climate change on sage-grouse populations must be considered when management practices for sage-grouse are selected.

Priorities For Implementation of Conservation Projects

Conservation projects presented in the Conservation Strategy section of the plan are in various phases of implementation including completed, ongoing, planning, and conceptual. Implementation of projects will depend on a number of factors including funding, willing cooperators, project sponsors, and NEPA processes. The BHSBLWG is responsible for prioritizing projects submitted to the group for funding through the Wyoming Governor's Sage-grouse Conservation Fund. Others interested in initiating projects to benefit sage-grouse can proceed on their own by obtaining technical assistance and securing funding through other sources. The BHSBLWG will consider various criteria to prioritize projects for funding such as relative significance of project, availability of cooperative funding, and potentially limiting factors. Projects receiving the highest priority will be those which mitigate for significant habitat loss resulting from natural resource development or those which have substantial potential to benefit sage-grouse and/or sage-grouse habitats. Figure 31 depicts a flow chart developed by the BHSBLWG to prioritize and rank sage-grouse conservation projects based on the aforementioned criteria and the Conservation Strategy Goal(s) (in order of relative importance as defined by the working group) addressed. Relative sage-grouse population densities were not considered when prioritizing conservation projects due to the variety of projects anticipated to be submitted in the future and the likelihood relative significance and feasibility of proposed projects will be readily determined, thus providing for unambiguous selection. Essentially, the BHSBLWG will prioritize funding conservation projects which provide the most benefit for the cost. As of July 2006, the BHSBLWG received an allocation of approximately $134,000 to be spent on conservation and education practices over the following two years.

Figure 31. Project Implementation Prioritization Flow Chart.



CONSERVATION STRATEGY

Introduction

The Bates Hole Shirley Basin (BHSB) Sage-grouse Working Group Conservation Strategy is presented below with conservation goals, objectives, conservation commitments, and proposed management actions. Recommended Management Practices (RMPs) are listed by limiting factor in the following section.

The strategy for sage-grouse conservation in the BHSBCA is to meet the goals set forth below through the development and implementation of action items for specified objectives. These action items are based upon the general biology of the species, their seasonal habitat requirements specific to the area, and the potential and documented impacts and issues associated with long-term management of the species. Some objectives and management actions may be valid for several conservation goals.

Conservation Goal 1 includes factors that impact sage-grouse populations indirectly through habitat modification or land uses. Conservation Goal 2 includes factors with direct mortality effects on sage-grouse. Conservation Goal 3 sets targets for research in the BHSB Sage-grouse Working Group conservation plan area. Conservation Goal 4 provides for monitoring, feedback, and program adjustment where monitoring indicates such adjustment is necessary. Conservation Goal 5 seeks to educate and raise awareness of the importance of sage-grouse conservation and methods to achieve that objective.

Conservation commitments and proposed management actions are provided in this strategy. A conservation commitment is an action that an agency or group has agreed to complete or has already completed. Conservation commitments have not necessarily been endorsed by the BHSBLWG. They simply represent what is currently being done to protect sage-grouse or mitigate impacts to sage-grouse habitats. Current conservation commitments may or may not be adequately protecting sage-grouse and their habitats, based on recent research. Proposed management actions are ideas or projects identified to promote sage-grouse and sagebrush habitat conservation beyond conservation commitments, although to date the working group has not secured a commitment to implement these actions. The working group will be contacting the identified parties over the next two years to secure commitments to address these actions. The lead agency or group was identified as a result of public or private sector jurisdiction in the category and will undoubtedly involve many partner organizations.

RMPs identified by the BHSBLWG are provided. These recommended practices or activities are in addition to conservation commitments and proposed management actions described in this document and are most appropriate in a certain set of conditions that may or may not be present throughout the LWG area. It is the user who determines the relevance and appropriateness of the RMP, and the user may modify any given RMP to meet particular circumstances. RMPs are not implied regulations and they are not appropriate in all circumstances.

While the BHSBLWG has attempted to identify existing and potential impacts to sage-grouse and their habitats within the BHSBCA, all impacts have not been covered in this document as they may be unforeseen or less significant than those factors identified. As they pertain to such identified factors, Proposed Management Actions and RMPs should be considered when recommending protective measures.

Monitoring

The success or failure of this conservation plan can only be determined through monitoring the status of sage-grouse populations and the projects being implemented to benefit sage-grouse. The success of conservation actions will be demonstrated over time through the annual analysis of changes in population indices based on lek monitoring data. Therefore, monitoring leks will continue to be a priority, with results reported in the Wyoming Game and Fish Department's annual Bates Hole/Shirley Basin Working Group Sage-grouse Completion Report. Projects recommended for funding by the BHSBLWG will include a monitoring plan. A summary of conservation actions such as research and habitat projects will be included in the annual Bates Hole/Shirley Basin Working Group Sage-grouse Completion Report.

Methods to monitor sage-grouse populations and habitat is provided in the Wyoming Game and Fish Department's Biological Techniques Manual. These monitoring methods are consistent with "Monitoring of Greater Sage-grouse Habitats and Populations" (Connelly et al. 2004).

Adaptive Management

Implementation and monitoring of conservation actions set forth in the Bates Hole/Shirley Basin Sage-grouse Conservation Plan is already underway. Much is being learned, and will continue to be learned, from research, lek monitoring, implementation of habitat projects, management of uses occurring in sage-grouse habitat, etc. Monitoring the success and/or failure of conservation actions will provide additional information from which to make future conservation planning decisions. Conservation actions deemed to be successful will be recognized and promoted in the future.

The BHSBLWG will continue to meet, although on a less frequent schedule. Updates to the plan will occur in the future and will include the most current information garnered through population monitoring, research, and habitat management. The Wyoming Game and Fish Department will continue to summarize population and habitat monitoring data as well as the status of project implementation and effectiveness in the Bates Hole/Shirley Basin Working Group Sage-grouse Completion Report. This report will be distributed to land management agencies as well as others interested in the conservation of sage-grouse.

CONSERVATION GOAL 1: Maintain, restore and/or enhance sage-grouse habitat to maintain and/or increase the abundance of sage-grouse based on the 2004 population level.

Mineral and energy development

Objective 1.1: Develop energy and mineral resources in a manner compatible with maintenance and enhancement of sage-grouse populations and habitats.

Vegetation Management

Objective 1.2: Prevent the introduction of invasive plants in sage-grouse habitat and promote control and reduction of infestations.

Objective 1.3: Promote livestock grazing practices that maintain healthy sagebrush habitats throughout the BHSBCA.

Objective 1.4: Assure vegetation management/treatments benefit necessary sage-grouse habitat, while considering ecological, economic and cumulative impacts.

Farming

Objective 1.5: Promote farming operations compatible with maintenance and enhancement of sage-grouse habitat.

Recreation

Objective 1.6: Manage recreation impacts on sage-grouse where these impacts are concentrated.

Residential development

Objective 1.7: Minimize negative impacts of urbanization on sage-grouse populations and habitat.

Weather

Objective 1.8: Encourage habitat management practices that mitigate adverse impacts of weather on sage-grouse.

Conflicting wildlife management

Objective 1.9: Minimize or avoid impacts on sage-grouse populations and habitat when developing management goals and strategies for other wildlife species that use sagebrush habitats.

CONSERVATION GOAL 2: Manage factors contributing to the direct mortality of sage-grouse to maintain and/or increase sage-grouse abundance and distribution based on the 2004 population level.

Hunting

Objective 2.1: Make hunting regulation adjustments as needed to maintain or increase sage-grouse numbers.

Parasites and Diseases

Objective 2.2: Encourage implementation of practices shown to reduce the incidences of sage-grouse parasites and diseases.

Predation

Objective 2.3: Predator management should be implemented to maintain or increase sage-grouse populations when the affects of predation are determined to be the cause of population decline.

Objective 2.4: Minimize the effects of predation by “newcomer” predators and artificially high levels of naturally occurring predators.

Pesticides

Objective 2.5: Minimize negative impacts of pesticide application on sage-grouse.

CONSERVATION GOAL 3: Initiate and/or encourage sage-grouse research.

Objective 3.1: Conduct research to better understand sage-grouse ecology and determine the extent to which identified factors affect populations.

CONSERVATION GOAL 4: Improve population and habitat monitoring within the BHSBCA.

Objectives 4.1: Monitor sage-grouse populations and habitats at a level adequate to assess trends and benefits of conservation efforts.

CONSERVATION GOAL 5: Inform and educate the public, landowners, government agencies and others whose interests are affected by sage-grouse conservation within the BHSBCA.

Objective 5.1: Involve and educate the local community on sage-grouse conservation efforts.

Objective 5.2: Promote Recommended Management Practices for sage-grouse conservation

