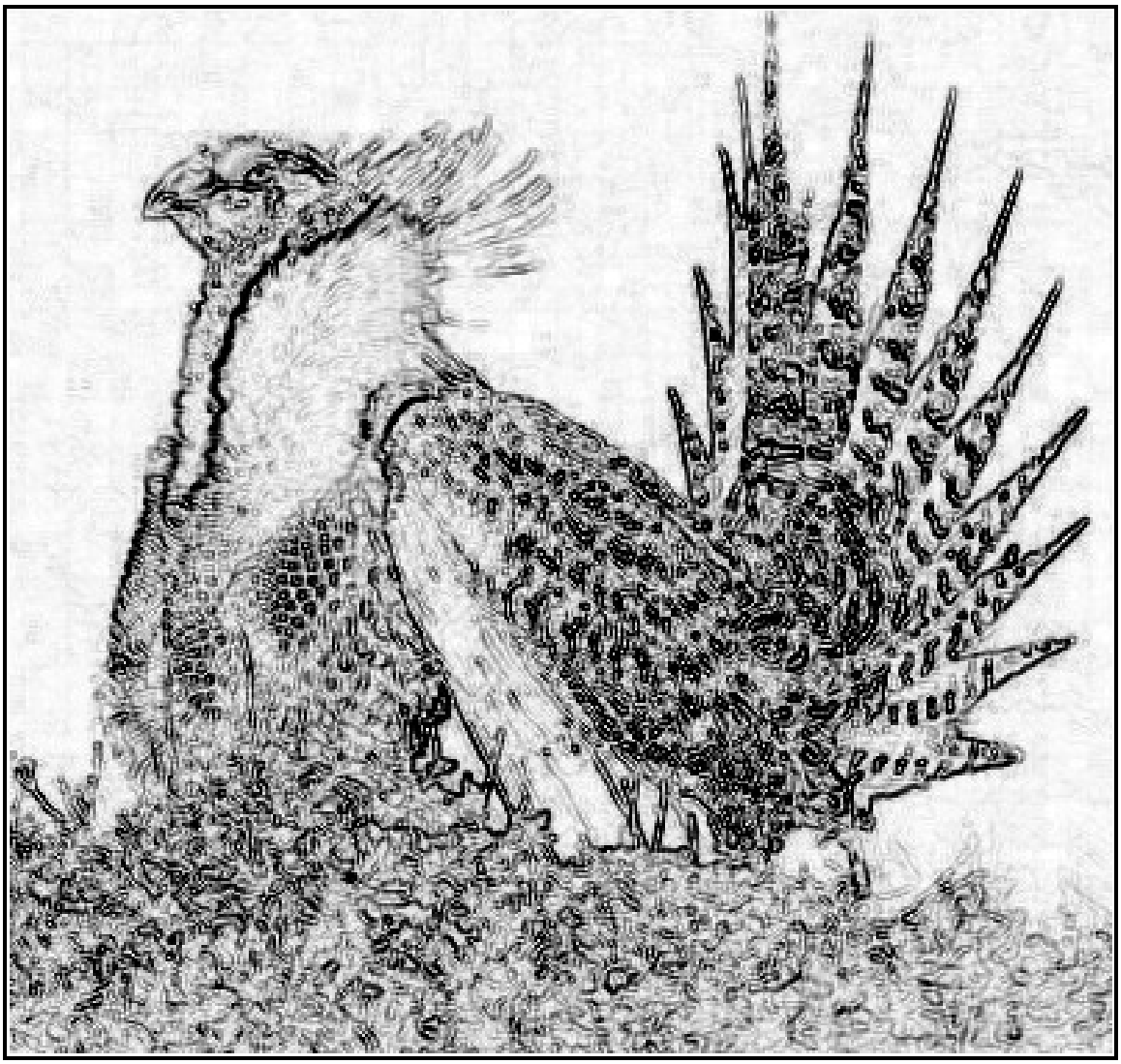
Northeast Wyoming Sage-Grouse Conservation Plan

August 15th 2006



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"Working Cooperatively to Benefit Sage-grouse"

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EXECUTIVE SUMMARY

The Northeast Wyoming Sage-grouse Working Group was established in March 2004 to develop and facilitate 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 13 members representing government agencies, industry, agriculture and wildlife stakeholders. The Northeast Wyoming Sage-grouse Conservation Plan encompasses most of the Powder River, Belle Fourche and Cheyenne River drainage basins of Wyoming and includes about 23,000 square-miles.

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.

Sage-grouse are found throughout the sagebrush grassland habitats of northeast Wyoming. Occupied habitat is fairly contiguous east of the Bighorn Mountains to the Black Hills and the Wyoming-Nebraska state line with the exception of woodland and agricultural lands. Sagebrush-grassland habitat in northeast Wyoming generally has lower densities of sagebrush and is less continuous than areas of Wyoming that support greater numbers of sage-grouse.

Most of the occupied sage-grouse habitat in northeast Wyoming is privately owned. Approximately 70 percent of known leks, or strutting grounds used during the breeding season, are found on private land; the remaining 30 percent are found on U.S. Forest Service, Bureau of Land Management and State lands.

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

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

Habitat fragmentation and degradation, disturbance and direct mortality are influences affecting sage-grouse. The Working Group identified oil and gas development, vegetation management and invasive plants as the factors with both the most influence on the northeast Wyoming sage-grouse population and as those factors that might most effectively be addressed to provide the greatest benefit for sage-grouse conservation in northeast Wyoming. Weather is considered to be an important 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.

Conservation Strategy

The goals of this conservation plan are to:

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

Commitments, recommended 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 the potential and documented impacts and issues associated with the long-term management of the species.

The Working Group will be soliciting additional projects for evaluation for the group's support and recommendation for financing as project funding becomes available.

This plan prioritizes areas for conservation actions that support the highest densities of grouse during the breeding season. These areas can also provide nesting, early brood-rearing and winter habitats. Conserving and enhancing the best habitat in the working group area is important, as is implementing actions to mitigate limiting factors in threatened habitat. The plan recognizes that ongoing research will enhance strategic tools.

The Lake DeSmet Conservation District Sagebrush/Grassland Restoration Program (Appendix I) is a great example of a partnership that considered opportunity, cooperating funds, limiting factor ranking and seasonal habitats. These types of efforts will be essential in promoting sage-grouse conservation efforts with private landowners in northeastern Wyoming.

Just released University of Montana research (Naugle 2006b) findings that energy development in the Powder River Basin is significantly impacting some segments of

the sage-grouse population will be considered by the Working Group. The planning schedule for completion of this conservation plan precludes getting final recommendations incorporated at this time. Preliminary conservation concepts are included in the Conservation Strategy.

Public input on the draft conservation plan was gathered during a series of five public meetings held throughout northeast Wyoming. Attendance was limited with 17 people attending. In addition, five organizations and agencies provided written comments.

PREFACE

The Northeast Wyoming Sage-grouse Working Group was established in March 2004 with the self-identified mission of, “working cooperatively to benefit sage-grouse”. The Wyoming Game and Fish Department established working groups throughout the State to develop local conservation plans that benefit greater sage-grouse (*Centrocerucus urophasianus*), hereafter called sage-grouse, and other sagebrush obligate species. The plans will identify management practices and financial and personnel means to implement these practices for the purpose of improving sage-grouse numbers. Originally, the Northeast Wyoming Sage-grouse Working Group Area included the Powder River and Belle Fourche River Drainages. The Cheyenne River drainage area was added in September 2004.

The group includes 13 members representing major interests within northeast Wyoming, including the Wyoming Game and Fish Department, the Bureau of Land Management, the U.S. Forest Service, the Natural Resources Conservation Service, County Conservation Districts, agriculture, coal mining, oil and gas development, conservation groups and sportsmen. Working group members represent their particular interests and provide liaison with the groups they represent. Working Group meetings are conducted about every month, typically last a day, and always include a public comment session regarding the program.

During its first year, the Northeast Wyoming Sage-grouse Working Group learned about sage-grouse populations, trends, habitat use and current status; took field trips to learn more about sagebrush-grassland habitats; published informational brochures about wildlife friendly livestock water tank construction and seeding practices; made presentations to state agencies; and identified private individuals who had made significant contributions to sage-grouse conservation

The primary objective of the Working Group is to develop a local conservation management plan for sage-grouse within northeast Wyoming, which is presented here.

NORTHEAST WYOMING SAGE-GROUSE WORKING GROUP MEMBERS

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INTRODUCTION

Background

Sage-grouse have long been part of Wyoming and the Wyoming way of life. Native Americans mimicked them, early travelers wrote about them, and pioneers ate them. For generations of Wyoming hunters, the opening day of "sage chicken" season was the first official day of autumn. In recent years, wildlife enthusiasts have been fascinated by the birds' dramatic spring courtship rituals.

Historical accounts suggest sage-grouse numbers were abundant in the 19th century. Populations fluctuated after the turn of the century due to market and subsistence hunting as well as competition with high numbers of livestock and drought (WGFD in prep). In 1906, Wyoming game warden John Duncan noted, "sage hens are decreasing rapidly." Drastic declines were again observed in the 1930's, but it appeared sage-grouse numbers rebounded in the late 1940's. In 1952, the Wyoming Game and Fish Commission published R. L. Patterson's, "*The Sage-grouse in Wyoming*". It was at that time, and still remains, the most exhaustive scientific publication about the bird and its habitat requirements within the state and region.

By the mid-1950's, biologists in other western states were expressing concerns about declining populations of sage-grouse and sagebrush-steppe habitats. This led the Western Association of Fish and Wildlife Agencies – of which Wyoming was, and is, a member – to establish the Western States Sage-grouse Technical Committee in 1956. Since that time, much sage-grouse information has been assembled, including the initial, "*Guidelines for the Protection of Sage-grouse*" (Braun et al. 1977), first published in 1977. This guideline was revised, updated and expanded in 2000 to become, "*Guidelines to Manage Sage-grouse Populations and their Habitats*" (Connelly et al. 2000). The guidelines are intended to assist biologists and land managers in managing sage-grouse populations and sagebrush-steppe habitats throughout the West. The Western States Sage-grouse Technical Committee continues to meet regularly to address the needs of the species.

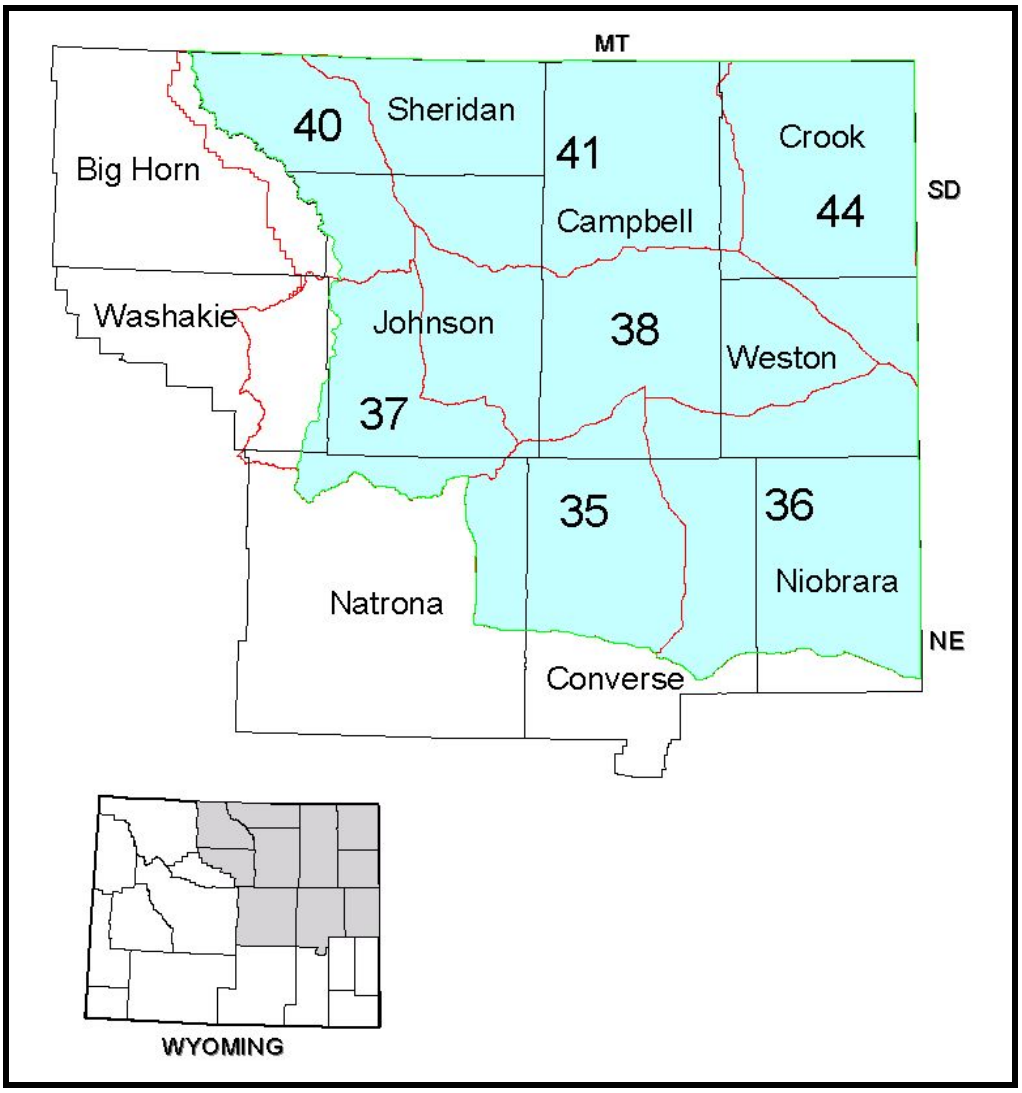
According to the recently completed range-wide Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats (Connelly et al. 2004), the numbers of sage-grouse have declined across their range during the past 50 years, as has the quality and distribution of the bird's requisite sagebrush-steppe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

Sage-grouse are found throughout the sagebrush grassland habitats of northeast Wyoming. Occupied habitat is fairly contiguous east of the Bighorn Mountains to the Black Hills and the Wyoming-Nebraska state line with the exception of woodland and agricultural lands. Sagebrush-grassland habitat in northeast Wyoming generally has lower densities of sagebrush and is less continuous than areas of Wyoming that support greater numbers of sage-grouse.

Most of the occupied sage-grouse habitat in northeast Wyoming is privately owned. Approximately 70 percent of known leks, or strutting grounds used during the breeding season, are found on private land; the remaining 30 percent are found on U.S. Forest Service, Bureau of Land Management and State lands.

The Northeast Wyoming Sage-grouse Working Group conservation plan area is shown in Figure 1. The area includes Wyoming Game and Fish Department (WGFD) Small Game/Upland Game Management Areas 35, 36, 38, 41 and 44 and the portions of Areas 37 and 40 occurring east of the Bighorn Mountain divide. These management areas do not correspond specifically to sage-grouse population boundaries, but are used for general data collection and reporting for all small and upland game species.

Figure 1. Northeast Wyoming Sage-grouse Working Group conservation plan area (shaded portion) including counties and WGFD upland bird management areas.



The Wyoming Game and Fish Department, federal agencies, coal mines and volunteers have conducted lek counts and surveys each spring within northeast Wyoming since at least 1967, providing the best management data currently available for sage-grouse. Lek searches may have been conducted earlier; however, few records exist for data verification. 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 include usually only one spring visit and are intended to determine general lek status.

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, wing data provide a much more reliable indicator of recruitment than do brood data. In northeast Wyoming, adequate numbers of wings are difficult to obtain because of the low number of birds harvested. The large number of roads makes it difficult to place wing barrels at a few key junctions to maximize wing collection.

During the late 1960's and early 1970's, most known sage-grouse leks were counted each spring. In the late 1970's, sage-grouse lek searches became a requirement for area coal mines. Private consultants typically conducted the work following established lek count protocol. Lek count data from the coal mines provide the most reliable indicators in sage-grouse population trends between Gillette and Wright since the late 1970's and is the only consistent lek count data available from the 1980's for northeast Wyoming.

Past habitat management for sage-grouse in northeast Wyoming has focused mainly on the protection of breeding and nesting areas. Protection efforts have primarily occurred through project review processes conducted by some State and Federal agencies. These project reviews promote sage-grouse conservation by requiring minimal disturbance on and around leks and protecting adjacent habitats during the sage-grouse nesting and early brood-rearing periods.

Most sage-grouse populations in Wyoming are hunted, although some portions of the state have been closed because estimated populations within those areas are less than the minimum number required for hunting. Historically, sage-grouse hunting seasons in Wyoming opened in early September. Research indicates that a late September opener has 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). For this reason, sage-grouse seasons in Wyoming currently open in late September and close on or before early October. Bag and possession limits have been 2 or 3 and 4 or 6, respectively.

Purpose

The purpose of the Northeast Wyoming Sage-Grouse Working Group is to develop and facilitate 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 management practices and the financial and personnel means to accomplish these practices, within an explicit time frame, for the purpose of improving sage-grouse numbers and precluding the need for listing under the Endangered Species Act.

The mission statement of the Northeast Wyoming Sage-Grouse Working Group is: "Working cooperatively to benefit sage-grouse."

CONSERVATION ASSESSMENT

Plan Area

The Northeast Wyoming Sage-grouse Conservation Plan encompasses most of the Powder River, Belle Fourche and Cheyenne River drainage basins and includes about 23,000 square miles. Political jurisdictions include Sheridan, Johnson, Campbell, Crook, Weston, and portions of Niobrara, Natrona, Converse and Washakie Counties. The plan area extends from the Bighorn Mountain divide east to South Dakota and Nebraska and from Montana south to Interstate Highway 25 and U.S. Highway 20.

The plan area is primarily sagebrush-grasslands although forest, woodland, grassland, riparian, agricultural land, and industrial and urban areas are also present. Sage-grouse are generally found throughout the plan area except in the forested areas of the northern Bighorn Mountains, Black Hills and Rochelle Hills. Some historic habitat on the fringe of the plan area is no longer considered occupied habitat primarily due to sagebrush conversion (Figure 2).

Sage-Grouse Biology and Habitats

The following information on sage-grouse biology and habitats comes from the Wyoming Greater Sage-grouse Conservation Plan (2003). In some instances research currently being conducted in northeast Wyoming provides information more specific to this area of the state.

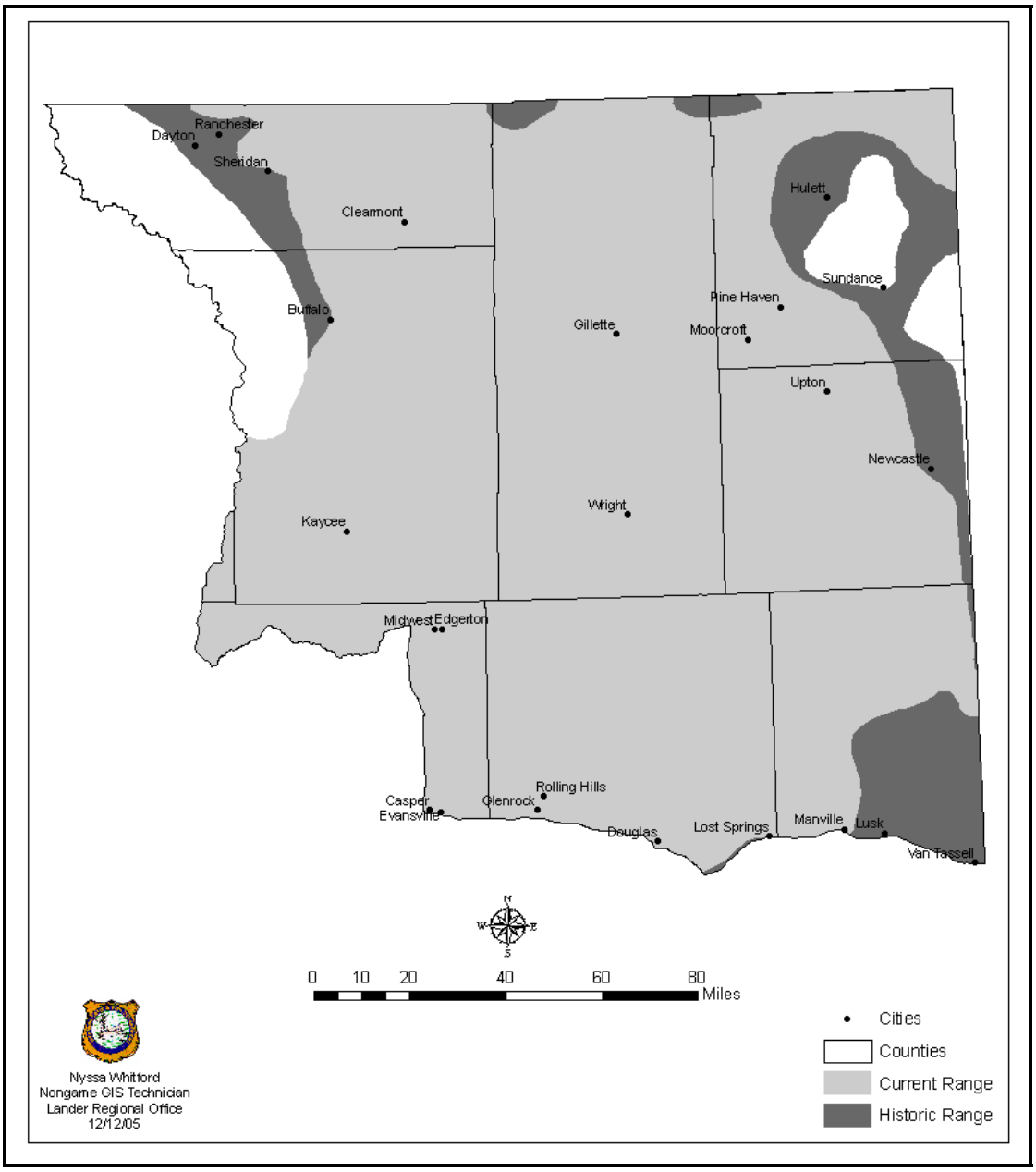
Sagebrush habitat is essential for sage-grouse survival. Suitable habitat consists of plant communities dominated by sagebrush and a diverse native grass and forb (flowering herbaceous plants) understory. The composition of shrubs, grasses and forbs varies with the subspecies of sagebrush, the condition of the habitat at any given location, and range site potential. Seasonal habitats must occur in a patchwork or mosaic across the landscape. 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 sagebrush above snow. Sage-grouse tend to select wintering sites where sagebrush is 10-14 inches above the snow. Sagebrush canopy cover utilized by sage-grouse above the snow 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. 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.

Figure 2. Current and historic range of sage-grouse in northeast Wyoming (Source: Wyoming Greater Sage-grouse Conservation Plan).



During severe winters, the amount of suitable available habitat is greatly reduced. Severe winter habitat may, or may not be, considered crucial habitat. Some severe winter habitat may be essential and used to a great extent 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. Within the study area, a large block of winter habitat exists southeast of Buffalo. Sage-grouse were semi-migratory with some marked birds moving 28 km to winter. These documented movements support preliminary findings that a large portion of the Powder River Basin has a low probability of use by wintering sage-grouse.

Breeding Habitat (Leks) - Early Spring

Breeding occurs on strutting grounds (leks) during late March and April. Leks are generally situated on sites with minimal sagebrush, broad ridge tops, grassy openings, and disturbed sites such as burns, abandoned well locations, airstrips or roads. Sage-grouse select spots with lower herbaceous height and less shrub cover than surrounding areas as lek sites. Leks are generally 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 habitat 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; however as populations increase and expand, leks can become active again.

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 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 these protein, calcium, and phosphorus rich foods to support nest initiation, increase clutch size, and improve hatch success as well as early chick survival. Low growing leafy forbs, especially milky-stemmed composites (e.g. dandelion), represent potential food forbs. 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*) although 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 3 miles of the lek where they were bred (Holloran et al. 2005). The remainder of the birds usually nest within 15 miles of the lek, but one 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 that the nest bush heights (Artemesia tridentata wyomingensis) ranged between 8 to 18 inches for sage-grouse, but individual plants (all subspecies of Artemisia tridentata) utilized rangewide 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.

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

Early Brood-Rearing Habitat - June to Mid-July

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

A highly diverse vegetation mosaic is essential to early brood-rearing. Early brood-rearing habitat is more open (10-15% sagebrush canopy cover and similar sagebrush height) with higher herbaceous cover than nesting habitat. 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. Insects are crucial during the first ten days post-hatch. Studies suggest insects can make up to 75% of chick diets. Insects remain an important source of protein throughout the summer.

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

As summer progresses and food plants mature and dry, sage-grouse move to areas still supporting succulent herbaceous vegetation. They continue to rely on adjacent sagebrush for protection from weather and predators, and for roosting and loafing. These areas may be lower elevation native or irrigated meadows where uplands lack green vegetation.

Sage-grouse will also migrate to higher elevations, seeking habitats where succulent forbs are still available in sagebrush habitats or select sites such as moist grassy areas, or upland meadows. A delay in maturing of forbs has a noticeable effect on bird movements. In years with above-normal summer precipitation, sage-grouse may find succulent forbs on upland sites all summer. In more arid areas, riparian meadows become more important to survival of broods in the late summer.

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

Fall Habitat - Mid-September to First Major Snow

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

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 of sagebrush communities to sage-grouse is not well understood. Therefore there is debate about how they should be managed to maximize benefits to sage-grouse. There is also a need to identify structure and cover components. These challenges are greatest in breeding (pre-nesting, nesting and early brood-rearing) habitats. These habitats have to be in proximity to one another and constitute a small-grained mosaic of seral stages and vegetation structure (height and cover).

All habitat types are important, and an overabundance of one type will not make up for a lack of another. For example, managing for a late-seral stage on a landscape scale will not necessarily provide for early brood-rearing habitat, and conversely managing for early seral sagebrush habitats on a large scale usually fails to provide the nesting and security cover needs of sage-grouse.

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

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

Sage-grouse in the Plan Area

The Wyoming Game and Fish Department summarizes lek survey data each year. Figure 3 presents the demographics of sage-grouse leks within northeast Wyoming as of May 2005.

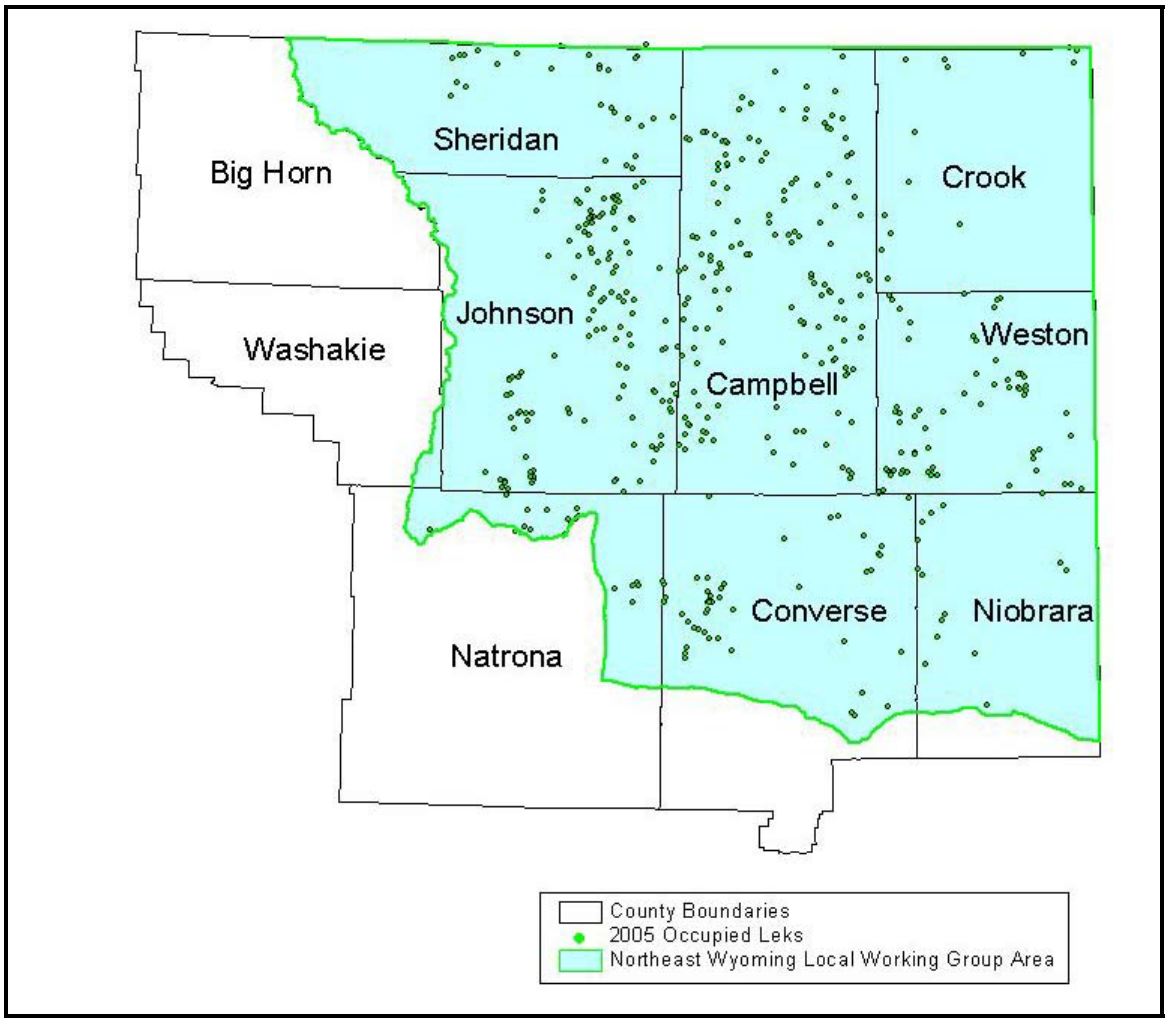
Figure 3. Sage-grouse lek demographics by various categories within the Northeast Wyoming Sage-grouse Working Group conservation plan area (WGFD 2005a).

General Category	Lek Count	Percent of Category
Northeast Area Total	495	100.0
Classification		
Occupied	462	93.3
Unoccupied	33	6.7
(Abandoned)	(21)	
(Destroyed)	(12)	
Land Ownership		
BLM	61	12.3
Private	348	70.3
State	45	9.1
USFS	38	7.7
County		
Big Horn, MT	1	0.2
Campbell	175	35.4
Converse	44	8.9
Crook	15	3.0
Johnson	128	25.9
Natrona	23	4.6
Niobrara	15	3.0
Powder River, MT	1	0.2
Sheridan	29	5.9
Weston	64	12.9
BLM District		
Buffalo	345	69.7
Casper	54	10.9
Newcastle	96	19.4

Game & Fish Category	Lek Count	Percent of Category
G&F Region		
Casper	132	26.7
Sheridan	363	73.3
Biologist District		
Buffalo	77	15.6
Casper	33	6.7
Douglas	35	7.1
Gillette	211	42.6
Newcastle	64	12.9
Sheridan	75	15.2
Game Warden		
Buffalo	69	13.9
Dayton	15	3.0
Douglas	15	3.0
East Casper	9	1.8
Glenrock	27	5.5
Kaycee	57	11.5
Lusk	16	3.2
Moorcroft	44	8.9
Newcastle	59	11.9
North Gillette	63	12.7
Sheridan	14	2.8
South Gillette	101	20.4
Sundance	5	1.0
West Casper	1	0.2
Management Area		
#35	38	7.7
#36	71	14.3
#37	47	9.5
#38	165	33.3
#40	5	1.0
#41	156	31.5
#44	13	2.6

Two Montana leks are included in the summary because they occur close enough to the Wyoming state line that breeding or nesting activities associated with these leks may take place in Wyoming. Locations of the 462 occupied sage-grouse leks within the plan area are shown in Figure 4. In 2005, monitoring efforts revealed that peak male lek attendance ranged from one to 70 males with an average of 15 males per lek. Twenty-one percent of leks had 1 to 5 males, 49% of leks had 6 to 20 males and 30% of leks had more than 20 males.

Figure 4. Occupied sage-grouse leks within the Northeast Wyoming Sage-grouse Working Group conservation plan area as of May 2005 (WGFD 2005a).



Lek counts and lek surveys have been conducted within the area since the late 1960's; however, the most consistent data sets were collected after 1980. The average number of male sage-grouse per lek from 1980 through 2005 for leks within northeast Wyoming is shown in Figure 5.

Sage-grouse lek complexes include one or more leks that are located relatively close together, between which sage-grouse may be expected to interchange during the course of the breeding season. Connelly et al. (2004) considered leks located within 2.5 km of each

other to comprise a complex. Therefore, counts of leks comprising a complex may more accurately estimate the actual number of male sage-grouse in a given area thereby providing a more accurate estimate of sage-grouse population trends. The average number of male sage-grouse per lek complex from 1980 through 2005 for lek complexes within the plan area is shown in Figure 6.

Figure 5. Average number of male sage-grouse per lek within the Northeast Wyoming Sage-grouse Working Group conservation plan area (WGFD 2005a).

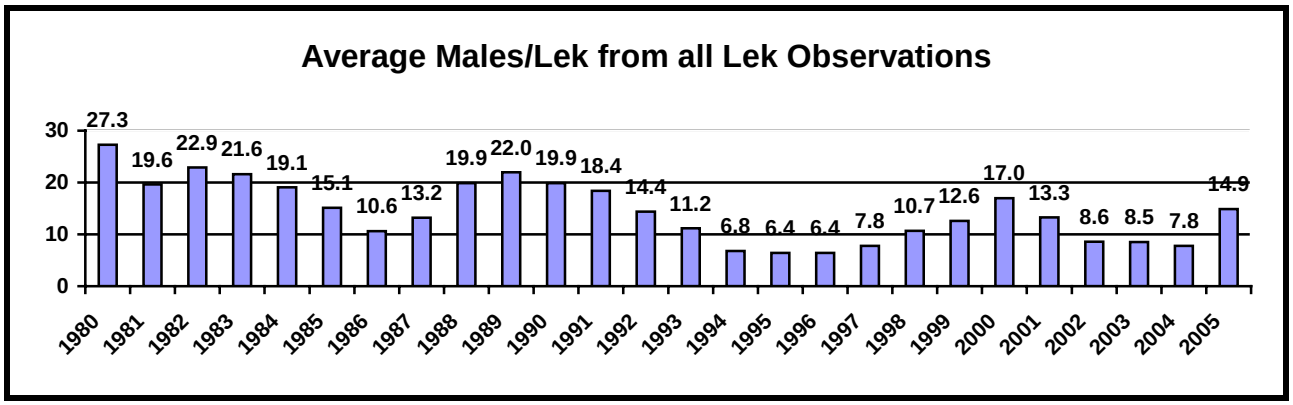
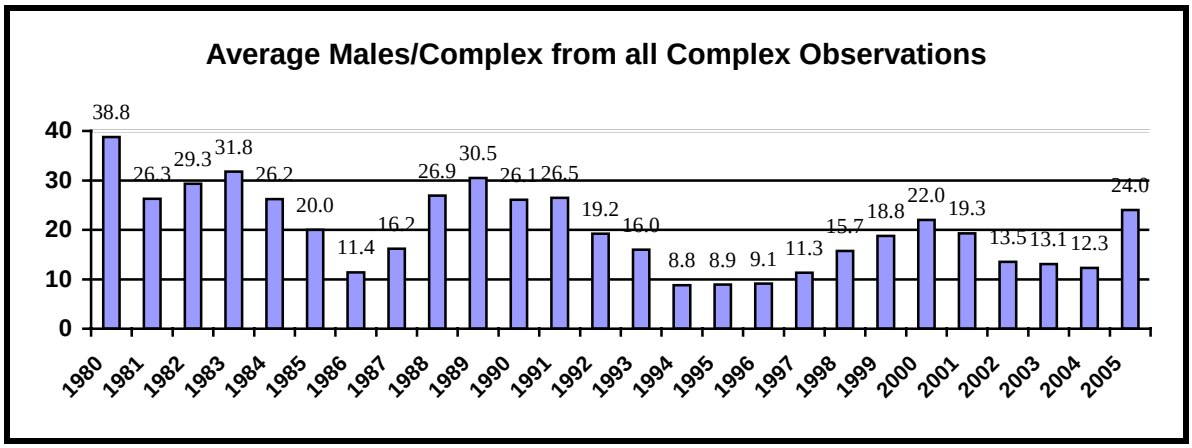


Figure 6. Average number of male sage-grouse per lek complex within the Northeast Wyoming Sage-grouse Working Group conservation plan area (WGFD 2005a).