Conservation Commitments and Proposed Management Actions

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
OIL AND GAS DEVELOPMENT – *Conservation Commitments*				
1.1	1) Leks occurring on lands and mineral leases of the U.S. Forest Service and BLM have a controlled surface occupancy restriction within 0.25 miles of lek site perimeters to protect breeding areas. Avoid human activity between 8:00 PM and 8:00 AM from March 1 – May 15 within 0.25 miles of the perimeter of occupied sage-grouse leks within the Casper and Lander BLM Field Offices. Avoid human activity between 6:00 PM and 9:00 AM from March 1 – May 20 within 0.25 miles of the perimeter of occupied sage-grouse leks within the Rawlins BLM Field Office. Adhere to the seasonal timing limitation on new surface disturbing activities within suitable sage-grouse nesting and early brood rearing habitat within 2.0 miles of an occupied lek from March 15 – July 15 within the Casper and Lander BLM Field Offices and from March 1 – July 15 within the Rawlins BLM Field Office. Adhere to the seasonal timing limitation on new surface disturbing activities within identified sage-grouse winter habitat from November 15 – March 14. *(Note: under the most recent Resource Management Plan revision, the Lander Field Office is proposing to adopt the same dates used by the Rawlins Field Office).*	*BLM, Oil & Gas Companies*	*Ongoing*	*NA*
1.1	2) Containment impoundments are designed and constructed to prevent entrapment and drowning of sage-grouse.		*As projects are proposed*	*Oil & Gas Companies*
1.1, 2.3	3) Locate power lines in areas to minimize potential avian collisions. Potential modifications include burying the lines, avoiding areas of high avian use (for example, wetlands, prairie dog towns, and grouse leks), and increasing the visibility of individual conductors.	*BLM, Oil & Gas Companies, Power Companies*	*Ongoing*	*Oil & Gas Companies, Power Companies*
1.1	4) Locate aboveground power lines, where practical, at least 0.5 miles from any sage-grouse breeding or nesting grounds to prevent raptor predation and sage-grouse collisions with conductors. Raptor-proof power poles within 0.5 miles of any sage-grouse lek to prevent raptors from perching on the poles.		*Ongoing*	*Oil & Gas Companies, Power Companies*
1.1, 1.2, 1.4	5) Distribute the NE Wyoming Sage-grouse Working Groups brochure identifying plant species, seeding practices, and seed mixes beneficial to sage-grouse in reclamation of disturbed sites. The brochure is available	*BHSBLWG*	*Completed*	*WGFD*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	on the Wyoming Oil and Gas Conservation Commission web site, the Wyoming Game and Fish Department web site and at county conservation district offices.			
1.1, 1.2, 1.4	6) Select proper seed types to ensure plants are appropriate and provide benefit to wildlife and prevent erosion during reclamation processes.	*BLM, Oil & Gas Companies, landowners*	*Ongoing*	*Oil & Gas Companies*
OIL AND GAS DEVELOPMENT – *Proposed Management Actions*				
1.1, 4.1	1) Apply landscape planning principles and concepts prior to project development as part of cumulative analyses completed for NEPA to ensure that planning, analysis, mitigation, and reclamation of large, intense energy developments be done at a landscape scale appropriate to address the total grouse impacts that are realized. The President's Council on Environmental Quality defined the term "mitigation" in NEPA regulations to include: "(a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments."[40CFR Part 1508.20 (a-e)]. Consider the following (WGFD in prep): • Comprehensively describe past, present, and reasonably foreseeable developments and land uses including the potential locations and scale of oil and gas developments. Identify direct, indirect, and cumulative effects of development and land uses, including aspects that may impair the condition or function of the various ecological components. • Identify and delineate appropriate landscape planning units for sage-grouse. Gather existing information or comprehensively inventory the biological and physical components of those units (including vegetation cover types, grouse seasonal habitats, current land uses, existing patterns of development, etc.). • Describe how key physical and biological components are functionally interconnected or interdependent (i.e. sage-grouse seasonal habitat selection or migration).	*BLM (Field Offices and State Office), Oil & Gas Companies*	*TBD*	*Oil & Gas Companies*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	• Identify landscape goals and objectives based on the desired condition (properly functioning condition) of grouse habitats. • Objectively assess the existing condition of all season grouse habitat components based on quantitative inventory and monitoring data. If adequate resource data are not available, include a means of collecting the information. • Design a technically sound monitoring plan that will enable managers to refine their assessments of impacts, evaluate the effectiveness of mitigation, and detect unforeseen conditions. • As necessary, design and conduct research to study and evaluate presently un-quantified effects, resource conditions, and key ecological processes. • To avoid or reduce unnecessary disturbances, wildlife conflicts, and habitat impacts, coordinate planning among companies to minimize impacts within the same oil and gas field.			
1.1	2) Propose areas for "no lease" within areas of critical sage-grouse habitats before the "auction phase" of the BLM leasing procedure.		*TBD*	*NA*
1.1	3) Recommend areas within 3.4 miles of an occupied sage-grouse lek not be leased for oil and gas development unless mitigation plans have been developed, approved, and funded. Consider increasing No Surface Occupancy (NSO) and Time Limited Stipulation (TLS) buffers for sage-grouse stipulations to encompass larger areas of protection. All surface activity should be avoided or minimized within 3.4 miles (Holloran and Anderson 2005) of occupied sage-grouse leks. No surface occupancy stipulations are preferred over TLS buffers. TLS stipulations are more appropriate for temporary surface disturbances such as sub-surface pipeline installation.		*TBD*	*NA*
1.1	4) Consider off-site mitigation as an alternative mitigation for mineral development impacts in known sage-grouse habitats. Work with mineral entities to develop and implement acceptable offsite mitigation measures for enhancing sage-grouse populations or habitat, as needed, to offset impacts of surface disturbing activities. Off-site mitigation should be conducted as close to the disturbed area as possible. • Mitigate habitat loss through offsite sage-grouse habitat improvement and/or protection from development at a 2:1 area ratio. Offsite mitigation should occur when well pad densities exceed four		*TBD*	*NA*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	per section. Habitat improvement methodologies shall be tested and proven beneficial before they are applied as mitigation. • Encourage research on effectiveness of off-site mitigation (i.e. size and habitat requirements, connectivity to effected area). • Continue research on specific impacts of development (i.e. noise, roads, power lines, etc.) to aid in mitigation.			
1.1	5) Encourage the Wyoming State BLM office to adopt and enforce standardized statewide (across all BLM field offices) stipulations as they pertain to sage-grouse protection.		*TBD*	*NA*
1.1	6) Increase reclamation bond on well pad sites from 1954 standards of $24,000 (currently used today) to current fair market price to assure mineral interests will not abandon reclamation processes after development is completed. • Establish effective, interim reclamation on all surface disturbances associated with ancillary facilities, including equipment staging areas, reseeding with a variety of native grasses and forbs. Although non-native, species such as yellow flowering alfalfa can be used to increase desired forb availability for sage-grouse. • Reclamation is defined as the process by which lands disturbed by development activities are restored to their pre-development land use or better by the re-establishment of the original ground conditions and the pre-existing vegetative community. Land uses can include wildlife habitat, grazing land, cropland, recreational lands, etc. Reclamation by revegetation is deemed complete when the vegetative cover of the affected land is shown to be capable of renewing itself under natural conditions and is at least equal to the vegetative cover and type prior to the development. • Salvage topsoil from all road construction and re-apply during interim and final reclamation. • Continue to monitor and treat reclaimed areas, applying irrigation if necessary and feasible, until plant cover, composition, and diversity standards have been met.		*TBD*	*NA*
1.1	7) Where possible, require directional drilling to minimize surface disturbance in sage-grouse habitats. Centralize and combine drill pads, roads, pipelines, and ancillary facilities.		*TBD*	*NA*
1.1	8) Avoid or minimize human activity, roads, and pipeline right-of-ways		*TBD*	*NA*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	within 3.4 miles of occupied leks. If roads are present, they should be seasonally closed during the sage-grouse breeding season from March 1 to June 20. Secondary roads within 3.4 miles should also be closed during winter months (November 15 – March 14). • Avoid or minimize human activity between 8:00 PM and 8:00 AM from March 1 – May 15 within 3.4 miles of the perimeter of occupied sage-grouse leks. • Require transportation plans in each field office. Both permanent and seasonal road/trail closures should be considered to reduce disturbance to sage-grouse during breeding activities and winter. • Use existing roads & two-tracks before creating new roads.			
1.1	9) Operating noise from compressor stations should not exceed 49 decibels (10 dBA above background noise) at any sage-grouse leks. All existing and new compressor stations should add noise abatement devices (mufflers) (not exceed 10 dBA above natural, ambient noise) to reduce audible noise within 3.4 miles of occupied leks.		*As compressors are constructed*	*NA*
1.1	10) Urge agency decision-makers to honor recommendations provided by agency biologists in regard to exception request determinations.		*TBD*	*NA*
1.1, 5.1	11) All industry employees should receive environmental awareness training during orientation. • Industry employees should not be allowed to carry firearms while on the job or riding in company vehicles.		*TBD*	*Oil & Gas Companies*
1.1, 4.1	12) Identify and map sage-grouse winter habitat. TLS stipulations are in place but are not applied as no winter habitat has been delineated within the Casper BLM Field Office.	*BLM, WGFD*	*TBD*	*WGFD, BLM, Oil & Gas Companies*
1.1, 4.1	13) For any surface-disturbing activities proposed in sagebrush shrublands, industry should conduct clearance surveys for sage-grouse breeding activity during the breeding season before initiating the activities. The surveys should encompass all sagebrush shrublands within 3.4 miles of the proposed activities.	*BLM, Oil & Gas Companies*	*As projects are proposed*	*Oil & Gas Companies*
1.1	14) Re-inject produced water resulting from oil and gas extraction if feasible, and if not beneficial for other uses.		*As projects are proposed*	*Oil & Gas Companies*
1.1	15) Provide Audubon Wyoming's *Sage-grouse Species Survival Plan* to industry operators within the BHSBCA.	*Audubon Wyoming*	*TBD*	*Audubon Wyoming*
1.1	16) Identify landowners holding private surface/private mineral rights and encourage them to apply development restrictions on important breeding	*BHSBLWG*	*December 2007*	*WGFD*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	and nesting habitats (Avoid or minimize surface disturbance or occupancy within 3.4 miles of the perimeter of occupied sage-grouse leks. Avoid human activity between 8:00 p.m. and 8 a.m. from March 1 – May 15 within 3.4 miles of the perimeter of occupied sage-grouse leks).			
1.1	17) Discuss well-spacing criteria with the Wyoming Oil & Gas Commission. Advocate for ways to minimize the footprint of surface disturbance from oil and gas extraction development.		*TBD*	*NA*
1.1	18) Adopt Wyoming Sage-grouse Conservation Plan RMPs on state trust lands with oil and gas development.	*WY State Land Board, Wyoming Oil and Gas Commission, BLM*	*TBD*	*NA*
1.1	19) Consider the following stipulations to be applied to oil and gas leases covering state trust lands within the BHSBCA: • Propose areas for "no lease" within areas of critical sage-grouse habitats before the "auction phase" of the BLM leasing procedure. • Recommend areas within 3.4 miles of a sage-grouse lek on state trust lands not be leased for oil and gas development unless mitigation plans have been developed, approved, and funded. Consider No Surface Occupancy (NSO) and Time Limited Stipulation (TLS) buffers for sage-grouse protection. All surface activity should be avoided or minimized within 3.4 miles (Holloran and Anderson 2005) of occupied sage-grouse leks. Consider such methods as directional drilling and centralized ancillary facility/road construction to minimize surface disturbance. No surface occupancy stipulations are preferred over TLS buffers. TLS stipulations are more appropriate for temporary surface disturbances such as sub-surface pipeline installation. • Avoid or minimize human activity, roads, and pipeline right-of-ways within 3.4 miles of occupied leks. If roads are present, they should be seasonally closed during the sage-grouse breeding season from March 1 to June 20. Secondary roads within 3.4 miles should also be closed during winter months (November 15 – March 14). • Avoid or minimize human activity between 8:00 PM and 8:00 AM from March 1 – May 15 within 3.4 miles of the perimeter of occupied sage-grouse leks. • Avoid human activity from November 15 – March 14 in designated important sage-grouse winter habitat. • In the alternative, exploration and development activities shall be		*TBD*	*NA*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	subject to approval by the Director of the Office of State Lands and Investments, subject to the Director's consultation with the WGFD regarding alternative practices and/or plans of development providing similar resource protection and mitigation.			
COAL/MINERAL DEVELOPMENT – *Conservation Commitments*				
1.1	1) Leks occurring on lands and mineral leases of the U.S. Forest Service and BLM have a controlled surface occupancy restriction within 0.25 miles of lek site perimeters to protect breeding areas. Avoid human activity between 8:00 PM and 8:00 AM from March 1 – May 15 within 0.25 miles of the perimeter of occupied sage-grouse leks within the Casper and Lander BLM Field Offices. Avoid human activity between 6:00 PM and 9:00 AM from March 1 – May 20 within 0.25 miles of the perimeter of occupied sage-grouse leks within the Rawlins BLM Field Office. Adhere to the seasonal timing limitation on new surface disturbing activities within suitable sage-grouse nesting and early brood rearing habitat within 2.0 miles of an occupied lek from March 15 – July 15 within the Casper and Lander BLM Field Offices and from March 1 – July 15 within the Rawlins BLM Field Office.	*BLM, Mineral Companies, WDEQ*	*Ongoing*	*NA*
1.1, 4.1	2) For any surface-disturbing activities proposed in sagebrush shrublands, companies conduct clearance surveys for sage-grouse breeding activity during the sage-grouse's breeding season before initiating the activities. The surveys encompass all sagebrush shrublands within 0.5 miles of the proposed activities.		*As projects are proposed*	*NA*
1.1, 4.1	3) Operators search all suitable breeding habitat for leks on the term-of-permit area and a 1-mile perimeter at least once each spring. Every third year, the lek searches are expanded to cover the entire permit area and its 1-mile perimeter.	*Mineral Companies*	*Ongoing*	*Mineral Companies*
4.1	4) Annual reclamation reports include a complete record of the status and history of all leks, including those which have been destroyed or have become inactive.		*TBD*	*Mineral Companies*
1.1, 1.2, 1.3, 1.4, 4.1	5) Surface coal mine reclamation plans include an agency (USFS, DEQ-LQD, WGFD, USFWS) approved Wildlife Mitigation and Monitoring Plan which includes the establishment and restoration of sage-grouse habitat when pertinent.		*Ongoing*	*Mineral Companies*
1.1, 4.1	6) The Wyoming Game and Fish Department provides direct review of relevant parts of mine and reclamation plans that deal with the resources	*WGFD*	*Ongoing*	*N/A*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	under the agency's purview.			
COAL/MINERAL DEVELOPMENT – *Proposed Management Actions*				
1.1 1.1	1) Minimize leasing areas for mining/mineral development within 3.4 miles of an occupied sage-grouse lek (including on state trust lands). 2) Recommend areas within 3.4 miles of an occupied sage-grouse lek not be leased for mining/mineral development unless mitigation plans have been developed, approved, and funded.	*BLM, USFS, WY State Land Board, WGFD*	*As projects are proposed*	*NA*
1.1 1.1, 1.2	3) Encourage mineral companies to conduct off-site mitigation. Identify potential off-site mitigation plans to protect sage-grouse habitats in areas where semi-permanent mineral development occurs in sagebrush communities. 4) Consult the Handbook of Western Reclamation Techniques for recommended reclamation practices when designing reclamation plans and standards.	*BLM, WDEQ/LQD*	*As projects are proposed* *As mining is completed*	*Mineral Companies* *NA*
1.1, 1.2	5) Work with WDEQ/LQD to update their Regulatory Guide No. 5 to incorporate the BHSBLWG RMPs for sage-grouse.	*BHSBLWG, WDEQ/LQD*	*TBD*	*NA*
1.1	6) Adopt Wyoming Sage-grouse Conservation Plan RMPs on state trust lands with coal/mineral development.	*WY State Land Board*	*TBD*	*NA*
WIND ENERGY DEVELOPMENT – *Conservation Commitments*				
1.1 1.1 1.1, 4.1	1) Identify potential areas of wind power development. 2) Identify transmission lines or corridors within potential areas of wind power development. 3) Identify and routinely monitor sage-grouse populations within proposed wind energy development areas and developed areas.	*BLM*	*Completed* *Completed* *As projects are proposed*	*BLM* *BLM* *BLM, WGFD, Industry*
WIND ENERGY DEVELOPMENT – *Proposed Management Actions*				
1.1 1.1	1) Minimize leasing areas for wind energy development within 3.4 miles of an occupied sage-grouse lek (including on state trust lands). 2) Recommend areas within 3.4 miles of an occupied sage-grouse lek not be leased for wind energy development unless mitigation plans have been developed, approved, and funded.	*BLM, USFS, WY State Land Board, WGFD*	*As projects are proposed*	*NA*
1.1, 4.1	3) Monitor and map sage-grouse season of use and migration patterns within identified wind energy proposed development areas and developed areas.	*BLM*	*As projects are proposed*	*BLM, WGFD, Industry*
1.1, 4.1	4) Encourage the Wyoming State Land Board to conduct the following: • Identify potential areas of wind power development.	*BHSBLWG, WY State Land Board*	*TBD*	*WY State Land Board, WGFD*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	• Identify transmission lines and corridors within potential areas of wind power development. • Identify and routinely monitor sage-grouse populations within proposed wind energy development areas and developed areas. • Monitor and map sage-grouse season of use and migration patterns within identified wind energy proposed development areas and developed areas.			
1.1	5) Adopt Wyoming Sage-grouse Conservation Plan RMPs on state trust lands with wind energy development.	*WY State Land Board*	*TBD*	*NA*
VEGETATION MANAGEMENT – *Conservation Commitments* (Invasive Plants)				
1.2, 1.3, 1.4	1) Develop a surface use agreement template to control the spread of undesirable plants. This information will be distributed by the Wyoming Stock Growers newsletter, Wyoming Farm Bureau newsletter, Wyoming Conservation District newsletter and UW Extension Service.	*BHSBLWG, Wyoming Weed and Pest Council*	*December 2007*	*BHSBLWG*
1.2	2) Write a letter of support to NRCS and FSA for providing financial assistance, through Farm Bill programs, to private landowners who actively control noxious weeds and/or cheatgrass and manage to minimize invasive weed establishment through practices such as reseeding disturbed areas, good grazing management, firebreak establishment, etc.		*December 2007*	*BHSBLWG*
1.2, 1.3, 1.4	3) Various Coordinated Resource Management efforts have been initiated to identify areas of concern and control the proliferation of invasive plants throughout portions of the BHSBCA. Oil & Gas companies also help treat invasive plant species.	*Conservation Districts, NRCS, Landowners, Weed and Pest Districts, Oil & Gas Companies*	*Ongoing*	*Conservation Districts, NRCS, Weed and Pest Districts*
VEGETATION MANAGEMENT – *Proposed Management Actions* (Invasive Plants)				
1.2, 1.3	1) Prior to conducting habitat management actions, landowners and land managers evaluate the potential for cheatgrass and other invasive species.	*BLM, NRCS, USFS, WGFD, Landowners, WY State Land Board*	*Ongoing*	*N/A*
1.2	2) Improve the standard for the percentage of cheatgrass seed allowed in	*Wyoming Weed*	*TBD*	*TBD*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	certified seed from 0.5% to 0.01%.	*and Pest Council*		
1.2	3) Maintain records for invasive plant treatment and prevention programs to evaluate their effectiveness and site specific and cumulative impacts to sage-grouse habitats.	*Weed and Pest Districts, UW Cooperative*	*TBD*	*TBD*
1.2, 1.3, 1.4, 1.5	4) Develop educational materials that incorporate sage-grouse RMPs concerning invasive species control.	*Extension Service*	*TBD*	*TBD*
1.2, 1.3, 1.4, 1.5	5) Identify habitat treatments that have occurred in their district and evaluate their effectiveness.		*TBD*	*TBD*
1.2, 1.3, 1.4	6) Develop land user incentives for the control of undesirable plant species specific to sage-grouse.		*TBD*	*TBD*
1.2, 1.4	7) Target at least one area of sage-grouse habitat in each Weed and Pest District for intensive control of undesirable plants.		*TBD*	*TBD*
1.2, 1.4	8) Where this has not been done, map areas where non-native invasive plants of concern to sage-grouse habitat already exist. Aggressively treat (chemical, mechanical, biological, grazing management) those areas. Where possible, chemical treatments should be spot treatments with ground crews to minimize impacts to desirable native forbs and shrubs.		*TBD*	*TBD*
1.2, 1.4, 5.1, 5.2	9) Develop and distribute material to educate the public, landowners, and industry about the significance of noxious and invasive weeds and their impact on wildlife habitat.		*TBD*	*TBD*
1.2, 1.4	10) Develop a program for controlling leafy spurge in sagebrush communities that does not compromise the value of the habitat for sage-grouse. (Contact Steven Enloe Department of Plant Sciences).	*UW Cooperative Extension Service, Weed and Pest*	*TBD*	*TBD*
1.2, 1.4	11) Develop and distribute a "risk assessment" for invasion by invasive species.	*Districts*	*TBD*	*TBD*
1.2, 1.4, 5.2	12) Identify appropriate resource materials and offer to support any requests for financial assistance made by the local Weed and Pest Districts where appropriate.	*BHSBLWG*	*TBD*	*TBD*
1.2, 1.3, 1.4	13) Manage livestock grazing to reduce weed invasions by adjusting periods of grazing rest, numbers, intensity, and duration.	*Landowners, BLM, NRCS, WY State Land Board, USFS*	*TBD*	*BLM, USFS, WY State Land Board, Landowners, NRCS*
1.2, 1.4	14) Identify and develop funding sources for private landowners and County Weed and Pest Boards to control cheat grass and noxious weeds.	*Wyo. Dept. of Ag.*	*TBD*	*NRCS, Wyo. Dept. of Ag.*
VEGETATION MANAGEMENT – *Conservation Commitments* (Livestock Grazing)				

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
1.3, 1.4, 3.1, 4.1	1) Continue with the 7E Ranch project to implement and evaluate a five-pasture rotational grazing system to improve sage-grouse habitat. A description of the project is provided in Appendix III.	*BLM, NRCS, WGFD, Landowners,*	*Ongoing*	*NRCS, WY Sage-grouse Conservation Fund*
1.3, 1.4, 3.1, 4.1	2) Continue with the Martin Ranch project to incorporate a three-pasture rotation grazing system and prescribed fire to create a mosaic of sage-grouse habitat. A description of the project is provided in Appendix III.	*BHSBLWG, WY State Land Board*	*Ongoing*	*NRCS, WY Sage-grouse Conservation Fund*
1.3, 1.4, 3.1	3) Continue supporting the Bates Creek Watershed restoration project.		*Ongoing*	*NA*
1.3, 1.4	4) Implement appropriate recommended grazing management, as developed on a site-specific basis by professional range/habitat specialists, following sagebrush treatments or natural disturbances that benefit long-term sagebrush diversity and ecosystem health and consider sage-grouse habitat requirements. • When appropriate, encourage agencies to prescribe post-disturbance grazing or deferment strategies to benefit sage-grouse habitats rather than require a set deferment duration period. Consider the relationship between post-disturbance livestock grazing and the potential for invasive plant establishment following disturbance.		*TBD*	*BLM, NRCS, Landowners*
1.3, 1.4, 5.1	5) Support future projects to evaluate grazing systems designed to benefit sage-grouse and sagebrush habitats.		*TBD*	*BLM, NRCS, Landowners*
1.3, 1.4, 5.1	6) Work with the BLM, USFS, and the State Land Board to incorporate livestock grazing RMPs to benefit sage-grouse, including drought-response measures, into all allotment management plans for grazing allotments within the BHSBCA.		*TBD*	*BLM, NRCS, Landowners, USFS, BHSBLWG*
1.3, 1.4, 5.1, 5.2	7) Write a brochure that covers grazing practices and current funding sources. This brochure should include: • A description of the basic sage-grouse habitat needs. • A description of the grazing systems that likely can improve sage-grouse habitats. • A list of major funding sources. • A description of the 7E Ranch project funded with help from the working group and the other sources of funds. • A description of the Martin Ranch project funded with help from the working group and the other sources of funds.	*BHSBLWG*	*Done, but may need to be updated*	*BHSBLWG*
1.2, 1.3, 1.4, 1.5, 1.6, 1.7	8) Engage the Wyoming State Land Board to promote conservation measures to enhance and maintain breeding, nesting, brood rearing, and wintering sites, to provide for effective mitigation and reclamation and encourage permittee installation of bird escape ramps in stock water		*Dec., 2006*	*NA*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	encourage permittee installation of bird escape ramps in stock water tanks.			
1.3, 1.4, 5.1, 5.2	9) Advocate for continued funding from the Wyoming Governor's Sage-grouse Conservation Program to support livestock grazing programs that benefit producers and sage-grouse.		*Ongoing*	*WGFD, NRCS, WY Sage-grouse Conservation Fund*
1.2, 1.3, 1.4	10) Enroll landowners in the Grazing Land Incentive Program in conjunction with implementing sage-grouse habitat RMPs.	*NRCS*	*Ongoing*	*NRCS*
VEGETATION MANAGEMENT – *Proposed Management Actions* (Livestock Grazing)				
1.2, 1.3, 1.4, 4.1, 5.2	1) Promote grazing management strategies to benefit sage-grouse and their habitats on private, state, and federal lands. • Develop livestock grazing strategies to increase soil moisture by promoting the retention of residual forage to provide for adequate sage-grouse habitat, retain soil moisture, increase water infiltration, and promote forb growth. • Define rangeland health goals specific to individual livestock producers. Consider individual producer needs and feasibility and rangeland site potential. • Determine what type(s) of habitat individual producers want to and are able to provide. Determine disturbance/management techniques appropriate to the site. • Consult with technical experts to develop grazing strategies tailored to specific ranch needs. • Establish repeatable monitoring protocols, specifically tailored to individual producers, to ensure monitoring is conducted on an annual basis to evaluate the efficacy of grazing management prescriptions. Consider various forms of monitoring such as establishing long-term photo points, utilization gauges/transects, nested plots to determine the presence/absence of key species, developing grazing response indices (Reed et. al. 1999), pasture-use map development, etc. • Maintain long-term records of timing and duration of grazing for individual pastures. • Develop contingency plans tailored to individual producers to implement during adverse conditions such as periods of drought, when monitoring has shown that desired conditions are not being	*Conservation Districts, WGFD, UW Extension, NRCS, BLM, USFS, WY State Land Board*	*TBD*	*Conservation Districts, WGFD, UW Extension, NRCS, BLM, USFS, Landowners,*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	met, water supply and soil moisture is diminishing, etc. • Develop and maintain flexibility in livestock operations to allow for contingency planning. • Consider disturbance activities (i.e. fire, mechanical treatments, etc.) to set back succession to obtain desired habitat conditions and diverse sagebrush communities.			
1.2, 1.3, 1.4	2) Encourage rotational grazing strategies to promote rangeland health.		*Need more effort*	*NRCS*
1.2, 1.3, 1.4, 4.1	3) Promote increased rangeland monitoring on all lands (public and private) within the BHSBCA to ensure rangeland health meets sage-grouse needs.		*Need more effort*	*NRCS, BLM, WY State Land Board*
5.1, 5.2	4) Develop and present a workshop series to promote livestock grazing practices that benefit livestock and sage-grouse.		*TBD*	*NA*
1.3, 1.4, 4.1	5) Develop and distribute a rangeland monitoring protocol with an emphasis on sage-grouse needs within the BHSBCA. Consult with rangeland specialists. Consider such measures as the following in conjunction with establishing rotational grazing strategies: • Establish photo points or monitoring stakes to determine location of green lines in riparian areas. • Monitor livestock trails and heavy use areas to determine if revegetation is occurring. • Increase efforts to map seasonal sage-grouse habitats. Consider seasonal habitat use when determining what type of monitoring is appropriate and where to monitor. Consider using sage-grouse fecal pellets to define seasonal habitats (based on timing of year and freshness of pellets). • Look for indicator plant species specific to appropriate rangeland site potential (i.e. hydrophytic plants in riparian areas which are indicative of increasing soil moisture/water table or those plants indicative of decreasing soil moisture). • Develop a list of indicator plants for mesic vs. xeric sites typical of rangeland sites within the BHSBCA. • Develop a suite of short-term indicator data for rangeland health as it pertains to sage-grouse habitat requirements. • Consult long-term data collected by federal land management agencies relative to sage-grouse needs (this range condition monitoring data is reported to Congress every ten years). • In general, monitor for (increase) forbs and forb diversity.	*WGFD, NRCS, BHSBLWG*	*TBD*	*WGFD*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	• Reference the Wyoming Rangelands Monitoring Guide. • Monitor for ground cover (percent bare ground vs. ground cover). Increasing percentage of bare ground is typically caused by over-utilization and not climatic conditions.			
1.3, 1.4, 3.1	6) Apply for additional funding for grazing/research projects to benefit sage-grouse.		*TBD*	*NA*
1.3, 1.4	7) Promote opportunities to improve grazing management to meet the needs of sage-grouse habitats.	*Landowners, BLM, NRCS, WGFD, WY State Land Board*	*TBD*	*NRCS, WGFD, WY State Land Board, Landowners, BLM*
1.3, 1.4	8) Adopt Wyoming Sage-grouse Conservation Plan RMPs on state trust lands with livestock grazing.	*WY State Land Board*	*TBD*	*NA*
VEGETATION TREATMENTS – *Conservation Commitments*				
1.2, 1.3, 1.4	1) Develop a standardized protocol to classify sites within BHSBCA that currently: • Require no change from current management. • Require management action for those areas in need of restoration and/or treatment within sites that have been degraded.	*BHSBLWG, BLM,NRCS, WGFD, Landowners*	*Ongoing*	*WGFD*
1.1, 1.2, 1.3, 1.4, 1.5	2) Identify private and public lands with key sage-grouse habitats including important seasonal habitats and habitats which support isolated sage-grouse populations. Protect such key habitats (which may be a dynamic classification) from invasive species, deleterious succession, improper livestock grazing practices, and energy/natural resource development within BHSBCA. Also consider suppressing wildfire in key habitats where appropriate.		*2009*	*WGFD, BLM, NRCS, Landowners*
1.4	3) Establish local standard criteria to determine a prioritized list of sites to restore (i.e. treatments in sagebrush habitats with canopy cover values outside the range necessary to sustain sage-grouse) within BHSBCA.		*2009*	*BHSBLWG*
1.4	4) Implement a minimum of one sage-grouse habitat restoration/ conservation project per year based on priority habitat enhancement project(s) that aid in the protection of quality sage-grouse habitats.		*Ongoing*	*BHSBLWG*
1.4	5) For each treatment project: establish and complete a template for work plans, including desired future condition objectives, treatment methods (i.e. ensure that a mosaic of varying shapes and sizes are created within the sagebrush and patches of decadent sage remain for nesting), seed mix and quantity, equipment and resources needed, post-treatment management (monitor results of restoration efforts) is included.		*As projects are developed*	*NA*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	management (monitor results of restoration efforts) is included.			
1.4, 5.1, 5.2	6) Conduct a workshop that demonstrates restoration/treatment efforts that worked and did not work, conduct at least one workshop every two years to discuss and portray results of sagebrush habitat restoration efforts throughout BHSBCA.		*TBD*	*BHSBLWG*
1.2, 1.3, 1.4	7) Design grazing management strategies to permit reestablishment of native sagebrush, grasses and forbs that benefit sage-grouse.		*Ongoing*	*NRCS, BLM, WY State Land Board, Landowners*
1.4	8) Coordinate and target restoration efforts between state and federal agencies and private landowners.		*Ongoing*	*NRCS*
1.4	9) Utilize existing and/or future compensation and incentive programs to restore or protect sage-grouse habitats.		*Ongoing*	*Various*
1.4, 4.1	10) Establish standard monitoring programs, protocols, and methods to evaluate status and trend of protected and enhanced habitats (i.e. establish common sampling strategies, and monitoring metrics and methods at the local scales that can be aggregated and synthesized at the range-wide scale and also establish reference points in selected representative habitats).	*UW Extension Service, NRCS*	*2007*	*BLM, NRCS, WGFD*
1.2, 1.3, 1.4	11) Develop guidelines for fire management in sagebrush ecosystems.	*WGFD, BLM*	*Completed*	*NA*
1.3, 1.4, 1.5	12) NRCS funded projects should consider ways to increase soil moisture retention to promote healthy rangelands (i.e. ground cover, healthy riparian areas, etc.).	*NRCS, Landowners*	*As projects are proposed*	*NRCS, Landowners*
VEGETATION TREATMENTS – *Proposed Management Actions*				
1.3, 1.4, 1.5	1) Discourage the use of NRCS EQIP funds to conduct sagebrush eradication practices.	*NRCS, Landowners*	*Ongoing, but not in all districts*	*NA*
1.2, 1.3, 1.4, 1.5, 1.6, 1.7	2) Formally engage local, state, and federal agencies to incorporate the elements of the BHSB Sage-grouse Conservation Plan in habitat planning and management activities.	*BHSBLWG*	*December 2007*	*NA*
1.4	3) Adjust agency sagebrush habitat management guidelines to ensure: • A mosaic of early to late seral stages of sagebrush are available for sage-grouse to meet seasonal habitat requirements; • Sagebrush canopy cover of 15-25% in nesting, brood-rearing, and winter habitats; • Conduct site-specific surveys to define suitable and potentially limiting local sage-grouse seasonal habitats prior to implementing vegetation treatments in sage-grouse habitats. Generally, no more	*BLM,USFS, NRCS, WGFD*	*TBD*	*NA*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	than 20% of a defined sage-grouse seasonal habitat type in a given area should be treated/affected until previously treated areas provide similar (in kind) seasonal habitat.			
1.4	4) Focus extension effort toward utilizing USDA programs and grants to fund wildlife projects.	*Conservation Districts, NRCS*	*TBD*	*Conservation Districts, NRCS*
1.4	5) Work with county fire agencies and land owners/managers to develop resource oriented fire management strategies, including the encouragement of allowing beneficial wildfires to burn. Consider developing guidelines for fire management in sagebrush ecosystems specific to the BHSBCA, which includes wildfire suppression guidelines that consider sage-grouse habitat health.	*BHSBLWG, WGFD*	*TBD*	*TBD*
1.2, 1.4	6) Evaluate all wildfires greater than 40 acres in occupied sage-grouse habitat to determine if rehabilitation of the burned area is needed with emphasis placed on habitats that would be susceptible to invasion by annual grasses.	*BLM, USFS, WGFD, NRCS, Landowners*	*TBD*	*BLM, USFS, WGFD, NRCS*
1.4, 4.1	7) Develop and maintain cumulative records for all vegetation treatments and wildfire (with landowner permission on private lands) to determine and evaluate site specific and cumulative impacts to sage-grouse habitats and identify recommended management practices for successful vegetation treatments.	*BLM, USFS, WGFD, NRCS*	*TBD*	*BLM, USFS, WGFD*
1.4, 3.1	8) Develop a consolidated warehouse of aforementioned cumulative records which can be accessed by multiple agencies and the public. Maintenance responsibility of this database will be assigned in the future. Consider database restrictions/access needs, especially with proprietary information.		*TBD*	*BLM, USFS, WGFD*
1.2, 1.3, 1.4	9) When requested, WGFD should assist local NRCS and BLM field offices by providing recommendations for sagebrush treatment projects.		*As projects are proposed*	*WGFD, NRCS*
FARMING – *Conservation Commitments*				
1.4, 1.5	1) WGFD actively participates on the USDA State Technical committee to ensure that conservation and restoration of functioning sagebrush ecosystems are considered in NRCS and FSA programs and policies.	*WGFD, NRCS*	*Ongoing*	*NA*
	2) Monitor the federal Farm Bill rules to recommend they do not provide federal subsidies for projects that result in sagebrush habitat conversion.		*Ongoing*	*NA*
CONFLICTING WILDLIFE MANAGEMENT – *Conservation Commitments*				
1.4, 2.1	1) Pronghorn and mule deer populations are adaptively managed so that	*WGFD*	*Ongoing*	*WGFD*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	utilization levels on key shrub species do not exceed 35% to avoid damaging sagebrush communities.			
1.4, 2.1	2) Manage elk populations to established management objectives.		*Ongoing*	*WGFD*
1.4, 2.1	3) Focus management efforts of other wildlife species towards maintaining habitats under a multiple use mandate to: • Ensure sensitive species and associated habitat components are considered in land management decisions. • Prevent a need for species listing under the Endangered Species Act. • Prioritize needed conservation work with an emphasis on habitat.	*BLM, WGFD, USFS*	*Ongoing*	*BLM*
2.1	4) Provide adequate habitats to sustain big-game populations at mutually agreed upon management objectives.	*BLM*	*Ongoing*	*BLM*
CONFLICTING WILDLIFE MANAGEMENT – *Proposed Management Actions*				
1.4, 2.1	1) Focus management efforts of other wildlife species towards maintaining habitats under a multiple use mandate to: • Ensure sensitive species and associated habitat components are considered in land management decisions. • Prevent a need for species listing under the Endangered Species Act. • Prioritize needed conservation work with an emphasis on habitat.	*WY State Land Board*	*TBD*	*TBD*