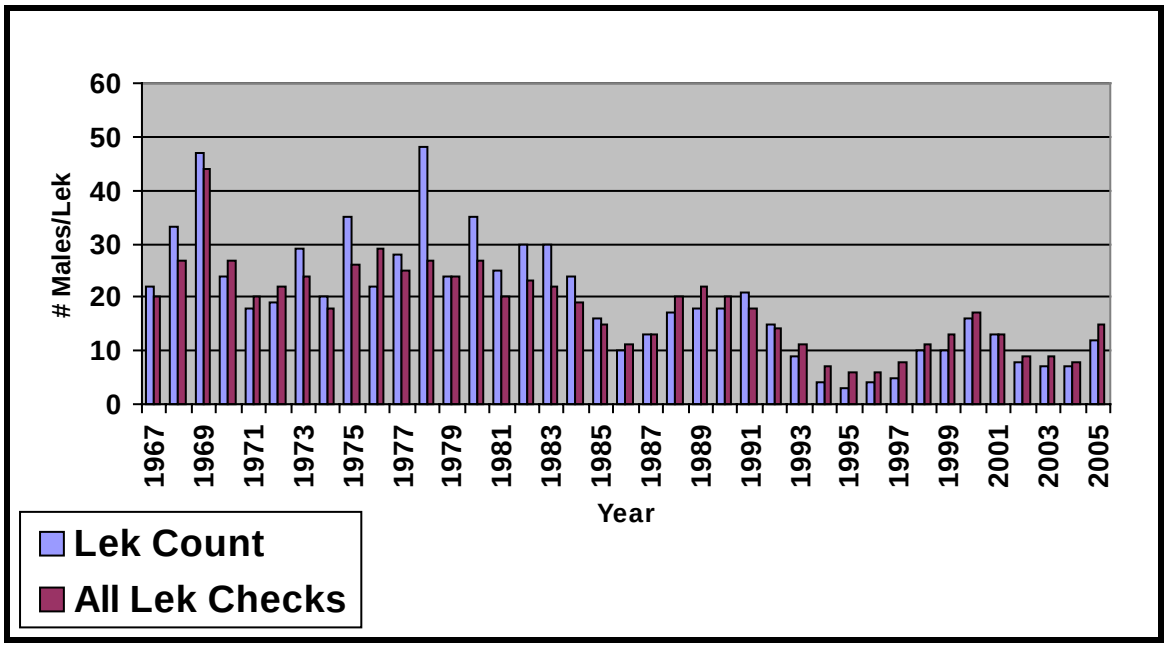


No reliable or cost effective method for estimating the sage-grouse population in the Northeast Wyoming Sage-grouse Working Group area exists at this time. Both the number of leks and the number of males attending these leks must be quantified in order to estimate population size. However, the number of males/lek observed provides a reasonable reflection of the sage-grouse population trend over time in response to environmental conditions. Lek data must be interpreted with caution for several reasons: 1) the survey effort and the number of leks surveyed/counted has varied over time, 2) it is assumed that not all leks in the area have been located, 3) sage-grouse populations can exhibit cyclic

patterns over approximately a decade, 4) the effects of unlocated or unmonitored leks that have become inactive cannot be quantified or qualified, and 5) lek sites may change over time.

Figure 7 shows the average number of males/lek for lek counts and all lek monitoring combined from 1967 to 2005 for the Northeast Wyoming Sage-grouse Working Group area. If the average number of males/lek reflects the sage-grouse population, the trend suggests about a 10-year cycle of periodic highs and lows. Of concern is the general downward trend of the cycles. Each subsequent peak in the number of males observed is usually lower than the previous peak and each periodic low in the number of males observed is generally lower than the previous low. The long-term trend suggests a steadily declining sage-grouse population in northeast Wyoming.

Figure 7. Graph of Northeast Wyoming Sage-grouse Working Group conservation plan area male sage-grouse lek attendance 1967- 2005 (WGFD 2005a).

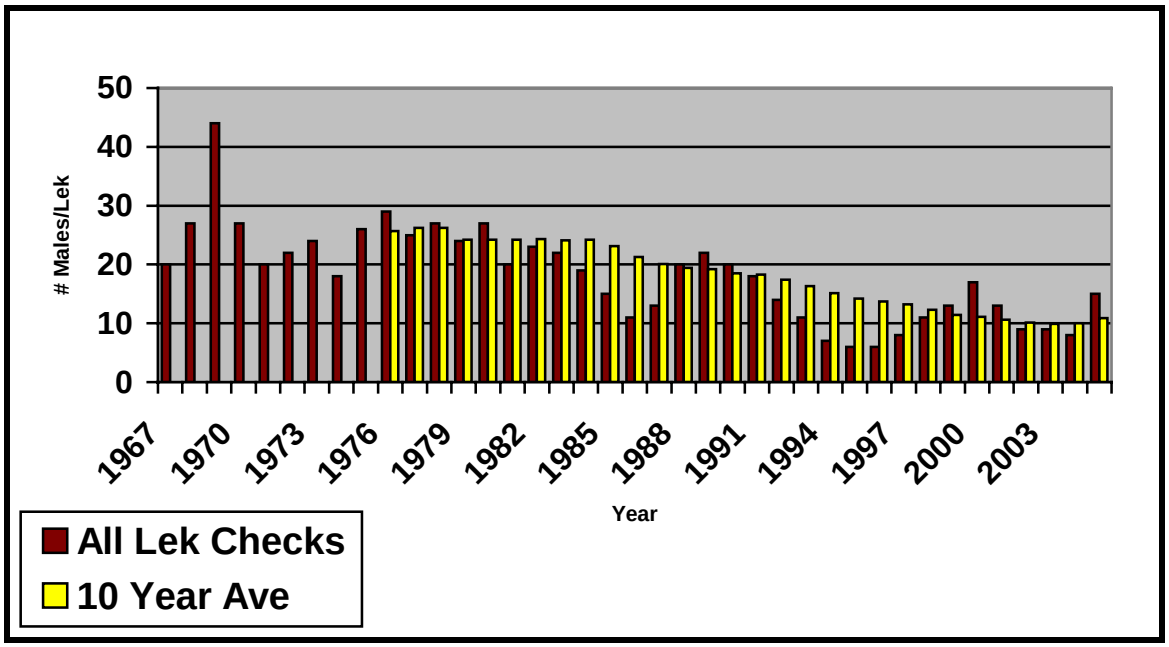


It appears the most recent peak in sage-grouse numbers occurred in 2000. Drought conditions from 2000-03 likely resulted in poor brood survival and recruitment into the subsequent year's breeding population. West Nile virus is thought to have had an impact on sage-grouse in 2003. The increase in 2005 is somewhat surprising as 2004 was very dry with little spring green up. However, chick production and survival must have been high with good recruitment into the 2005 breeding population.

Another way of looking at lek monitoring data is to average the number of males/lek observed for a 10-year period to dampen the effect of yearly population fluctuations and the 10-year cycle of high and low populations. Figure 8 presents the average number of male sage-grouse observed per lek from 1967 through 2005 for all lek checks. Additionally, the 10-year averages are presented beginning in 1976. The 10-year average for 1976 reflects

the average number of males/lek from 1967 through 1976. The 10-year averages reflect a decreasing trend caused by lower number of males attending leks during both high and low cycle periods, or more years of low male numbers than high male numbers. To reverse this trend, a significant short-term increase in male lek attendance or a sustained increase in male lek attendance over a long period will be necessary. An increasing 10-year average trend is a good indicator of how favorable environmental factors and conservation actions benefit sage-grouse.

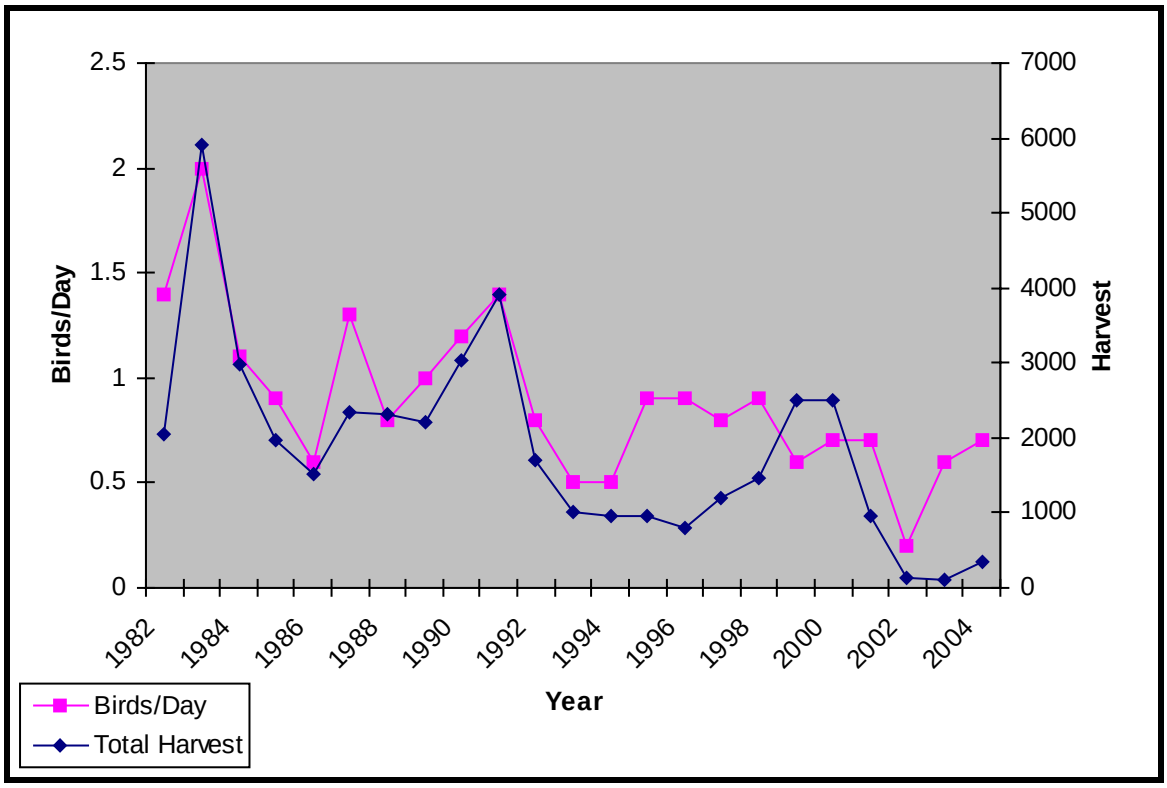
Figure 8. Male sage-grouse lek attendance and 10-year averages, 1967- 2005, for the Northeast Wyoming Sage-grouse Working Group conservation plan area (WGFD 2005a).



Long-term harvest trends are similar to that of spring counts of males on leks. Because hunting season regulations have varied over time, potentially changing total harvest irrespective of the grouse population trend, the number of birds harvested per hunter day statistic may provide a more consistent measure of relative bird availability, and therefore, abundance (Figure 9). From 1982 to 2004 the number of birds harvested per day in the Northeast Wyoming Sage-grouse Working Group area has declined significantly, mimicking the number of males/lek and thus the population.

Typically, bird hunters put more effort into hunting when populations are high and there is higher success for time expended. The number of birds harvested per hunter day generally follows a trend similar to the total number of birds harvested. Both have trended downward over the last 20 years. The rate of decline is very similar to that reflected in the lek data. The extremely low statistics on birds per day for years 2002 thru 2003 correspond to the reduction in the daily bag limit to two birds implemented in 2002. However, this statistic should not be influenced by the bag limit. It should reflect the availability of birds and thus the population.

Figure 9. Sage-grouse harvest and birds/day, 1982-2004, in the Northeast Wyoming Sage-grouse Working Group conservation plan area (WGFD 2005a).



Factors Affecting Sage-grouse Populations and Habitats

Sage-grouse are influenced by many factors, both individually and cumulatively. Habitat loss and fragmentation, direct mortality and disturbance affect 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 northeast Wyoming. The Northeast Wyoming Sage-grouse Working Group identified those factors believed to be most influencing the northeast Wyoming sage-grouse population, as well as those factors that might most effectively be addressed to provide the greatest benefit for sage-grouse conservation in northeast Wyoming. The working group felt oil, gas, and coal bed natural gas (CBNG) development, weather, vegetation management, invasive plants, and parasites and diseases were the most important influences on the northeast Wyoming sage-grouse population. In the opinion of the group, conservation efforts targeting oil, gas and CBNG development, vegetation management, invasive plants, local residential land use, and livestock grazing would be most effective.

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 or not possible because practices that benefit some species can be detrimental to others. Approximately 100 bird species, 70 mammal species, and several reptiles are found in sagebrush habitats including many sagebrush obligates or near-obligates such as the sage-grouse, sage sparrow (*Amphispiza belli*), Brewer's sparrow (*Spizella breweri*), sage thrasher (*Oreoscoptes montanus*), sagebrush vole (*Lemmiscus curtatus*), sagebrush lizard (*Sceloporun graciosus graciosus*) and pronghorn (Antilocapra americana). A number of other priority or sensitive wildlife species are dependent upon or inhabit the sagebrush ecosystem including the black-tailed prairie dog (*Cynomys leucurus*), ferruginous hawk (*Buteo regalis*), mountain plover (*Charadrius montanus*), and swift fox (*Vulpes velox*). Each has specific micro-site habitat requirements that often conflict with the seasonal habitat requirements of sage-grouse. On a landscape scale, with a mosaic of seral stages and vegetation types, the specific seasonal habitat requirements of the various wildlife species that inhabit sagebrush ecosystems can be accommodated.

The U.S. Forest Service manages some portions of the Thunder Basin National Grasslands for sensitive species that are not necessarily compatible with sage-grouse. For example, in recent years, increased emphasis has been placed on the black-tailed prairie dog. Although prairie dog towns adjacent to sagebrush habitats are often used as lek sites, the lack of cover and forage provides little value to sage-grouse during the remainder of the year. Conversion of sagebrush to grasslands, which can be helpful to the mountain plover, can decrease available sage-grouse habitat. Likewise, high intensity grazing to promote barren landscapes favoring the prairie dog and mountain plover do not benefit sage-grouse. Sagebrush and residual grass cover are important components of sage-grouse seasonal habitat requirements.

Mule deer (*Odocoileus hemionus*) and pronghorn are the primary wild ungulates that occur within occupied sage-grouse habitat. Grazing and browsing can contribute to long-term changes in plant communities and can alter various habitat components that contribute to the health of sagebrush ecosystems and the sage-grouse habitat it supports. As with livestock, these grazing/browsing effects may be positive, negative or neutral depending on site specific conditions. Areas of concern may be where there is annual heavy sagebrush browsing by large winter concentrations of mule deer and pronghorn. In northeast Wyoming, geography, generally uniform habitat, and limited periods of snowpack negate the need for mule deer and pronghorn populations to concentrate in high numbers on winter ranges.

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

2. Farming

Dryland farming of wheat, oats, and barley, dryland haying of grass, and haying of irrigated alfalfa are the major farming activities in northeast Wyoming. Irrigated alfalfa occurs primarily along Clear Creek, Piney Creek, the Powder River, the Cheyenne River, the North Platte River and in some areas along the Belle Fourche River in northeast Wyoming. Small but critical stands of irrigated or sub-irrigated alfalfa occur throughout the region along certain reaches of drainages such as Wildcat Creek, the Little Powder River, and Wild Horse Creek in Campbell County, Crazy Woman Creek in Johnson County, the Little Missouri River in Crook County, and Beaver Creek in Weston County. Farming areas (dry land and irrigated) constitute only a small percentage of the landscape in northeast Wyoming (Figure 10).

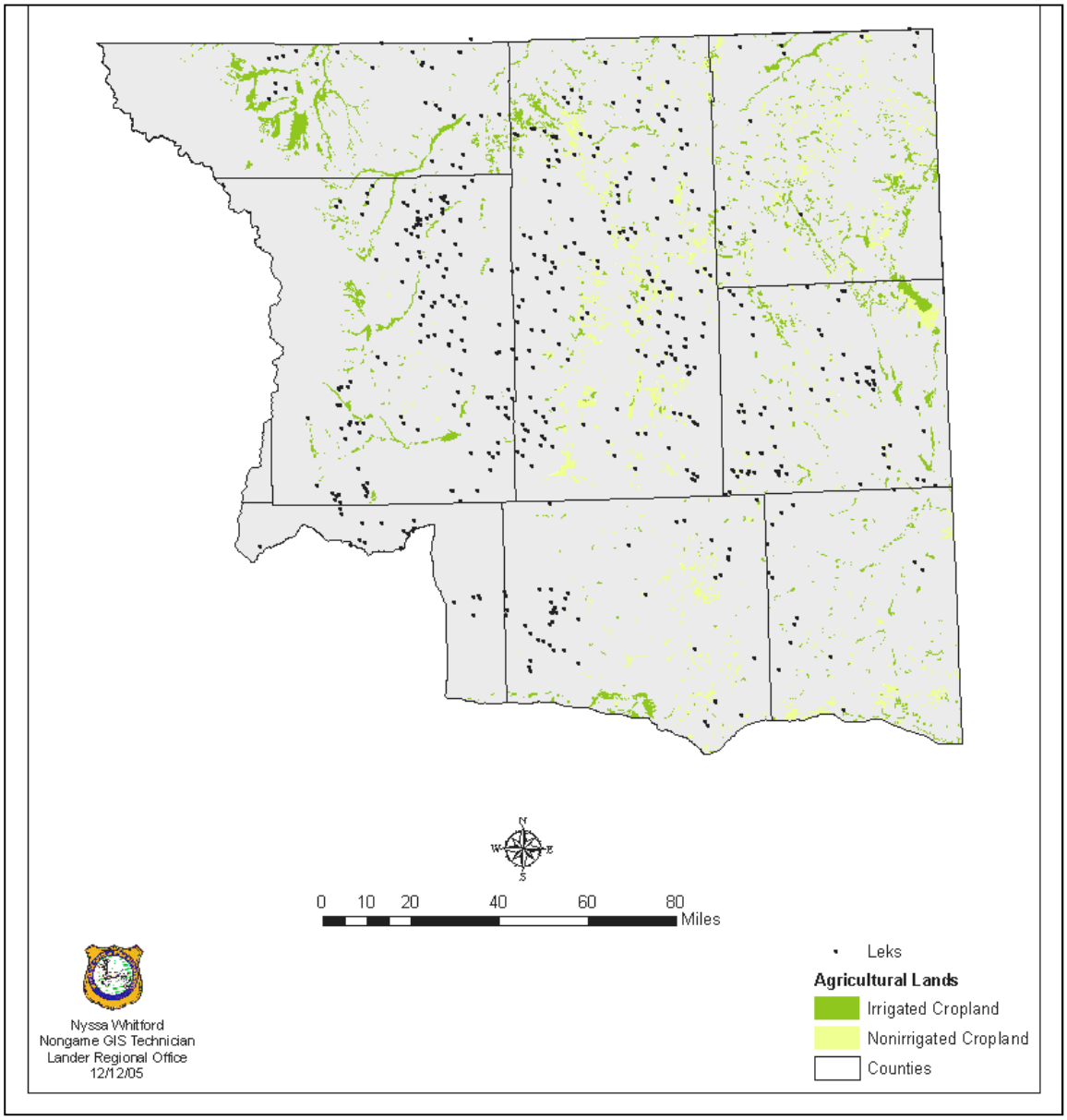
Most farmland is privately owned, and the value of habitat and open space provided by the continued existence of farm operations should be recognized. On the other hand, it was often the sagebrush habitats with the best soils that were converted to farmland during the homesteading period. Some of these agricultural lands in and adjacent to sagebrush habitat reverted to native rangeland. This “go back” land may have potential for sage-grouse habitat enhancement through seeding to increase forage diversity and quality. There is little conversion of native rangeland to farmland today. In areas of CBNG development, some companies are managing water produced as a by-product of natural gas extraction by establishing introduced grass stands and irrigating with surplus water.

Farms that raise alfalfa or native hay may be beneficial to sage-grouse. Irrigated alfalfa is a food source of sage-grouse in summer and fall provided the fields are adjacent to sagebrush cover. University of Montana research found that some birds move considerable distances to utilize these habitats. In general, smaller fields scattered across the landscape provide valuable habitat and are favored by sage-grouse.

Some degree of habitat fragmentation may occur as a result of farming and associated infrastructure. Ecological and economic constraints limit the amount of land in northeast Wyoming that can be converted to farmland. In the past, federal farm programs associated

with dry land crops led to some conversion of sagebrush habitats to farmland. But, since the inception of the 1985 Farm Bill, all USDA programs are written to ensure that producers cannot benefit by converting native land to farm land. In fact, emphasis has been placed on programs to restore native species on previously farmed lands.

Figure 10. Occupied sage-grouse leks with irrigated and nonirrigated cropland in the Northeast Wyoming Sage-grouse Working Group conservation plan area (WyGISC 2005).



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 that grouse and their needs as a population are met. However, concern has been expressed about the impacts of recreational hunting to sage-grouse populations in Wyoming.

It appears that hunting harvest of adult hens may have a detrimental impact on population. For many years it was traditional in Wyoming to hunt sage-grouse in late August or early September. 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 big game in western Wyoming, 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 Northeast Wyoming Sage-Grouse Working Group Area are managed concurrently with other open areas in the state.

Up 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 a 9 day season. 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. This area included portions of Management Areas 35 – 38 and 40 – 41. The hunting season was resumed in this area for the 2004 hunting season because increased monitoring of radio collared birds indicated that West Nile virus, while still present, had not caused a statistically significant population decline.

Wyoming offers a falconry hunting season. In 2004-05, the season was open September 15 through February 28 with a bag limit of 1 grouse per day and 2 grouse in possession. Sage-grouse are a challenging quarry for falcons and falconers because of their size and speed. The Wyoming Game and Fish Department falconry survey harvest estimates are only obtained for Wyoming resident falconers. However, harvest by both resident and nonresident falconers is accounted for in the Wyoming Game and Fish Department small and upland game harvest survey estimates.

During the 2004-05 falconry season, resident falconers harvested 50 sage-grouse in Wyoming (WGFD 2005b). Falconers spent 359 days in the field, averaging 7.2 days/grouse harvested.

Over the last ten years, sage-grouse harvest for the Northeast Wyoming Sage-grouse Working Group area has ranged from a high of 2,515 birds in 2000 to a low of 104 birds in 2003 when Sheridan, Johnson and Campbell Counties were closed to hunting. Only 120 birds were harvested in 2002 when more conservative season dates and bag/possession limits were enacted. Hunter numbers have generally reflected harvest, with more hunters going afield when populations are high. Such was the case in 1999 and 2000 when more than 2,500 birds were harvested annually.

No studies have shown that 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. This is especially true in northeast Wyoming where surveying an adequate sample of broods or harvested wings rarely occurs.

The sage-grouse population in northeast Wyoming greatly exceeds the recommended minimum population size of 300 birds to allow recreational hunting (Connelly et al. 2000). Conservative hunting season structure provides that a low harvest rate is achieved thereby meeting recommendations set forth in the Sage-Grouse Management Guidelines (Connelly et al. 2000). Continued monitoring of lek attendance and harvest provides indicators of population status and trend.

Hunting season data (harvest, hunter numbers, and hunter effort) provide indications of fall sage-grouse population status that would otherwise not readily be obtained. Furthermore, sage-grouse wings collected from hunter-harvested grouse have been used to 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 northeast Wyoming is unknown. However, as more terrain in the Northeast Wyoming Sage-grouse Working Group conservation plan area is disturbed by activities such as pipeline and powerline installation, subdivision development, and well installation, 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 for sage-grouse nesting and brood-rearing. Chemical treatment of invasive plants established in sagebrush habitats can kill desired forbs and shrubs. The extent of leafy spurge along Clear Creek and in the adjacent uplands in Sheridan and Johnson Counties is a good example of how noxious weeds can negatively affect desirable sage-grouse habitat.

Little information exists on the effects invasive plants have on sage-grouse populations. County weed and pest districts know which species are most pervasive and which are most difficult to control, and often have some information on area extent. However, there is no region wide comprehensive mapping effort of infestations or tracking of rate of spreading. These shortcomings limit a strategic approach to control of invasive plants. A coordinated mapping effort would facilitate more effective weed control.

Treatments for controlling the spread of invasive plants include mechanical, chemical, biological and grazing. Prevention though proper grazing management, treatment of pioneering plants, reclamation practices favoring native plants and washing of equipment before transportation is necessary to control the proliferation 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*) 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 factor that may affect the suitability and extent of sage-grouse habitat across the western United States. Grazing and browsing can contribute to long-term changes in plant communities and can alter various habitat components that contribute to the health of sagebrush ecosystems and the sage-grouse habitat it supports.

Both positive and negative direct effects of livestock grazing on sage-grouse habitats have been identified. For example, short duration grazing in late spring and early summer has been reported to improve both quantity and quality of summer forage (forbs) for sage-grouse (Beck and Mitchell 2000). Conversely, continuous heavy use by livestock and/or wild ungulates rarely leaves suitable residual cover for nesting or maintains the site potential for riparian areas in sage-grouse habitat. However, there have been few research efforts made, and 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 that grazing 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, class and season of use, grazing management systems, and total numbers of herbivores on the range, large and small, domestic and wild. 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 but these impacts are not well documented.

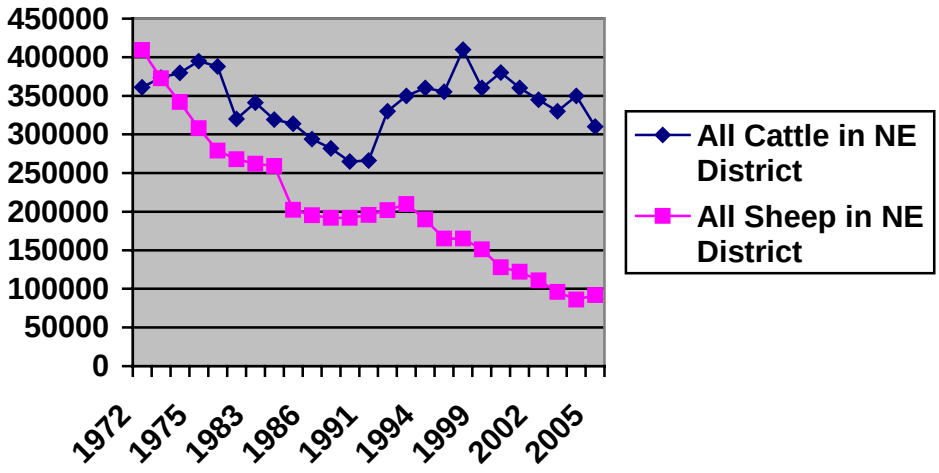
Active management aimed toward opening the canopy in decadent sagebrush stands and creating and maintaining a diversity of desirable micro-sites is beneficial to sage-grouse. Forb diversity and forb-associated insects are important to pre-nesting condition of hens and early brood-rearing of chicks. There 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 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. Ecosystems that do not provide this diversity need long-term management strategies to allow recovery. Management changes should be analyzed so that those made on behalf of sage-grouse do not inadvertently cause unacceptable harm to other species.

Sheep and cattle are the mainstays of the livestock industry in northeast Wyoming. There has been a gradual conversion of sheep operations to cattle operations in recent years (Figure 11). Both cattle and sheep producers generally sell the current years production while maintaining the producing herd. Most ranching operations include Federal or State grazing lands. Many ranchers along the Bighorn Mountains and Black Hills summer their

herds on privately owned mountain pastures or National Forest grazing allotments. Wintering herds forage on native range and are generally supplemented with hay.

Figure 11. Cattle and sheep production figures for northeast Wyoming (Wyoming Department of Agriculture).



Spring precipitation and livestock grazing 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. Research has shown that residual forage remaining from the prior year's growing season is a contributing factor influencing sage-grouse nest success.

Additional information on the agriculture industry is provided in Appendix II.

Energy/Mineral Development

The discovery and development of natural gas, oil, and CBNG 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 goods and services supported 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.

Some potential impacts of energy development to sage-grouse include: (1) direct habitat loss and fragmentation from mine, well, road, pipeline, transmission and power line

construction, (2) alteration of plant and animal communities, (3) increased human activity which could cause animals to avoid the area, (4) increased noise which could cause animals to avoid an area or reduce their breeding efficiency, (5) increased motorized access by the public leading to legal and illegal harvest, (6) direct mortality associated with water evaporation ponds and production pits, and (7) reduced water tables resulting in the loss of herbaceous vegetation. Many of these impacts can be minimized by planning, mitigation and reclamation for sage-grouse needs. Some of these impacts are short-term related to specific periods of activity, and some may result in positive effects such as increased forb production, habitat diversity and additional water sources. Impacts may be long-term (30 years or more), and rehabilitation of impacted habitats may take many years to complete.

Roads built to accommodate energy exploration and development activities often result in the establishment of permanent travel routes, improved public access, increased long-term traffic related disturbance, indirect noise impacts and direct mortality.

Research suggests that road-related disturbances during the breeding season may cause sage-grouse leks to become inactive over time, reduce the number of hens bred on disturbed leks that initiate nests, and 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.

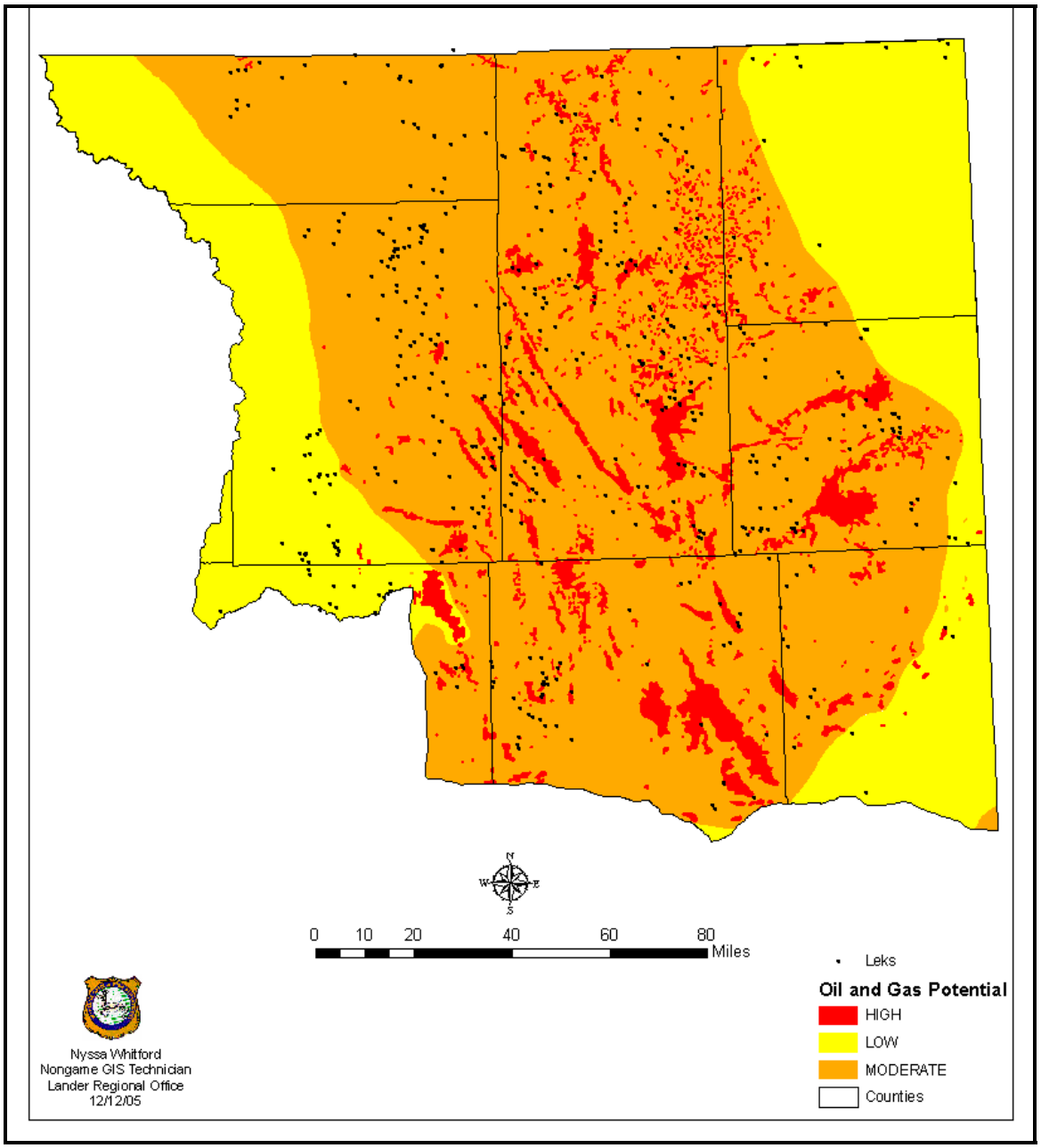
6. Oil/Gas/Coalbed Natural Gas Industry

The Powder River Basin of northeast Wyoming holds vast energy resources including oil, natural gas and CBNG (Figure 12). Due to the mapping scale, Figure 13 and 14 over-represent the actual area covered by an individual production site, which are small in relation to the size of the dot used to depict them.