HUNTING – *Conservation Commitments*				
2.2	1) When populations are stable or increasing (based on lek count information), hunting seasons are 2 to 4 weeks with a 3-bird daily bag limit beginning no earlier than September 15.	*WGFD*	*Ongoing*	*WGFD*
2.2	2) When populations are declining (for 3 or more consecutive years based on lek count information), more conservative regulations are implemented including reduced bag limits and adjusted season dates (Implemented in years 2002-05).		*Ongoing*	*WGFD*
2.2	3) Evaluate closing those areas or sub-populations within the BHSBCA where less than 100 males are observed on all known leks within the area in three consecutive years. Following any potential closure in a given area, re-institute hunting seasons when populations have recovered where more than 100 males are observed on leks for three consecutive years.		*Dec., 2007*	*WGFD*
2.2	4) Implement hunting seasons to harvest no more than 10% of the projected fall population.		*Ongoing*	*WGFD*
4.1	5) Continue using wing barrels to estimate sex and age structure of the harvest.		*Ongoing*	*WGFD*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
4.1	6) Continue to collect hunter harvest data using a hunter survey.		*Ongoing*	*WGFD*
PARASITES AND DISEASE – *Conservation Commitments*				
2.3	1) Investigate and record sage-grouse mortalities that could be attributed to parasites or disease.	*WGFD*	*Ongoing*	*WGFD, WY State Vet Lab*
2.3	2) Promote coordination to deal with disease outbreaks where appropriate.	*WGFD, BLM, Universities, WY State Vet Lab, WY Dept. of Health*	*Ongoing*	*TBD*
PREDATION – *Conservation Commitments*				
2.4	1) Consider species-specific predator management to maintain or enhance sage-grouse populations when predation is determined to be the limiting factor and habitats can support increased sage-grouse numbers.	*WGFD, ADMB*	*TBD*	*ADMB*
2.4, 3.1, 4.1	2) Monitor the effectiveness of any predator control efforts that are implemented.		*As projects are proposed*	*ADMB, WGFD*
2.4	3) Support projects to enhance sage-grouse nesting and early brood rearing habitats, which would in turn help decrease negative affects of predation.	*BHSBLWG*	*Ongoing*	*ADMB, WGFD*
1.7, 2.5, 5.1	4) Educate public and subdivision residents about the damage cats, dogs and other domestic animals can have on sage-grouse populations.		*TBD*	*WGFD*
1.7, 2.5	5) In urban influence areas or when the need has been demonstrated, encourage control action(s) on "newcomer" predators and discourage their establishment.		*When necessary*	*ADMB, WGFD*
PREDATION – *Proposed Management Actions*				
1.1, 1.7, 2.4, 2.5	1) When power lines are necessary within 3.4 miles of sage-grouse leks, install underground power lines where feasible to minimize raptor perching/predation and sage-grouse collision with conductors. Where practical, locate aboveground power lines at least 3.4 miles from any sage-grouse breeding or nesting grounds.	*Oil & Gas Companies, Power Companies, BLM, USFS*	*TBD*	*Oil & Gas Companies*
1.1	2) Raptor-proof power poles within 0.5 miles of any sage-grouse lek to prevent raptors from perching on the poles.		*TBD*	*Oil & Gas Companies*
2.5	3) Remove above-ground power lines and poles no longer in use.	*Power Companies*	*TBD*	*Power Companies*
2.4	4) Target appropriate (species-specific) predator control in areas determined to have the highest impact to sage-grouse populations.	*ADMB*	*TBD*	*ADMB, County Predator Boards*
2.1, 2.4, 2.5	5) Conduct a species assessment on the raven (Corvus corax) to include ravens in 50CFR21.43 "Control of Depredating Birds."	*USFWS*	*TBD*	*USFWS*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
RECREATION – *Conservation Commitments*				
5.1, 5.2	1) The Wyoming Game and Fish Department issues annual news releases promoting viewing of strutting sage-grouse on leks with recommendations on proper viewing etiquette to prevent disturbance included.	*WGFD*	*Ongoing*	*WGFD*
1.6, 4.1	2) Monitor effects of public recreation on breeding, nesting and wintering sage-grouse on public lands. If significant impacts are documented, agencies will coordinate mitigation measures to address problem areas.	*WGFD, BLM, USFS*	*TBD*	*WGFD, BLM, USFS*
1.6, 4.1	3) WGFD, in cooperation with Audubon and local landowners, will manage and maintain the Hat Six lek so that disturbance to birds is minimal.	*WGFD,WY State Land Board*	*Ongoing*	
RECREATION – *Proposed Management Actions*				
1.6, 5.1, 5.2	1) Include appropriate recreational information in all materials distributed by BHSBLWG (i.e. landowner brochure, media releases, WGFD I&E presentations etc.) related to recreation and its impact on sage-grouse habitat. Recognize and publicize threats to sage-grouse by OHVs, two-track roads, vandalism, shooting, dog training and litter.	*WGFD, BLM*	*TBD*	*WGFD, BLM*
RESIDENTIAL DEVELOPMENT – *Conservation Commitments*				
1.4, 1.7	1) Provide lek maps to County governments to encourage conservation of important sage-grouse habitats.	*WGFD*	*December 2006*	*WGFD*
1.4, 1.7	2) Where possible, provide a detailed inventory of lek locations, sagebrush ecosystems and land ownership in each county as zoning and/or planning changes are requested.		*TBD*	*WGFD, BHSBLWG*
1.4, 1.7	3) Meet with the Natrona County Planner, County Commissioners, and the WY State Land Board to establish long-range protection for the Hat Six lek and surrounding habitat.	*WGFD, BHSBLWG*	*December 2007*	*WGFD, BHSBLWG*
RESIDENTIAL DEVELOPMENT – *Proposed Management Actions*				
1.4, 1.7	1) Include sage-grouse habitat conservation guidelines in zoning laws and regulations applied to subdivisions in and adjacent to sage-grouse habitat.	*County Governments*	*TBD*	*TBD*
1.4, 1.7	2) Develop sage-grouse habitat conservation guidelines for incorporation in subdivision covenants.	*BHSBLWG*	*December 2007*	*WGFD*
1.4, 1.7, 5.1, 5.2	3) Develop and distribute appropriate literature for developers and county planners.		*December 2007*	*WGFD*
1.4, 2.5	4) Meet with Casper Metro Animal Control/City of Casper and County Commissions to establish plans for reducing the number of domestic and		*TBD*	*NA*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	feral cats and dogs in the adjacent rural sage-grouse habitat and for removing food sources for ravens.			
WEATHER – *Conservation Commitments*				
1.8, 4.1	1) Representative weather data for the BHSBCA will be analyzed and published annually in the BHSBLWG Sage-grouse Completion Report.	*WGFD*	*Ongoing*	*WGFD*
WEATHER – *Proposed Management Actions*				
1.3, 1.4, 1.8 1.8, 1.9	1) During periods of drought, utilize grazing schemes that reduce impacts to sage-grouse. Develop drought contingency plans for all public grazing allotments. 2) Consider drought management of wildlife herbivory, protection of critical sage-grouse habitats from wildfire 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.	*BLM, Landowners, WGFD, WY State Land Board, USFS*	*TBD* *Ongoing*	*BLM, WY State Land Board, USFS Landowners* *Various*
PESTICIDES– *Conservation Commitments*				
2.6, 4.1	1) Investigate and record deaths and sickness that could be attributed to pesticides.	*WGFD*	*Ongoing*	*WGFD, WY State Vet Lab*
PESTICIDES – *Proposed Management Actions*				
2.6, 5.1, 5.2	1) Develop training for certified pesticide applicators that emphasizes sage-grouse considerations.	*UW Extension Services*	*TBD*	*TBD*
2.6	2) Address grasshopper infestations issues using Reduced Area Application Treatments (RAATs) approach.	*Weed and Pest Districts, APHIS*	*TBD*	*TBD*
RESEARCH – *Conservation Commitments (Ongoing)*				
1.2, 1.3, 1.4, 1.6, 1.7, 3.1	1) Implement the Hat Six Sage-grouse Project. This two-year pilot project is designed to incorporate radio telemetry to identify existing movements and preferred nesting, brood rearing, and winter habitats of sage-grouse associated with the Hat Six and Altmann leks located outside of Casper, Wyoming. Once these habitats are identified, a plan for protection of the habitat will be pursued. As the city continues to expand, these leks and	*WGFD*	*2006 – 2007*	*WGFD, BHSBLWG, WY Sage-grouse Conservation Fund*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	the surrounding habitats may be altered. A better understanding of the movements and habitat use of these sage-grouse may lead to improvements in management/planning in other areas of Wyoming where development/expansion threatens sage-grouse habitats.			
RESEARCH – *Proposed Management Actions*				
3.1, 4.1	1) If funding is available, hire a contract technician to conduct field-work for the Hat Six sage-grouse project and inventory and map sage-grouse seasonal habitats throughout the BHSBCA.	*BHSBLWG, WGFD*	*February, 2007*	*WY Sage-grouse Conservation Fund, WGFD, Industry (possibly)*
1.3, 3.1	2) Experiment with types of grazing to improve sage-grouse habitat accompanied by monitoring to determine effects on sage-grouse.	*TBD*	*TBD*	*TBD*
1.8, 3.1	3) Correlate, on a local level, historical and present weather data with historical and present sage-grouse population data to determine weather impacts to sage-grouse populations and habitat.	*TBD*	*TBD*	*TBD*
1.4, 3.1	4) Encourage research/classification that determines seasonal habitat use for individual populations.	*TBD*	*TBD*	*TBD*
1.4, 3.1	5) Promote sagebrush ecosystem mapping efforts that more accurately classify potential sage-grouse habitat and thus narrow management priorities and help track habitat change over time.	*TBD*	*TBD*	*TBD*
1.7, 3.1	6) Encourage research on potential impacts of urban development on sage-grouse and other wildlife.	*TBD*	*TBD*	*TBD*
1.1, 3.1	7) Encourage research on potential impacts of wind energy development on sage-grouse and other wildlife.	*TBD*	*TBD*	*TBD*
2.4, 2.5, 3.1	8) Encourage a predator study to help better determine predator control effects on sage-grouse populations in the BHSBCA.	*TBD*	*TBD*	*TBD*
POPULATION AND HABITAT MONITORING – *Conservation Commitments*				
4.1	1) Attempt to monitor 50% of known leks each year within the BHSBCA to ensure an adequate sample to determine population trends. At least 15% of known leks should be "counted" each year to provide a more intensive assessment of population trends. Results are published annually in the BHSBLWG Sage-grouse Completion Report.	*WGFD, BLM, USFS, Oil & Gas Companies, Coal Mines, Volunteers*	*Ongoing*	*WGFD, BLM, USFS, Oil & Gas Companies, Coal Mines, Volunteers*
4.1	2) Harvest data collected by the hunter survey and wing barrels is analyzed and published annually in the BHSB Local Working Group Sage-grouse Completion Report.	*WGFD*	*Ongoing*	*WGFD*
4.1	3) Maintain lek survey protocol.		*Ongoing*	*WGFD*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
4.1, 5.1, 5.2	4) Encourage landowners, NGOs and others to assist local agencies with local lek counts on private and public lands.		*Ongoing*	*WGFD*
5.1, 5.2	5) Educate public on importance of lek counts and why state agencies need to know where a lek is located (i.e. private lands).		*Ongoing*	*WGFD*
1.4, 4.1	6) Require sage-grouse monitoring on all habitat improvement projects where applicable.		*Ongoing*	*WGFD*
3.1, 4.1	7) Pursue a source(s) of funding to hire a technician to map sage-grouse seasonal habitats and lek perimeters within the BHSBCA and to assist with the Hat Six sage-grouse study.	*BHSBLWG*	*Ongoing*	*WGFD, BHSBLWG*
1.1, 4.1	8) Map lek perimeter boundaries to ensure adequate stipulation buffers apply when protecting occupied leks.	*BLM, WGFD*	*Ongoing, needs more effort*	*BLM, WGFD, BHSBLWG*
1.1, 4.1, 1.7	9) Identify and map nesting, brood rearing and winter habitats to enable development planning and mitigation actions in maintaining the integrity of these critical areas.		*2007 Field Season*	*BLM, WGFD, BHSBLWG*
1.4, 4.1	10) Restore and rehabilitate sagebrush communities where feasible, desirable or possible to maintain or enhance desired sage-grouse populations.	*BLM, WGFD, NRCS, Landowners*	*Ongoing*	*BLM, WGFD, NRCS, Landowners*
4.1	11) Develop and continue to refine ecological site descriptions and state-and-transition model assessments based on rangeland health procedures.	*BLM, NRCS*	*Ongoing*	*BLM, NRCS*
1.4, 4.1	12) Monitor and evaluate herbaceous understory characteristics with an emphasis on diversity of native forbs and grasses based on ecological site potential and successional status.		*Ongoing*	*BLM, NRCS*
POPULATION AND HABITAT MONITORING – *Proposed Management Actions*				
1.4, 4.1	1) Incorporate sage-grouse habitat preference characteristics related to sagebrush cover, height, growth form, age class and sagebrush species to evaluate the relationship of these characteristics to herbaceous understory requirements for sage-grouse seasonal habitats in Wyoming.	*BLM, NRCS, WGFD*	*TBD*	*BLM, NRCS*
4.1	2) Assess, monitor and evaluate shrub cover characteristics capable of supporting sage-grouse seasonal habitat. Information and data should include patch sizes, successional stages, shrub age structure, height, density, and distribution throughout the range of sagebrush ecosystems. Particular attention should be made to identify blocks, islands, corridors, and mosaic patterns and how they are arranged. It is important to maintain connectivity between habitat types. Consult existing monitoring protocols (Sather-Blair et al. in prep, Connelly et al. 2003).		*TBD*	*BLM, NRCS, WGFD*
4.1	3) Provide incentives to landowners to provide relevant information on sage-grouse on their private lands.	*NRCS*	*TBD*	*NRCS*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
INFORMATION AND EDUCATION – *Conservation Commitments*				
1.2, 1.3, 1.4, 5.1, 5.2	1) Create and distribute a Wyoming guide to enhancing sage-grouse habitat.	*WGFD*	*2007*	*WGFD*
5.1	2) Agencies should generally not provide all lek locations to individuals simply interested in viewing birds.	*WGFD, BLM, USFS*	*Ongoing*	*NA*
5.1	3) Develop and provide information related to recreation and its impacts on sage-grouse habitat.		*Ongoing*	*WGFD*
5.1	4) Publish magazine and newspaper articles and conduct presentations, news releases, field trips, etc. to educate and bring increased awareness of sage-grouse conservation issues to schools and the general public.	*WGFD, Audubon Wyoming*	*Ongoing*	*WGFD*
5.1	5) Develop a sage-grouse management link to the agency website that provides the latest news and information on sage-grouse including the state management plan, research updates, working group news, management updates and conservation news.	*WGFD*	*Completed*	*WGFD*
5.1	6) Include appropriate BHSB leks in the statewide sage-grouse lek viewing brochure to provide public viewing opportunities where disturbance can be minimized. This brochure will foster interest in, and appreciation for, sage-grouse.		*Spring, 2007*	*WGFD, WY Sage-grouse Conservation Fund*
5.1, 5.2	7) Promote hunting as a valuable component of sage-grouse conservation. Hunter harvested birds provide demographics of the fall population and hunting promotes ownership in the wildlife resource.		*Ongoing*	*WGFD*
5.1	8) Develop a sage-grouse placemat to be distributed to selected restaurants.		*Completed*	*WGFD*
5.1	9) Create a brochure to be disseminated through WGFD, tourism centers and the National Historic Trails Museum and the Fort Caspar Museum concerning sage-grouse life history, habitat and need for protection.		*Fall, 2007*	*WGFD*
5.1, 5.2	10) Develop and provide information on funding sources available to landowners who wish to improve sage-grouse habitat.		*Completed*	*WGFD*
5.1	11) Continue participating in the WGFD Heritage EXPO, Stock Growers Meetings, county fairs and other community events in conjunction with WGFD, federal agencies and volunteer groups.		*Ongoing*	*WGFD, BHSBLWG*
5.1, 5.2	12) Conduct lek tours annually hosted by the The Murie Audubon Society.	*Murie Audubon*	*Ongoing*	*Murie Audubon*
5.1	13) Provide an article for local media explaining the progress of the conservation projects on the 7E Ranch and the Martin Ranch.	*WGFD*	*Summer, 2007*	*WGFD*
INFORMATION AND EDUCATION – *Proposed Management Actions*				
5.1	1) Engage the print media and TV channels to boost public awareness of	*WGFD*	*TBD*	*WGFD*