There are numerous oil and gas fields throughout northeast Wyoming including the Midwest, Gillette, Moorcroft, Newcastle and Douglas areas. Exploration, development and production have occurred since the early 20th century. Enhanced oil recovery is the latest technology now being used to extend production of many fields. As of November 2005 there were about 7,500 producing oil and gas wells (non CBNG) in the Northeast Wyoming Sage-grouse Working Group conservation plan area (Figure 13) (WOGCC 2005). Ninety-five percent of these wells are oil producing with the remaining being natural gas wells. More than 40,000 well records exist for the area with the bulk of non-producing wells being plugged and abandoned, shut-in wells or temporarily abandoned. Typically, plugged and abandoned well sites have been reclaimed, with roads revegetated and powerlines removed. Additionally, there are monitoring wells, water injection wells, gas injection wells and wells which produce water for various uses. Oil and gas development (exclusive of CBNG) is increasing in northeast Wyoming due to increased demand and is expected to continue to do so over the

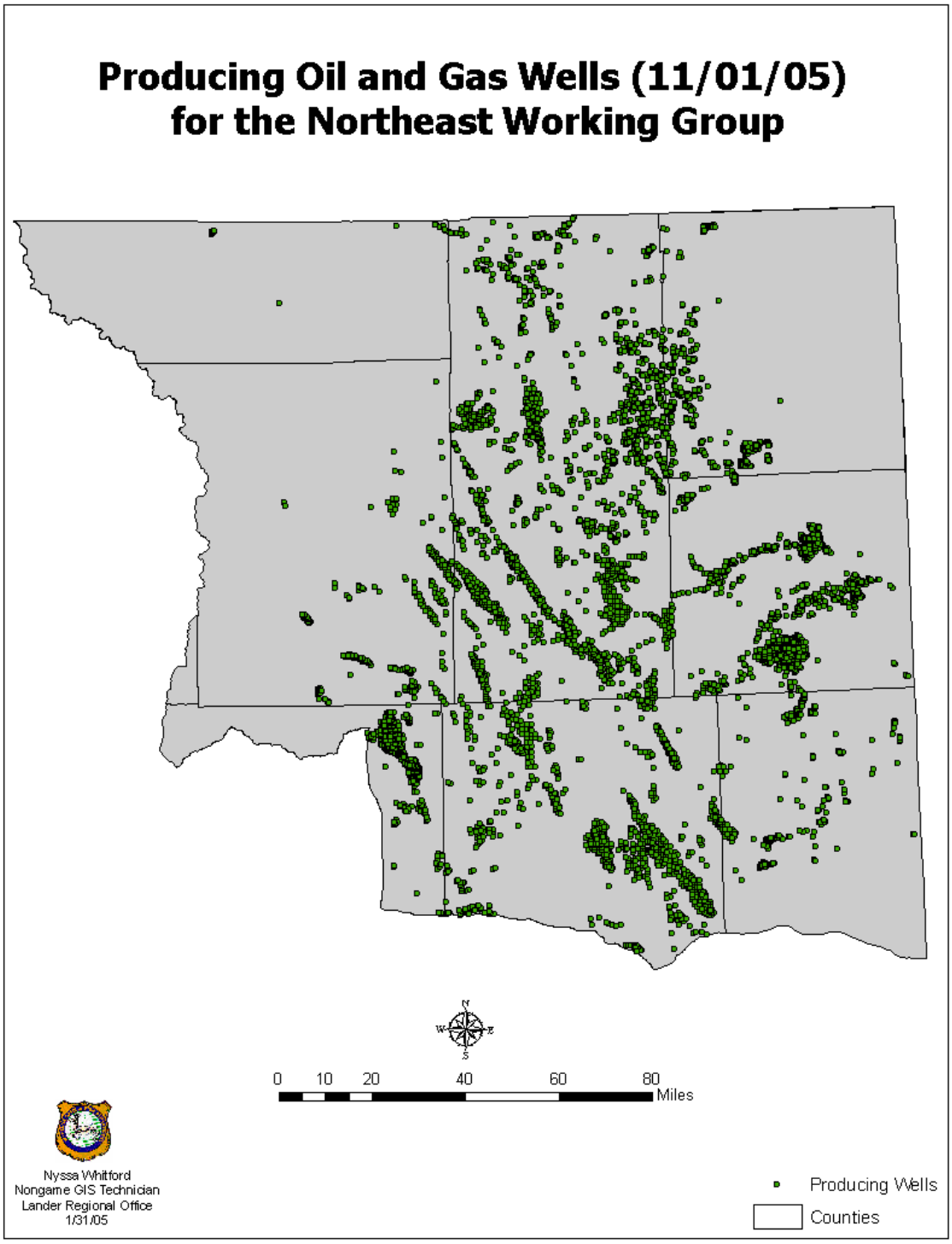
near term. The discovery of new reserves or a long-term increase in oil prices typically results in increased development activity.

Figure 12. Northeast Wyoming Oil and gas potential with occupied sage-grouse leks within the Northeast Wyoming conservation plan area (WyGISC 2005).



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 gas development. Holloran found that minimal levels of development within 1.9 miles of leks influenced breeding behavior. Distance to wells and densities of wells, along with traffic volume and distance to roads, influenced lek attendance.

Figure 13. Oil and natural gas development (non-CBNG) within the Northeast Wyoming Sage-grouse Working Group conservation plan area (WOGCC 2005).



Noise sources had negative effects on breeding birds. Nesting female sage-grouse generally avoided areas with high densities of producing wells and brooding females avoided producing wells. An increase in avian nest predation suggests that gas development attracts corvids due to increased food availability. Holloran concluded that current

development stipulations are inadequate to maintain sage-grouse breeding populations affected by high levels of gas development. He suggested that management of adjacent intact habitats to increase sage-grouse carrying capacity could benefit population segments supplemented by grouse dispersing from the gas fields.

In the late 1980's, the development of technology to extract coalbed natural gas initiated an unprecedented energy boom in the Powder River Basin of northeast Wyoming. The BLM has approved development plans for more than 50,000 wells on federal mineral leases located on federal and private surface (BLM 1999; BLM, 2003). In addition to federal mineral leases, development is occurring on private and state-owned mineral leases. Initial development occurred on 40-acre well spacing. A subsequent ruling by the Wyoming Oil and Gas Conservation Commission limited development to an 80 acre well spacing, although multiple wells can be placed on one well pad to reach different coal seams. As of September 2005, there were nearly 16,000 producing CBNG wells in the Powder River Basin (Figure 14) (WOGCC 2005).

In addition to producing wells, there are a number of plugged and abandoned wells, dormant wells, monitoring wells and potential producing wells not yet connected to transport pipelines. As of February 2006, the Wyoming Oil and Gas Conservation Commission had issued more than 49,000 drilling permits (WOGCC 2006). This includes over 17,000 permits for federal mineral leases and over 31,000 permits for state and private mineral leases. Nearly 40% of the approved permits have expired without development occurring. Nevertheless, nearly 21,000 wells have been drilled, the vast majority of which are in Campbell (65%), Johnson (17%) and Sheridan (18%) Counties. Associated with the wells themselves are compressor stations at a ratio of approximately one compressor unit per nine wells. These compressor stations represent significant incremental field activity and require more frequent servicing than do the inconspicuous and low maintenance gas production wells.

CBNG development is resulting in habitat loss from well sites, roads, pipelines, powerlines, compressor stations, and supporting infrastructure such as storage yards. Above-ground power lines supplying power to infrastructure provide raptor perches and are collision hazards. In addition to direct habitat loss, dust and disturbance compromise the quality of adjacent habitat. Surplus water from gas extraction is being stored in newly created reservoirs and discharged into drainages or held in ponds and reservoirs. Researchers from the University of Montana (Naugle 2006a) compared rangelands with CBNG development ($\geq$ 4 wells per 3 km^2) to non-CBNG development rangelands (< 4 wells per 3 km^2). Preliminary comparative analysis showed that areas with CBNG development had 2.1 times the miles of roads, 2.3 times the miles of powerlines, 5.1 times the number of ponds and 8.7 times the amount of pond surface water.

Roads, when buffered 100 meters to account for indirect effects, were identified as having the greatest impact to sagebrush, affecting 40% of sagebrush habitats on rangelands with CBNG development. At the current rate of development, it will take approximately 20 years for all rangelands with CBNG potential to be developed. Researchers concluded that 1) temporal restrictions will not change the spatial distribution of the "human footprint," 2) the "human footprint" should be minimized in developed areas to reduce potential impacts and 3) the time to form partnerships to implement solutions is limited.

Naugle, et al. (2006b) also reported preliminary analysis results that sage-grouse in the Powder River Basin of northeast Wyoming and southeast Montana 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 that sage-grouse avoid intensive CBNG development. 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.

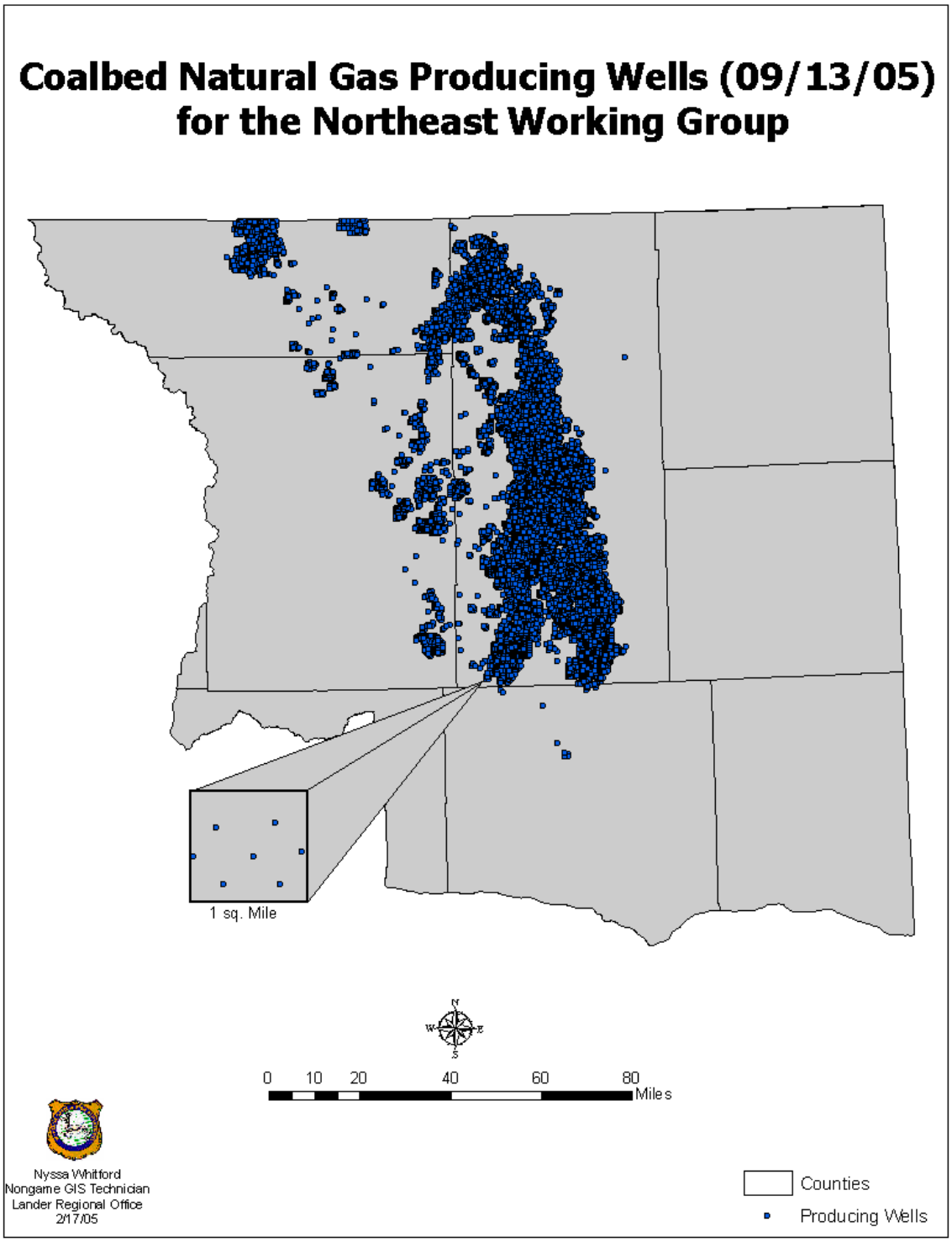
Leks were considered inside CBNG development if >40% of an area within 3.2 km of a lek was developed or if >25% of the area was developed with development overlapping the center of a lek. A 350 m buffer was placed around wells to define the area of development around each lek site. A lek was considered to be adjacent to development (edge lek) if 10-40% of the area within 3.2 km was developed and development did not overlap the center of the lek. Leks were considered outside CBNG development if there was less than 10% of the area developed.

Additional analysis of wells, powerlines and leks showed that active leks were 2 times 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 3.2 km of the lek complex than inactive leks.

In another phase of the study, Naugle et al. (2006c) identified sage-grouse winter habitat and evaluated the effect of energy development on habitat suitability. Researchers found that sage-grouse avoided otherwise suitable winter habitats where CBNG development has occurred. However, most suitable winter habitats within the study area have yet to be developed even though most of the areas encompassing these habitats have been leased to energy companies. Spatial habitat models show winter habitat to be limited in the Powder River Basin. Therefore, the researchers suggest there is an urgency to coordinate partnerships for implementing conservation actions. Recommendations include employing spatial limitations on development rather than temporal restrictions to maintain large “unimpacted” areas. Managers should conserve areas supporting leks with large numbers of males in areas with intact winter habitats.

CBNG-produced water can provide benefits to sage-grouse, but also creates habitat for the mosquito species (*Culex tarsalus*) that carries West Nile virus, to which the sage-grouse is extremely susceptible. 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

Figure 14. Coalbed natural gas development within the Northeast Wyoming Sage-grouse Working Group conservation plan area (WOGCC 2005).



provide excellent breeding habitat. There are numerous ponds associated with coalbed natural gas development with as many as 1,000 – 2,000 more possible in the next 10 years of development (Boswell 2005). Properly constructed CBNG ponds and an effective

mosquito larva control program could play a role in reducing the prevalence of mosquitoes. Researchers are currently developing guidelines to manage CBNG ponds in the Powder River Basin.

The effects of West Nile virus on sage-grouse were first identified in 2003 with some localized populations devastated by the disease (Walker 2004). The disease was less pronounced in 2004 and 2005 with fewer documented mortalities. Experts believe the life cycle of the Culex mosquito is driven by temperature and favorable breeding conditions are created when extended warm temperatures result in warm waters for breeding and larva development. The increased prevalence of the disease in 2003 corresponded with above normal summer temperatures.

Development stipulations imposed by the BLM on federal leases restrict development within 0.25 miles of leks and apply a timing stipulation extending an additional 1.75 miles to limit disturbance during the nesting season. However, once the nesting season is over, development can proceed. On state and private mineral leases, there are no protections for breeding and nesting habitat. However, the Office of State Lands and Investments has begun discussions with the Wyoming Game and Fish Department regarding implementation of protective stipulations for important sage-grouse habitats.

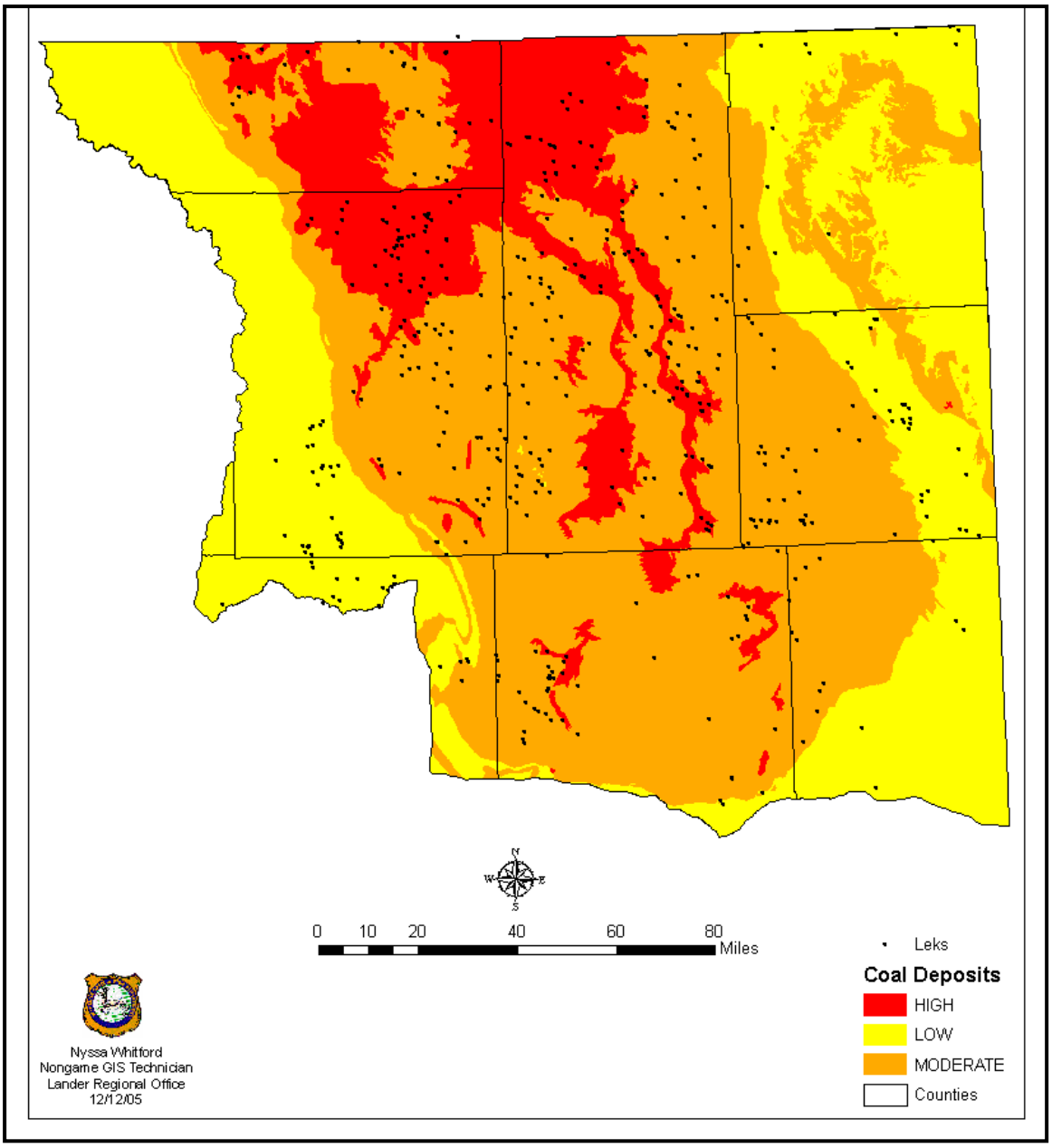
Additional information on the coalbed natural gas industry is provided in Appendix III.

7. Coal/Mineral Development

Mineral exploration, development and production in northeast Wyoming 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 that depends on the quantity and quality of the mineral resource reserve.

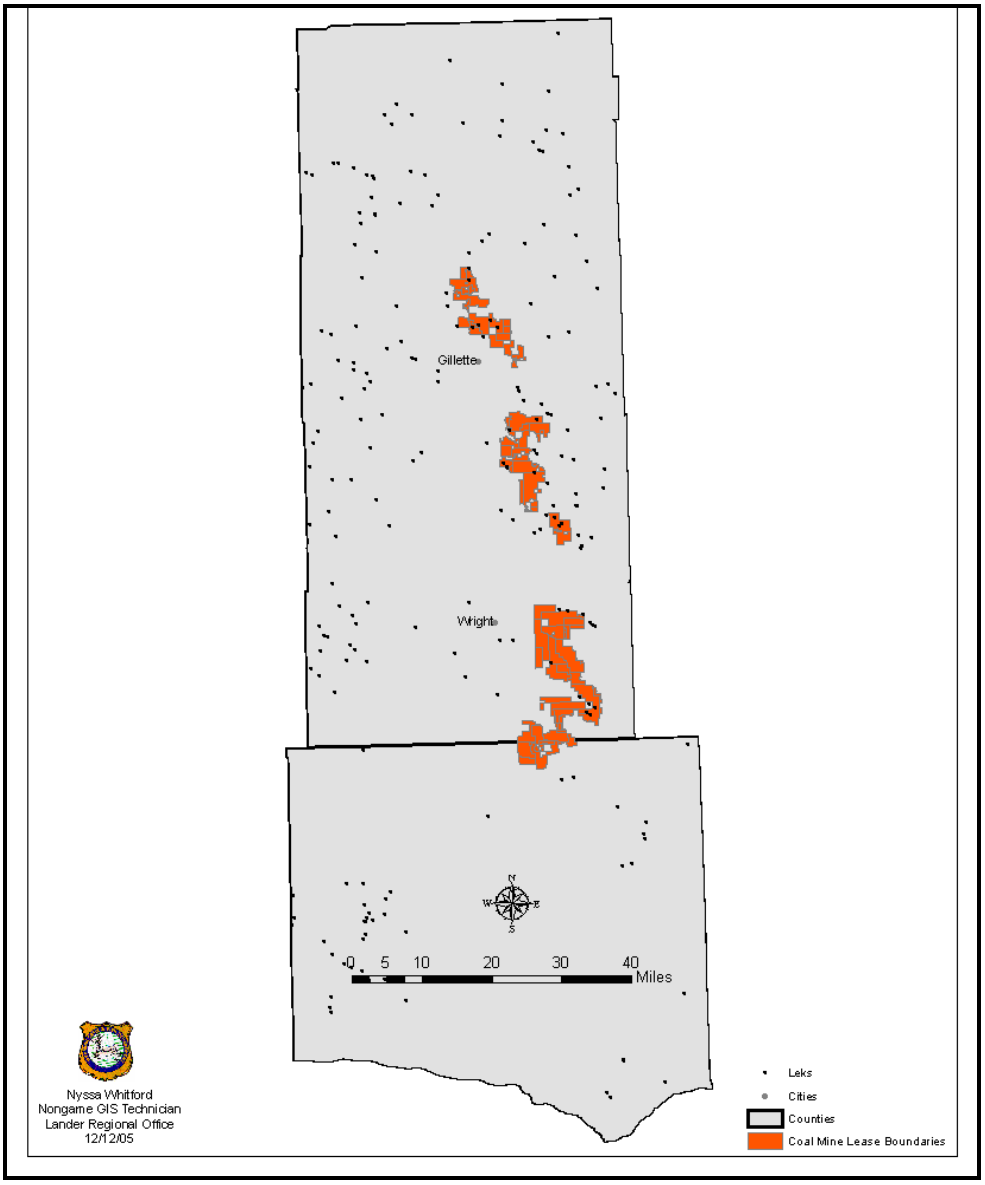
Coal reserves are extensive in northeast Wyoming with the bulk of the resource occurring in Campbell, Sheridan and Johnson Counties (Figure 15). In the BLM Buffalo Field Office, federal coal lands determined to be available for leasing as part of the Buffalo Resource Management Plan total 430,400 acres in eastern and southeastern Campbell County and north central Sheridan County (BLM 2001). Of those lands available for leasing, approximately 120,000 acres in Campbell County are currently leased. Other areas of the Powder River Basin do not currently have development potential due to quality, thickness, and depth considerations. As economic conditions change, the development potential for these reserves may increase. The Powder River Basin coal mines are located in eastern Campbell County where the coal seams occur at or near the ground surface (Figure 16). These existing operations are all surface coal mines.

Figure 15. Occupied sage-grouse leks and coal reserves in the Northeast Wyoming Working Group conservation plan area (WyGISC 2005).



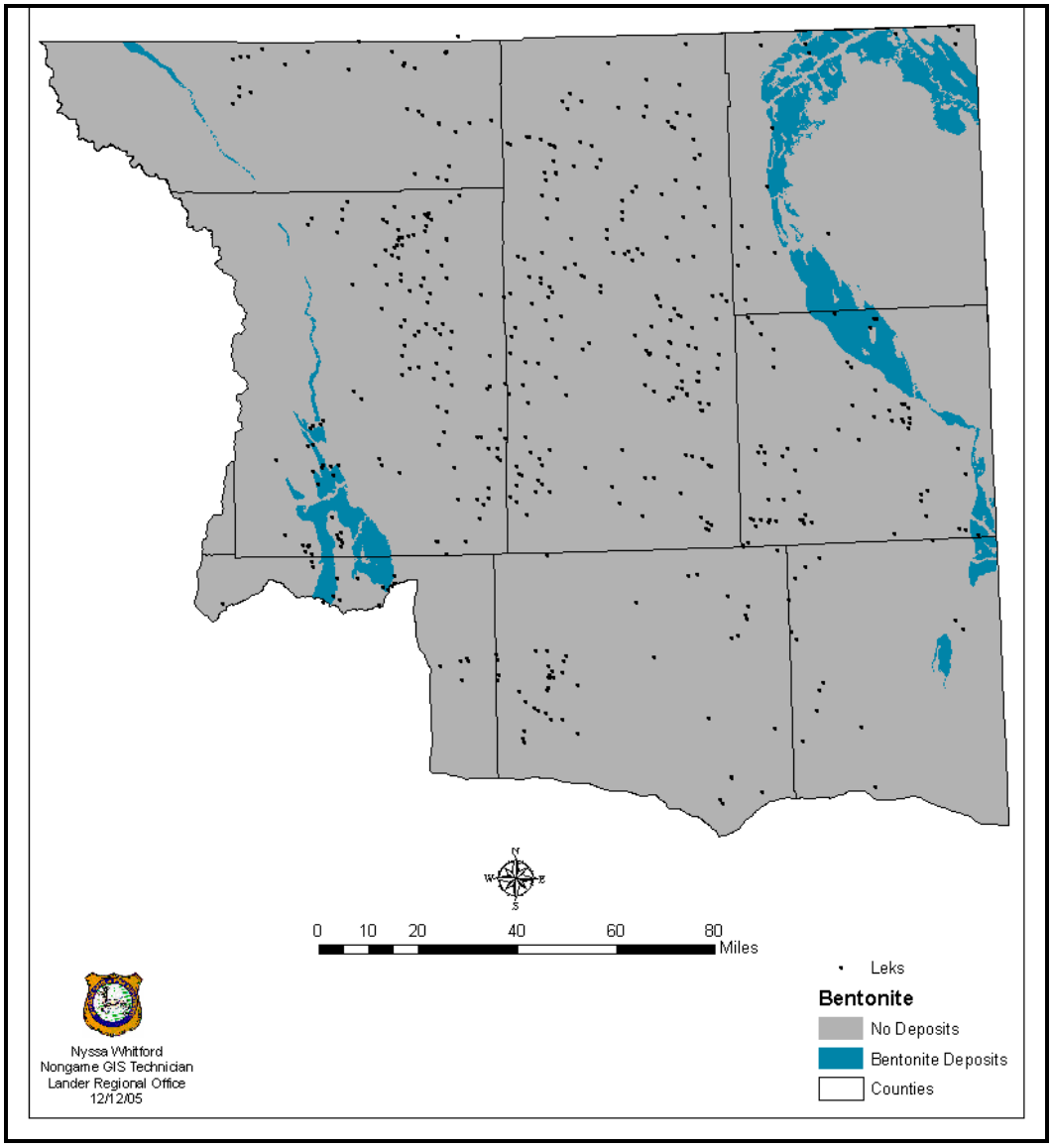
The reader is directed to Appendix IV – Coal Exploration, Mining and Reclamation for a detailed description and evaluation of the northeastern Wyoming coal industry as it relates to sage-grouse and habitats.

Figure 16. Coal mine lease boundaries and occupied sage-grouse leks.



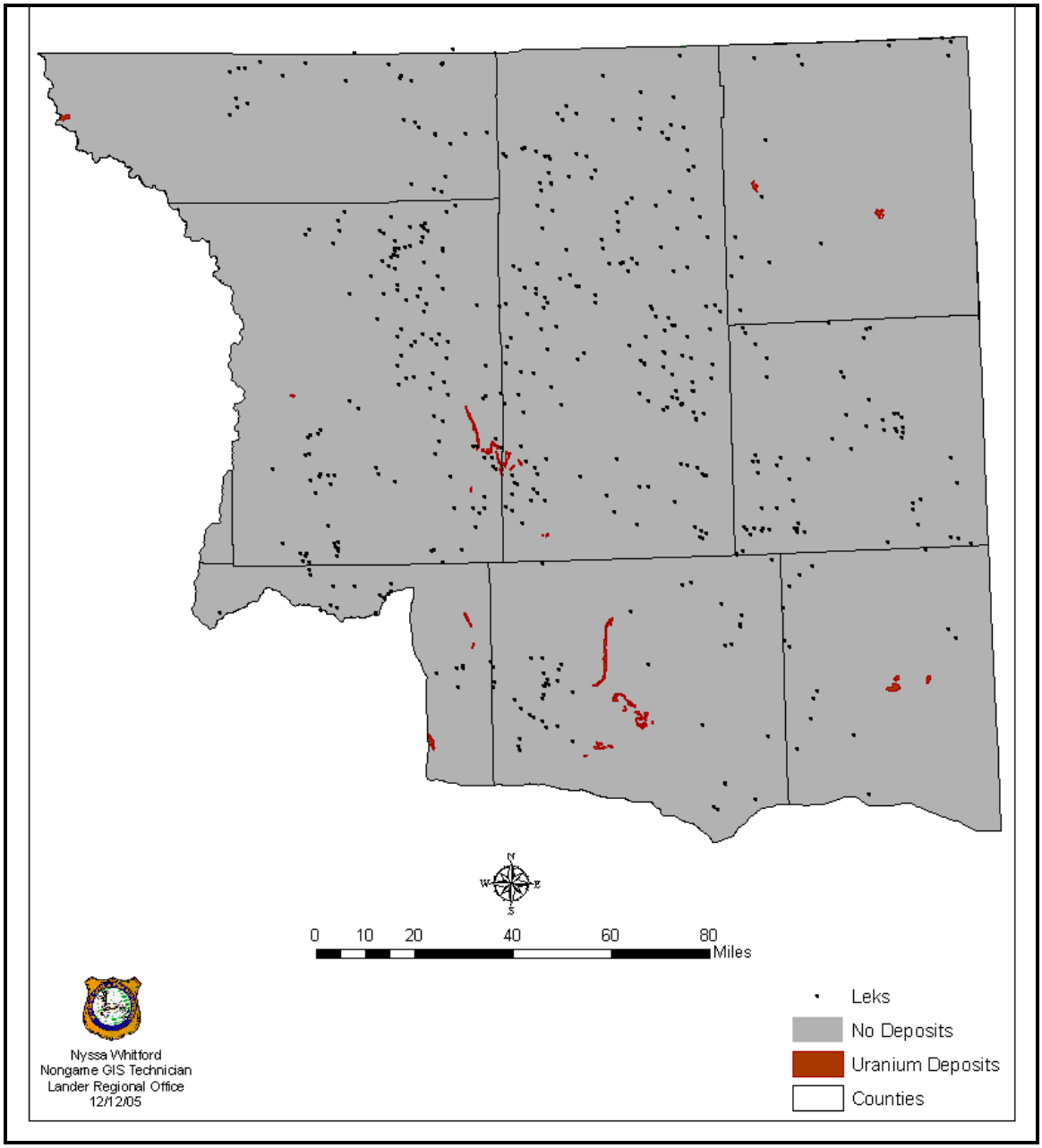
Bentonite is another mineable resource in northeast Wyoming, although its extent is limited and its effects on sage-grouse are similarly limited. Bentonite reserves are more restricted in the Northeast Wyoming Sage-grouse Working Group conservation plan area, with significant deposits in the northeastern Crook County, northern Weston County and southwestern Johnson County (Figure 17). Areas with bentonite generally feature sparse vegetation because of the makeup of the mineral. These open areas can serve as leks if adequate nesting cover is nearby. Mining activity is ongoing in a number of areas and is permitted by the Wyoming Department of Environmental Quality.

Figure 17. Occupied sage-grouse leks and bentonite reserves in the Northeast Wyoming Sage Grouse Working Group conservation plan area (WyGISC 2005).



Uranium is also extracted from the Northeast Wyoming Sage-grouse Working Group conservation plan area. Uranium reserves are rather limited in northeast Wyoming but do occur in sagebrush habitat (Figure 18). Several sage-grouse leks are located in areas of uranium reserves. The Irrigary Mine in southeastern Johnson County is an example of uranium activity in the conservation plan area. The mine is relatively limited in size. This mine is currently gearing up production operations after having been shut down due to low product demand. Additionally, another company initiated permitting to open a mine adjacent to the Pumpkin Buttes. Demand for uranium production is market driven and is again becoming a profitable industry in Wyoming.

Figure 18. Occupied sage-grouse leks and uranium reserves in the Northeast Wyoming Sage Grouse Working Group conservation plan area (WyGISC 2005).



There are numerous mining operations for various construction and road surfacing materials in northeast Wyoming including scoria (a porcelinite/clinker combination), sand, gravel and rock. Mining operations can be small, with limited permitting requirements, or large, requiring significant permitting and compliance activities. Scoria pits are found throughout the plan area wherever coal seams are found. Scoria mining, along with the mining of other materials suitable for road surfacing, represent the single largest mining disturbance in the plan area outside of coal mining. While all extraction activities for road surfacing materials are theoretically regulated by the Department of Environmental Quality Land Quality Division,

it is doubtful if all gravel pits in the conservation plan area have been registered with that agency. 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.

Significant limestone deposits occur in northeast Wyoming but are typically not located in sage-grouse habitat.

8. Parasites and Diseases

Sage-grouse are known to harbor a number of different parasites and diseases. Most diseases and parasites have evolved with sage-grouse over time. Many of these afflictions are often not a serious concern unless the sage-grouse are stressed. Diseases and parasites that affect sage-grouse include various bacteria, protozoa, worms and ecto-parasites. Many of the common parasites and diseases carried by sage-grouse appear to be non-pathogenic, but may increase the vulnerability of infected birds that are stressed or concentrated.

Coccidiasis is one disease that has been identified as a cause of sage-grouse mortality. Coccidiasis 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 known at this time. Diseases and parasites may potentially become an issue if sage-grouse come into contact with captive-raised birds released into the wild. West Nile virus has been identified as a cause of significant mortality at a local scale (Naugle 2005a). However, the implications of diseases and parasites at a range wide level are unknown (Connelly et al. 2004).

West Nile virus, however, may pose a serious threat to the sage-grouse, particularly in northeast Wyoming where the disease was shown to have a serious impact on a local sage-grouse sub-population near Recluse (Walker 2004). Transmission of the virus may be facilitated by the proliferation of reservoirs needed to store the water produced as a by-product of coalbed natural gas production. These reservoirs serve as breeding habitat for the Culex tarsalus mosquito, which is believed to be the primary vector of West Nile virus.