Objective	Action	Responsible Party(s)	Time Schedule	Funding Source
	increased threats to sage-grouse populations from raven and domestic/feral dogs and cats.			
5.1	2) Involve community groups in sage-grouse projects that have year-to-year carry over (i.e. 4-H, Boy and Girls Scouts, etc.).	*WGFD*	*TBD*	*WGFD*
5.1, 5.2	3) Develop articles/stories on noxious weeds and cheatgrass for inclusion in Wyoming Wildlife, Wildlife News, and other publications and non-profit newsletters.	*Wyoming Dept. of Ag, WGFD*	*TBD*	*Wyoming Dept. of Ag, WGFD*
5.1, 5.2	4) Educate landowners on different grazing practices. Encourage involvement from the Society of Range Management. • Explain time controlled grazing and the need for the plants to recover prior to being grazed a second time. • Promote a workshop for landowners and agency personnel on grazing systems that explains the various grazing systems that are designed to benefit sage-grouse habitat and that are being used in Bates Hole.	*WGFD, NRCS, BLM,BHSBLWG, Wyoming Dept. of Ag*	*WGFD, NRCS, BLM, Audubon Wyoming, BHSBLWG, Wyoming Dept. of Ag*	*TBD*
5.1, 5.2	5) Develop and distribute educational materials regarding human practices that may allow establishment and expansion of predator populations as necessary. 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.	*WGFD*	*TBD*	*WGFD*