West Nile virus was first confirmed in sage-grouse in 2003 in the northern Powder River Basin. Fourteen sage-grouse were confirmed positive with the disease that year. One of the birds had died, been collected and frozen for later analysis in 2002. In 2004 and 2005, four and two additional mortalities were confirmed positive for West Nile virus, respectively. 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) and Walker (2004) found that West Nile virus contributed to a 26% decline in the survival of four populations of marked sage-grouse in 2003. In the Powder River Basin of Wyoming and Montana, Walker (2004) determined late summer survival of marked sage-grouse was only 20% at a site with West Nile virus than two sites without (76%). In 2004, Naugle et. al. (2005b) found that late summer female survival was 10% lower in four populations with confirmed West Nile virus than in eight populations without West Nile virus.

No evidence of survival by sage-grouse exposed to the West Nile virus was found until 2005. Six (10%) 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.

9. Pesticides

Pesticides (herbicides, insecticides and rodenticides) are used in northeast Wyoming for a variety of purposes and have been identified as a possible influence on sage-grouse (WGFD 2003). However, it is not believed that pesticides are currently a major issue for sage-grouse under existing application practices. No direct research on the effects of the field applications of currently used pesticides on sage-grouse has been conducted in Wyoming. Toxicity under laboratory conditions does not equate well to wildlife hazards under field conditions. Sage-grouse exposure and potential risk are dependent on numerous factors, such as application rate, pesticide formulation, and timing of treatment.

Pesticide impacts on sage-grouse in the field are difficult to quantify. This is exacerbated by the fact that these effects are believed to be sub lethal, such as predisposing animals to predation or reducing reproductive success.

In northeast Wyoming, grasshopper and Mormon cricket control is common during years with infestations. Some treatment programs for invasive plants involve Integrated Pest Management (IPM). A successful example of IPM is the treatment of leafy spurge using chemical and biological management. Sagebrush is sprayed to make the leafy spurge more available to biological controls. Although this treatment may be effective for the invasive plant, the reduction or elimination of sagebrush has negative consequences 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.

10. Predation

As should be expected, predation is and has always been the major cause of sage-grouse mortality (WGFD 2003). Predation during nesting and early brood-rearing has the greatest influence on sage-grouse populations. 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.*) prey on sage-grouse throughout the year. Humans have altered the landscape and influenced predator-prey relationships that evolved between sage-grouse and native predators. These activities have led to a change in the number, distribution and type of predators that prey on sage-grouse.

As habitats are altered, and/or where predators dramatically increase in number or in type, impacts of predation may be magnified. "Newcomer" predators such as red fox and raccoons have expanded their range into sage-grouse habitats where they were not previously a factor. These newcomers and traditional sage-grouse predators have increased in numbers largely as a result of readily available food associated with human activities. Migratory bird protection has also allowed avian predator populations 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 a sage-grouse population.

Predator management may mean lethal control, but may also include removing key elements that attract predators (e.g. perches, food sources) and/or increasing the quality of habitat for sage-grouse. 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. Large-scale predator removal is not indicated as a statewide objective. Where predation is demonstrated to be of significant concern, planning groups should consider localized predator management. Research on the cause and effect relationship of predator control is needed.

Sage-grouse face predation pressures from many sources. In northeast Wyoming, large numbers of hawks and eagles migrate to the area during winter. Ravens, whose populations are increasing along the Bighorn Mountains, 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 that 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.

11. Recreation

Recreational impacts to sage-grouse populations include potential disturbance of breeding and nesting activities, and habitat fragmentation due to road usage. Research suggests that road-related disturbances during the breeding season may cause sage-grouse leks to become inactive over time, cause fewer hens to breed 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. Recreational viewing of leks can cause disruption of breeding activities, especially when it is conducted from too close a distance and/or on a long-term basis. The increased use of off-road vehicles and other outdoor recreational activities may result in greater disturbance of sage-grouse and degradation of habitats. These impacts are more likely to occur on public lands, or on leks adjacent to public roads.

Northeast Wyoming is largely private land with much of the public land supporting sage-grouse habitat inaccessible because of landownership patterns. Seventy percent of the

sage-grouse leks occur on private land with many of the public land leks located on parcels of BLM and state lands that are inaccessible to the public. Little public activity occurs on private lands during the spring breeding and nesting periods. Additionally, very limited sage-grouse hunting occurs on private lands. Accessible public lands receive considerable recreation activity especially during hunting seasons. During the spring season, recreational activities include ATV riding, prairie dog hunting, sightseeing, driving and lek viewing. Effective travel management plans should preclude disturbance to sage-grouse at this time of year.

12. Local Residential Land Use

Little or no research is available that directly addresses the effects of residential development on sage-grouse, but some of the effects are obvious. Residential development can cause direct loss of lek sites and seasonal habitats and also fragment those habitats. Other factors that may impact sage-grouse populations include increased roads, fencing, power lines, human activity, and density of cats and dogs. In addition, new landfills/trash facilities may increase predator populations.

Research suggests that road-related disturbances during the breeding season may cause sage-grouse leks to become inactive over time, cause fewer hens bred on disturbed leks to initiate nests, and 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.

Almost every population center in northeast Wyoming is experiencing significant residential development outside of city limits. Much of this residential expansion occurs because of people's desire to live outside of town to distance themselves from neighbors and have enough property for animals. There has been a significant influx of people in recent years due to the work force demands of the energy industry as well as retirees moving west. Significant development has occurred adjacent to Sheridan, Buffalo, Gillette, Wright and Newcastle. Subdivisions with home sites greater than 35 acres are not regulated by Wyoming's subdivision law. County governments vary in their regulation of subdivisions depending on their zoning laws, if any. 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.

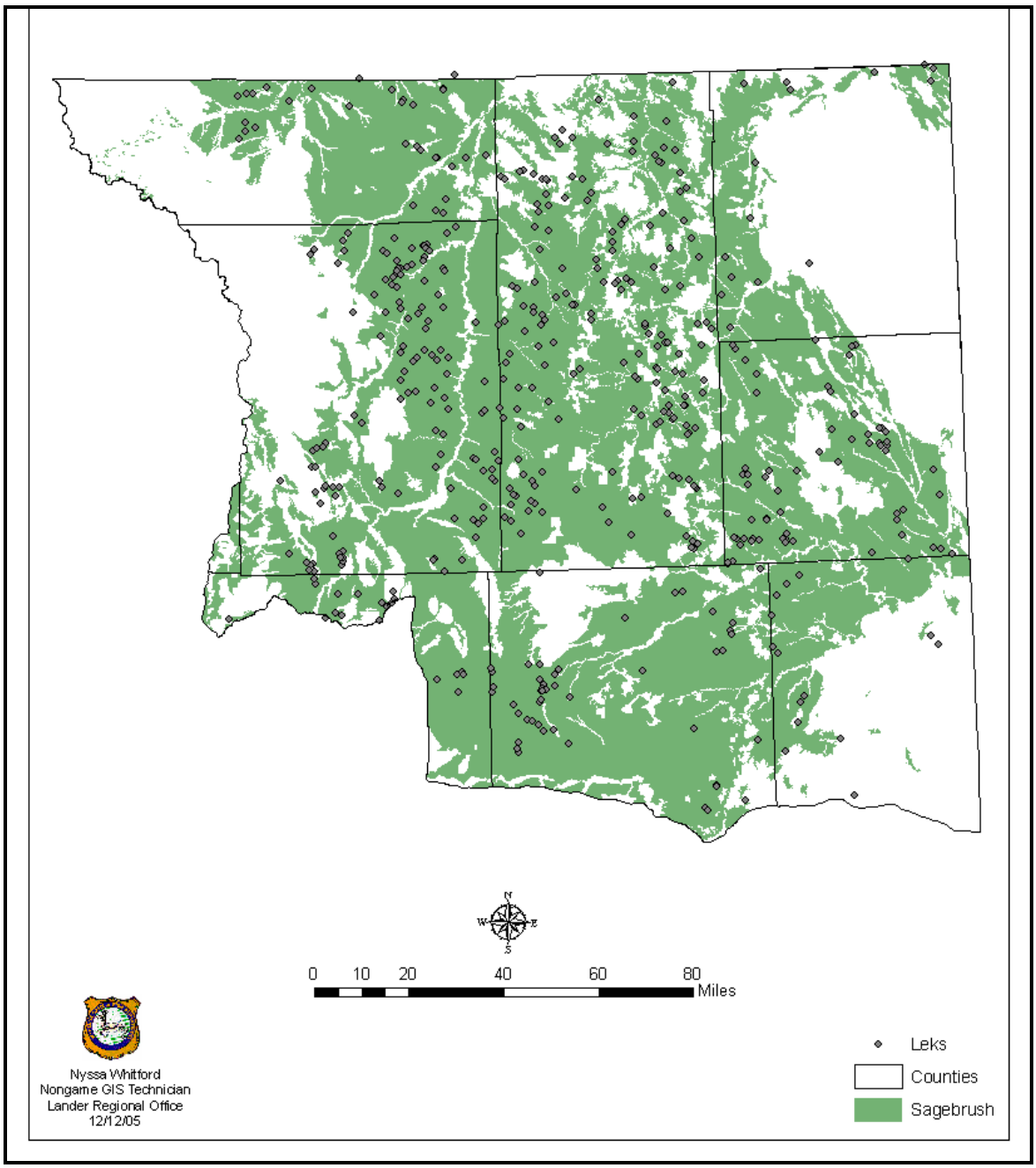
Additional information on local government is provided in Appendix V.

13. Vegetation Management

Sage-grouse are dependent on sagebrush habitat. Sagebrush communities occur throughout northeast Wyoming with the exception of the northern Bighorn Mountains, the

western Black Hills and the grasslands of northern Crook and Niobrara Counties. Figure 19 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 57% of the Northeast Wyoming Sage-grouse Working Group conservation plan area.

Figure 19. Sagebrush habitats and occupied sage-grouse leks within the Northeast Wyoming Sage-grouse Working Group conservation plan area (Source: BLM based largely on Wyoming GAP Analysis Land Cover Map).



A recent sagebrush cover assessment within Wyoming basins estimated average cover of sagebrush in the Powder River Basin to be 35%, with an average sagebrush patch size less than 300 acres (Rowland et al. 2005). Sagebrush patch size in the Powder River Basin has decreased by more than 63% in forty years, down from 820 acre patches and an overall coverage of 41% in 1964.

The close association between sage-grouse and sagebrush is reflected by the lek locations in Figure 19. The sagebrush species found in northeast Wyoming most important to sage-grouse are Wyoming big sagebrush (*Artemisia tridentata subsp. wyomingensis*) and silver sagebrush (*Artemisia cana subsp. cana*), both of which occur at lower elevations. Mountain big sagebrush (*Artemisia tridentata subsp. vaseyana*) occurs at higher elevations of the Bighorn Mountains.

Sagebrush communities evolved as dynamic landscapes with climatic and soil-type variation driving changes in fire frequencies, and in adaptive development of different sagebrush species. These sagebrush communities commonly occur in tracts occupying hundreds or thousands of acres. The combination of active fire suppression and inappropriate livestock grazing 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.

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 in press). 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. Drought and grasshopper infestations have also been reported to change the dynamics of sagebrush communities in northeast Wyoming (Allred 1941).

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

Removal of large tracts of sagebrush is detrimental to sage-grouse populations. Spraying and burning are the most common treatments in northeast Wyoming. Limited spraying occurs today, but was used extensively in the past. Many large stands of sagebrush were converted to grassland by spraying (Figure 20). There are a number of leks that no longer attract sage-grouse because the sagebrush habitat has been converted to grassland. As an example, several lek sites within the 3T Complex are no used by sage-grouse. While some birds may be able to adjust by using adjacent sagebrush habitats, areas of extensive

treatment no longer support sage-grouse. Sage-grouse hens show fidelity for nesting in the same general area.

Figure 20. Photo of sagebrush spray project in Johnson County.

Burning is now more popular than other methods of sagebrush eradication because federal cost share programs have been reduced. Burning is also preferable because it promotes forb growth and generally produces a patchy treatment pattern. 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 so that sufficient stands of desirable sagebrush remain.

14. 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 lands in northeast Wyoming 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 about 10% of leks in northeast Wyoming occurring on state lands. Given the managing agency's mission to maximize revenue, little consideration has been given to the impacts of one user group on the other resources. Ranchers who lease the grazing use generally serve as the state's overseer because of the dispersed distribution of these lands and the limited personnel of the Office of State Lands and Investments. In fact, grazing lessees play a large role in negotiating surface easements with oil and gas companies.

To date there has been little consideration given to minimizing impacts to sage-grouse from oil, gas and CBNG development on State lands. The Office has begun to apply protections to key wildlife habitats, including sage-grouse habitat, in some parts of Wyoming, but to date none have been applied in northeast Wyoming. Protection of breeding areas and consideration of nesting and winter habitat would be valuable actions in the effort to effectively manage habitat for the northeast Wyoming sage-grouse population.

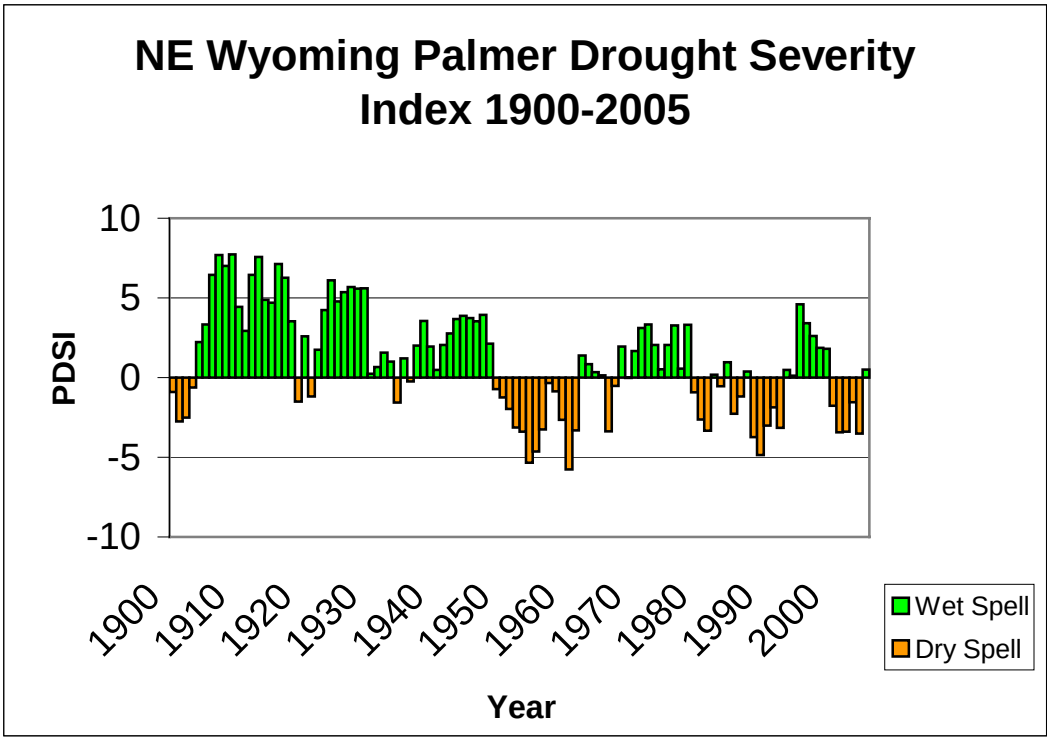
15. Weather

Because of the large area and geographical variation of the Northeast Wyoming Sage-grouse Working Group conservation plan area, climate conditions also vary. Nevertheless, a general description of weather for sage-grouse occupied habitat in northeast Wyoming is provided. Mean annual precipitation ranges from 11-15 inches, with 41-60 days per year receiving measurable precipitation (Curtis and Grimes 2004). Significant snowfall events are limited with less than three days annually receiving five or more inches. Mean annual snowfall over the area ranges from 36-77 inches. The mean annual temperature over northeast Wyoming ranges from 40-50 degrees Fahrenheit. Temperatures 32 degrees or lower are recorded an average of 171-210 days per year.

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 21 shows the index for the Powder River drainage for years 1900 through 2005. Drought periods lasting three years or longer have been more frequent and more severe in the last one-half of the 20th century.

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 by physically stressing them and by modifying their habitats. Annual variations in precipitation and temperature can affect annual sage-grouse production and can be very site-specific. Cold, wet weather during early-brood-rearing can physically stress and kill young chicks and have adverse affects on insect populations. However, cool, wet springs can be advantageous to sage-grouse by promoting herbaceous growth, especially forbs. Extremely hot-dry conditions during the early summer 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 21. Palmer Drought Severity Index (1900-2005) for the Powder River drainage of northeast Wyoming (NCDA 2005)



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 affect upon sage-grouse populations, and wildlife managers must understand these effects in order to correctly assess the extent to which they are limiting a population or contributing to its decline. The short-term role that weather plays and long-term climate change effects on sage-grouse populations must be considered when management practices for sage-grouse are selected.

Priority Areas For Implementation of Conservation Actions

Conservation actions presented in the Conservation Strategy section of the plan are in various phases of implementation including completed, ongoing, planning and concept. Implementation of projects will depend on a number of factors including funding, willing cooperators and project sponsors. The Northeast Wyoming Sage-grouse Working Group 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 Northeast Wyoming Sage-grouse Working Group will utilize the sage-grouse density map (Figure 22) along with other criteria to prioritize projects for funding. Priority areas are sagebrush and associated habitats supporting high numbers of sage-grouse during the breeding season. In addition to providing breeding habitat, these areas can provide nesting, early brood rearing and winter habitats.

Figure 22 shows the relative density of sage-grouse during the breeding season based on observations of male sage-grouse obtained during lek monitoring. Areas of sagebrush habitat not closely associated with documented leks do not have a male density value but may be of importance to sage-grouse as seasonal habitat outside of the breeding season. Likewise, these areas may have leks that have not yet been documented. A few leks occur outside of areas with a male density value. Three factors individually, or in combination, contribute to this; 1) the graphic displays occupied leks as of 2005 whereas the male density was calculated from monitoring efforts from 2000-2003, 2) leks may not have been monitored during the period, and 3) monitoring failed to document male attendance at the lek.

Areas of high, medium and low value to the northeast Wyoming sage-grouse population during the breeding season are areas that also provide nesting and brood rearing habitats. Wintering habitats are not accounted for at this time. However, University of Montana researchers are conducting studies of sage-grouse in the Powder River Basin and are developing a winter habitat model which will be available in the near future.

The Northeast Wyoming Sage-grouse Working Group is focusing on areas that support the highest densities of grouse during the breeding season. Or, in other words, conserving and enhancing the best habitat in the working group area if it is not threatened, and implementing actions to mitigate limiting factors in threatened habitat. Obviously, a number of additional factors will contribute to which projects will be implemented, including opportunity (landowner, agency, etc.), cooperating funds, limiting factor ranking and seasonal habitats (Figure 23).

Figure 22. Project implementation priority areas for the Northeast Wyoming Sage-grouse Working Group as determined by male lek attendance and sagebrush habitat.

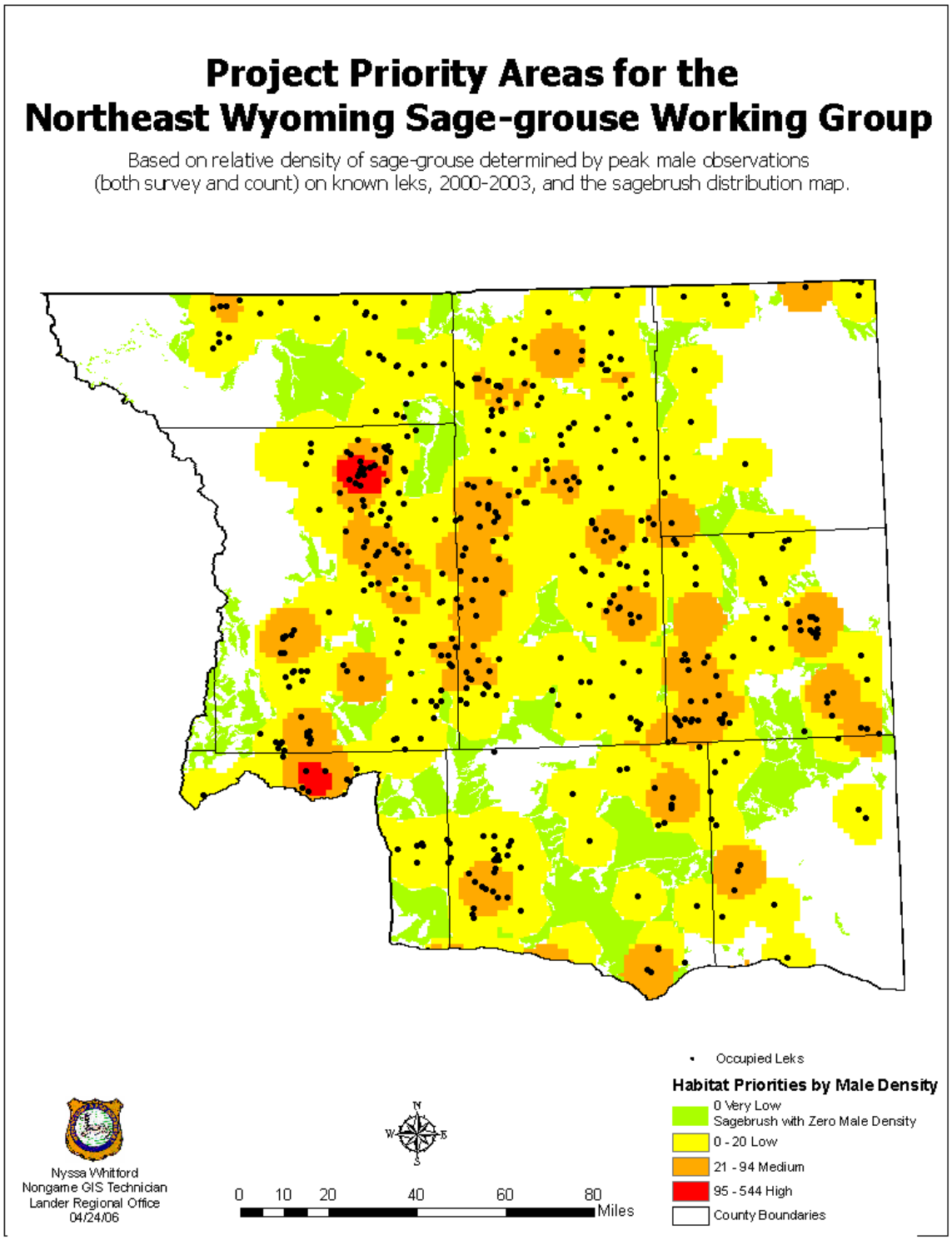
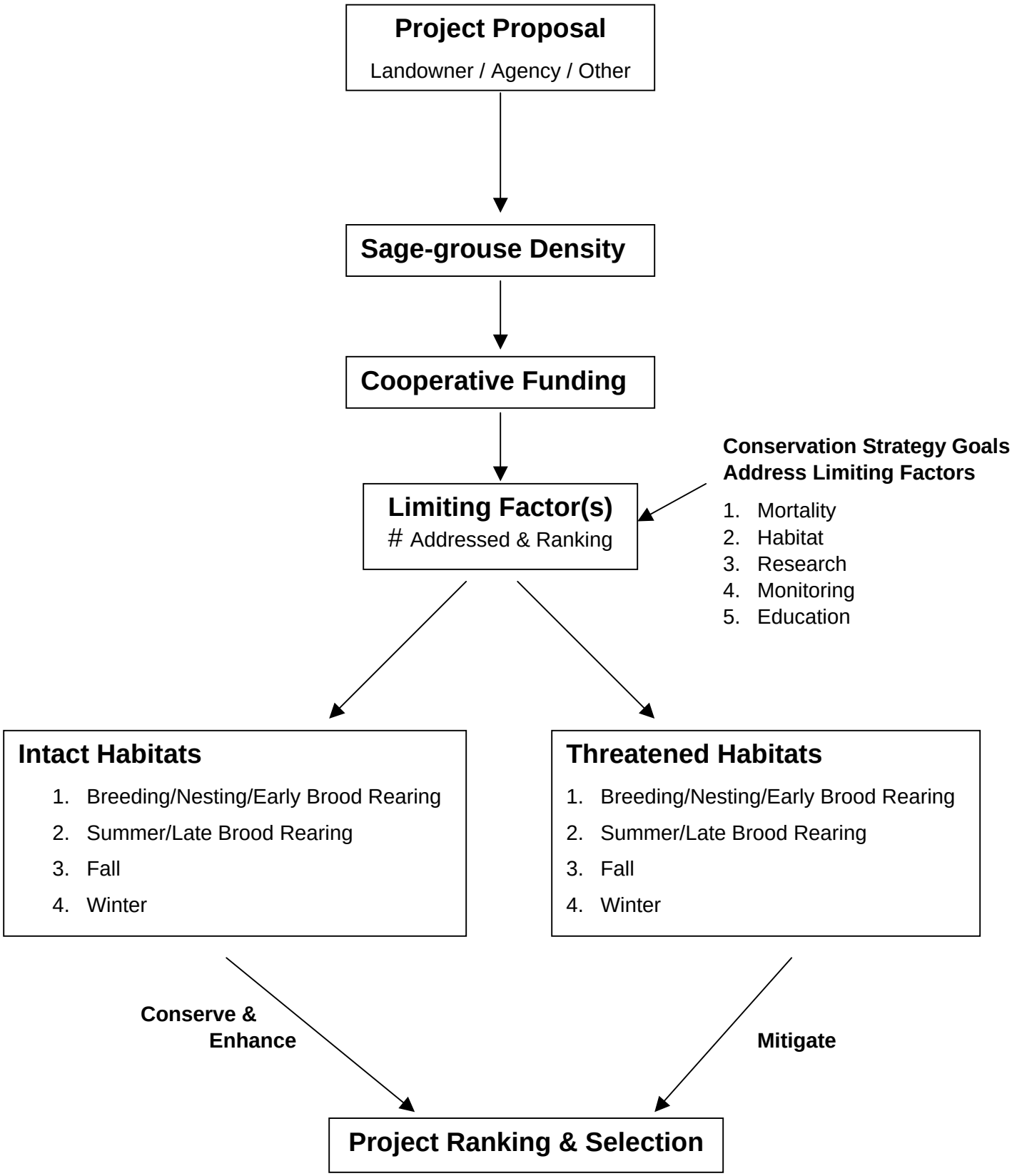


Figure 23. Project Implementation Prioritization Flow Chart.



CONSERVATION STRATEGY

The Northeast Wyoming Sage-grouse Working Group Conservation Strategy is presented below with conservation goals, objectives, commitments and recommended actions. Recommended management practices (RMPs) are listed by limiting factor in the following section. Agency and industry sector commitments that were already underway as of the writing of the conservation strategy are more fully documented in the appendices.

The strategy for sage-grouse conservation in northeast Wyoming 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 Northeast Wyoming 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.

A table of commitments is provided with pertinent information on implementation of conservation actions. A commitment is an action that an agency or group has agreed to complete or has already completed. Recommended actions are projects identified by the working group to promote sage-grouse and sagebrush habitat conservation. The working group identified actions and lead agencies or groups to promote the actions. The working group will be contacting the identified parties over the next two years to secure commitments for accomplishing the 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.

The working group will be soliciting additional projects for evaluation for the group's support and recommendation for financial support as project funding becomes available.

Conservation Goal 1 – Habitat

Maintain, restore and/or enhance sage-grouse habitat.

Conflicting Wildlife Management Objective - Minimize or avoid impacts to sage-grouse and sagebrush habitat when developing management goals and strategies for other wildlife species.

Farming Objective - Adapt farming operations in northeast Wyoming to be compatible with the maintenance and enhancement of sage-grouse habitat.

Invasive Plants Objective - Prevent, eliminate and reduce undesirable plants in the landscape.

Livestock Grazing Objective - Adapt livestock grazing practices on state, federal, and private lands that result in healthy rangelands and improves degraded habitats.

Coal/Mineral Development Objective - Develop the mineral resource in a manner compatible with maintenance and enhancement of the sage-grouse population and habitat.

Oil and Gas Development Objective - Develop the oil and gas resource in a manner compatible with maintenance and enhancement of sage-grouse populations and habitat.

Recreation Objective – Manage to minimize recreation impacts on sage-grouse where these impacts are concentrated.

Vegetation Management Objective - Provide incentives and funding of programs on private and public lands for conservation of sagebrush communities and forage production.

Residential Land Use Objective - Minimize the impacts of residential development on sage-grouse habitats and populations.

Wyoming State Lands Management Objective - Manage state lands to achieve the Office of State Lands and Investments mission while implementing the Northeast Wyoming Sage-grouse Conservation Plan.

Conservation Goal 2 – Direct Mortality

Manage factors contributing to the direct mortality of sage-grouse.

Hunting Objective - Conduct hunting of sage-grouse in a manner that is compatible with maintaining robust populations and allows depressed populations to increase.

Parasites and Disease Objective - Minimize the effects of parasites and disease on sage-grouse in northeast Wyoming.

Pesticides Objective - Document and minimize the effects of pesticides on sage-grouse.

Predation Objective - Minimize harmful predation of sage-grouse where predator impacts are concentrated.

Conservation Goal 3 – Research

Initiate and encourage sage-grouse research.

Weather Objective - Recognize that weather is a significant factor in determining the status of the sage-grouse population.
Research and Development Objective - Conduct research to better understand sage-grouse ecology and determine the extent that identified factors affect populations.

Conservation Goal 4 – Monitoring

Monitor the sage-grouse population and habitat characteristics to determine current status and trends.

Monitoring Objective - Monitor breeding populations at a level adequate to assess population trends and benefits of conservation efforts.

Risks Assessment Objective - Identify the risks for sage-grouse conservation as a result of human activities such as subdivisions, roads, power lines, coal mines and oil and gas wells.

Conservation Goal 5 – Outreach

Increase public awareness, knowledge, and support of sage-grouse conservation.

Public Education Objective – Initiate public outreach to improve awareness of sage-grouse conservation.

Recommended Management Outreach Objective - Promote Recommended Management Practices for sage-grouse conservation.

Table of Commitments and Recommended Actions

Commitment - an action that an agency or group has agreed to complete or has already completed.
Recommended Actions - projects identified by the working group to promote sage-grouse and sagebrush habitat conservation. The working group identified actions and lead agencies or groups to promote the actions. The working group will be contacting the identified parties over the next two years to secure commitments for accomplishing the actions.

Oil and Gas Development	Responsible Parties	Action	Time Schedule	Funding Source
Commitment(s)	***BLM – all actions*** (from the Powder River Basin EIS)	**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 mile of lek sites to protect breeding areas and a seasonal timing limitation (March 1 to June 15) on new surface disturbing activities an additional 1.75 mile radius beyond the 0.25 mile lek radius to protect nesting activity.** **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.** **3) Compressor stations are located so that operating noise does not exceed 49 decibels (10 dBA above background noise) at adjacent sage-grouse and sharp-tailed grouse leks.** **4) Power lines are located 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.** **5) Above ground power lines, where practical, are located at least 0.5 mile from any sage-grouse breeding or nesting grounds to prevent raptor predation and sage-grouse collisions with conductors. Power poles within 0.5 mile of any sage-grouse breeding ground are raptor-proofed to prevent raptors from perching on the poles.**	***Ongoing – all actions***	***Oil & Gas Companies – all actions***

		6) Produced water impoundments are located in areas other than sagebrush shrublands, where practical. **7) Produced water impoundments would be fenced to manage wildlife and livestock. If they are not fenced, they would be designed and constructed to prevent entrapment and drowning.**		
	USFS-Thunder Basin National Grasslands	**1) Construction of new oil and gas facilities is prohibited within 0.25 miles of active display grounds.** **2) Surface disturbing activities are restricted within 2 miles of active display grounds from March 1 to June 15.** **3) Noise from facilities and activities adjacent to leks is limited from nearby facilities and activities to 49 decibels (10 dBA above background noise) from March 1 to June 15.** **4) Facilities constructed within 2 miles of leks are designed to discourage perching raptors or use perch inhibitors.** **5) Bury electrical utility lines of 33 KV or less.**	***Ongoing - all actions***	***USFS***
* Commitments identified are for the Buffalo Field Office and the Powder River Basin project area (Buffalo + northern Converse County). Commitments in other portions of the working group area may vary.				
	NE Wyoming Sage Grouse Working Group	**1. Research by Naugle (2006b) forecasts serious declines of sage-grouse in areas with energy development despite utilization of conservation measures employed by government agencies. The group will promote consideration of the following options to further sage-grouse conservation in and adjacent to areas of energy development:** **a. Continued analysis of lek data to determine effects of development on sage-grouse.** **b. Select an area with ongoing development as a demonstration area, collect baseline data and apply all applicable conservation measure to determine if impacts can be mitigated.** **c. Select an area where development is imminent as a demonstration area, collect baseline data and apply all**	***December 2007***	***To be determined (TBD)***

		applicable conservation measures to determine if impacts can be mitigated. **d. Consider the option of augmenting depressed population segments where reclamation has occurred and limiting factors, either singly or in combination, are not suppressing sage-grouse recruitment.** **e. Identify areas within or adjacent to development as set-aside areas, collect baseline data and apply all applicable conservation measures to benefit sage-grouse and enhance habitat. Set-aside areas have potential for development, but development would be delayed until adjacent disturbed areas are reclaimed.** **f. Identify areas for habitat banking outside of active development, collect baseline data and initiate projects to benefit sage-grouse and enhance habitat.** **The habitat set-aside and banking projects would focus on areas with high breeding and wintering numbers of sage-grouse (quality breeding, nesting and wintering habitats). The set-aside concept may involve conservation payments to lease holders.**		
		2. Publication of a brochure identifying plant species, seeding practices, and seed mixes beneficial to sage-grouse in reclamation of disturbed sites. The brochure is available on the Wyoming Oil and Gas Conservation Commission web site, the Wyoming Game and Fish Department web site and at county conservation district offices.	***Completed***	***WGFD***
		Provide landowners holding private surface/private mineral rights with information to formulate surface use agreements and encourage them to apply development restrictions on important breeding and nesting habitats (Avoid surface disturbance or occupancy within ¼ mile 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 ¼ mile of the perimeter of "occupied"	***December 2007***	***WGFD***

		sage-grouse leks.)		
	Industry / Petroleum Assocation of Wyoming – all projects	**1) Participate in the interagency working group to implement the measures required by the Powder River Basin Oil and Gas EIS Record of Decision. The terrestrial wildlife group includes members from the BLM, WGFD, USFS and USF&WS. The working group sponsored a consultant's coordination meeting in February 2004 to better synchronize lek monitoring efforts. The working group also refined mitigation and monitoring requirements associated with CBNG development in sage-grouse habitats.** **2) Continued monetary support and in kind contributions via their collective hydrology and biology staffs and consultants for ongoing West Nile virus and sage-grouse habitat research by the University of Wyoming and through the University of Montana/BLM Sage-grouse Study. Several technical papers and dissertations have resulted from the work in progress.** **3) Company specific mosquito control in light of the WNV outbreak of 2003. During 2004 and 2005, at least 26 CBNG produced water impoundments have been tested and treated. Work included identification and elimination of mosquito habitat and working with consulting biologists to identify mosquito species, quantify carrier species, and treat larvae.** **4) Oil and gas are certainly providing extensive but temporary surface disturbance for well and facility sites and for pipeline right-of-ways. Typically these disturbances are reclaimed and reseeded as soon as practical to take advantage of the limited growing season and snow melt and rainfall. Industry works with the BLM and landowners to select proper seed types to ensure plants are appropriate and provide benefit to livestock and wildlife and prevent erosion. More and more, industry is including sage-grouse beneficial seed mixes in their reclamation plans. This practice should increase as regulators and surface owners acknowledge the benefit to sage-grouse.**	***Ongoing – all projects***	***Oil & Gas Companies – all projects***

	Williams Production RMT	**1) LOWER MORGAN RESERVOIR DAM - Description: As part of the Storm Water Pollution Prevention Plan (SWPPP) approximately 5 acres of reclaimed land in southwestern Campbell County was planted and irrigated adjacent to a reservoir dam on the Rice/Mankin Ranch. Produced coalbed methane water from the Lower Morgan reservoir has been used to irrigate the sage-grouse beneficial species. The following species, at varying pounds per acre, were planted in mid-June 2005 and periodically irrigated by a ground sprinkler system: Fourwing Saltbush, Rabbitbrush, Winterfat, Silver Sage, American Vetch, Western Wheatgrass, Green Needlegrass and Sandberg Bluegrass.** **Expansion of the pilot area is pending inspection in the spring of 2006 to determine the success during the late 2005 growing season.** • **Long Term Goal: Establish forbs and shrubs in close proximity to Morgan Reservoir dam and potentially expand application to other reservoirs in the vicinity.**	***Ongoing***	***Williams Production RMT***
	J. M. Huber Corporation	**1) LOWER PRAIRIE DOG CREEK - Description: Subsurface drip irrigation system in Sheridan County. Produced coalbed methane water is used to irrigate forage grasses and alfalfa. Project has been ongoing. Success of this drip system may result in expansion to other areas outside Lower Prairie Dog Creek.** **2) Long Term Goal: Establish beneficial grasses, alfalfa, in the subsurface irrigation project area.**	***Completed***	***J. M. Huber Corporation***
	Windsor Energy Group	**1) AG RESERVE RANCH - Description: Subirrigation project on 1,200 acres in northern Campbell County for various pilot projects including hybrid poplar tree farm, enhancement of existing and beneficial grasses and forbs, and water related projects. Produced coalbed methane water is used in the subirrigation project. SCADA will be used to monitor and control the entire subirrigation system**	***Spring 2006***	***Windsor Energy Group***

		including water rates and volumes. • **Long Term Goal: Establish beneficial grasses, forbs and shrubs in the subirrigation project.**		
	Audubon Wyoming	**1) Audubon Wyoming has prioritized development of the *Sage-grouse Species Survival Plan*, a compilation of recommended management practices designed to sustain sage-grouse in areas of energy development. The plan will be provided to industry operators. Audubon Wyoming believes guidelines and stipulations are inadequate to protect sage-grouse in areas of development. Planned development is needed including formation of a field plan including industry's commitment to incorporate best management practices.**	***2006***	***Audubon Wyoming***
	Private Landowners	**1) Private landowners have incorporated reclamation plans into surface use agreements, including the use of seed mixes beneficial to sage-grouse.**	***Ongoing***	***Energy Companies***
Recommended Action(s)	*Williams Production RMT*	1) BLUE BUTTE RANCH PILOT - Description: Small area (less than 10 acres) habitat enhancement pilot, in eastern Johnson County, to include decadent sagebrush management, planting and irrigation of site specific and beneficial grasses, forbs and shrubs, and construction and maintenance of stock water tanks with wildlife escape ramps. Pilot project may include enhancement of existing reservoir. Currently in initial planning stage. Long Term Goal: If successful, will evaluate plans to expand to other sites on Blue Butte Ranch.	*Summer 2006*	*Williams Production RMT*
Vegetation Management	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***Lake DeSmet Conservation District, NRCS***	**1) The Lake DeSmet Conservation District Sage-grouse Restoration Program began in 2004 and continues to expand with additional landowner sign-ups and funding programs supporting in the program. Currently, 14 landowners have enrolled about 227,665**	***Ongoing***	***NRCS, BLM, USFWS, Ag Producers, St. of Wyoming, Eyas***

		acres in the program. The project budget is currently about $1.3 million. The project employs a number of strategies to improve rangelands including resource inventory, livestock grazing systems, and rangeland renovation using a Lawson aerator. The project is based on successes documented in "Sage-grouse Ecology and Management in Northern Utah Sagebrush-Steppe, a Deseret Land and Livestock Wildlife Research Report, 2002". A brief of the Lake DeSmet project is included in Appendix I.		***Found, Pheasants Forever, Wyo. Private Lands Grazing Team, Bighorn Envir. Consult., Wyo. Gov. Big Game License Coal., Anadarko Petroleum, Lance O&G Co. Inc., Kennedy Oil***
	NRCS, NE Wyoming Sage Grouse Working Group	**1) The NE Wyoming Sage-grouse Working Group secured $90,000 for the 173,500 acre Lake DeSmet Conservation District Sage-grouse Habitat Restoration Program.**	***Completed***	***2005 Wyoming Legislative Supplemental Budget Appropriation***
	WGFD, NRCS, Conservation Districts	**1) Utilize the Wyoming Game & Fish Department/NRCS wildlife extension biologist positions in northeast Wyoming to provide assistance to livestock producers and other cooperators to develop projects that will enhance sagebrush/grassland habitats.**	***Ongoing***	***WGFD, NRCS, Conservation Districts***
	USFS–Thunder Basin National Grasslands	**1) High structure sagebrush understory is managed for within 3.0 miles of leks where sagebrush is irregularly distributed and within 2.0 miles of leks where sagebrush is uniformly distributed.**	***Ongoing***	***USFS***
Recommended Action(s)	*BLM, USFS*	1) Adjust agency sagebrush habitat management guidelines to provide: a. A mosaic of early to late serial stages of sagebrush available for sage-grouse to meet seasonal habitat requirements; b. Sagebrush canopy cover of 15-25% in nesting, brood-rearing, and winter habitats; c. No more than 20% of breeding habitat in a given area is affected in	*TBD*	*BLM, USFS*

		any 30-year period; Additional treatments should be delayed until previously treated areas provide breeding habitat.		
	WGFD, NRCS, BLM, USFS, NGO's, Landowners	1) Identify suitable sage-grouse habitat and focus conservation and management efforts on areas where the most benefit can be realized.	*TBD*	*TBD*
	NRCS, Conservation Districts	1) Focus extension effort toward utilizing USDA and other grants to fund wildlife projects.	*TBD*	*NRCS, Conservation Districts* *Budget - program dollars*
	County Fire, BLM, USFS, WGFD	1) Work with county fire agencies and land owners/managers to develop resource oriented fire management strategies (encourage beneficial wildfires to burn). 2) Develop and implement wildfire suppression guidelines that address sage-grouse habitat health and management.	*TBD* *TBD*	*TBD* *TBD*
	BLM, USFS, WGFD, NRCS	1) 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. 2) 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.	*TBD* *TBD*	*BLM, USFS, WGFD, NRCS* *BLM, USFS, WGFD, NRCS*
	NRCS, Landowners	1) 2005 Contract Expenditures for Threatened and Endangered Species, Declining Species, or Species of Concern has 70,643 acres planned or applied in the seven counties of the NE region. Projects range from prescribed grazing to brush management to water development projects.	*Ongoing*	*NRCS, Landowners* *Budget $1,356,171*

Invasive Plants	Responsible Parties	Action	Time Schedule	Funding Source
Commitment(s)	***Landowners, local, state, and federal agencies, industry***	**1) Coordinated Resource Management for the Bitter Creek watershed in northern Campbell County identifies and treats invasive weeds in sage-grouse habitat.**	***Ongoing***	***Private Landowner***
Recommended Action(s)	*BLM, NRCS, USFS, WGFD, Landowners*	1) Prior to conducting habitat management actions, landowners and land managers evaluate the potential for cheatgrass and other invasive species and incorporate actions to minimize or limit their spread as part of project implementation.	*Ongoing*	*N/A*
	Wyoming Weed and Pest Council	1) Improve the standard for the percentage of cheatgrass seed allowed in certified seed from 2% to 1%.	*TBD*	*TBD*
	Weed and Pest Districts – all projects	1) Maintain records for invasive plant treatment and prevention programs to evaluate site specific and cumulative impacts to sage-grouse habitats. 2) Develop educational materials that promote methods to reduce the spread of noxious weeds. 3) Identify habitat treatments that have occurred in their district and evaluate their effectiveness. 4) Develop land user incentives for the control of undesirable plant species specific to sage-grouse. 5) Target at least one area of sage-grouse habitat in each district for control of undesirable plants.	*TBD - all projects*	*TBD – all projects*
	UW Cooperative Extension Service – all projects	1) Develop a program for controlling leafy spurge in sagebrush communities that does not compromise the value of the habitat for sage-grouse. (Contact the Extension Weed Specialist at the University of Wyoming Department of Plant Sciences 307-766-3113).	*TBD – all projects*	*TBD - all projects*

		2) Cooperate with local Weed and Pest Districts and Conservation Districts to develop and implement the approach. 3) Identify appropriate resource materials and financial needs for program implementation. 4) Map areas where non-native invasive plants of concern to sage-grouse already exist.		
Residential Land Use	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***WGFD***	**1) Provide lek maps to County governments to encourage conservation of important sage-grouse habitats.**	***December 2006***	***WGFD***
	Wyoming Stock Growers Association Land Trust Program	**1) The Land Trust Program utilizes conservation easements to protect land from development and remain in agriculture production.**	***Ongoing***	
	NE Wyoming Sage Grouse Working Group	**1) Develop sage-grouse habitat conservation guidelines for incorporation in subdivision covenants.** **2) Develop and distribute appropriate literature for developers and county planners.**	***December 2007*** ***December 2007***	***WGFD*** ***WGFD***
Recommended Action(s)	*County Governments*	1) Include sage-grouse habitat conservation guidelines in zoning laws and regulations applied to subdivisions in and adjacent to sage-grouse habitat.	*TBD*	*TBD*
Parasites and Disease	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***WGFD***	**1) Investigate and record sage-grouse deaths that could be attributed to parasites or disease.**	***Ongoing***	***WGFD, Wyo. State Vet Lab***

	NE Wyoming Sage-grouse Working Group	**1) Discourage impoundment construction that provides suitable breeding habitat for the mosquito species (Culex tarsalus) that carry West Nile virus. Recommend regulating water levels to discourage favorable breeding habitat.**	***December 2007***	***WGFD***
	Montana State University, USDA-ARS, University of Monatana	**1) Developed recommendations for CBNG development pond construction that would minimize exploitation of ponds by breeding mosquitoes, presented in: Naugle, D. E. 2006d. Sage-grouse and energy research in the Powder River Basin: An update for possible inclusion in the Audubon Wyoming's Greater Sage-grouse Species Survival Plan. Wildlife Biology Program, College of Forestry and Conservation, Unpublished report. University of Montana. 6 pp.**	***Completed***	***Montana State University, USDA-ARS, University of Montana***
Recommended Action(s)	*WGFD, BLM, USGS, Univ. of Montana, WY State Vet Lab, Montana State Univ.*	1) Promote research coordination to deal with disease outbreaks where appropriate.	*Ongoing*	*TBD*
Predation	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***BLM***	**1) Powder River Basin oil & gas projects: Recommend companies to locate aboveground power lines, where practical, at least 0.5 mile from any sage-grouse breeding or nesting grounds to prevent raptor predation and sage-grouse collision with conductors. Power poles within 0.5 mile of any sage-grouse breeding ground would be raptor-proofed to prevent raptors from perching on the poles.**	***Ongoing***	***N/A***
	Wyoming Animal Damage Management Board, County	**1) The 2006 Wyoming State Legislature appropriated $6 million for predator management in Wyoming. A newly created State Predator Management Administrator will work with County Predator Management Boards to implement predator control programs and research. These monies may be used to fund projects benefiting**	***2008***	***State of Wyoming Budget $6 million***

	Predator Boards	**sage-grouse**		
Recommended Action(s)	*PAW – Energy Sector*	1) Install underground power lines within ½ mile of sage-grouse leks to limit raptor predation.	*TBD*	*Oil & Gas Companies*
	PRE Corp	1) Remove above-ground power lines no longer in use.	*TBD*	*PRE Corp*
	County Predator Boards	1) Target appropriate predator control for the highest impact to sage-grouse populations.	*TBD*	*County Predator Boards*
	USF&WS	1) Conduct a species assessment on the raven (Corvus corax) and golden eagle (Aguila chrysaetos). 2) Include ravens in 50CFR21.43 "Control of Depredating Birds."	*TBD* *TBD*	*USFWS* *USFWS*
Livestock Grazing	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***Wyoming Water Development Commission***	**1) Approved 16 water pipelines and 3 water wells and pipelines to facilitate improved livestock grazing management and water for wildlife on 181,929 acres.**	***Ongoing***	***Wyoming Water Development Commission*** ***Budget $1.1 million***
	NRCS	**1) Continue to provide funding for incentive programs like the Environmental Quality Incentive Program (EQUIP) - Grazing Land Initiative, Conservation Security Program (CSP) and Wildlife Habitat Incentive Program (WHIP).**	***Ongoing***	***NRCS***
	USFS-Thunder Basin National Grassland	**1) Revised Allotment Management Plans provide for livestock grazing strategies that provide quality nesting cover in all sagebrush stands (>15% canopy cover of big sagebrush, silver sagebrush, and greasewood) within at least 3.0 miles of leks where sagebrush is irregularly distributed and within 2.0 miles of leks where sagebrush is uniformly distributed.**	***Ongoing***	***USFS***
Recommended Action(s)	*Conservation Districts,*	1) Develop and distribute livestock grazing RMPs that benefit producers and sage-grouse.	*TBD*	*TBD*

	WGFD, UW Extension and NRCS	2) Develop and present a workshop series that promotes livestock grazing practices that benefit livestock and sage-grouse.	*TBD*	*TBD*
	NRCS	1) Work with landowners/managers to develop grazing management plans in conjunction with implementing sage-grouse habitat RMPs.	*Ongoing*	*NRCS*
	NE Wyoming Sage Grouse Working Group	1) 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*	*Wyoming Governor's Sage-grouse Conservation Fund* *WGFD, NRCS, Campbell County Conservation District*
State Lands Management	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***NE Wyoming Sage Grouse Working Group***	**1) The Northeast Wyoming Sage-grouse Working Group made a presentation to the Wyoming Office of State Lands and Investments board promoting conservation measures to favor sage-grouse, namely, protection of breeding sites, environmentally friendly reclamation practices and wildlife escape ramps in stock water tanks.**	***Completed***	***N/A***
Recommended Action(s)	*Wyoming State Land Board*	1) Adopt Wyoming Sage-Grouse Conservation Plan RMPs on State Lands. 2) Adopt surface occupancy and timing stipulations to protect breeding and nesting habitat on State lands as outlined in Wyoming Greater Sage-Grouse Conservation Plan: • Avoid surface disturbance or occupancy within ¼-mile of the perimeter of occupied sage grouse leks; • Avoid human activity between 8:00 PM and 8:00 AM from March 1 thru May 15 within ¼-mile of the perimeter of occupied sage grouse leks;	*TBD* *TBD*	*Wyoming State Land Board* *Wyoming State Land Board*

		• Avoid surface disturbing activities and geophysical surveys in suitable sage grouse nesting and early brood-rearing habitat within 2 miles of an occupied lek or in identified sage grouse nesting from May 15 to July 15; and • Avoid human activity from November 15 to March 14 in designated important sage grouse winter habitat. • In the alternative, exploration and development activities shall be 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.		
Weather	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***WGFD***	**1) Representative weather data for northeast Wyoming will be analyzed and published annually in the Northeast Wyoming Local Working Group Sage-grouse Completion Report.**	***Ongoing***	***WGFD***
Coal/Mineral Development	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***Coal mines – all projects***	**1) Coal 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 it's one mile perimeter.** **2) Known leks are monitored by lek counts, a census technique that requires a minimum of three lek visits following a strict protocol during April and early May.** **3) Annual reclamation reports include a complete record of the status and history of all leks, including those that have been destroyed or have become inactive.** **4) Surface coal mines are required to develop and implement a highly detailed life-of-mine and reclamation plan. Federal and state laws are strictly enforced to ensure that all affected land is reclaimed.**	***Ongoing – all projects***	***Coal Mines – all projects***

		Furthermore, these laws require that reclamation be completed contemporaneously with the mining process. Surface coal mines in the Powder River Basin are reclaimed to a dual post-mine land use of livestock grazing and wildlife use. **5) Surface coal mine reclamation plans include an agency (USFS, DEQ-LQD, WGFD, USFWS) approved Wildlife Mitigation and Monitoring Plan which includes the reclamation of sage-grouse habitat when pertinent.** **6) The Powder River Basin (PRB) coal industry is committed to act within the spirit and letter of environmental laws, including those specific to wildlife in general and sage grouse in particular.** **7) The PRB coal industry will continue to develop and implement approaches to mine planning and development that are responsive to environmental impacts through every stage of the mining cycle.** **8) The PRB coal industry will continue to explore, develop and utilize environmental practices and technologies that improve environmental performance in mining operations.** **9) The PRB coal industry will employ the most suitable reclamation practices to timely return affected lands to a condition that will sustain livestock grazing and wildlife use.**		
Recommended Action(s)	*Coal mines*	Through the Wyoming Abandoned Coal Mine Lands Research Program (AMLRP), a Handbook of Western Reclamation Techniques (Handbook) was developed and published. This publication is the culmination of cooperative effort of the PRB mining industry, industry professionals, the academic community and regulatory agencies. It is designed to document field-proven reclamation techniques. 1) The Wyoming AMLRP which, in part, supported the development and publication of the Handbook will be ending in the near future. Therefore, the PRB coal industry in partnership with the University of Wyoming Office of Research and the Wyoming Department of Environmental Quality – Land Quality Division propose to periodically	*Ongoing*	*Coal Mines*

		seek funding and provide expertise to keep the Handbook current and available for use by energy and mineral extraction industries, as well as agriculture, land developers, agency personnel or any other entity requiring this specific information. The Handbook is currently undergoing the final update to be funded through the AMLRP and will be available for distribution in late 2006. It is also undergoing review and will, if necessary, be revised in the near future to include the most up-to-date field-tested reclamation techniques that benefit sage grouse and other wildlife habitat.		
Pesticides	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***WGFD***	**1) Investigate and record deaths and sickness that could be attributed to pesticides.**	***Ongoing***	***WGFD, Wyo. State Vet Lab***
Recommended Action(s)	*Weed and Pest Districts*	1) Develop a training program for certified pesticide applicators that emphasizes sage-grouse considerations. 2) Address grasshopper infestation issues using Reduced Area Application Treatments (RAAT's) approach.	*TBD* *TBD*	*TBD* *TBD*
Recreation	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***WGFD***	**1) The Wyoming Game and Fish Department issues news releases annually promoting viewing of strutting sage-grouse on leks. Recommendations on proper viewing etiquette to prevent disturbance are included.**	***Ongoing***	***WGFD***
	WGFD, BLM, USFS	**1) Agencies will document 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.**	***Ongoing***	***WGFD, BLM, USFS***

Conflicting Wildlife Management	Responsible Parties	Action	Time Schedule	Funding Source
Commitment(s)	***WGFD***	**1) Pronghorn and mule deer populations are managed so that utilization levels on key vegetative species do not exceed 35%.**	***Ongoing***	***WGFD***
	BLM	**1) The USDI Bureau of Land Management (BLM) lists sensitive species to focus management efforts towards maintaining habitats under a multiple use mandate. The goals of sensitive species management are to:** • **Maintain vulnerable species and habitat components in functional BLM ecosystems.** • **Ensure sensitive species 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.**	***Ongoing***	***BLM***
Farming	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***WGFD***	**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.**	***Ongoing***	***N/A***
	NRCS	**1) Provide funding for incentive programs to encourage the use of farming practices that maintain and enhance the sage-grouse population.**	***Ongoing***	***NRCS***
Hunting	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***WGFD***	**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**	***Ongoing***	***WGFD***

		bag limit beginning no earlier than September 15.		
		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*
		3) Hunting seasons are designed for harvest rates of 10% or less of the projected fall population.	*Ongoing*	*WGFD*
		4) The Wyoming Game and Fish Commission reduced the bag limit and shortened the hunting season by delaying the opening date in 1995 due to concerns over declining sage-grouse numbers.	*Completed*	*WGFD*
		5) A more conservative hunting season was enacted in 2002 with a later opening date and a 9-day season. The bag and possession limits were reduced to 2 and 4 birds, respectively.	*Completed*	*WGFD*
		6) In 2003, the hunting season was closed in Campbell, Johnson and Sheridan Counties by Wyoming Game and Fish Commission emergency regulation after West Nile virus was identified as a significant mortality factor in segments of the population.	*Completed*	*WGFD*
		7) A program of wing barrels is used to determine sex and age structure of the harvest.	*Ongoing*	*WGFD*
		8) Collect harvest data using a hunter survey and wing barrels. Results are analyzed and published annually in the Northeast Wyoming Local Working Group Sage-grouse Completion Report.	*Ongoing*	*WGFD*
Research and Development	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	*University of Montana – D. Naugle, B. Walker, K. Doherty*	1) Investigate potential effects of CBNG development and West Nile virus on sage-grouse in the Powder River Basin. The University of Montana is conducting an analysis of trends in Powder River Basin lek count data in relation to habitat suitability and energy development and completing a sensitivity analysis to assess potential impacts of various mortality factors on population growth. Models are being developed to predict sage-grouse habitat use and development impacts. Efforts continue cooperatively with USDA to	*December 2008*	*BLM, Wyoming Governor's Sage-grouse Fund, Dept of Energy, Wolf Cr Charitable Found., USDA-ARS, Univ. of Montana, Montana State University*

		identify likely reservoir hosts of the virus. **2) An analysis of sage-grouse breeding and brood-rearing habitat selection will enable the development of conservation planning maps identifying key habitats to focus protection measures on.** **3) Analyze lek monitoring trends in the Powder River Basin in relation to habitat suitability and energy development.** **4) Complete a sensitivity analysis to assess potential impacts of various mortality factors on population growth.** **5) Develop a winter habitat selection model based on sagebrush occurrence and topography supported by winter sage-grouse locations.** **6) Develop a population model and conduct a risk assessment analysis of influencing factors in the Powder River Basin.**	***December 2007*** ***Completed*** ***December 2006*** ***Completed*** ***December 2006***	***State University*** ***Budget $900,000 (all projects)***
	Montana State University	**1) Research CBNG and non-CBNG aquatic habitats in the Powder River Basin to determine levels of production of larval mosquitoes with emphasis on West Nile virus vectors. Seasonal and geographic distribution of adult West Nile virus vector mosquitoes will be determined and infection rates of adult vector mosquitoes will be estimated.** **2) Determine the effectiveness of plains killifish and fathead minnow, singlely and in combination, in decreasing *Culex tarsalus* mosquito larva in reservoirs holding water produced from coalbed natural gas extraction.**	***December 2006*** ***December 2008***	***BLM, Wyoming Governor's Sage-grouse Fund, Dept of Energy, Wolf Cr Charitable Found., USDA-ARS, Univ. of Montana, Montana State University***
	Arthropod-Borne Animal Disease Research Laboratory, Montana State University, University of Wyoming,	**1) Researchers are investigating West Nile virus vector mosquitoes host dynamics and feeding patterns in the Powder River Basin. Manuscripts in progress.** **2) West Nile virus Vectors and Sage-grouse: Sentinel Bird Study. Researchers investigated West Nile virus transmission in the Powder River Basin Wyoming using ring-necked pheasants to determine suspected vectors and transmission routes which may affect sage-grouse. Two manuscripts in progress.**	***2006*** ***2006***	***Dept of Energy, Montana State University*** ***Dept of Energy, Montana State University***

	University of Montana			
	University of Wyoming, Arthropod-Borne Animal Disease Research Laboratory	**1) Researchers are conducting an assessment of mosquito larval habitats in the Powder River Basin using satellite imagery. Potential habitats are identified and changes in availability of ponds due to CBNG development were monitored. Results will be used to develop a risk assessment model for prevalence of West Nile virus.**	***2007***	***Dept of Energy***
	USDA-ARS Rangeland Resource Research Unit – Gerald E. Schuman	**1) Research focused on global change and rangeland, pasture, and forage (falcate alfalfa). On-going research plots are implemented and providing data for enhanced range conditions benefiting land, livestock and wildlife.**		
Completed Research	***University of Montana***	**1) Naugle, D. E., et. al. 2004. West Nile virus: pending crisis for greater sage-grouse. Ecology Letters. 7:704-713** **2) Walker, B. L.., et. al. 2004. From the Field: Outbreak of West Nile virus in greater sage-grouse and guidelines for monitoring, handling and submitting dead birds. Wildl. Soc. Bull. 32(3):1000-10006** **3) Naugle, D. E., C. A. Aldridge, B. L. Walker, K. E. Doherty, M. R. Matchett, J. McIntosh, T. E. Cornish, and M. S. Boyce. 2005. West Nile virus and sage-grouse: What more have we learned? Wildlife Society Bulletin 33:616-623**	***Completed*** ***Completed*** ***Completed***	***N/A*** ***N/A*** ***N/A***
	Thunderbird Wildlife Consulting, Inc.	**1) Brown, K. G. and K. M. Clayton. 2004. Ecology of the Greater Sage-grouse in the Coal Mining Landscape Wyoming's Powder River Basin. Final Technical Report. Thunderbird Wildlife Consulting, Inc. Gillette, WY. 18 pp.**	***Completed***	***Powder River Basin Coal Mines***
Recommended Action(s)	*TBD - all*	1) Determine threshold levels of habitat alteration that can occur without negatively impacting specific sage-grouse populations.	*TBD - all*	*TBD - all*

		2) Determine the effects of hunting on sage-grouse populations. 3) Identify invasive plants of concern in sage-grouse habitats. 4) Experiment with types of grazing to improve sage-grouse habitat accompanied by monitoring to determine effects on sage-grouse. 5) Continue research efforts to determine the effects of mineral development on sage-grouse populations. 6) Encourage the development of new technologies that would reduce total surface disturbance within occupied sage-grouse habitat. 7) Determine which pesticides and application strategies are simultaneously beneficial to agriculture and least harmful to sage-grouse. 8) Identify low-toxicity alternatives to pesticides classified as a medium to very high risk to game birds. 9) Examine what, if any, effects each pesticide use may have on sage-grouse populations. 10) Determine the extent of pesticide use within sage-grouse habitats. 11) Quantify and qualify the role of predation on sage-grouse in Wyoming. 12) 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. 13) 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. 14) Determine cause and effect relationships between forage, drought, multiple uses, and sage-grouse recruitment. 15) 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.		

		16) Correlate climate data with sage-grouse population distribution. 17) 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. 18) Determine cause and effect relationships between forage drought, multiple uses, and sage-grouse recruitment. 19) Determine the impacts of wind turbines on sage-grouse.		
Monitoring	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***WGFD, BLM, USFS, Oil & Gas Co., Coal Mines, Volunteers***	**1) Cooperate in monitoring 50% of known leks each year 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 Northeast Wyoming Sage-grouse Completion Report.**	***Ongoing***	***WGFD, BLM, USFS, Oil & Gas Co., Coal Mines, Volunteers***
	WGFD	**1) Harvest data collected by the hunter survey and wing barrels is analyzed and published annually in the Northeast Wyoming Local Working Group Sage-grouse Completion Report.** **2) An intra-agency sage-grouse working group was formed to address sage-grouse management issues and conduct the annual wing bee.**	***Ongoing*** ***Ongoing***	***WGFD*** ***WGFD***
	Weston County Natural Resource District	**1) Sagebrush enhancement trails were conducted in 2002. Different mow heights and one and two pass treatments with a Dixie harrow are being evaluated. Monitoring continues on trail areas, including control areas, for sagebrush leader growth, protein content, vegetation trends and wildlife use.**	***Ongoing***	***Wyoming Private Lands Grazing Team***
Recommended Action(s)	*WGFD*	1) Map lek perimeter boundaries to ensure adequate stipulation buffers in protecting breeding habitats. 2) Identify and map winter habitats to enable development planning and	*Ongoing*	*WGFD*

	WGFD	mitigation actions in maintaining the integrity of these critical areas.	*Ongoing*	*WGFD*
Risk Assessment	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Recommended Action(s)	*NE Wyoming Sage Grouse Working Group*	1) Meet with the Governor to request funding for a proposal to develop a state of the art risk assessment model to evaluate cumulative impacts of all potential sagebrush habitat.	*TBD*	*N/A*
	WGFD, BLM, NRCS, USFS, USGS	2) Ask the WGFD, BLM, NRCS, USFS, and USGS to create a GIS data layer that encompasses all of the available habitat treatments that have taken place basin-wide for use in assessing cumulative impacts and guidance on future habitat treatments.	*TBD*	*TBD*
	TBD – all projects	1) Implement effective monitoring plans to determine the effectiveness of vegetation treatments. 2) Maintain cumulative records for invasive plants treatment and prevention programs to evaluate site specific and cumulative impacts to sage-grouse habitats. 3) Evaluate effects of different grazing treatments on sage-grouse productivity, survival, and habitat use. 4) Monitor the effectiveness of any predator control efforts that are implemented. 5) Request land managers earmark future funds for personnel to coordinate, maintain, and implement use of the GIS overlays and risk assessment tools once completed.	*TBD – all projects*	*TBD – all projects*
Public Education	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Commitment(s)	***NE Wyoming Sage-Grouse Working Group***	**1) The Northeast Wyoming Sage-grouse Working Group has published four newspaper articles to educate the public and increase public awareness of sage-grouse conservation issues.**	***Completed & Ongoing***	***N/A***
	WGFD	**1) The WGFD has published numerous magazine and newspaper articles to educate and bring increased public awareness of sage-**	***Completed & Ongoing***	***WGFD***

		articles to educate and bring increased public awareness of sage-grouse conservation issues.	***& Ongoing***	
		2) The WGFD has developed 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.	***Completed***	***WGFD***
		3) Four northeast Wyoming leks will be included in a 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.	***December 2006***	***WGFD***
		4) Promote hunting as a valuable component of conservation efforts by annually publishing the benefits of sage-grouse hunting. Hunter harvested birds provide demographics of the fall population and hunting promotes ownership in the wildlife resource.	***Annually***	***WGFD***
		5) Develop a high school education program to promote sage-grouse conservation and an appreciation of sagebrush habitat.	***June 2007***	***WGFD***
	WGFD / NE Wyoming Sage-grouse Working Group	**1) Participated in the annual Wyoming Hunting and Fishing Heritage Expo promoting conservation of sage-grouse and sagebrush habitats.**	***Ongoing***	***WGFD***
Recommend-ed Management Outreach	**Responsible Parties**	**Action**	**Time Schedule**	**Funding Source**
Recommended Action(s)	*TBD – all projects*	1) Identify and make available Recommended Management Practices for sage-grouse. 2) Develop and distribute a brochure of Recommended Management Practices information for sage-grouse. 3) Inform and educate the public about hunting impacts and benefits.	*TBD – all projects*	*TBD – all projects*

		4) Educate the hunting public on distinguishing between sage-grouse and other upland game birds. 5) 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. 6) Provide Wyoming retail dealers, Weed and Pest Districts, and county extension agents with information intended for users regarding product toxicity levels to sage-grouse, and alternatives that are effective while less toxic. 7) Develop and distribute educational materials regarding human practices that may allow establishment and expansion of predator populations. Examples of these activities include landfills and other garbage/waste disposal that may provide artificial food sources for a variety of predators, and buildings/structures that provide nesting/roosting habitat for ravens/raptors. 8) Develop and distribute appropriate literature for developers and county planners. 9) Provide education on the effects of residential development on sage-grouse habitat and populations. 10) Facilitate conservation districts and extension agents' ability to educate the public about sage-grouse. 11) 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. 12) Agencies should generally not provide all lek locations to individuals simply interested in viewing birds. 13) Develop and provide information related to recreation and its impacts on sage-grouse habitat. 14) 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.		

Monitoring

The success or failure of this conservation plan can only be determined through monitoring the status of the sage-grouse population 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 Northeast Wyoming Working Group Sage-grouse Completion Report. Projects recommended for funding by the Northeast Wyoming Sage-grouse Working Group will include a monitoring plan. A summary of conservation actions such as research and habitat projects will be included in the Northeast Wyoming 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 Northeast Wyoming 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 action implementation will provide additional information from which to make future conservation planning decisions. For example, managers implementing the Lake DeSmet Conservation Project have made a number of presentations to groups interested in sage-grouse management, livestock management and vegetation management to promote sound range management practices and share their experiences in improving rangeland health.

The Northeast Wyoming Sage-grouse Working Group will continue to meet, although on a less frequent schedule. Updates to the plan will occur in the future and will include the most up to date information garnered through population monitoring, research and habitat management. The project priority map will be updated with the latest lek survey data so managers can make decisions on where best to spend funding to benefit sage-grouse.

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 Northeast Wyoming Working Group Sage-grouse Completion Report. This report is distributed to land management agencies as well as others interested in the conservation of sage-grouse.

Recommended Management Practices for Sage-Grouse Conservation

Recommended management practices (RMPs) are those that are most appropriate in a certain set of conditions, which may or may not be present. ***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 certainly not appropriate in all circumstances. It is the voluntary nature, flexibility and capacity to change that make RMPs a useful management tool.*** The RMPs that have so far been identified by the Northeast Wyoming Sage-grouse Working Group are listed below. RMPs were taken from the Wyoming Greater Sage-grouse Conservation Plan and adapted when necessary to better fit northeast Wyoming.

Seasonal RMPs entail clear timing guidelines for activities such as road building, facility placement, project development, vehicular and general human activity near and around sage-grouse habitat areas.

Project type RMPs are also identified for common practices such as road building and powerline placement. Many of these guidelines are also restated under relevant limiting factors.

Seasonal Guidelines
Year-round • To protect lek sites, avoid development within 1/4 mile (400 m) of occupied sage-grouse leks. March 1st thru May 15th • To minimize disturbance during the breeding season, avoid human activity within 1/4 mile (400 m) of occupied sage-grouse leks. March 1st thru July 15th • To protect nesting and early brood rearing areas, avoid all activity within 3 miles (5 km) of sage-grouse leks (Connelly et al. 2000). November 15th thru March 1st • Minimize development and human disturbance in winter habitats.