Recommended Management Practices for Sage-grouse Conservation

RMPs identified by the BHSB working group are provided. These recommended practices or activities are in addition to conservation commitments and proposed management actions described in this document and are most appropriate in a certain set of conditions that may or may not be present throughout the LWG area. It is the user who determines the relevance and appropriateness of the RMP, and the user may modify any given RMP to meet particular circumstances. RMPs are not implied regulations and they are not appropriate in all circumstances.

Oil & Gas, Coal/Mineral, and Wind Development

1. Consider an exception or waiver of seasonal stipulations if technologies that significantly reduce surface disturbance are used.
2. Implement proper planning to address the needs of sage-grouse when developing all natural resources and associated infrastructure. Compare development plans with mapped lek sites and habitats to minimize impacts to sage-grouse and sage-grouse habitat. Where possible, coordinate planning with other companies operating in the same area.
    - Locate all facilities in the least environmentally sensitive areas, away from riparian habitats and below ridgelines.
    - Where possible, use the same corridor for all roads, pipelines and power lines.
    - Limit the size of roads. Avoid stripping of topsoil and vegetation for construction. Use existing two-track roads where possible, or create two-track roads instead of large, permanent features.
    - Locate roads away from the bottom of drainages.
    - Post and enforce speed limits on all roads to reduce collisions with grouse.
    - Consider developing travel management plans that would allow seasonal closure of roads for all but permitted uses (i.e. well maintenance) and encourage the reclamation of unnecessary or redundant roads.
    - Limit noise from industrial development or traffic, especially in breeding and brood-rearing habitats. Establish acceptable decibel levels where appropriate.
    - Control dust from roads and other surface disturbances within sage-grouse habitats.
    - Equip compressors with mufflers or noise suppression systems. Install noise baffles to direct noise away from sage-grouse leks, especially during breeding and nesting seasons (March 15 – July 15).
    - Locate wells and surface facilities in concentrated clusters to limit overall surface disturbance. Use directional drilling to drill multiple wells from the same pad. Encourage the development of new technologies to reduce total surface disturbance within occupied sage-grouse habitat.
    - Minimize year-round activity associated with an operation. Use carpooling, synchronized shift changes, centralized collection facilities, etc.
    - Use remote monitoring for wells, pipelines, etc. to decrease activity and disturbance.
3. Immediately upon drilling completion (when practical), reclaim as much surface disturbance as possible, leaving only the producing wellhead and minimal production equipment.

- Require adequate bonds to ensure reclamation success. Compliance with revegetation standards should be required by the particular agency regulating the activity.
- Conduct vegetation surveys of areas to be developed prior to development to use for later site reclamation.
- Where mineral development occurs in sage-grouse habitat, tailor reclamation to restore, replace or augment needed habitat types.
- Use aggressive noxious and invasive weed control on all disturbed/reclaimed areas.
- Use fertilizer, irrigation, mulching, grazing, etc. to maximize the success of the revegetation.
- Encourage follow-up research on effectiveness of reclamation work (i.e. how long does it take to restore vegetative communities and bird populations?) to aid future efforts.

4. Advocate for increased well-spacing within the context of field development.
5. As sage-grouse seasonal habitat mapping efforts are completed, re-direct mitigation efforts toward protecting identified nesting and early brood rearing habitats.
6. Avoid or minimize the permitting of new or expansion of existing sand and gravel activities within 3.4 miles of occupied leks.
7. Manage water production to enhance or maintain sage-grouse habitat.
8. Avoid surface and sub-surface water depletion that impacts sage-grouse habitats.
9. Develop water sources for sage-grouse using discharge water (where acceptable quality exists).
10. Discourage impoundment construction that provides suitable breeding habitat for the mosquito species (Culex tarsalus) which carry West Nile virus.
11. Remove all trash and waste which may attract predators.

Vegetation Management

1. Develop priorities and implement habitat enhancements in areas currently occupied by sage-grouse and in historical or potential sage-grouse habitats.
    - Coordinate and target sagebrush habitat restoration efforts between state and federal agencies and private landowners.
    - Map suitable sage-grouse habitat and focus conservation and management efforts on areas where the most benefit can be realized.
    - Ensure vegetation treatments and post-treatment management actions are appropriate to the soil, climate, and landform of the area.
    - Consider various alternatives when designing sagebrush treatments.
    - Experiments in habitat manipulation should be relatively small in comparison to the range of a specific grouse population.
    - Promote research to investigate rest requirements for range following various treatments.
    - As a general rule, treat no more than 20% of any seasonal habitat type until results are evaluated through monitoring.
    - Treat sagebrush in a mosaic pattern rather than contiguous blocks.
    - Protect patches of undisturbed sagebrush within treated areas/pastures from disturbance.

- Additional treatments in adjacent areas should be deferred until the previously treated area again provides suitable sage-grouse habitat.
- Implement monitoring plans to determine the effectiveness of vegetation treatments.
- Utilize existing and/or future compensation and incentive programs to restore or protect sage-grouse habitats.
- Develop and maintain cumulative records for all vegetation treatments to determine and evaluate site specific and cumulative impacts to sage-grouse habitats and identify recommended management practices for successful vegetation treatments.
- Establish a user guide to restore sagebrush habitats based on information currently available.

2. Develop and implement wildfire suppression guidelines that address sage-grouse habitat health and management.
   - Recognize that fire provides a natural diversity component in sagebrush habitats; manage fire on a landscape and patch scale at a local level.
   - Fire management objectives should recognize that fire generally burns the better sage-grouse nesting and severe winter habitat.
   - When rehabilitation is necessary, the first priority is protection of the soil resource. Revegetate with appropriate mixtures of sagebrush, native grasses, and forbs that permit burned areas to recover to a sagebrush-perennial grass habitat.
3. Remove juniper and other conifers where they have invaded sagebrush and/or riparian sites important to sage-grouse.
4. Conduct prescribed fire in xeric sagebrush communities only where it is likely to promote sagebrush ecosystem health. Prescribed fire should maintain, enhance or promote sagebrush ecosystem health by mimicking natural fire frequencies.
5. Grazing management following sagebrush treatments or manipulations should be designed to benefit long-term sagebrush diversity and ecosystem health. Grazing management strategies should be designed to permit reestablishment of native sagebrush, grasses, and forbs that benefit sage-grouse.
6. Avoid removing sagebrush adjacent to sage-grouse foraging areas along riparian zones, meadows, lakebeds and farmland unless such removal is necessary to achieve habitat management goals.
7. Consider using fire, mechanical, or other appropriate treatments such as herbicides in areas with relatively high shrub cover (>30%) and a poor herbaceous component in order to improve brood-rearing habitats when determined necessary (i.e. canopy cover encroachment in areas once more suitable to brood rearing, as can happen in mountain shrub dominated foothill riparian areas).
8. Implement strategies to assist in prevention of the spread of noxious weeds or invasive plants detrimental to sage-grouse.
   - Compile and/or identify beneficial management practices to minimize negative impacts of invasive species control methods (and identify invasive species control methods for the area). Compile and/or identify guidelines for containment of existing infestations.
   - Prioritize and aggressively treat invasive plants in identified areas of concern.
   - Identify and map invasive plants of concern in sage-grouse habitats. Identify and treat areas with limited weed problems to decrease spreading.

- Support existing and establishment of new active CRMs that address control of invasive weeds including cheat grass.
- Hold annual Farm and Ranch Demonstrations and field tours to showcase successful invasive weed control efforts.
- Spot treat weeds instead of broadcast treatment. NRCS presently offers financial incentives for spot treatment of weeds through the Conservation Security Program and EQIP.
- Employ appropriate site preparation techniques and timely reseeding with approved seed mixes of any disturbed areas to prevent encroachment of invasive plants.

9. Develop and implement management plans for livestock grazing that consider seasonal sage-grouse habitat needs. These management plans could include a variety of grazing systems designed to reach habitat goals, including short-duration, rest rotation, etc.
   - In interactions between wildlife professionals, livestock producers and other interested parties, employ tolerance and understanding, and respect other perspectives. Focus on areas of mutual interest.
   - Evaluate effects of different grazing treatments on sage-grouse habitat condition and sage-grouse productivity, survival, and habitat use.
   - Actively educate stakeholders about grazing strategies that can be used to improve or maintain sage-grouse habitats. Create and distribute a Wyoming guide to enhancing sage-grouse habitat.
   - In general, yearlong and spring-to-fall continuous grazing schemes in sage-grouse habitat should be avoided. Yearlong and spring-to-fall grazing may be a tool if it is not continued each year.
   - Avoid heavy utilization of grazed pastures to compensate for rested pastures (a year of rest cannot compensate for a year of excessive use). Provide time for plants to recover from grazing before being grazed again.
   - Design grazing systems that provide sage-grouse habitat in riparian areas and around water sources.
   - During periods of drought, utilize grazing schemes to reduce impacts to sage-grouse by avoiding degradation of drought-stressed rangelands (e.g. adjust intensity, timing and/or duration of grazing).
   - Investigate the possibility of developing forage banks for use during periods of drought to alleviate inappropriate use by grazing animals in sage-grouse habitat.
   - Reduce disturbance to sage-grouse habitat from livestock management activities (e.g. salting or mineral placement, turnout or gathering, bed ground/camp locations, etc.).
   - Use techniques such as increased visibility, alternate location, or alternative design to build and maintain fences that are not hazards to flying grouse.
   - Look for ways to minimize negative impacts and enhance sage-grouse habitat when establishing livestock range improvement projects (e.g. water overflow for sage-grouse from water developments, placement of fences, facilities that provide raptor perch sites, construction of roads, salt grounds).
   - When feeding supplemental feed (i.e. cake or hay) in sagebrush habitat, feed in a slightly different place each day.

- Work with private landowners to prepare habitat maps, which identify seasonal habitats for sage-grouse and to develop a voluntary site-specific management program.

10. Develop water sources to benefit both crop production and healthy riparian habitat while avoiding surface and sub-surface water depletion that impacts sage-grouse habitats.
11. Consider sage-grouse seasonal habitat and life history requirements when conducting farming practices.
    - Use certified seed for planting to avoid the introduction of undesirable species.
    - Use a flushing bar on haying equipment. When possible, hay from the center of the field out, or from one side to the other. This will provide escape routes to sage-grouse in the path of haying equipment.
    - Research and develop incentives that would reward farmers who provide the type of habitat that maintains and enhances sage-grouse populations without removing additional acres from sagebrush-steppe.
    - Minimize applications of insecticides in hayfields.
    - Minimize threats of West Nile Virus by minimizing standing irrigation tail-water.
    - Promptly re-establish suitable and desirable vegetation on disturbed land to manage invasive weed encroachment.
12. Provide bird escapes (e.g. bird ladders) or covers for water tanks. Designate an agency to encourage/monitor use of bird ladders.

Parasites and Diseases

1. Develop and implement strategies to contain, investigate epidemiology, and prevent future disease outbreaks where appropriate.
2. Control and minimize mosquito breeding habitat where appropriate.

Predation

1. Better quantify and qualify the role of predation on sage-grouse in Wyoming.
2. Encourage population monitoring of sage-grouse predators and identify "sources" and control measures (including education) for "new", human induced predators.