RMP's are voluntary conservation practices available for use on a site specific basis.

Road Building Maintenance and Usage
1) Work cooperatively with all involved permittees, lease holders or field operators, and affected landowners, develop a road use and travel plan for areas within 3 miles (5 km) of sage grouse leks (Connelly et al. 2000). 2) Coordinate planning among all companies operating in the same field and strongly encourage everyone involved to follow the same road use plan. 3) Map all existing and proposed roads for areas to be developed, and consolidate activities using existing roads and other facilities where possible. 4) Minimize the number of vehicles per visit, and the number of roads used within the area. 5) Encourage remote monitoring of production sites to minimize road use and reduce harassment of birds during critical seasons (breeding, nesting, brood-rearing, and winter). 6) Allow traffic at most, only every other day, less frequently if possible. 7) Limit traffic on all roads to three, one-hour travel periods per day spaced at least two hours apart. 8) Establish acceptable stopping points and “drive through only” areas. 9) Sign roads as appropriate to prevent off-road travel and to inform all users of the roads of acceptable use times and approved stopping areas 10) As appropriate, gate and close all newly constructed (project related) roads to public travel. 11) Consider using pipelines to bring product to a central facility to reduce needed number of roads and traffic. 12) Minimize visual/auditory impacts where practicable (e.g. place roads below ridgelines or along topographic features). 13) Place roads outside of riparian areas where possible. 14) If avoidance is not possible, minimize impacts to riparian, wetland, or wet meadow habitats to limit impacts to brood rearing areas. (exploration, drilling, production and operations). 15) Avoid placement of well pads, roads and other well field facilities on mapped winter habitats, or within a 1/8-mile (200 m) buffer surrounding winter habitat. 16) Encourage road rehabilitation or realignment to minimize impacts to sage grouse. 17) Select sites for construction that will not disturb suitable nest cover or brood-rearing habitats within 3 miles (5 km) of occupied leks, or within identified nesting and brood-rearing habitats outside the 3-mile (5 km) perimeter (Connelly et al. 2000). 18) Utilize minimum construction and maintenance standards appropriate for the operation. 19) Establish acceptable times for road construction and maintenance that will minimize disturbance during critical seasonal use periods. 20) Reclaim roads that are only needed periodically, and allow operators to drive over reclaimed roads when needed.
Power line Construction and Maintenance
1. Working cooperatively with all involved permittees, lease holders or field operators to develop a master powerline plan for all areas within 3 miles (5 km) (Connelly et al.

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2000) of sage-grouse leks and on other identified sage-grouse habitats.

2. Where feasible, bury new power lines.
3. Map all existing and proposed powerlines for the area, consolidating new powerlines into existing disturbance corridors.
4. Coordinate planning and power line needs among companies operating in the same field.
5. Include power-line access roads in the road use and travel plan to include power companies in appropriate use times.
6. Select sites for construction that will not disturb suitable nest cover and brood-rearing habitats within 3 miles (Connelly et al. 2000) of a lek.
7. Select sites for construction that will not disturb wintering habitat.
8. Locate any above-ground power-lines off of ridges and out of riparian areas (1,000 ft (300 m) riparian buffer where feasible).
9. Direct power-line construction (above or underground) to areas of existing disturbance corridors (ie existing roads, railroads, power-lines, etc).
10. Recommend the lowest voltage powerline needed for the project while considering future needs.
11. Reduce existing above ground powerlines by burying them as opportunities (such as rebuilds) arise.
    a) If burying power-lines cannot be accomplished, install perch guards to prevent raptor use.
    b) Recommend on-site power generation to minimize overhead power lines.
    c) Visibility markers should be included on above ground lines in high avian use areas such as across drainages, water bodies, prairie dog colonies, etc.

General Mineral Development

(NOTE: These Recommended Management Practices are not applicable to the northeast Wyoming coal industry in their entirety – See Coal Exploration, Mining and Reclamation Recommended Management Practices for the complete list applicable to this industry)

1) Evaluate and address the needs of sage-grouse when placing well sites, mines, pits and infrastructure. Develop a plan for roads, pipelines, etc. to minimize impacts to sage-grouse
2) Consider developing travel management plans that would allow seasonal closure of roads for all but permitted uses (i.e. recreation and hunting) and encourage the reclamation of unnecessary or redundant roads.
3) Where mineral development occurs in sage-grouse habitat, tailor reclamation to restore, replace or augment needed habitat types.
4) Where necessary to build or maintain fences, evaluate whether increased visibility, alternate location, or different fence design will reduce hazards to flying grouse.
5) Avoid construction of overhead lines and other perch sites in occupied sage-grouse habitat. Where these structures must be built, or presently exist, bury the lines, locate along existing utility corridors or modify the structures to prevent perching raptors, where possible.
6) Reduce noise from industrial development or traffic especially in breeding and brood-

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rearing habitats.

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) Consider an exception or waiver of seasonal stipulations if technologies that significantly reduce surface disturbance are used.
10) Control dust from roads and other surface disturbances within the population's seasonal habitats.
11) Continue research efforts to determine the effects of mineral development on sage-grouse populations.
12) Consider off-site mitigation as an alternative mitigation for mineral development impacts on known sage-grouse habitat. Work with mineral entities to develop and implement acceptable offsite mitigative measures for enhancing sage-grouse or habitat, as needed, to offset impacts of surface disturbing activities.

Oil and Gas Development and Sand and Gravel Mining

(Also See General Mineral Development RMPs)

1. As a general rule, do not drill or permit new or expand existing sand and gravel activities within 3 miles (5 km) (Connelly et al. 2000) of active leks between March 1st and July 15th. As seasonal habitat mapping efforts are completed, re-direct efforts towards protecting nesting habitat.
2. Avoid surface disturbance or occupancy on or within 1/4 miles of known active lek sites.
3. Evaluate well spacing and location requirements under Wyoming Oil and Gas Conservation Commission jurisdiction in light of sage-grouse habitat needs and consider spacing exceptions that protect habitat. The limitations of obtaining spacing exceptions must be recognized.
4. To minimize disturbance during the breeding season, avoid human activity within 1/4 mile of occupied sage-grouse leks.
5. Where technically and economically feasible, use directional drilling or multiple wells from the same pad.
6. Where facilities are developed within sage-grouse habitat, minimize potential use by predators (i.e. raptor proof power poles, eliminate crawlspaces under buildings).
7. Encourage the development of new technologies that would reduce total surface disturbance within occupied sage-grouse habitat (i.e. directional drilling, multiple wells from the same well pad and reinjection of produced water).

Vegetation Management

1. Develop priorities and implement habitat enhancements in areas currently occupied by sage-grouse.
2. Develop priorities and implement habitat enhancements in historical or potential sage-grouse habitats.
3. Develop and implement wildfire suppression guidelines that address sage-grouse habitat health and management.

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4. Remove juniper and other conifers where they have invaded sagebrush sites important to sage-grouse.
5. Ensure vegetation treatments and post-treatment management actions are appropriate to the soil, climate, and landform of the area.
6. Recognize that fire provides a natural diversity component in sagebrush habitats; manage fire on a landscape and patch scale at a local level.
   a. Use prescribed fire to maintain, enhance or promote sagebrush ecosystem health by mimicking natural fire frequencies.
   b. Where sage-grouse are present or desired, fire management objectives should recognize that fire generally burns the better sage-grouse nesting and severe winter habitat.
   c. 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.
7. When rehabilitation is necessary, the first priority is protection of the soil resource. Use appropriate mixtures of sagebrush, native grasses, and forbs that permit burned areas to recover to a sagebrush-perennial grass habitat.
8. 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.
9. Experiments in habitat manipulation should be relatively small in comparison to a specific sage-grouse population.
10. Determine threshold levels of habitat alteration that can occur without negatively impacting specific sage-grouse populations. As a general rule, treat no more than 20% of any seasonal habitat type until results are evaluated.
11. Treat sagebrush in patches rather than contiguous blocks.
12. Protect patches of sagebrush within burned areas from disturbance and manipulation.
13. Consider all alternatives when designing sagebrush treatments.
14. Additional treatments in adjacent areas should be deferred until the previously treated area again provides suitable sage-grouse habitat.
15. 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.
16. Use 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.
17. Implement effective monitoring plans to determine the effectiveness of vegetation treatments.
18. 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.

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Invasive Plants

1. Identify invasive plants of concern in sage-grouse habitats.
2. Map areas where invasive plants of concern already exist.
3. Implement strategies to assist in prevention of the spread of noxious weeds or invasive plants detrimental to sage-grouse.
4. Prioritize and aggressively treat invasive plants in identified areas of concern.
5. Employ appropriate site preparation techniques and timely reseeding with approved seed mixes of any disturbed areas to prevent encroachment of invasive plants.
6. Maintain cumulative records for invasive plants treatment and prevention programs to evaluate site specific and cumulative impacts to sage-grouse habitats.

Residential Land Use

1. Encourage assimilation of sage-grouse information into county plans as they are developed. Develop and distribute appropriate literature for developers and county planners.
2. Limit free-roaming dogs and cats.
3. Maintain appropriate stocking rates of livestock on small acreages.
4. Encourage cluster development, road consolidation and common facilities that would have a reduced impact on sage-grouse.
5. Where necessary to build or maintain fences, evaluate whether increased visibility, alternate location, or different fence design will reduce hazards to flying grouse.
6. Maintain healthy sagebrush communities on small acreages.
7. Plan development to allow for sage-grouse movement.
8. Where possible protect habitat through conservation. (i.e. land exchanges, conservation easements, leases or CRP type programs)
9. Locate and manage sanitary landfills, dumps and trash transfer stations to eliminate predator impacts to sage-grouse.
10. 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.
11. Consider developing travel management plans that would allow seasonal closure and reclamation of roads.
12. Reduce noise from industrial development or traffic especially in breeding and brood-rearing habitats.
13. Avoid construction of overhead lines and other perch sites in occupied sage-grouse habitat. Where these structures must be built, or presently exist, bury the lines, locate along existing utility corridors or modify the structures in key areas.
14. Control dust from roads and other surface disturbances.

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Parasites and Diseases
1. Investigate and record deaths that could be attributed to parasites or disease. 2. Develop and implement strategies to deal with disease outbreaks where appropriate. 3. Implement pond design standards to minimize mosquito breeding habitat (Naugle 2006d). a. Overbuild the size of ponds to accommodate a greater volume of water than is discharged. This will result in non-vegetated and muddy shorelines that breeding mosquitoes avoid. b. Build steep shorelines to reduce shallow water and aquatic vegetation around the perimeter of impoundments. Construction of steep shorelines also will increase wave action that deters mosquito production. c. Maintain the water level below that of rooted vegetation for a muddy shoreline that is unfavorable habitat for mosquito larvae. Rooted vegetation includes both aquatic and upland vegetative types. Always avoid flooding terrestrial vegetation in flat terrain or low lying areas. d. Construct dams or impoundments that restrict down slope seepage or overflow. Seepage and overflow results in down-grade accumulation of vegetated shallow water areas that support breeding mosquitoes. e. Line the channel where discharge water flows into the pond with crushed rock, or use a horizontal pipe to discharge inflow directly into existing open water, thus precluding shallow surface inflow and accumulation of sediment that promotes aquatic vegetation. f. Line the overflow spillway with crushed rock, and construct the spillway with steep sides to preclude the accumulation of shallow water and vegetation. g. Fence pond sites to restrict access by livestock and other wild ungulates that trample and disturb shorelines, enrich sediments with manure and create hoof print pockets of water that are attractive to breeding mosquitoes.
Predation
1. Predator control may be warranted to maintain or enhance local sage-grouse populations when there is a demonstrated need such as a population is trending downward over a 3-year period; populations of "newcomer" predators are artificially high in sage-grouse habitat; specific sage-grouse populations need short-term help. 2. Develop and distribute educational materials regarding human practices that may allow establishment/expansion of predator populations. Examples of these activities include landfills and other garbage/waste disposal that may provide artificial food sources for a variety of predators, and buildings/structures that provide nesting/roosting habitat for ravens/raptors. 3. Avoid construction of overhead lines and other perch sites in occupied sage-grouse habitat. Where these structures must be built, or presently exist, bury the lines, locate along existing utility corridors or modify the structures in key areas. 4. Predator control to enhance sage-grouse survival should be targeted only to

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predators identified as impacting that sage-grouse population.

5. Better quantify and qualify the role of predation on sage-grouse in Wyoming.
6. Discourage the establishment, and bring into balance artificially high populations of "newcomer" predators in sage-grouse habitat.
7. Monitor the effectiveness of any predator control efforts that are implemented.
8. Request the U.S. Fish and Wildlife Service to do a species assessment on the raven. Encourage the FWS to include ravens in 50CFR21.43 "Control of Depredating Birds."

Livestock Grazing

1. 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.
2. Evaluate effects of different grazing treatments on sage-grouse productivity, survival, and habitat use.
3. 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.
4. In general, avoid yearlong and spring-to-fall continuous grazing schemes in sage-grouse habitat. Yearlong and spring-to-fall grazing may be a tool if it is not continued each year.
5. Where appropriate, implement livestock grazing systems that provide for areas and times of rest or deferment.
6. Where practicable, avoid heavy utilization of grazed pastures to compensate for rested pastures (a year of rest cannot compensate for a year of excessive use).
7. Design grazing systems that provide sage-grouse habitat in riparian areas and around water sources.
8. During periods of forage drought, utilize grazing schemes that reduce impacts to sage-grouse (e.g. adjust intensity, timing and/or duration of grazing).
9. Investigate the possibility of developing forage banks for use during periods of drought to alleviate inappropriate use by grazing animals on sage-grouse habitat.
10. Reduce disturbance to sage-grouse habitat from livestock management activities (e.g. salting or mineral placement, turnout or gathering, bed ground/camp locations, etc.)
11. Develop and implement management plans for grazing that take into consideration the 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.
12. 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).

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13. Avoid human activity near leks during the breeding season between the hours of 8 p.m. to 8 a.m.
14. Except for livestock guard dogs, avoid allowing dogs to run unchecked in sage-grouse habitats.
15. Experiment with types of grazing to improve sage-grouse habitat accompanied by monitoring to determine effects on sage-grouse.
16. Use techniques such as increased visibility, alternate location, or different design to build and maintain fences that are not hazards to flying grouse.
17. During the breeding season (March 1st through May 15th), use sheep bedding grounds at least ½ mile from leks. Should herding practices regain popularity, herders should attempt to avoid disturbing occupied leks with their sheep bands, once they leave the bed ground and begin their daily movements.
18. During the breeding season (March 1st through May 15th), reduce physical disturbance to breeding sage-grouse by placing salt or mineral supplements beyond 1/4 mile of lek locations.
19. In suitable nesting habitats within 3 miles of leks, design grazing systems to manage for residual herbaceous vegetation to provide cover for nesting sage-grouse hens. Options to promote herbaceous cover include:
    a. When circumstances allow, shift early-season livestock use to pastures with minimal, or no, potential for nesting (e.g. pastures lacking sagebrush, exotic grass seedings, annual grasslands, etc.).
    b. When pastures with potential nesting habitat are grazed early in the season, use an appropriate stocking rate when herbaceous plants are not rapidly growing (generally prior to late-April). Options for monitoring grazing can be found in the Wyoming Rangeland Monitoring Guide (BLM et al. 2001). One example is the Colorado State University's Grazing Response Index that can be used to evaluate the effects of grazing on rangelands (http://www.behave.net/factsheets/GRI_plantevaluation.pdf).
20. Manage stocking rates and rotations to maintain the health and productivity of rangelands for livestock and sage-grouse. Incorporate one of the monitoring programs from the Wyoming Rangeland Monitoring Guide (BLM et al. 2001) to ensure proper grazing utilization and plant recovery. One option is Colorado State University Range Extension Program's Grazing Response Index (GRI) which scores grazing management based on grazing frequency, intensity and timing to promote proper utilization rates and plant recovery (Reed et al. 1999). Instructions for implementing the GRI can be found at most NRCS and USFS offices or on the Internet at: http://www.behave.net/fact_sheets/GRIplantevaluation.pdf. Managers should strive to achieve positive GRI values in pastures with nesting and early-brood rearing habitats.
    a. "Frequency " refers to the number of times forage plants are defoliated during the grazing period. Three or more successive defoliations of a plant in one growing season have been shown to be detrimental to plants. Planned grazing periods should be less than 21 days during the growing season (assuming seven days are required for a plant to grow enough to be grazed again).

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b. “Intensity” is a description of the amount of leaf material removed during the grazing period. To ensure sufficient photosynthetically active material remains, planned grazing should not remove more than 50% of the leaf material (Reed et al. 1999). This is not the age-old rule of “take half, leave half” (50% total utilization). The idea is to leave one-half the leaf of desirable grass species, to jump-start photosynthesis.

c. “Timing” of grazing should provide the opportunity for plants to grow prior to grazing or to re-grow after grazing. This is critical to maintaining the plant. The plant must be able to fully store energy at some time during the active growing season (Reed et al. 1999). Grazing programs should allow for this.

21. If your goal is to increase production of grasses and forbs, manage for increased soil water intake by promoting residual vegetation and mulch through implementation of light grazing intensities.
22. In pastures with riparian habitats (assuming riparian vegetation is actively growing), manage livestock grazing to allow herbaceous vegetation recovery.
23. Supplemental winter-feeding of livestock in occupied sage-grouse winter habitats should be avoided for both sheep and cattle operations to prevent over-utilization of sagebrush resources by sheep and trampling damage by cattle.
24. Utilization of sagebrush plants should not exceed 20% by livestock and big game.
25. Placement of new fences and structures should include consideration of their impact on sage-grouse. In general, avoid constructing fences within ½ mile of leks. Avoid locating fences in swales and on ridge tops. Minimize fence height and maximize bottom wire height to the extent possible. In areas with documented collisions make fences as visible as possible, (e.g. wire markers, use white-topped steel fence posts, use wooden stays and/or reduce spacing between fence posts, etc.).
26. Where feasible, place new, taller structures such as corrals, loading facilities, water storage tanks, windmills, etc. at least ½ miles from leks to reduce opportunities for perching raptors.
27. New spring developments in sage-grouse habitat should be designed to maintain or enhance the free-flowing characteristics of springs and wet meadows with the use of float valves on troughs or other features where feasible. Spring and wet meadows should be protected from over utilization and trampling by livestock.
28. Equip new and existing livestock troughs and open water storage tanks with ramps to facilitate the use of, and escape from, troughs by sage-grouse and other wildlife.

Weather

1. Where drought has been documented for two consecutive years, consider implementation of Recommended Management Practices in year three that may include:
   a. Drought management of livestock and wildlife grazing.
   b. Protection of critical sage-grouse habitats from wildfire and prescribed fire.
   c. Reduced bag limits during sage-grouse hunting seasons.

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d. Predator management programs to enhance nesting and early-brood-rearing success of impacted populations.
e. Water hauling and protection of water sources from evaporation.
f. Installation of guzzlers, snow fences and fencing of water source overflows.
g. Insure wildlife escape ramps are in place on existing water sources.
h. Implement other appropriate management options developed by local sage-grouse working groups.

Coal Exploration, Mining and Reclamation Recommended Management Practices – NE Wyoming

(NOTE: Many, but not all, of these RMPs are based, in part, on those stated in the Wyoming Greater Sage-Grouse Conservation Plan that may have applicability for Powder River Basin surface coal mines. It should be noted that site specific situations and conditions should be acknowledged and accounted for when considering the practicability of these RMPs for coal mine operations.)

1. Evaluate and address the needs of sage-grouse when siting mines, and mining-related infrastructure. Impacts to sage grouse should be minimized where practicable.
2. Tailor reclamation to replace or augment sage grouse habitat to the extent practicable in instances where such habitat is adversely affected.
3. Evaluate fence design, location and visibility to reduce hazards to flying grouse.
4. Manage water production to enhance or maintain sage grouse habitat.
5. Control dust from roads.
6. Control mosquito larvae, to the extent practicable and feasible, in mine-related surface water impoundments.
7. Install wildlife escape ramps in mine reclamation-related livestock watering facilities (tanks).
8. Continue sage-grouse and sage-grouse habitat-related research and monitoring efforts.
9. Remove only that amount of topsoil necessary to support continued mining operations on an annual basis or otherwise manage topsoil removal operations to minimize the impact on sage-grouse.
10. Consider alternative mitigation measures for mining impacts on known sage-grouse habitat. This may include, but not be limited to, implementing offsite mitigative measures for enhancing sage-grouse habitat to offset the temporary impacts of coal mine surface disturbing activities.
11. When feasible and practicable, new or expanded exploration within two miles of active leks should occur prior to March 15th or after July 15th. Following initiation of mining (i.e. topsoil removal) this recommendation will not be applicable.
12. When feasible and practicable, plan to avoid new surface occupancy or disturbance activities on or within ¼ mile (400 m) of the perimeter of known active lek sites from March 1 to May 15. Following initiation of mining (i.e. topsoil removal) this recommendation will not be applicable.
13. Continue the effort to establish Wyoming big sagebrush, to meet shrub density requirements.

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Other Solid Mineral Mining Operations

(NOTE: These Recommended Management Practices are not applicable to the northeast Wyoming coal industry in their entirety – See Coal Exploration, Mining and Reclamation Recommended Management Practices for the complete list applicable to this industry)

(*Also See General Mineral Development RMPs)*

1. When feasible, new or expanded exploration and/or mining activities within 3 miles (5 km) (Connelly et al. 2000) of active leks should be avoided between March 1st and July 15th. Following initiation of mining (i.e. topsoil stripping) this recommendation would not be applied. As seasonal habitat mapping efforts are completed, re-direct efforts towards protecting nesting habitat.
2. When feasible, plan to avoid new surface occupancy or disturbance activities within 3 miles (5 km) (Connelly et al. 2000) of the perimeter of known active lek sites from March 1 to May 15.
3. Where sage-grouse are present or desired, avoid human activity adjacent to leks during the breeding season between the hours of 8 p.m. and 8 a.m. This RMP may not be practical in active coal mining areas.

Pesticides

1. Determine the extent of pesticide use within sage-grouse habitats.
2. Examine what, if any, effects each pesticide use may have on sage-grouse populations.
3. Where possible, adjust alfalfa harvest timing instead of applying pesticides to control weevils.
4. Make use of current laboratory analysis procedures where sage-grouse mortality is observed. Report where pesticides have caused mortality in sage-grouse.
5. Determine which pesticides and application strategies are simultaneously beneficial to agriculture and least harmful to sage-grouse.
6. Research effects of pesticides on sage-grouse in Wyoming with a specific goal of testing impacts of actual rangeland applications.
7. Work with county Weed and Pest Districts to identify low-toxicity alternatives to pesticides classified as a medium to very high risk to game birds.
8. Provide Wyoming retail dealers, Weed and Pest Districts, and county extension agents with information intended for users regarding product toxicity levels to sage-grouse, and alternatives that are effective while less toxic.
9. Encourage simple, standardized record-keeping formats for all Weed and Pest Districts, that would allow access to pesticide use information in their counties and statewide.
10. Address grasshopper issues using Reduced Area Application Treatments (RAATs) approach.
11. Avoid broadcast spraying during the nesting season, March 1 to July 15, within three miles of a sage grouse lek site.

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Recreation
1. Develop travel management plans and enforce existing plans.
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 between March 1 and July 15 within 3 miles (5 km) (Connelly et al. 2000) of a lek site.
5. Recreational facilities should be located at least 3 miles (5 km) (Connelly et al. 2000) from lek sites and in areas that are not in crucial sage-grouse habitat
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. Agencies should generally not provide all lek locations to individuals simply interested in viewing birds.
8. Develop and provide information related to recreation and its impacts on sage-grouse habitat.
9. Discourage dispersed camping within important riparian habitats occupied by sage-grouse during late summer.
10. Avoid construction of overhead lines and other perch sites in occupied sage-grouse habitat. Where these structures must be built, or presently exist, bury the lines, locate along existing utility corridors or modify the structures in key areas.
11. Control dust from roads and other surface disturbances.
12. Inform the public that dog training on sage-grouse outside the hunting season is wildlife harassment and therefore illegal.

Farming
1. Map suitable sage-grouse habitat and focus conservation and management efforts on areas where the most benefit can be realized.
2. Identify the types of agricultural practices that are beneficial or detrimental to sage-grouse.
3. Work with private landowners to prepare habitat maps, which identify seasonal habitats for sage-grouse and to develop a voluntary site-specific management program.
4. Provide landowners with information on sage-grouse and how to provide for and protect sage-grouse habitat.
5. Develop water sources to benefit both crop production and healthy riparian habitat. Avoid surface and sub-surface water depletion that impacts sage-grouse habitats.
6. Improve visibility of new fences, and of existing fences where problems have been documented, in sage-grouse habitats.
7. Research and develop incentives that would reward farmers who provide the type of habitat that maintains and enhances sage-grouse populations.

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8. Use a flushing bar on haying equipment, and when possible, hav 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.
9. Use certified seed for planting to avoid the introduction of undesirable species.

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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%.

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

Tribal Wildlife Grants – Provides for development and implementation of programs for the benefit of tribal wildlife and their habitat. 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/

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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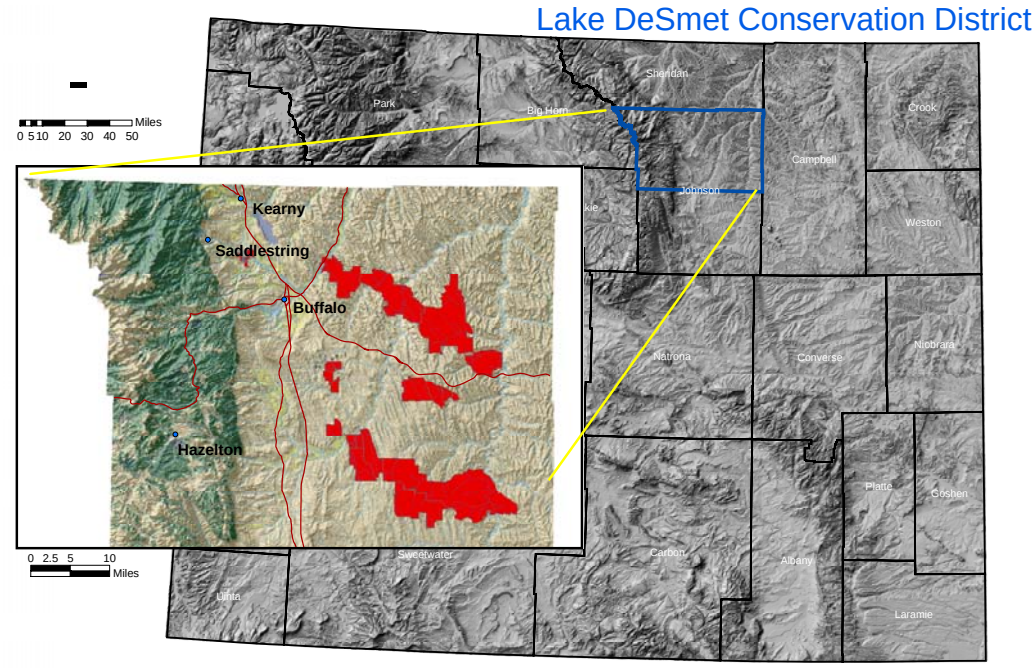
Appendix I – Lake DeSmet Conservation District – Sagebrush/Grassland Restoration Program

Projects are located within the 1.4 million acre Lake DeSmet Conservation District (LDCD), which is the north half of Johnson County (north of Township 46N). The red polygons are locations of seven ranches participating in phase one of the program. Another seven producers will be ready for funding later this year, making it a total of 14 landowners participating in the project and benefiting 230,000+ acres within the District.



The first phase of this program, involves seven landowners comprising 143,501 acres. These lands consist of 60% private, 30% BLM and 10% State of Wyoming ownership. Please refer to Map 1 – *LDCD SG Project – Surface Ownership*

Phase two will involve another seven landowners comprising 91,160 acres- for a grand total of 234,661 acres. Please refer to Map 2 – *LDCD SG Project – Total Project Area.*

The Lake DeSmet Conservation District (LDCD) has partnered with private landowners, Natural Resource Conservation Service (NRCS), Wyoming Game and Fish Department (WGFD), oil and gas industry, conservation groups and federal and state governments to restore the productivity of sagebrush/grassland and previously converted cropland habitat in Johnson County, Buffalo, Wyoming. This community-based program has had tremendous success. So far, 234,661 acres have enrolled to enhance important habitats for mule deer, pronghorn antelope, sagebrush obligates and other wildlife in northern Johnson County. Grazing plans have been completed on four (4) units, with another two close to completion. Plans on seven additional units are in working progress for a total of

234,661 acres. To date, approximately 1500 acres have been treated with the Lawson Aerator. The treatment is to improve the productivity of sagebrush/grassland rangelands for both wildlife and livestock. Cooperating ranchers, in both phases, control livestock grazing on 234,661 acres, a huge geographic area!

The basis of this program is to use the Deseret Land & Livestock and Parker Mountain studies to achieve enhanced benefits for livestock and wildlife. The papers *Sage Grouse Ecology and Management in Northern Utah Sagebrush-Steppe, a Deseret Land and Livestock Wildlife Research Report, 2002 by R. E. Danvir*, and the *Parker Mountain Adaptive Resource Management Plan* provide documentation of benefits to sage-grouse and other sagebrush obligates, as well as mule deer, pronghorn antelope and other wildlife from their ranch management operations. Increases in wildlife associated with sagebrush/grassland communities by implementing innovative ranch conservation technologies and approaches have been documented. These include, timed livestock grazing, forb plantings and mechanical and fire treatments. Due to Deseret's success at increasing wildlife populations while maintaining a working ranch, the LDCD, in partnership with private landowners, initiated a program to replicate and test this "win-win" management model on private and public lands in northern Johnson County.

Although this program continues to grow and evolve, the following strategies are currently in place:

Develop a Community-Based Program by Expanding Partnerships- Habitat restoration projects are not cheap. In order to create a funding mechanism and a steady flow of dollars, the LDCD is preparing agreements, when necessary, with the WGFD, U.S. Fish and Wildlife Service (USF&WS) and non-governmental organizations. In addition, an advisory group consisting of interested parties has been created to oversee plan implementation and monitoring needs.

Bighorn Environmental Consultants use English setters that are fitted with telemetry equipment to locate sage-grouse on ranches enrolled in the program. On this day, they are determining how grouse use the landscape during the winter months.

Improving and Developing Fine-Scale Mapping to Inventory At-Risk Wildlife Habitats- Fine-scale inventories are costly and time consuming. Nevertheless, the information is needed for project-level planning. This program involves testing methods that will provide biological information for decision-making in a rapid and efficient manner. Researchers are beginning to use birddog surveys, where sage-grouse are flushed and classified, to determine differential habitat selection by sage-grouse. This program is utilizing this age-old technology for contemporary applications. A local sage-grouse specialist and his trained dogs are hired to work with producers to search enrolled properties. These English setters are trained to search large areas. Because they range long distances, the dogs are fitted with radio collars that transmit their location and activity, or lack there of. When it's determined that the setter is on point (no activity), triangulation is used to locate it. The consultant can

then flush and classify the sage-grouse. These locations are collected by a global positioning system (GPS) and installed in a GIS. At that time, the sagebrush patch is searched and sage-grouse pellets are examined to determine the season of use. Pellets containing mostly sagebrush are from wintering sage-grouse. The consultant will sample enough pellets to determine if the area should be classified as winter range. If forbs make up the pellets, the areas will be classified as spring-summer-fall habitat. The size of the pellets will determine if it's important brood-rearing habitat or not. In addition to classifying sagebrush based on sage-grouse use, the consultant will use a scorecard to measure the ecological condition of the sagebrush community. The patch will be delineated on aerial photography and on-the-fly digitizing will install and attribute it in a GIS.

Anadarko Petroleum purchased a Lawson Pasture Aerator and donated it to the WGFD for habitat restoration. Lance Oil and Gas Company money was used to make modifications and purchase seed.

Purchase Needed Equipment to Offer Producers Innovative Rangeland Restoration Options – Modern equipment will be needed to implement the habitat management model. Coal-Bed Natural Gas (CBNG) companies were solicited to make the purchases for the program. Anadarko Petroleum purchased a $42,762 Lawson Pasture Aerator and donated it to the WGFD. Lance Oil and Gas Company donated $10,000 to make necessary modifications to the Lawson aerator and initiate its use. The aerator has two drop-seeders installed for planting native grasses and forbs. The aerator, although not designed specifically for treating rangelands, has shown promise in restoring rangelands and for increasing biological diversity.

This new technology will be used to restore and enhance grazing lands and previously converted croplands to sustain productivity for livestock and wildlife. The aerator tends to eliminate larger, older, decadent plants while limiting harm to younger plants. It also leaves protective litter in place for seed establishment. It can also be used on sod sites and aged converted croplands (which will be a primary use) to increase biological diversity by favoring cool season grasses, shrubs and forbs.

The Lawson Pasture Aerator is being used to restore depleted rangelands and install forb patches to enhance forage for mule deer, pronghorn antelope and brood rearing habitat for sage-grouse.

Build on the NRCS's EQIP Grazing Lands Initiative Program (GLI) – NRCS, in Wyoming, has initiated a GLI program and LDCD, through the Local Work Group, have incorporated sage grouse and sage grouse habitat to the ranking process for prioritization of funding. The agency intends to target development of sound livestock grazing plans to help producers in management of range and pasture lands to mitigate impacts of the on-going drought. EQIP is a voluntary conservation program under the Farm Bill umbrella that promotes agricultural production and environmental quality as compatible national goals. Farmers and ranchers receive financial and technical help via NRCS to implement land management conservation practices on eligible private lands. Highest priority for involvement in the Wyoming program will be submission of applications for a three-year contract for a prescribed grazing incentive. Key factors considered in the ranking process will include: areas of the state most severely impacted by drought; actions already taken to adjust operations to drought conditions, such as cutbacks in herd size, feeding hay, hauling livestock to feed, and hauling water; the current grazing system and potential enhancements; and the producer's goal of developing or enhancing and implementing a prescribed grazing plan. The Local Work Group, for Johnson County, added how it affects sagebrush and sage grouse habitat, to the ranking criteria.

Develop Livestock Grazing and Monitoring Strategies and Develop Long-Term Plans - The purpose of this program is to replicate and test best management practices (BMPs) and conservation technologies/approaches. Promising ranch conservation technologies and approaches will be promoted by providing assistance and education opportunities to producers. Dr. Roy Roath, range extension specialist with Colorado State University, was hired to work with producers. Dr. Roath has developed the Grazing Response Index (GRI), an easy to administrate method to develop, evaluate and monitor prescribed grazing systems. Numerous agencies and ranchers throughout the Rocky Mountain region have employed the GRI with tremendous success. Dr. Roath has already met with seven of the producers that are participating in the program. Two plans have been completed with grazing strategies that will benefit livestock and wildlife, in terms of improved rangeland condition and health.

Dr. Roath is used to provide training for participating ranchers concerning livestock grazing strategies and monitoring. He also helps with ranch planning.

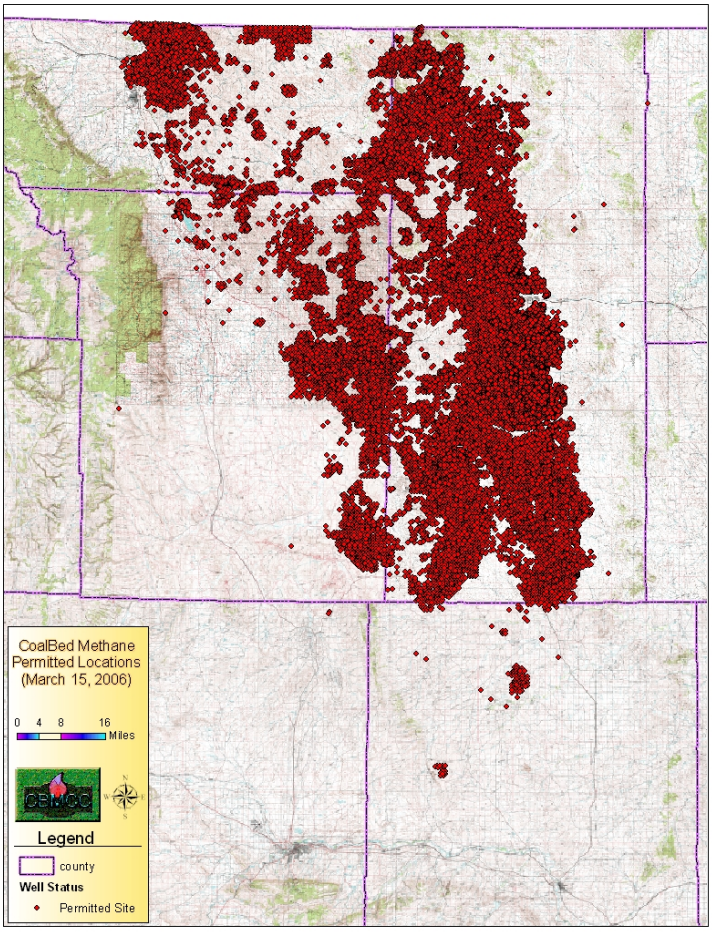
Testing and Monitoring Conservation Technologies and Approaches- Monitoring and quantifying improvements to rangeland production and biodiversity, that resulted from improved grazing systems, mechanical treatments and forb plantings, will be a major component of this program. Agency personnel will evaluate mechanical treatments. The first objective will be to determine shrub response to treatment by comparing sagebrush canopy cover. The second objective will be to examine differences in plant community diversity between treated and reference areas.

Variation of plant diversity among the different specialized habitat types is important for quantifying habitat quality. The aerator will be applied in a mosaic pattern and adjacent "reference areas" can be established for comparison. Post treatment data will be compared to the reference areas to account for vegetative differences resulting from grazing, drought, disturbances, etc.

Participating producers will also monitor the effects of their management. As mentioned above, Dr. Roy Roath will assist them in developing the methods to monitor their grazing systems. The GRI, photo points and forage utilization mapping will be taught. The GRI can assess the effects of grazing during the current year, and aid in planning the grazing for the following year. The GRI is based on general assessment of grazing use that occurs during the current growing season. GRI considers three concepts related to plant health in evaluating the impacts of grazing – frequency of defoliation, intensity of defoliation, and opportunity of the plant to grow or re-grow.

c. **Primary Habitat Function**- The need to work with producers to develop conservation technologies, practices, systems, procedures and approaches to conserve wildlife habitats is urgently needed in the Powder River Basin. Most of the Basin will experience coal-bed natural gas activities within the next few years. This development continues at an unprecedented scale and rate. The BLM's proposed action includes drilling, completing, operating and reclaiming more than 50,000 new wells in and constructing, operating, and reclaiming various ancillary facilities needed to support them in the Wyoming portion of the Basin. Drilling will continue for a minimum of ten years. If this development has negative consequences for wildlife, mitigation can only come from working with landowners and energy developers.

Coal Bed Natural Gas Permitted Locations for the Northeast Working Group - March 15, 2006



Rangeland health will be substantially improved on 234,661 acres. We anticipate grazing management and renovation will add mulch and vegetative structure which will capture more moisture in the soil and enhance riparian and wetland communities.

Mule Deer and Pronghorn Antelope- Improved grazing systems will increase residual cover, plant structure and plant recovery that will facilitate water absorption and retention in the soil profile. Improved soil moisture results in greater vegetative growth and superior forb production. Forbs contain high protein and other nutrients during the summer months, and are linked to milk production in females… thus the overall productivity of the herd. In addition, the establishment of falcate alfalfa and other forbs using the Lawson aerator/drop seeder could have remarkable benefits for both deer and antelope.

Sage-Grouse and Other Sagebrush Obligates- In the second half of the 20th Century, numbers of greater sage-grouse have declined throughout their range. Eleven western states are working to conserve sage-grouse and their habitat. Many conservation-planning efforts have been initiated. These plans focused on outlining what's required to sustain or perpetuate populations. Despite the availability of voluminous quantities of research papers, conservation plans, and other documents concerning sage-grouse, there are few examples of land management strategies that result in population recovery. The paper *Sage Grouse Ecology and Management in Northern Utah Sagebrush-Steppe, a Deseret Land and Livestock Wildlife Research Report, 2002 by R. E. Danvir*, provides documentation of benefits to sage-grouse from their ranch management operations. Deseret has experienced a six-fold increase in male lek attendance by implementing innovative ranch conservation technologies and approaches. These include, timed livestock grazing, forb plantings, mechanical and fire treatments, fence modifications and escape-ramp installation in water troughs- all of which will be accomplished in this program.

Riparian Associated Wildlife Species- Short duration grazing results in improved infiltration of moisture into the soil profile. There are examples of ephemeral streams becoming perennial and riparian vegetation being restored due to additional moisture that gravitates to low areas. New wetlands can even appear. The riparian/stream ecosystem is the single most productive type of wildlife habitat, benefiting the greatest number of species. It's estimated that approximately 80% of our wildlife in Wyoming make use of riparian habitats during their life cycle.

Rangeland Management- There is a need for changes in various land management philosophies that have caused losses or reduction in wildlife habitat. The last seven years of drought have shown that there needs to be a change in properly managing landscapes for both livestock and wildlife. The land management strategies being employed through this project will help manage water for increased forage for livestock and wildlife.

Coal-Bed Natural Gas Development- The BLM's proposed action includes drilling, completing, operating and reclaiming more than 50,000 new wells in and constructing, operating, and reclaiming various ancillary facilities needed to support them in the Wyoming portion of the Powder River Basin. Some of these impacts can be partially mitigated by improving the overall productivity of the land.

Rangeland Management- Producers will have a wealth of information that will be current (e.g. stocking rates, range health, soil types, wildlife distribution, etc.) for making management & business decisions. This, in combination with education and employing a

Grazing Response Index, as well as other monitoring techniques, will have significant benefits to wildlife.

Coal-Bed Natural Gas Development- The impact of CBNG is so substantial, we can only hope to mediate some impacts with this program.

Program sponsors are the Lake DeSmet Conservation District (LDCD) supervisors. Nikki Lohse, LDCD District Manager, will administrate funds. The LDCD and Phil Gonzales, NRCS District Conservationist in Buffalo will provide project oversight.

Active participants in the review team are Sage-Grouse Working Group chair Tom Maechtle, WGFD Habitat Biologist Bert Jellison, USF&WS Private Lands Program Coordinator Mark Hogan. The following list includes all individuals who are collaborating on the project.

Contact List:	Phone Number
Lake DeSmet Conservation District - Nikki Lohse, District Manager	(307) 684-2526 ext 101
Northeast Wyoming Sage-Grouse Working Group Tom Maechtle (chairperson) Box 207, Sheridan WY	(307) 673-4419
Natural Resource Conservation District Phil Gonzales, District Conservationist, Buffalo, WY	(307) 684-2526 ext 106
Wyoming Game and Fish Department Bert Jellison, WGFD Habitat Biologist, Sheridan, WY Dan Thiele, District Biologist, Buffalo, WY	(307) 672-8003 ext 229 (307) 684-2801
Bureau of Land Management	(307) 684-1100
U.S. Fish and Wildlife Service Mark Hogan, Private Lands Program Coordinator, Lander, WY	(307) 332-8719
Anadarko Petroleum- Tom Clayson, Envir. Affairs Specialist	(307) 265-2666
Eyas Foundation - P.A.B. Widener, Sheridan WY	(307) 674-08489
Lance Oil and Gas Company, Inc., a wholly owned Subsidiary of Western Gas Resources, Inc. - Krista Mutch	(303) 252-6094
Wyoming Private Lands Grazing Team (WyPGLT)- Bryce Reece (Coordinator)	(307) 265-5250
Wyoming Governor's Big Game License Coalition- John Emmerich, WGFD Wildlife Division Assistant Chief, Cheyenne, WY	(307) 777-4579
Kennedy Oil Company – Tammy Henry, Gillette, WY	(307) 682-1629
Pheasant's Forever – Brian Kirven, Sheridan, WY	(307) 683-2892

Federal Agencies

NRCS (Wyoming) WHIP, EQIP…… $1,243,908
NRCS (National) Conservation Innovation Grant……. $ 240,500
US Fish & Wildlife Service, Private Lands Program……. $ 40,000

State Agencies

Governor's Sage-Grouse Fund …… $ 90,000
Wyoming Game and Fish Department …….…….... $ 10,000

Non-Government Organizations

Eyas Foundation…….…….. $ 10,000
Pheasants Forever, Inc.- Sheridan/Johnson County Chapter……. $ 10,000
Wyoming Private Lands Grazing Team…….…….. $ 3,000
Wyoming Governor's Big Game License Coalition…….… $ 2,500

O&G Industry

Anadarko Petroleum (purchase of Aerator)……..……..…….. $ 42,762
Anadarko Petroleum……. $ 20,000
Lance O&G Co., Inc. (a subsidiary of Western Gas Resources, Inc.).…. $ 10,000
Kennedy Oil…….…….. $ 3,000

In-kind match will be provided by WG&F for time associated with tracking and monitoring the project. BLM will provide in-kind services for flight surveys and imagery. BH Environmental Consultants has offered in-kind services for sage grouse inventories.

Big Horn Environmental Consultants…….. $ 3,000
BLM (flight time) …… $ 31,000
Wyoming Game & Fish……. $ 37,950

If we can develop, test, implement and transfer ranch conservation technologies and approaches that result in the recovery of local sage-grouse populations, the likelihood of a future federal "listing" is much reduced. It goes without saying, that the listing would impact every commodity producer and every company that makes a living on the grassland/sagebrush landscapes of the Powder River Basin, not to mention one of the largest energy plays in the U.S.

Appendix II - Agriculture

NE Wyoming Local Sage-grouse Working Group
Agriculture White Paper
12 May 2006

Introduction

Agriculture is one of the most influential industries of the Western United States. The discovery of prime grazing lands throughout the West, including Wyoming brought settlers and millions of head of livestock. In 1870, seventeen western states had 4.6 million cattle grazing, while only 14 years later in 1884, a peak of 35 – 40 million head occurred. Severe drought, harsh winters, and poor range conditions reduced these numbers to approximately 27 million head of cattle. Sheep numbers peaked by 1910, with many conflicts occurring between cattlemen and sheepherders.

Government intervention in agriculture began in 1905 with a number of congressional acts to help alleviate tensions and continued range degradation. The following acts were instrumental in the settlement of the West and exhibits the evolution of agriculture in Wyoming. (Range Management: Principles and Practices. Holechek, J.L., etc al.. 1989).

Homestead Act (1862):
The act enabled any person over 21 years of age to stake claim on 160 acres for the purpose of settlement and cultivation. After five years of residence, the government deeded the land.

Enlarged Homestead Act (1909):
The act was the same as the 1862 act, but the amount of land changed to 320 acres and required only three years of residence.

Stockraising Homestead Act (1916):
The act changed the focus from cultivation to grazing. The homesteads were 640 acres, but the government retained the mineral rights.

Forest Reserves Act (1891):
The act created the ability for ranchers in the areas to use forest for timber and grazing.

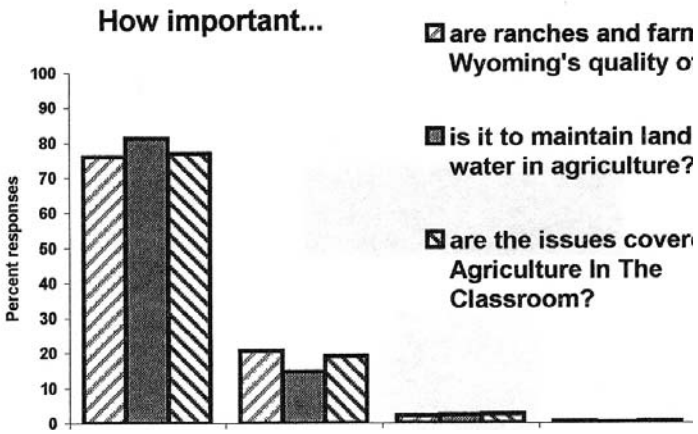
Taylor Grazing Act (1934):
The act allocated ranchers grazing privileges on a fee basis on remaining unsold and unsettled lands. The act affected 16 million acres in Wyoming.

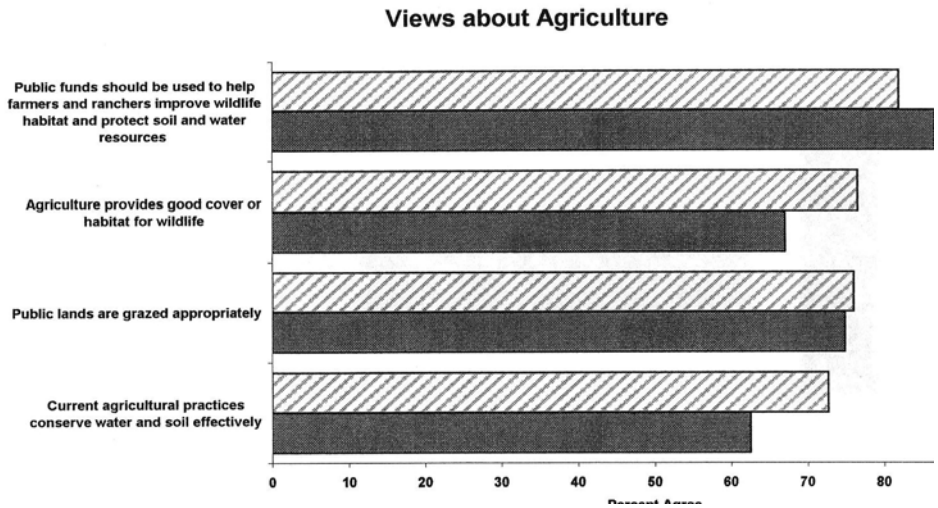
Two-thirds of Wyoming's new homesteaders failed to meet the requirements of the Homestead Act. The lack of knowledge by the government who created the acts misled homesteaders to believe they could produce crops on the same amount of land as in the East and Midwest. The development and implementation of Conservation Districts, Cooperative Extension, and the Natural Resource Conservation Service (NRCS) now

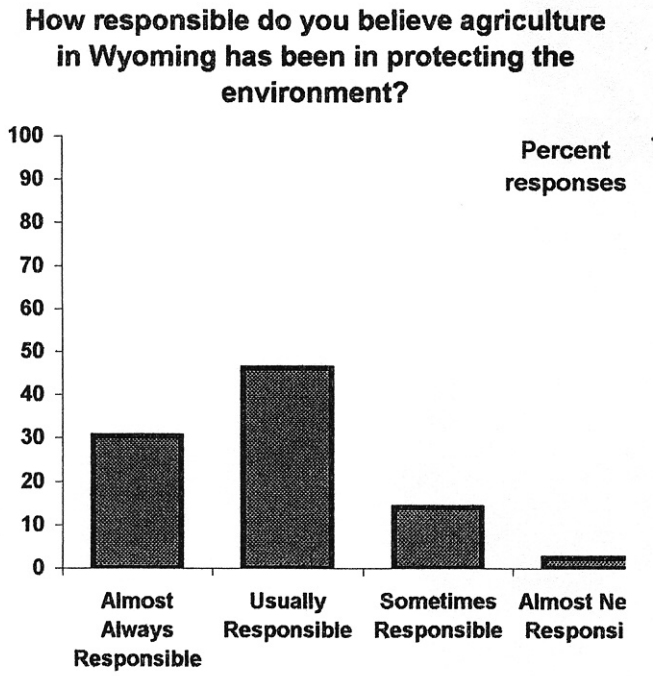
assist present-day farmers and ranchers with range management, watershed improvement, enhanced farming techniques, wildlife habitat improvements, and more.

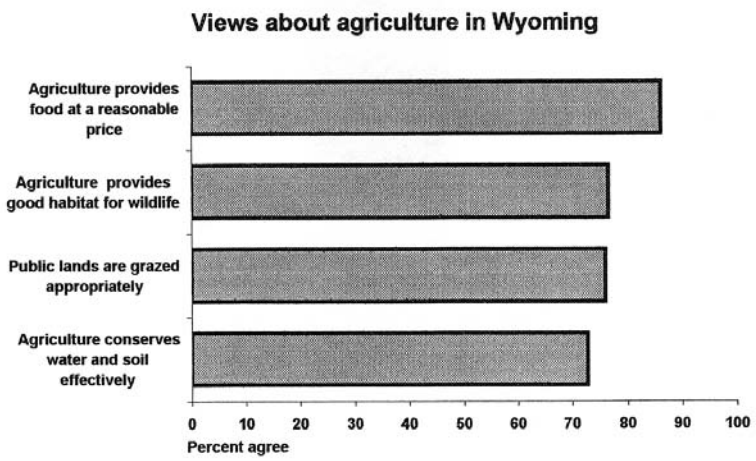
A survey titled Public Attitudes About Agriculture in Wyoming, 2002 published by the Wyoming Department of Agriculture and conducted in cooperation with the Survey Research Center at the University of Wyoming yielded the following results:

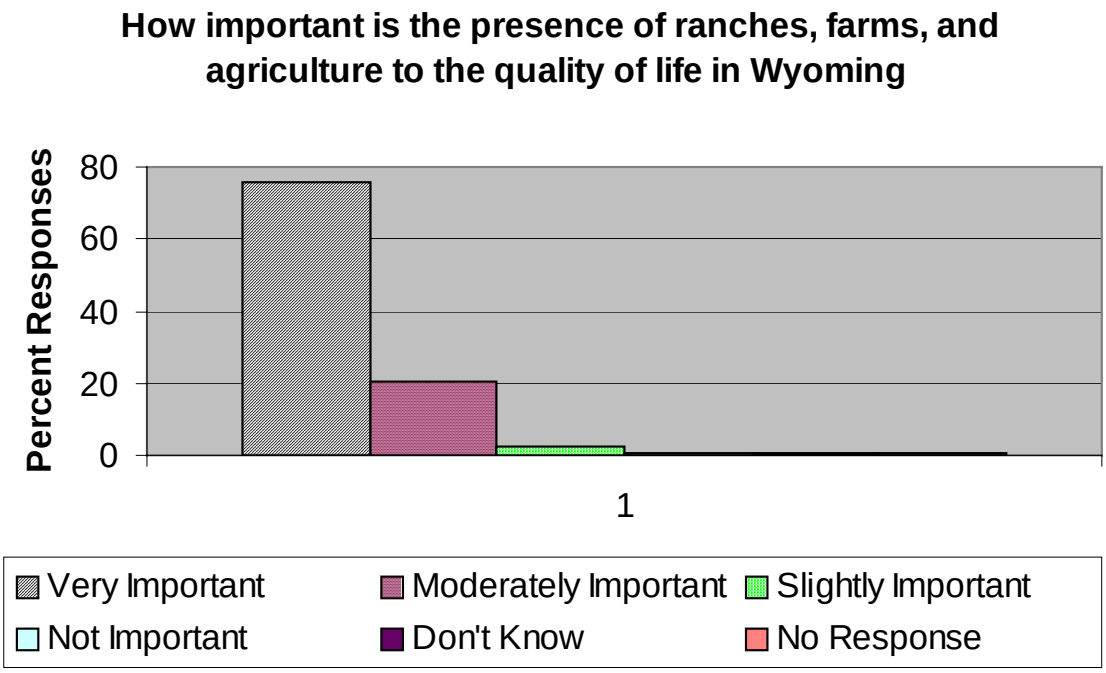
- Nearly all those surveyed (97%) think that ranches, farms and agriculture are important to Wyoming's quality of life.
- 81% say it is very important to maintain land and water in agriculture production. The reasons included keeping jobs and businesses, production of food and fiber, habitat for wildlife, and preservation of open space.
- Agriculture ranked as the second most important economic sector for the long-term future of Wyoming. Mining and petroleum was first.
- 76% of respondents say that agriculture in Wyoming is responsible in protecting the environment.
- Most people in Wyoming agree that agricultural practices do a good job of providing wildlife habitat (77%) and conserving water and soil (73%). They also agree that ranchers with permits to graze on public lands treat the land appropriately (76%).
- By 82%, Wyoming citizens favor using public funds to help farmers and ranchers improve wildlife habitat and protect soil and water.




Views about Agriculture
Public funds should be used to help farmers and ranchers improve wildlife habitat and protect soil and water resources
Agriculture provides good cover or habitat for wildlife
Public lands are grazed appropriately
Current agricultural practices conserve water and soil effectively
0
10
20
30
40
50
60
70
80


How responsible do you believe agriculture in Wyoming has been in protecting the environment?
Percent responses
100
90
80
70
60
50
40
30
20
10
0
Almost Always Responsible
Usually Responsible
Sometimes Responsible
Almost Ne Responsi


Views about agriculture in Wyoming
Agriculture provides food at a reasonable price
Agriculture provides good habitat for wildlife
Public lands are grazed appropriately
Agriculture conserves water and soil effectively
0
10
20
30
40
50
60
70
80
90
100
Percent agree


How important is the presence of ranches, farms, and agriculture to the quality of life in Wyoming
Percent Responses
80
60
40
20
0
1
Very Important
Moderately Important
Slightly Important
Not Important
Don't Know
No Response

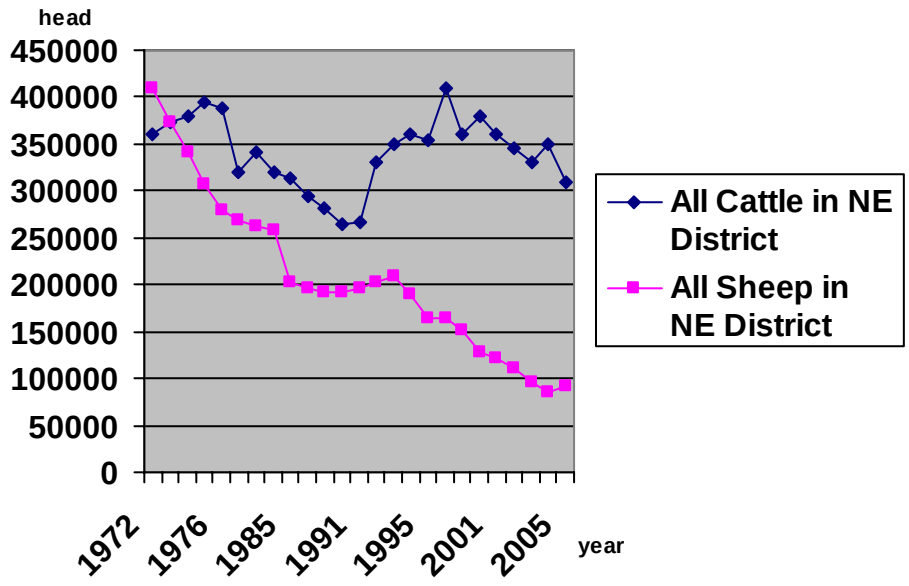
Agricultural Lands

County	Owner	Acres	Total Acres
Campbell			**2,977,606**
	1) Forest Service	145,795	
	2) BLM	234,871	
	3) State	212,095	
	4) Private	2,384,845	
Converse			**2,597,304**
	1) Forest Service	260,620	
	2) BLM	144,186	
	3) Bureau of Reclamation	1,480	
	4) State	212,149	
	5) Private	1,978,869	
Crook			**1,940,692**
	1) Forest Service	197,972	
	2) BLM	87,834	
	3) Bureau of Reclamation	16,129	
	4) State	228,053	
	5) Private	1,410,704	
Johnson			**2,658,245**
	1) Forest Service	326,881	
	2) BLM	510,757	
	3) State Lands/Game and Fish	224,318	
	4) Private	1,596,289	
Niobrara			**1,723,156**
	1) Forest Service	840	
	2) BLM	124,245	
	3) State	212,095	
	4) Private	1,385,976	
Sheridan			**1,713,101**
	1) Forest Service	393,627	
	2) BLM	48,073	
	3) State and G&F	220,602	
	4) Private	1,050,799	
Weston			**1,630,368**
	1) Forest Service	232,914	
	2) BLM	74,777	
	3) State	212,095	
	4) Private	1,110,582	

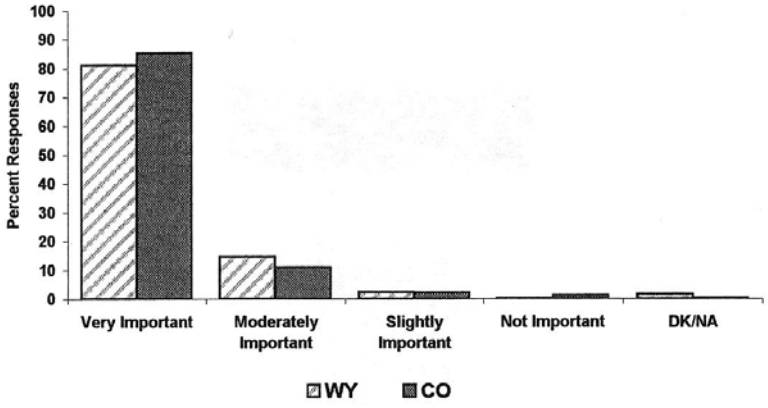
There are seven counties in the NE district. These county lines do not match the exact boundaries of the NE sage-grouse local working group. However, when the general NE area is averaged, private landowners own approximately 71%. Farmers and ranchers are an important component when conserving habitat for sage-grouse and other wildlife. The daily operational duties such as fixing fences, irrigating, calving and lambing, haying, and other on-site tasks, give the landowners the chance to view wildlife such as sage-grouse. Many landowners are fully aware of the upward or downward trends of all types of wildlife. Keeping these landowners on the ground is important in assisting federal and state wildlife managers aware of the general trends of leks, brood survivals, and winter range locations.

The science behind range monitoring has evolved. The timing of grazing, weather conditions, stocking rates, livestock prices, and other factors are all important in making operational management decisions. Over the years, livestock producers have voluntarily lowered stocking rates to create better forage and habitat for both their livestock and the wildlife using the land. The following graph depicts the downward trend of livestock numbers found in northeastern Wyoming.

Campbell, Converse, Crook, Johnson, Sheridan, and Weston Counties
Source: USDA NASS, Wyoming Field Office

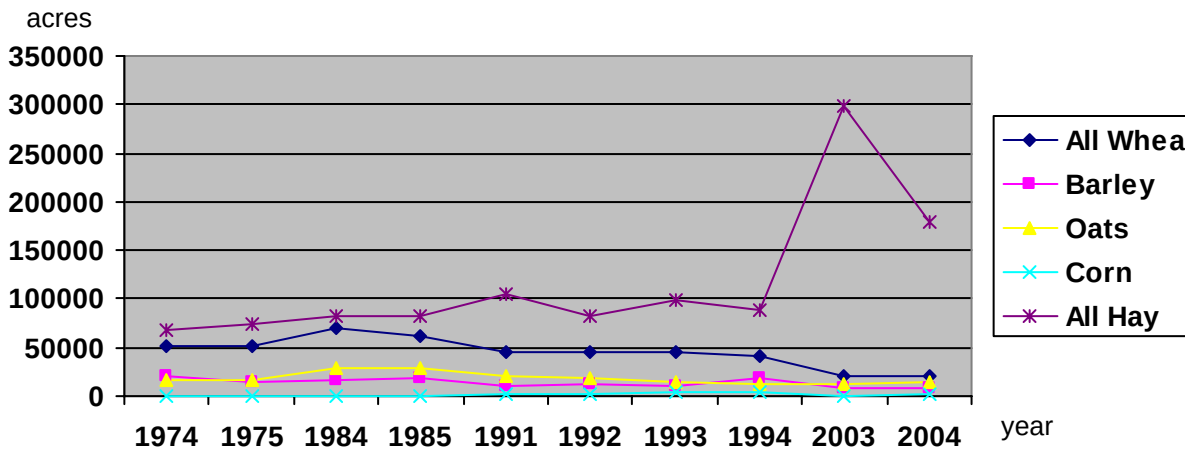


Q.6. How important is it to maintain land and water in agricultural production?



Forage and Crops

Alfalfa is a common crop planted and harvested by many Wyoming farmers and ranchers. Sage-grouse are often found in these alfalfa fields throughout the growing season. Producers harvested 508,000 acres of alfalfa in the Northeast Region of Wyoming in 2005. Alfalfa, a domesticated forb is commonly an irrigated crop. The producers who harvest the alfalfa are becoming more aware of the importance of alfalfa to sage-grouse as a protein and moisture source from the plants and insects. Additionally, taller alfalfa may provide cover for young broods.



A new yellow flowering variety of alfalfa *Medicago sativa ssp. falcata*, a legume native to the plains of Siberia and Mongolia, is a fine stemmed, fibrous rooted species, which has become a unique option for producers in arid regions including NE Wyoming. This species of alfalfa increases forage production and palatability for both domestic livestock and wildlife including sage-grouse. Farmers and ranchers are not planting falcata for hay production, but rather for grazing. In the future as falcata becomes more wide spread, sage-grouse may not need to enter hayed alfalfa fields, which may reduce mortalities from haying equipment. Various landowners continue to incorporate falcata on their operations using private, government, and industry funding.

<u>ACTION ITEMS:</u>

1) Alfalfa producers continue to reduce the number of sage-grouse mortalities by harvesting later in the day and reducing the speed of haying equipment.
2) Smith Ranch Field Day: Falcata and rangeland tour, Lodgepole, SD. June 2002. This ranch is continually used as a tour site for producers interested in falcata.
3) Global Change and Rangeland, Pasture, and Forages Research. Gerald E. Schuman, USDA-ARS Rangeland Resources Research Unit, Cheyenne, WY. On going research plots are implemented and providing data for enhanced range conditions benefiting the land, livestock, and wildlife.
4) 4W Ranch Rangeland Enhancement Project. Rancher will continue to monitor sage-grouse using falcata as a food source. Newcastle, WY.
5) The Lake DeSmet Conservation District Sage-grouse Restoration Project began in 2004 and continues to expand with additional landowner sign-ups and funding

programs supporting in the program. Currently, 10 landowners have enrolled about 173,500 acres in the program. The project budget is currently about $1.4 million. Four additional ranchers have applied to enter the program. If approved, total funding could approximate 2 million dollars and benefit over 270,000 acres. The project employs a number of strategies to improve rangelands including resource inventory, livestock grazing systems, and rangeland renovation using a Lawson aerator. The project is based on successes documented in "Sage-grouse Ecology and Management in Northern Utah Sagebrush-Steppe, a Deseret Land and Livestock Wildlife Research Report, 2002".

Surface-use-agreements with Industry

Falcata seed has become more readily available and more economical to use on private land. Private landowners, working with the oil and gas industry are successfully negotiating surface-use-agreements and incorporating falcata and native forb seed in their planting mix. The ability of landowners to negotiate seed mixes benefits both livestock and sage-grouse. These landowners are also on site to ensure the proper seeding rates, planting techniques, and monitoring the health of these newly seeded reclamation and range improvement projects.

Landowners are implementing the burying of power lines in their surface-use-agreements. Landowners want power lines buried for a number of reasons including aesthetics and reduction of sage-grouse mortalities by raptors and collision.

Additional negotiations by landowners on surface-use-agreements are on coal bed methane (CBM) wells. Northeast Wyoming has large CBM gas reserves, with many found on private land. CBM production creates large volumes of water in some areas and this excessive water must be dispersed. Private landowners' negotiations accommodate the distribution of this excess water across their land. The dispersal of excessive CBM water must occur and be planned to reduce future salinity and plant toxicity issues. Private landowners are involved in the implementation of pipelines, stock tanks, reservoirs, irrigation, treatment facilities and other dispersal methods. Federal lands are limited to only using the CBM water in stock tanks or storage facilities. The private landowners' projects are using the water to enhance their operations and in turn, increase habitat and food sources for sage-grouse and other wildlife.

One of the methods for removing the excess CBM water is through reservoirs and evaporation. These reservoirs however can harbor large mosquito populations and possibly the West Nile Virus (WNV). Private landowners continue to provide assistance in the identification and testing of dead birds for WNV.

<u>ACTION ITEMS:</u>

1) Current efforts by landowners successfully negotiate contracts and share their knowledge of surface-use-agreements to other private landowners.
2) Design a future education program by successful private landowners, consulting firms, attorneys, and others to absentee landowners on negotiating surface-use-agreements.

3) University of Wyoming and Montana State University scientists work with private landowners in NE Wyoming to identify mosquito habitat, research and monitor mosquito species that can carry the WNV to sage-grouse, incorporate the testing and use of predatory minnows and use tracking devices to locate birds. Laboratory results identified dead birds testing positive for WNV.
4) Landowners and industry companies are treating ponds and reservoirs with larvicides to reduce WNV.

Mosaic of Habitat

Sagebrush treatments historically were in large blocks to create more forage for livestock and wild ungulates. Research proves this method of sagebrush treatment can have negative effects on sage-grouse and other sagebrush obligates. Sagebrush treatment is still necessary to create a mosaic of different structures and age classes of all vegetation. Wildfires typically created these mosaics naturally. Currently people extinguish wildfires to avoid the loss of structures and large amounts of timber or vegetation.

Farmers and ranchers with large tracts of land use prescribed fire to remove decadent sagebrush and vegetation. There are additional treatment options for sagebrush, including aerators, harrows, and chemical. The landowner must know why they are treating a given area and consider all possible alternative options for optimal results. Treating sagebrush can improve forage quality for livestock and create a more diverse and healthier habitat for sage-grouse and other wildlife.

ACTION ITEMS:

1) The Sage Grouse Habitat Enhancement Project in Weston County was funded by the Wyoming Private Grazing Lands Team for the Weston County Natural Resource District. Sagebrush enhancement trials were conducted in 2002 using different mow heights, one, and two passes with a Dixie harrow. Monitoring has continued since then on the trial areas, including control areas, for sagebrush leader growth, protein content, vegetation trends and wildlife use.