Recreation

1. Develop travel management plans and enforce existing plans on all federal and state lands. Consider developing travel management plans that would allow seasonal closure and reclamation of roads.
2. Restrict off-road-vehicle use in occupied sage-grouse habitats.
3. Avoid recreational activities in sage-grouse nesting habitat during the nesting season.
4. Restrict organized recreational activities from March 15 – July 15 within 3.4 miles of a lek.
5. Recreational facilities should be located at least 3.4 miles from leks and in areas outside of crucial sage-grouse habitats.
6. Establish and maintain a small number of lek viewing sites and minimize viewing impacts on these sites. Viewing sage-grouse on leks (and censusing leks) should be conducted so that disturbance to birds is minimized or preferably eliminated.
7. Develop methods for measuring recreational/censusing disturbance.

8. Discourage dispersed camping within important riparian habitats occupied by sage-grouse during late summer.
9. Control dust from roads and other surface disturbances.
10. Inform the public that dog training on sage-grouse outside the hunting season is illegal. Enforce this law.

Residential Land Use

1. Encourage appropriate stocking rates of livestock, especially in rural subdivisions.
2. Encourage cluster development, road consolidation and common facilities that would have a reduced impact on sage-grouse and sagebrush habitats.
3. Maintain healthy sagebrush communities in rural subdivisions.
4. Plan development to allow for sage-grouse movement.
5. Where possible protect habitat through conservation (i.e. land exchanges, conservation easements, leases or CRP type programs).
6. Locate and manage sanitary landfills, dumps and trash transfer stations to eliminate predator impacts to sage-grouse.
7. Provide education on the effects of residential development on sage-grouse habitat and populations. Facilitate conservation districts and extension agents' ability to educate the public about sage-grouse.

Weather

1. Where drought has been documented for two consecutive years, consider implementation of Recommended Management Practices in year three that may include drought management of livestock and wildlife grazing, protection of critical sage-grouse habitats from wildfire 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. 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.

Education

1. Encourage wise use of non-renewable energy resources (namely coal generated electricity and natural gas) by consumers and industry. Conduct an educational campaign on wasteful use and its impact on sagebrush-steppe habitat. Target out-of-state consumers (e.g. CO, CA, etc.).
2. Highlight the impact each person has on natural resource depletion and habitat conversion.
3. Develop conservation material directed to other ethnicities and limited-english speaking populations.
4. Increase conservation education in schools. Target all age groups.

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.

Crucial Habitat. Any particular seasonal range or habitat that has been documented as the determining factor in a populations ability to maintain and reproduce itself at a certain level over the long term.

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-leafed 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)

Lek. A traditional courtship display area attended by male sage-grouse in or adjacent to sagebrush dominated habitat. Designation of the site as a lek requires observation of two or more male sage-grouse engaged in courtship displays. In addition new leks must be confirmed by a survey conducted during the appropriate time of day and during the strutting season. Observation of sign of strutting activity can also be used to confirm a suspected lek.

Annual status – Each year a lek will be determined to be in one of the following status categories:

Active. Any lek that has been attended by male sage-grouse during the strutting season. Presence can be documented by observation of birds using the site or by signs of strutting activity.

Inactive. A lek where sufficient data suggests that there was no strutting activity through the course of a strutting season. A single visit without strutting grouse being seen is not adequate documentation to designate a lek as inactive. This designation requires documentation of either an absence of birds on the lek during multiple (3+) ground visits under ideal conditions (4/1-5/7, no precipitation, light or no wind, ½ hour before to 1 hour after sunrise) **or** a ground check of the exact known lek site late in the strutting season (after 4/15) that fails to find any sign (droppings/feathers) of strutting activity. Data collected by aerial surveys may not be used to designate inactive status.

Unknown. Leks that have not been documented either active or inactive during the course of a strutting season.

Based on annual status a lek may be put into one of the following categories for management purposes:

Occupied Lek. A lek that has been active during at least one strutting season within the last ten years. Management protection will be afforded to occupied leks.

Unoccupied Lek. (Formerly termed "historical lek".) There are two types of unoccupied leks, "destroyed" or "abandoned". Management protection will not be afforded to unoccupied leks.

Destroyed lek. A formerly active lek site and surrounding sagebrush habitat that has been destroyed and no longer capable of supporting sage-grouse breeding activity. 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 do not require monitoring unless the site is reclaimed to suitable sage-grouse habitat.

Abandoned lek. A lek in otherwise suitable habitat that has not been active during a consecutive ten-year period. Before a lek is designated "abandoned" it must be confirmed as "inactive" (see above criteria) in at least four non-consecutive strutting seasons spanning the ten years. Once designated "abandoned", the site should be surveyed at least once every ten years to determine whether or not the lek has been reoccupied.

Undetermined Lek. Any lek that has not been documented as being active in the last ten years but does not have sufficient documentation to be designated unoccupied. Management protection will be afforded to undetermined leks until their status has been documented as unoccupied.

Lek Complex. A group of leks in close proximity between which male sage-grouse may be expected to interchange from one day to the next. A specific distance criteria does not yet exist.

Lek Count. A census technique that documents the actual number of male sage-grouse observed on a particular lek or complex of leks using the methods described below.

Lek Survey. A monitoring technique designed primarily to determine whether leks are active or inactive and obtaining accurate counts of the numbers of males attending is secondary.

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.

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.

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Appendix I. Funding Opportunities for Wyoming Sage-grouse Conservation Efforts.

This list of potential funding sources is not intended to be all encompassing. Various private foundations, companies and individuals not listed below often partner in conservation efforts. Finding and making contact with these potential partners is best accomplished on a local level. The list below includes funding sources that can address various scales of projects ranging from the individual landowner to multi-state efforts. Contact the sources for detailed information, eligibility, and application criteria.

State of Wyoming Sources:

Wyoming Wildlife and Natural Resource Trust Account - Created by legislative action in 2005 for the purposes of preserving and enhancing Wyoming's wildlife and natural resources. Income from the trust account is used to fund a wide variety of conservation programs. http://wwnrt.state.wy.us

Wyoming Game and Fish Department (WGFD) Trust Fund - Matching grants program for riparian or upland habitat improvement, water development, and industrial water projects. http://gf.state.wy.us

WGFD/U.S. Fish & Wildlife Service – Landowner Incentive Program (LIP) - Provides Federal funds to enhance habitats for sensitive fish and wildlife species on private lands. Priorities in Wyoming are grassland, sagebrush and prairie watersheds. Matching funds, goods or services are required. http://gf.state.wy.us

WGFD/Wyoming State General Fund – Wyoming Sage-Grouse Conservation Fund - Funding approved by the legislature via the Governor's budget request designed to implement projects identified in local Sage-Grouse Conservation Plans. http://gf.state.wy.us

Wyoming Animal Damage Management Board (ADMB) - Provides funding for the purposes of mitigating damage caused to livestock, wildlife and crops by predatory animals, predacious birds and depredating animals or for the protection of human health and safety. http://www.wyadmb.com

Federal Sources:

U.S. Dept. of Interior, Fish and Wildlife Service *http://www.fws.gov*

Partners for Fish and Wildlife Program – Provides assistance to private landowners who want to restore or improve habitat on their property. The landowner is reimbursed based on the cost sharing formula in the agreement, after project completion.

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

Cooperative Conservation Initiative - Supports efforts to restore natural resources and establish or expand wildlife habitat. Maximum Federal share is 50%.

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

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

U.S.D.A. Farm Service Agency (FSA) *http://www.fsa.usda.gov/pas/*
Conservation Reserve Program (CRP) - A voluntary program for agricultural landowners. Through CRP, you can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers and enhance wildlife habitat on eligible agricultural land.

U.S.D.A. Natural Resource Conservation Service (NRCS) *http://www.wy.nrcs.usda.gov*
Conservation Innovation Grants (CIG) - CIG is a voluntary program that enables the NRCS to work with public and private entities to accelerate the development and adoption of innovative conservation approaches and technologies in conjunction with agricultural production.

Conservation Technical Assistance (CTA) - Provides voluntary conservation technical assistance to land-users, communities, units of state and local government, and other Federal agencies in planning and implementing conservation systems. This assistance is for planning and implementing conservation practices that address natural resource issues.

Environmental Quality Incentives Program (EQIP) - Provides a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

Wildlife Habitat Incentives Program (WHIP) – Provides a voluntary program to develop and improve wildlife habitat primarily on private land by providing both technical assistance and up to 75% cost-share assistance to establish and/or improve fish and wildlife habitat.

Sage-Grouse Restoration Project (SGRP) – Cooperative effort involving private landowners, agencies, organizations and universities in a process to evaluate and document, through research and demonstration areas, the effects of NRCS conservation practices in restoring sage-grouse habitat and populations.

Grazing Land Conservation Initiative (GLCI) grants - A nationwide collaborative process of individuals and organizations working to maintain and improve the management, productivity,

and health of the Nation's privately owned grazing land. This process has formed coalitions that actively seek sources to increase technical assistance and public awareness activities that maintain or enhance grazing land resources.

Cooperative Conservation Partnership Initiative (CCPI) - A voluntary program established to foster conservation partnerships that focus technical and financial resources on conservation priorities in watersheds and airsheds of special significance. Under CCPI, funds are awarded to State and local governments and agencies; Indian tribes; and non-governmental organizations that have a history of working with agricultural producers.

Conservation Security Program (CSP) - A unique program that goes beyond the past approach of installing conservation practices. Instead, CSP offers rewards to those who have been good stewards of the soil and water resources on their working agricultural land. It also offers incentives for those who wish to exceed the minimum levels of resource protection and enhance the natural resources on the land they manage. The program is available in designated watersheds.

U.S. Dept. of Interior, Bureau of Land Management *http://www.blm.gov*
Challenge Cost Share – This program is designed to leverage funds with partners to monitor and inventory resources; implement habitat improvement projects; develop recovery plans; protect or document cultural resources; provide enhanced recreational experiences; and to better manage wild horse and burro populations. Matching funds, goods or services are required.

Cooperative Conservation Initiative (CCI) – CCI was designed to remove barriers to citizen participation in the stewardship of our natural resources and to help people take conservation into their own hands by undertaking projects at the local level. Projects must seek to achieve the actual restoration of natural resources and/or the establishment or expansion of habitat for wildlife. Matching funds, goods or services are required.

U.S.D.A. Forest Service *http://www.fs.fed.us*
Cooperative Project Funding – Contact local U.S. Forest Service staff for information about opportunities to develop partnerships in projects involving National Forests or National Grasslands.

Partnership Resource Center - The Partnership Resource Center of the National Forest Foundation (NFF) and the USDA - Forest Service (FS) provides partnering organizations and FS staff with the information to enhance working relationships. Partnerships expand opportunities for obtaining grants. Many funding sources prefer or require them because projects involving partnerships have an increased potential for success. http://www.partnershipresourcecenter.org

Other potential funding sources include but are not limited to:

Wildlife Heritage Foundation of Wyoming - The Wyoming Wildlife Heritage Foundation is an independent, charitable organization whose purpose is to provide financial support, through philanthropy, to critical wildlife conservation efforts in Wyoming. http://whfw.org

Wyoming Governor's Big Game License Coalition - Funding generated from the sale of Governor's licenses placed in five accounts: bighorn sheep, moose, elk, mule deer and general wildlife. Funds administered by the Wildlife Heritage Foundation of Wyoming. http://whfw.org

National Fish and Wildlife Foundation (NFWF) - General Matching Grant Program - Provides matching grants to priority projects that address fish and wildlife conservation and the habitats on which they depend, work proactively to involve other conservation and community interests, leverage NFWF funding, and evaluate project outcomes. Government agencies, educational institutions, and nonprofit organizations may apply. Grants typically range from $10,000-$150,000. http://www.nfwf.org

National Fish and Wildlife Foundation - Native Plant Conservation Initiative (NPCI) - NPCI grants of federal dollars are provided to non-profit organizations and agencies for conservation of native plants. NPCI grants range from $5,000 to $40,000, averaging $15,000. Non-Federal matching funds, goods or services are required. There is a strong preference for "on-the-ground" projects that involve local communities and citizen volunteers in the restoration of native plant communities. http://www.nfwf.org/programs/npci.cfm

National Fish and Wildlife Foundation - Pulling Together Initiative (PTI) - Provides support for the formation of local Weed Management Area (WMA) partnerships. These partnerships engage federal resource agencies, state and local governments, private landowners, and others in developing weed management projects within an integrated pest management strategy. Non-Federal matching funds, goods or services are required. http://www.nfwf.org/programs/pti.cfm

Intermountain West Joint Venture (IWJV) - Joint Venture Cost-Share - Habitats within the IWJV area support nearly 100% of the range of all high priority sagebrush steppe landbird species, such as: Sage Sparrow, Sage Thrasher, Sage-Grouse and Brewer's Sparrow. The purpose of Cost-Share is long-term conservation of bird habitat through partnerships. http://iwjv.org/costshare.htm

The Nature Conservancy (TNC) - TNC works with conservation supporters and partner organizations to create funding for conservation worldwide using a variety of creative methods. http://nature.org

Tom Thorne Sage-grouse Conservation Fund – Provides grants for the conservation of sage-grouse in the Upper Green River Basin. The fund was created by Shell Exploration & Production Co. and managed by a board overseen by the Wyoming Community Foundation. www.wycf.com

Rocky Mountain Elk Foundation (RMEF) - RMEF is a wildlife conservation organization with an emphasis on elk. It advocates sustainable, ethical use of resources and seeks common ground among stakeholders. RMEF funds habitat restoration and improvement projects, acquires land or conservation easements. http://www.rmef.org

Mule Deer Foundation (MDF) - MDF's goals center on restoring, improving and protecting mule deer habitat. MDF achieves its goals through partnering with state and federal wildlife

agencies, conservation groups, businesses and individuals to fund and implement habitat enhancement projects on both public and private lands. http://www.muledeer.org

One Shot Antelope Foundation -Water for Wildlife - Water for Wildlife is a conservation program designed to benefit wildlife and the environment in arid regions of the West. Emphasis focuses on the development of supplemental water resources in areas where both the habitat and wildlife are being impaired by lack of this vital resource. http://www.waterforwildlife.com

North American Grouse Partnership (NAGP) - Promotes the conservation of prairie grouse and the habitats necessary for their survival and reproduction. http://www.grousepartners.org

Pheasants Forever (PF) – Some sage-grouse populations in Wyoming occur within areas that have a local PF chapter. Local chapters determine how their funds are spent. Game birds other than pheasants may be eligible for funding. http://www.pheasantsforever.org/chapters/

Appendix II. Project proposal for the Hat Six Sage-grouse Habitat Use Research Project (Pilot Study).

PROJECT PROPOSAL (AUGUST 2005)

PROJECT TITLE: Hat Six Sage-grouse Habitat Use Research Project (Pilot Study)

SUBMITTED BY: Rebecca Schilowsky, Daryl Lutz

STUDY AREA: Casper Biologist District. The primary study area will consist of those areas within a 10-mile radius of the Hat Six and Altmann sage-grouse leks, located in small and upland game management units 27 and 35. However, if radio-collared sage-grouse disperse out of the primary area, the study area will expand to include their movements.

> **Land Status:** Intermixed public (BLM, State) and private. Land use patterns include domestic livestock grazing, farming, recreational activities, and urban expansion/development.
>
> **Present Habitats:** At lower elevations, dominant species include cottonwood (*Populus sp.*), willow (*Salix sp.*), and agricultural croplands and pastures. Intermediate elevations are dominated by Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), rabbitbrush (*Chrysothamnus spp.*), black greasewood (*Sarcobatus vermiculatus*), and mountain mahogany (*Cercocarpus montanus*). Higher elevations are dominated by limber pine (*Pinus flexilis*), ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), and aspen (*Populus tremuloides*).
>
> **Topography:** Topography in the primary study area ranges from flats, rolling hills, benches, and draws at lower elevations to mountainous terrain (slopes, ridges, and canyons) at higher elevations. Elevation ranges from 1,400 to 2,200 meters.
>
> **Water:** Water in the primary study area varies from limited to abundant, based on physiographic location, and is primarily in the form of stock ponds, springs, and streams.

PROJECT DESCRIPTION: This two-year pilot project is designed to incorporate radio telemetry to identify existing movements and preferred nesting, brood rearing, and winter habitats of sage-grouse (*Centrocercus urophasianus*) associated with the Hat Six and Altmann leks located outside of Casper, Wyoming. Once these habitats are identified, a plan for protection of the habitat may be pursued. As the city continues to expand, these leks and the surrounding habitats may be altered. A better understanding of the movements and habitat use of these sage-grouse may lead to improvements in management/planning in other areas of Wyoming where development/expansion threatens sage-grouse habitats.

Objectives for this pilot project are to: (1) document nesting, brood rearing, barren hen summering habitat, and winter habitats through the use of radio telemetry to identify seasonal movements from the Hat Six and Altmann sage-grouse leks. This is the primary objective of this pilot project. Along with this objective, additional information such as nesting site habitat

selection, nesting success, and identification of nest predators will be gathered where feasible. (2) Monitor sage-grouse responses to vehicle observer activity, and (3) Use GIS technology to document changes to habitat within a 4-mile radius of these leks over the past 30 years or as image availability allows. This objective may be linked to a remote sensing project being conducted for Keith Schoup (Casper Habitat Biologist) and may only require a detailed analysis of the project area in relation to objective 1.

Methodology:

Objective 1:

Similar to techniques used by Holloran (1999), during the spring breeding season (15 March – 30 April) of 2006, 20 female and 10 male sage-grouse in the vicinity of the Hat Six and Altmann leks will be captured using night-lighting techniques and affixed with a necklace-type, mortality-sensing radio transmitter. Seasonal movements and habitat use data will be collected by tracking the radio-collared birds throughout the year. Using the homing technique, the birds will be located during the spring, summer, fall (and winter when ground access is possible), and when a mortality signal is transmitted, with a hand-held, 3-element Yagi antenna and ATS receiver (Advanced Telemetry Systems, Isanti, MN). A telemetry-equipped fixed-wing aircraft will be used to locate the birds during the winter (weekly) when ground access is not possible, and as necessary to document long distance movements. Nesting sites will be located and the area marked. Nesting success will be determined when the hen abandons the site. Unsuccessful nests will be investigated to determine the cause of the nest failure, (i.e. predation, abandonment, nonviable eggs, etc.).

Objective 2:

Radio-collared male and female sage-grouse from both the Hat Six lek (treatment) and the Altmann lek (control) will be observed for responses to vehicle activity. The Altmann lek is not situated near a road, thus serving as the control. Road vehicle counters will be used to document daily traffic during the period when sage-grouse are occupying the lek. Lek viewing data will be documented during lek counts. Data such as daily male lek attendance, amount of time per day males spend on the lek, and the number of predator visits (human presence could potentially decrease the impact of eagles on the lek) can be compared between the two leks and can be obtained from observing the collared birds. Furthermore, differences in lek-to-nest distance, nest initiation, and nesting success data collected from the collared hens will be analyzed to estimate any female sage-grouse response to increased human activity.

Objective 3:

As stated above, this objective would be best achieved in conjunction with a detailed analysis of the project area as a subcategory of the remote sensing vegetation analysis project currently underway. Work associated with this objective will begin the summer of 2005, as data from sagebrush-grassland vegetation transects---such as percent canopy cover of grasses and forbs, and percentage of live sagebrush---will be collected by an intern working with Keith Schoup.

PURPOSE AND NEED

Sage-grouse attendance at the Hat Six lek has declined in recent years. Public viewing opportunities are excellent at this lek, as it lies adjacent to a well-maintained county road within a 15-mile drive of Casper. The lek and associated nesting habitats occupy private and state lands. Habitat alterations in the form of subdivisions, agricultural croplands, and sagebrush removal treatments have likely affected the number of birds attending this lek and the nearby Altmann lek. In addition, there may be some affect from increased vehicle traffic from observers watching the strutting activity. Major subdivision development appears imminent along the Hat Six Road corridor as the City of Casper increases development easterly. The goal of this pilot project will be to provide guidance in protection of crucial habitats utilized by sage-grouse from this lek complex and to assist Natrona and Converse County planning efforts in identifying this important area.

SPECIFIC QUANTIFIABLE WILDLIFE BENEFITS: The results of this pilot study will help enable land and wildlife managers to better understand the distribution and habitats used by this relatively isolated grouse population. As urban development continues to encompass remaining grouse habitats, primarily on State of Wyoming lands, this data should increase our ability to more effectively conserve and perhaps improve critical habitats for this sub-population.

PROJECT GOALS: The goals of this pilot project are: (1) Determine survival, seasonal movements and habitat use of sage-grouse utilizing the Hat Six and Altmann leks to better understand this relatively isolated sage-grouse population, (2) determine potential habitat-related limiting factors to sage-grouse in this population, and (3) create a baseline for comparison of possible effects of urban development on this sage-grouse population.

PROJECT WORK PLAN/TIME LINES:

July 2005 – February 2006: Initiate pilot project, write study plan, obtain necessary equipment (i.e. radio-collars, telemetry equipment, traffic counters, etc.) for the project, and begin organization of personnel for project. Initiation of the remote sensing project via Keith Schoup, the Casper Habitat Biologist.

March – April 2006 (Spring Breeding Season): Initiate pilot project, capture and radio-collar sage-grouse, begin tracking radio-collared birds to evaluate survival, movements, and habitat use. Begin monitoring responses of sage-grouse to vehicle observer activity.

May 2006– February 2007: Track radio-collared birds to evaluate survival, seasonal movements, habitat use during nesting, brood rearing, summering, and wintering periods, nest initiation, and nesting and brood rearing success. Identify causes of mortalities and nesting failures.

March – April 2007 (Spring Breeding Season): Capture and radio-collar additional grouse to bring sample size back up, continue tracking radio-collared birds to evaluate survival, movements, and habitat use. Continue monitoring responses of sage-grouse to vehicle observer activity.

May 2007 – June 2008: Track radio-collared birds to evaluate survival, seasonal movements, habitat use during nesting, brood rearing, summering, and wintering periods, nest initiation, nesting and brood rearing success. Identify causes of mortalities and nesting failures. Complete analysis and summarize all collected data. Complete and publish final report.

Total Cost

Project Total = $21,000 (FY06 $12,500, FY07 $8,500)

Cost breakdown: (Personnel costs will not be paid from this project's budget.)

FY06:

A4060 Avian Transmitter Necklaces – 30 necklaces @ $180 ea. = $5,400
folding, 3-element Yagi Antenna Setup – 2 @ $120 ea. = $240
Replacement Cables – 8 @ $12.50 ea. = $100
Flight time = $4,400
Personal Vehicle Mileage – 3000 miles @ $0.405/mile = $1,215
Traffic Counters – 2 @ $300 ea. = $600
Miscellaneous = $545

FY07:

A4060 Avian Transmitter Necklaces – 10 replacement necklaces @ $180 ea. = $1,800
Equipment Repair = $500
Replacement Cables – 8 @ $12.50 ea. = $100
Flight time = $4,400
Personal Vehicle Mileage – 3000 miles @ $0.405/mile = $1,215
Miscellaneous = $485

Appendix III. Descriptions of ongoing conservation projects within the BHSBCA funded through the Wyoming Governor's Sage-grouse Conservation Fund (via the BHSBLWG) and NRCS EQIP funds.

Martin Ranch Project

The Martin Ranch Project aims to increase the herbaceous forage component available to wildlife and livestock through prescribed fire and fencing. The project area comprises 3,735 acres dominated by mountain big sagebrush and Idaho fescue. Approximately 40% of the project area contains mountain big sagebrush with a live canopy cover between 25% - 40%. In 2006, 130 acres of this dense sagebrush were burned and approximately 22,000 ft of high tensile electric fence was installed. Another 200 - 400 acres are scheduled to be burned in the spring of 2007 with plans to expand the project further in coming years. Sage-grouse use the area for nesting, early brood-rearing, and late brood-rearing. This area also receives summer and fall pronghorn use, yearlong mule deer use, and primarily winter elk use. The anticipated increase in diversity of native forbs and insects is intended to increase the quality and quantity of forage available for sage-grouse chicks. Meanwhile, the anticipated increase in grass and forb production and young sagebrush plants will provide a greater quantity and quality of forage for mule deer, elk, and pronghorn. Finally, the fencing will provide greater control of livestock and allow for more effective grazing management which should improve rangeland health over the long term.

7E Ranch Project

The 7E Ranch Project aims to increase the herbaceous forage component available to wildlife and livestock through the implementation of a rotational grazing system. The project requires cross-fencing and water development for up to six pastures covering approximately 16,000 acres in Shirley Basin. Upon establishment of the rotational grazing system, the project intends to conduct sagebrush management practices through prescribed burning and Lawson aeration (if available) to revitalize sagebrush communities on the ranch. This area also receives summer and fall pronghorn use, yearlong mule deer use, and some winter elk use. The anticipated increase in diversity of native forbs and insects is intended to increase the quality and quantity of forage available for sage-grouse chicks. Meanwhile, the anticipated increase in grass and forb production and young sagebrush plants will provide a greater quantity and quality of forage for mule deer, elk, and pronghorn. Finally, the fencing will provide greater control of livestock and allow for more effective grazing management which should improve rangeland health over the long term.