Equipment	**Approx. # of Acres**	**Cost per Acre**		**Monitoring Sources**	**Partners**
Dixie Harrow Single Pass	4 acres	$25.00		Sagebrush leader growth	Wyoming Private Grazing Lands Team
Dixie Harrow Double Pass	4 acres	$25.00		Protein Analysis on sagebrush leader growth	NRCS – Everet Bainter State Range Conservationist
Mowing 4”	4 acres	$24.00		Vegetative Transects	Weston County NRD
Mowing 8 “	4 acres	$24.00		Wildlife Transects	One (1) Landowner
Mowing 12”	4 acres	$24.00			

2) Private landowners work with the NRCS to create a sagebrush mosaic using Spike, Tordon, and 2,4-D. Ten years of spraying have resulted in 16,757 treated acres in six NE WY counties. Future spraying needs remain unknown.
3) Private landowners work in cooperation with federal and state agencies to increase the usage of harrows and aerators to create sagebrush mosaics on rangelands.

Weed Control

Noxious weeds can quickly spread reducing forage for livestock and invade habitat for sage-grouse. Private landowners use a variety of methods to control weeds, including mechanical, biological, cultural and chemical. Continual monitoring helps to determine the success of the vegetative treatment and weed suppression on reclamation sites.

ACTION ITEMS:

1) Coordinated Resource Management (CRM) is currently used by private landowners in cooperation with other local, state and federal agencies as well as private industry to identify and treat invasive weeds in sage-grouse habitat on the Bitter Creek watershed in northern Campbell County, Wyoming.
2) Private landowners continue to educate themselves, update pesticide applicator licenses, and apply chemicals with environmentally sound techniques. Every five years applicators must retest.
3) Private landowners work with their local weed and pest districts to cost-share and control weeds on their land. County Commissioners appoint landowners to serve voluntarily on local weed and pest districts. Additional promotion of the districts should increase to provide additional landowners the districts' services.
4) Grazing leases on state and federal lands are responsible to monitor and control noxious and invasive weeds on their leases each year.

Small Water Development

Some farmers and ranchers continue to develop water projects on their land to increase their overall productivity. These projects include pipelines and stock water tanks, reservoirs, flood, sprinkler and other irrigation applications. The distribution of water across vast areas has allowed livestock and wildlife to fully utilize their entire range.

Action Items:

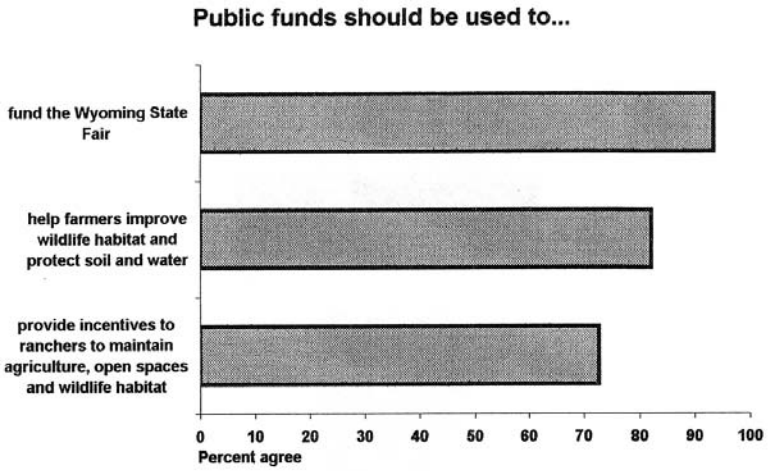
1) Area 1 of the Wyoming Water Development Commission has approved and will complete 16 pipelines small water projects and 3 well/pipelines. Total costs $1,056,926.01, and covers 181,929 acres.

Open Spaces

Wyoming's recent economic boom is due to a number of factors. Energy development companies have a tremendous need for employees. These employees along with an influx of out-of-state people who seek a lifestyle change. Wyoming's open space, scenic vistas, wildlife and cowboy culture lures many to develop small acreages to experience a rural lifestyle. This new population has brought drastic changes to the open spaces in Wyoming.

Residential and commercial developments destroy sage-grouse habitat, migration routes, and populations. Once development has occurred, wildlife habitat will permanently be lost. Deeded lands contain a majority of the riparian habitats in NE Wyoming. If ranchers sell these lands to development, federal and state lands may not contain enough of the riparian habitat that sage-grouse need to sustain a healthy population.

Wyoming's agricultural economic viability is paramount to maintain the open spaces the state currently experiences. Subdivisions are responsible for increased water use, the spread of noxious weeds, land use degradation, and impediment of wildlife travel. The agricultural industry is vital to protecting the remaining open spaces. One tool landowners use to ensure the longevity of their operation as an agricultural entity are conservation easements.



ACTION ITEMS:

1) Financial assistance programs for young farmers and ranchers help keep agricultural lands in operation. The Farm Service Agency and Farm Credit Services are offering low interest loans to young agriculturalists.
2) Wyoming Stock Growers Association has the Land Trust Program to protect open space with conservation easements to protect the land from development while still enabling the land to remain agricultural. The Association added a second position in February 2006 in Cody. The two positions search for land and funding to implement the easement. WSGALT has four conservation easements in Sheridan County totally 6,200 acres. Existing sources of funding for purchasing conservations easements include: U.S. Department of Agricultures Farm and Ranchland Protection Program and Grasslands Reserve Program (administered by the NRCS), Wyoming Wildlife and Natural Resources Trust Fund, and potential energy development mitigation money.
3) Estate planning is an essential component in the continuation of production agriculture and open spaces. There are a number of steps agriculture families can take immediately to alleviate frustration, forced sales, inflated estate taxes, and

personal strife due to the untimely death of family members. Local Farm Bureau Insurance agents are available to help organize an estate planning team to set the process in motion. A team consists of a local accountant, attorney, Farm Bureau agent, and the family members. Families are beginning this process much earlier than in previous generations.

4) Federal legislation to repeal estate tax is an ongoing effort. Wyoming senators Enzi and Thomas and House Representative Cubin continue to work on this issue to reduce producers' tax burdens.

Predator Management

A number of predators have a negative influence on sage-grouse populations. Private landowners voluntarily contribute money to predator management programs, practice on-site control, and according to state statues, pay a predetermined tax included in the livestock inspection fee. All of these actions positively influence the sage-grouse populations. According to Wyoming Wool Growers Association, the sheep industry expends $2.5 million dollars per year to manage predators. In 2004, there was $535,000 in predator fees collected from the State Livestock Board.

ACTION ITEMS:

1) State Livestock Board continues to collect fees by livestock producers to pay for predator control.
2) The 2006 Wyoming state legislature approved $6 million biennially for predator management. Part of the $6 million will compensate a state predator management administrator. The administrator will work with county predator management boards and budget finances for control and research.

Projects

The United States Department of Agriculture's 2002 Farm Bill Conservation Programs include Conservation Reserve Program (CRP), Conservation Security Program (CSP), Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program, (WHIP), Farm and Ranch Lands Protection Program (FRPP), Watershed Rehabilitation Program, Grassland Reserve Program (GRP), and Wetlands Reserve Program (WRP). Revisions of the 2007 Farm Bill are underway.

The most implemented programs in Wyoming have been EQIP and WHIP. EQIP makes up 90% of NRCS' contracts in NE Wyoming. EQIP is a cost share program intended to improve ground and surface waters, improve air quality, reduce soil erosion and promote at-risk species habitat conservation. WHIP is a cost share program creating high quality wildlife habitats on private lands. Many of the programs in the table below are using funds benefiting the landowner and wildlife including sage-grouse.

2005 Contract Expenditures for Threatened and Endangered Species, Declining Species, or Species of Concern *These funds may be for multiple species, not just sage-grouse				
District	**Year**	**Federal Dollars**	**Private Dollars**	**Project Total**
Campbell	2004	$2,526.00	$1515.60	$4,041.60
	2005	$0	$0	$0
Converse	2004	$0	$0	$0
	2005	$21,835.12	$13,101.07	$34,936.19
Crook	2004	$1097.00	$658.20	$1,755.20
	2005	$4375.00	$2625	$7,000.00
Johnson	2004	$0	$0	$0
	2005	$36,396	$21,837.60	$58,233.60
Niobrara	2004	$49,093.70	$29,456.22	$78,549.92
	2005	$82,732.50	$49,639.00	$57,913.00
Sheridan	2004	$245,080.52	$147,048.31	$392,128.83
	2005	$150,165.70	$90,099.42	$240,265.12
Weston	2004	$232,178.59	$139,307.15	$371,485.74
	2005	$68,664.00	$41,198.40	$109,862.40
			TOTAL	**$1,356,171.60**

ACTION ITEMS:

1) 2005 Contract Expenditures for Threatened and Endangered Species, Declining Species, or Species of Concern has 70,643 acres planned or applied in the seven counties of the NE region. Projects range from prescribed grazing to brush management to water development projects.

Conclusion

Wildlife including sage-grouse are readily found on private land throughout the state. The landowners and managers working the land, make daily decisions affecting the land, the livestock, and the wildlife. In the end, farming and ranching is a business and economics plays the largest role when a landowner makes their decisions. It is important for landowners to pass on their knowledge to others in the industry to keep the state as beautiful and open as it is for future generations.

Appendix III - Coalbed Natural Gas

GREATER SAGE-GROUSE CONSERVATION

Oil and Gas Development and Reclamation in Northeast Wyoming

ABSTRACT

Oil and gas development impacts on sage-grouse are in the process of being quantified across the State. Issues related to the potential loss of sagebrush and sagebrush habitats, shrubs, grasses and forbs during oil and gas development are a concern. Seasonal habitats may become mosaics and development activities, motorized access, noise, and increased human activity may disrupt breeding, nesting and rearing requirements for the sage-grouse.

The purpose of this document is to address what those oil and gas impacts may be, what the approach of the Northeast Wyoming Greater-Sage Grouse Local Working Group may do to deal with those local issues, adapted to local conditions, and to ensure and develop with stakeholders cooperative site specific strategies for sage-grouse conservation. A number of Recommended Management Practices have been developed for oil and gas activities in northeastern Wyoming. Oil and gas development, reclamation and regulatory requirements, voluntary conservation efforts, best management practices, as well as proposed and ongoing conservation pilot programs are discussed.

BACKGROUND

As per the Wyoming Greater Sage-Grouse Conservation Plan the purpose of the Local Working Groups (LWG) is to allow citizen participation in the conservation process. The Northeast Wyoming Greater Sage-Grouse LWG is comprised of thirteen local citizens, representing groups interested in sage-grouse conservation. The role of the group, is to develop and implement local conservation plans to benefit sage grouse and, whenever feasible, other species that use sagebrush habitats. The oil and gas industry is one of the stakeholders represented on the LWG. The area of interest for the Northeast Wyoming Greater Sage-Grouse LWG includes the following counties: Campbell, Johnson, Sheridan, Crook and Weston as well as most of Niobrara and Converse and portions of northeastern Natrona.

Oil and natural gas development in northeastern Wyoming has a long and varied history of boom and bust. Activity level is directly tied to the changes in oil and natural gas prices. Exploration and development was typically relegated to specific surface areas reflecting the subsurface geology where oil and gas resources were trapped.

Coalbed natural gas (CBNG) development is relatively new to northeast Wyoming with substantial development over the past 8 to 10 years. Most of Campbell, Johnson and Sheridan Counties as well as northern Converse County are underlain with significant shallow coal deposits. In the Powder River Basin, twelve active open pit coal mines produce almost 400 million tons of coal each year along the eastern and northwestern outcrops. Due to the extensive nature of the shallow coal deposition, coalbed natural gas

development may occur over a vast area of the Northeast Wyoming Greater Sage-Grouse LWG area.

Energy development impacts on sage-grouse are in the process of being quantified across the State. Issues related to the potential loss of sagebrush and sagebrush habitats, shrubs, grasses and forbs during oil and gas development are a concern. Seasonal habitats may become mosaics and development activities, motorized access, noise, and increased human activity may disrupt breeding, nesting and rearing requirements for the sage-grouse. A number of Recommended Management Practices, RMPs, have been developed for oil and gas across the State. Not all Recommended Management Practices will work for all forms of mineral and energy development. Site specific regulatory control, specifically on federal estate, stipulates allowed activity as a Condition of Approval to drill a well. On State and fee estates the operators must use RMP controls to minimize impacts. Oil and gas development statewide is varied and complex but ongoing.

STATISTICAL OVERVEIW

The Wyoming Oil and Gas Conservation Commission, OGCC, tracks production from 640 oil and gas fields in the Powder River Basin of northeastern Wyoming. In 2005, the production from those fields was 16.3 million barrels of oil, MBO, and 54.7 billion cubic feet of gas, BCF, and an additional 273.5 billion cubic feet of CBNG gas, BCF.

OIL, GAS AND CBNG PRODUCTION DATA

COUNTY	Cum MBO	Cum BCF	CBNG, BCF	Cum MBW	CBNG, MBW
Campbell	574.5	2,235.7	1,563.6	4,922.6	2,730.8
Johnson	66.6	124.4	85.2	924.6	320.6
Sheridan	2.9	19.4	191.8	387.5	354.5
Crook	94.7	4.4	0	613.8	0
Weston	48.6	60.2	0	202.1	0
Niobrara	23.6	24.2	0	344.3	0

Based on OGCC data January 1978 through October 2005 http://wogcc.state.wy.us. Cum = cumulative

CBNG production in the Powder River Basin is approximately 925,000,000 cubic feet per day, based on October 2005 OGCC production data,. The average residential consumer uses approximately 100,000 cubic feet of gas per year, or 274 cubic feet per day. CBNG in the Powder River Basin of northeast Wyoming produces enough gas to heat 3,376,000 homes each and every day.

By using 2005 well counts and average production rates, the OGCC has estimated that some 81,400 CBNG wells may be needed to produce the 25 trillion cubic feet (TFC) of gas estimated recoverable by the Wyoming State Geologist. To date, some 20,800 CBNG wells have been drilled with 14,900 wells producing either water or water and gas. The development is approximately 26% complete and OGCC estimates 18 years will be required to finish the drilling.

According to the Petroleum Association of Wyoming, in 2005 Wyoming's petroleum industry directly employs over 18,000 people with an annual payroll estimated to exceed $750 million. In the Powder River Basin more than 1,800 people are employed in drilling, servicing and supplying the oil and gas activity. Due to increased oil and gas

prices, drilling for oil and gas has seen resurgence in northeast Wyoming. CBNG activity continues as the development expands across the Powder River Basin. Labor shortages, the inadequate supply of housing, limited city and county resources and infrastructure, are among the factors that may impact the pace of development.

Oil and gas revenue for the State of Wyoming is provided by the following:

- Six percent severance tax on gross revenue, tax paid on 100% of the value in contrast to only 11.5% for industrial and 9.5% for residential value taxed.
- 12-1/2 percent to 16-2/3 percent royalty on State school lands
- Wyoming receives 50 percent of the federal mineral royalty of 12-1/2 percent (6.25%)
- Ad Valorem tax ranges by county, in the LWG area the range is 6-1/2 to XXX percent
- State would receive 11 percent share of the revenue for an estimated $13.8 billion *
- The counties would share in 6-1/2 percent or $8.1 billion *

*Estimates based on State Geologist's expectation for recoverable reserves is 25 trillion cubic feet, TCF, and estimating an average price of $5.00 per thousand cubic feet

DEVELOPMENT

Conventional Oil and Gas

For the purposes of this document, convention oil and gas development is defined as exploitation of oil and gas minerals from conventional deep structures known as reservoirs. These reservoirs are distinct geologic subsurface features where oil and gas has been trapped within the sand or limestone, either as they were deposited or after deposition due to migration from source rocks. These structures were typically deposited in a marine environment and may be millions of years old. Oil, gas and water is trapped in the pore spaces of the sand or limestone reservoir. The oil or gas is produced by pressure depletion, in other words, as the pressure is relieved in the reservoir by production of oil and gas the pressure is continually decreasing. Once the pressure is released or depleted no more oil and gas can flow to the well and be produced to the surface. In proportion to the oil and gas volumes produced, not much water is produced from conventional oil and gas wells as the water shares the pore space with the oil and gas.

Coalbed Natural Gas

Coalbed natural gas development is relatively new to the Powder River Basin of northeast Wyoming in relation to conventional oil and gas. For purposes of this document coalbed natural gas, CBNG, is natural gas absorbed to the surface of the coal particles and held in place by the hydrostatic pressure of the water in the coal. In contrast to convention oil and gas pressure depletion, CBNG requires pumping of water from the coal to allow the hydrostatic pressure to be reduced until the gas can desorb from the coal surface and migrate to the well. As the gas production volume increases the water production typically decreases with time.

Projected

Projected development is contingent to well-by-well economic evaluation. The regulatory climate plays an ever increasing role in decision making as economic viability may swing on increased cost to prepare permits, plans of development, and onerous regulations and conditions of approval may cause timing delays or prevent development. Operators are continually looking to spend capital dollars in other areas that may provide the corporation with the best benefit to the stockholders. On the federal estate, in order to understand the potential for a major oil and gas development, a National Environmental Policy Act (NEPA) environmental impact document needs to be prepared by BLM.

The Powder River Oil and Gas Project Environmental Impact Statement, January 2003, was prepared based on planned development in Wyoming's Powder River Basin. Industry provided BLM with proposed development plans initiating the NEPA process . The project area studied in the EIS was almost 8,000,000 acres. The EIS study included the impacts of drilling, completing, operating, and reclaiming almost 39,400 new federal and non-federal coalbed natural gas wells to be drilled on almost 26,000 well pads. In addition, the EIS studied an additional 3,200 new conventional oil and gas wells to be developed over the next ten years. The EIS analysis studied the estimated short-term disturbance to be 211,643 acres. Disturbance studied includes the aerial extent of well pads, roads, pipelines water handling facilities including direct discharge facilities, containment reservoirs, land application facilities, and injection wells, compression facilities and gathering pipelines, and overhead power lines. The long-term disturbance was estimated to be 102,658 acres based upon the above disturbances. Short- and long-term disturbance were estimated at 2.6 percent and 1.3 percent, respectively, of the total project area of almost 8,000,000 acres.

The total acreage affected by oil and gas development would not be disturbed simultaneously because development would occur over a period of several years. Some of the disturbed acreage would be reclaimed or would be in the process of reclamation when new disturbances are initiated. Development is likely to occur at a rate faster than abandonment and reclamation of wells. In the near future, the amount of disturbed bird species habitat is likely to increase, but as concluded in the Powder River O & G EIS, the anticipated life of CBNG wells indicates reclamation would eventually overtake development of new wells, resulting in a net decrease in disturbed vegetation for the long-term. In areas reclaimed after development, vegetation often differs significantly from undisturbed areas as directed primarily by OGCC and federal Conditions of Approval and stipulations placed on operators for specific seed mixes and application rates.

Sage-Grouse Impacts

Effects to Greater Sage-Grouse would include direct and indirect injury or mortality (poaching, poisoning, collisions with vehicles, power lines and poles, and fences, or drowning), displacement, and direct destruction or fragmentation of habitats. Direct disturbance of the Sage-Grouse habitats and indirect effects, including displacement, would occur in varying degrees during the construction, production and decommissioning and abandonment phases of the development. Increased levels of activity, equipment operation, vehicular traffic, and noise may cause grouse to avoid areas causing overuse and under use of suitable habitat.

Cumulatively, the impact of CBNG on sage-grouse could potentially be significant. Critical research is currently being conducted within the area of interest for the Northeast

Wyoming Greater Sage-Grouse LWG. Data from these sites will better quantify the impacts to sage-grouse are occurring as a result of oil and gas development. Efforts have been made by the Petroleum Association of Wyoming and Wyoming Game and Fish Department to encourage voluntary compliance to mitigation and stipulations, not only on mandated federal surface and minerals, but also on private and State owned surface, irregardless of the mineral estate. Most companies are taking more proactive measures to protect lek sites, and nesting and rearing habitat, through the breeding and fledgling season.

Reclamation is regulated under the OGCC Rules and Regulations and BLM Plan of Development Reclamation Plans that require annual inspections of plugged and abandoned well sites, reclaimed facilities, and reclaimed infrastructure to ensure proper vegetative cover is in place to restore the site as well as prevent or control erosion. Industry works with the BLM and landowners to select proper seed types to ensure plants are appropriate and provide benefit to livestock and wildlife and prevent erosion. More and more, industry is including sage-grouse beneficial seed mixes in their reclamation plans.

REGULATORY FRAMEWORK

As many as 14 different permits are required from six State and federal regulatory agencies to drill and produce an oil or gas well.

Permit to Drill

All wells require a permit to drill from the Wyoming Oil and Gas Conservation Commission, OGCC. In addition the OGCC requires that Sundry Notices be filed by the operator providing the detailed drilling, completion, stimulation, plug back and plug and abandonment information for each well. Open hole logs must also be supplied. Once production begins at a well, the operator must file timely reports on oil, water and gas production of each well. OGCC also permits off-channel pits. These regulations apply to all oil and gas wells. Should drilling fluids or produced water be needed to control dust on lease roads, OGCC requires permits for these activities as well. Various surety and/or blanket bonds may be required prior to drilling of wells or installation of off-channel pits. The OGCC website, located at http://wogcc.state.wy.us provides well statistics as well as information about the various forms and permits required.

Water Allocation

Each well drilled for CBNG activities must also have a permit from the Wyoming State Engineers Office, SEO, to appropriate ground water. The removal of water from coal seams in the production of CBNG is considered to be a beneficial use and requires a permit. The permit provides the location of the well and an estimate of the volume of water to be produced yearly by that well. If an on-channel reservoir is to be constructed or upgraded to contain CBNG water, another permit is required by SEO. Based on the volume of reservoir, the height of the dam, and the long-term use of the structure, the permit application may require the signature of a WY licensed professional engineer or land surveyor, and additional stipulations. A bond will also have to be posted through the Wyoming Department of environmental Quality as part of the discharge permitting process (see below). Reservoir permits can take up to three months for SEO approval without Safety of Dams requirements, and up to a year with Safety of Dams requirements. The SEO website is http://seo.state.wy.us.

Produced Water

A permit to discharge the produced water is required from the Wyoming Department of Environmental Quality – Water Quality Division, DEQ-WQD. DEQ-WQD has primacy to administer the Wyoming Pollution Discharge Elimination System, WYPDES, and permits through jurisdiction under the federal Clean Water Act. This water discharge permit stipulates the acceptable concentration of chemical constituents in the water to be discharged based on the proximity of the discharge to live surface waters of the State. DEQ-WQD issues several types of discharge permits including watershed-based permits where all sources of water discharged to ephemeral drainages with a given watershed are accounted for and capacity allocated prior to issuance of the WYPDES permits. Considerable time delays in permitting can be associated with WYPDES discharge permits due to multiple factors

If produced water is to be stored in surface impoundments (on-channel reservoirs or off-channel pits), the DEQ-WQD requires that the operator investigate shallow ground water below the reservoir site. If the ground water is of sufficient quality, DEQ-WQD will provide protection of the ground water in the form of a Chapter 3 Permit-to-Construct. Both the WYPDES discharge permit and the Permit to Construct are required to be approved and in place prior to the commencement of discharge to a reservoir. A typical groundwater investigation can take up to six months or more from the time the well is drilled to the time permit is approved.

The DEQ-WQD also manages storm water runoff from active construction sites through the WYPDES permitting process as part of the federal Clean Water Act. A Storm Water Pollution Prevention Plan (SWPPP) is required for both large construction sites (greater than 5 acres of disturbance) and small construction sites (1-5 acres of disturbance). The directive of the SWPPP is to prevent sediment from being washed into surface waters of the State. Typically, CBNG operations are grouped together by field under a single SWPPP. The DEQ-WQD website is http://deq.state.wy.us

State Lands

On State owned surface, a water management plan is required prior to discharge of the produced water. The plan describes where wells will be located, and how the produced water will be managed on State lands. Approval to construct access roads, drill groundwater monitoring wells, build reservoirs and pipelines, etc, on State land is granted through the Wyoming State Board of Land Commissioners under Temporary Use Permits or Easements. The Office of State Lands and Investments webpage is http://slf-web.state.wy.us.

Air Quality

All compression equipment must have air quality permits issued by the Wyoming Department of Environmental Quality – Air Quality Division, DEQ-AQD. Major pipeline station compressors and infield booster compression must be permitted. For CBNG additional permitting is required for diesel and natural gas fueled portable electrical generators. Venting permits are also required through the OGCC to test production rates in new areas, as well as for wells and gathering lines that are not currently producing enough gas to run compressor stations or for gas that needs to be cleaned for sale.

Split Estate

In the Powder River Basin 68 percent of the minerals belong to the federal government, however only 14 percent of the surface is owned by the federal government.

Conflicts arose when federal mineral leaseholders attempted to access the private surface to develop the federal mineral estate. To resolve conflicting interests, the Wyoming Split Estate Act was passed by the State Legislature and signed into law by the Governor in 2005. The OGCC started enforcing the law in July 2005. See 30-4-401 through 30-5-410, or Chapter 3 of the OGCC Rules and Regulations, http://wogcc.state.wy.us. The Split Estate Act provides a means for negotiating access and surface damage payments between the federal mineral leaseholder and the private surface estate owner or lessee. The Split Estate Act requires 5-day notice from operator to surface owner to allow access for non-surface disturbing activities; requires 30-day written notice from operator to landowner of proposed oil and gas operations including proposed dates to commence, extent of facility locations and access routes including roads, wells, well pads, seismic locations, pits, reservoirs, power lines, pipelines, compressor pads, tank batteries, and other facilities; requires notice of good faith negotiations to reach a surface use agreement or notice of securing a written waiver or notice of posting a surety bond; requires OGCC notification to surface owner of accepted bond and then issues the approved permit to perform oil and gas operations.

Federal Lands/Minerals

Federal management of the minerals on public lands is managed by the US Department of Interior through the Bureau of Land Management, webpage http://www.wy.blm.gov/bfo/. The Buffalo Field Office oversees federal mineral development in northeastern Wyoming. With the passage of the National Environmental Policy Act, NEPA, BLM has been required to prepare an Environmental Impact Statement, EIS, or an Environmental Assessment, EA, or both, for mineral development. In northeastern Wyoming, 22 major NEPA documents have been prepared from 1979 through July 2003 to manage the development of coal and CBNG. The latest of these documents include t he Wyodak Coal Bed Methane Project Final Environmental Impact Statement - October 1999, Wyodak CBM FEIS, the Wyodak CBM Record of Decision - November 1999, the Wyodak Drainage Coal Bed Methane Environmental Assessment Decision Record – March 2001, the Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project - January 2003, and the Powder River O&G Record of Decision – July 2003.

In order to develop oil and gas from the federal mineral estate an operator must purchase an Oil and Gas Lease at a competitive auction. With the lease in hand the operator has a limited time to develop the mineral. Prior to any development the operator must prepare and submit a detailed Plan of Development. Considerable time delays in permitting are associated with the federal drilling permits. Federal permits currently require an average of 6 to 12 months to conduct surface use, archeological and biological surveys and to develop water management plans and finally to prepare Plan of Development (POD) documents prior to submittal. Once submitted, the permits take an average of 6 to 9 months to receive approval. Overall total elapsed time from start to approved federal permit is 12 to 24 months. In addition, once approved, most Federal permits prohibit drilling and construction operations for a portion of the year due to Conditions of Approval and wildlife stipulations attached to the permit. In addition to the Federal Application for Permit to Drill (APD), a State APD must be obtained from the OGCC, as addressed above. For access across federal land surface a Federal Right-of-

Way must be obtained. For disturbances on federal land surface a Federal Bond is required. BLM regulations and notices to lessees detail all requirements.

WATER

Conventional Oil and Gas

Conventional oil and gas produced water is typically considerably low in proportion to the oil and gas volumes produced, therefore not much water is produced from conventional oil and gas wells as the water shares the pore space with the oil and gas. The depletion of the oil and gas subsurface reservoir results in a steady decline in oil, gas and water production from the well over time. Produced water is stored in small pits and is evaporated or is transported to permitted water disposal facilities.

Coalbed Natural Gas

Coalbed natural gas production requires the production of significant quantities of water. Typically, individual well water is collected and, depending upon permit requirements, discharged to the surface, discharged to a reservoir for storage, or treated and stored in a reservoir, or treated and released. The OGCC water production data for CBNG for the past 18 years indicates approximately 3,300 million barrels of water, MBW, have been produced since 1987 at an average rate of 3.8 gallon per minute per well, GPM per well. Note that recent EIS, used projected average water rates at 12 GPM per well, three times higher than actual produced water volumes.

As a perspective, all the water produced in association with CBNG production activity, approximately 429,400 acre-feet, (AC-FT):

- If collected for the past 18 years would fill Keyhole Reservoir 2-1/4 times.
- Total water produced over 18 years is equivalent to a single rain event of approximately 5/8 inch of precipitation over Campbell, Sheridan and Johnson Counties.
- Total produced in 18 years is less than 1/5 the State of Wyoming's annual irrigation water use.

West Nile Virus

The recent development of CBNG in northeast Wyoming coincided with 7 years drought. The use of reservoirs to store water provided beneficial use of the produced water for livestock and wildlife. During the late summer of 2003 evidence mounted that West Nile Virus (WNV), had spread into the State. Stagnant water and reservoirs could provide suitable habitat for mosquito carriers of the virus.

Of the 2,500 mosquito species worldwide, about 200 species are found in the United States. Only female mosquitoes transmit diseases since they need the protein from blood to breed. Arthropod vectors for WNV identified *Culex tarsalis* mosquitoes as the disease carrier. In July and August 2003 significant mortality of sage-grouse was experienced in the Northeast Wyoming Greater Sage-Grouse LWG area due to WNV. The primary breeding habitat for mosquitoes is stagnant or shallow pools of water, generally less than 3 feet in depth, that must exist for at least 7 to 10 days, and may include any aquatic sites with vegetation areas such as swales that have poor infiltration. The *Culex tarsalis* mosquito mainly flies between 10 p.m. and 1 a.m. A number of CBNG impoundments, ponds, and reservoirs could serve as potential breeding areas for the *Culex* mosquito most often associated with the spread of WNV.

The oil and gas industry has reacted to WNV by adopting voluntary sampling of CBNG impoundments, ponds, and reservoirs for mosquito larvae. Dip testing for

mosquito larvae and setting and sampling mosquito traps is performed May through September each year. If *Culex* larvae is identified and/or trapped mosquitoes are identified as *Culex*, then larvacide briquettes are placed in the impoundments. The appropriate County Weed and Pest office trains industry personnel and provides larvacide materials and application rates. During 2004 and 2005 approximately 26 CBNG produced water impoundments scattered across the LWG area were treated with larvacide. While this is a small sampling of CBNG impoundments, the oversight and science applied to these tested reservoirs has provided useful information to be expanded upon in the future. Studies of collared sage-grouse mortality indicated significantly lower mortality in 2004 and 2005 than in 2003, likely related to weather patterns not necessarily to larvacide treatment. Industry has become aware of proper impoundment design and construction methods to minimize or eliminate the potential mosquito breeding areas by building steep walled and deeper CBNG produced water impoundments where practical and cost effective.

SAGE GROUSE CONSERVATION EFFORTS

RECOMMENDED MANAGEMENT PRACTICES

- Develop oil and gas in a manner compatible with maintenance and enhancement of sage-grouse populations and habitat and minimize impacts by mitigation, reclamation, and planning for sage-grouse needs.
- Minimize sage-grouse habitat disturbance. Incorporate biologic study and consultation to evaluate and address the needs of sage-grouse in project planning, and during construction and production operations.
- Develop sage-grouse and raptor tracking procedures for operations personnel and provide WG&F with periodic reports as to location, count, mortality, etc.
- Where technically and economically feasible, drill on multiple well sites to minimize surface disturbing activities. Encourage the development of new technologies that would reduce total surface disturbance within occupied sage-grouse habitat.
- Construct long term roads to avoid sage-grouse breeding, nesting and rearing sites where possible. Post and observe speed limits and provide dust suppression as is economically feasible.
- Install telemetry systems at wells, meter buildings and compressor sites to minimize human activity and motorized vehicle traffic.
- Design, construct and locate production and compression facilities to minimize noise and traffic and to avoid sage-grouse habitat, breeding, nesting and rearing areas where practical.
- Include raptor perch prevention in the design and construction of facilities that may provide perch sites.
- Plan and construct overhead power lines with raptor perch site protection and locate to avoid sage-grouse habitat, breeding, nesting and rearing areas. Where necessary, technically feasible, economic and safe, construct underground power lines, high and low voltage.
- Avoid motorized vehicle and human activities around breeding, nesting and rearing habitats during appropriate times of the year. Avoid these areas at specific times during the day.

- Manage water production to enhance or maintain sage-grouse habitat.
- Design and construct pits and reservoirs for the storage of produced water to minimize mosquito habitat. Monitor mosquito populations on those reservoirs with mosquito habitat and test for occurrences of the West Nile Virus carrier species *Culex tarsalis*. Larvicide's and other control products should be used with caution and only when and where applicable.
- Coordinate with landowners in planning of disturbances including road right-of-way, habitat loss and improvement, placement of stock tanks, old growth sage brush management, reseeding of appropriate grasses, forbs and planting appropriate shrubs, water management, and invasive plant control.

  In 2005, the Northeast Wyoming Sage-Grouse LWG prepared, published and distributed a "Successful Seeding for Sage Grouse in Northeastern Wyoming" pamphlet as an aid in selecting seed mixes.
- Coordinate with appropriate agency, including non-regulatory agencies such federal and State Conservation Districts, County Weed and Pest, County Agriculture Agents, etc. to assist in selection of sage-grouse beneficial seed mixes, seeding rates, and rotational plan to enhance forb and shrub growth, minimize invasive species, and improve sagebrush habitat.

  In 2005, the Northeast Wyoming Sage-Grouse LWG prepared, published and distributed a "Successful Seeding for Sage Grouse in Northeastern Wyoming" pamphlet as an aid in selecting seed mixes.
- Work with appropriate regulators for offsite mitigation as an alternative to ensure enhancement of habitat to offset impacts of surface disturbing activities.

VOLUNTARY EFFORTS

- The Powder River Basin Oil and Gas EIS Record of Decision required that the BLM organize an interagency working group to implement the measures required by the Record of Decision. The terrestrial wildlife group includes members from the BLM, WGFD, USFS and USF&WS. The working group sponsored a consultant's coordination meeting in February 2004 to better synchronize lek monitoring efforts. The working group also refined mitigation and monitoring requirements associated with CBNG development in sage-grouse habitats.
- The oil and gas industry in northeastern Wyoming has contributed monetary support and in kind contributions from their collective hydrology and biology staffs and consultants for ongoing West Nile Virus and sage-grouse habitat research by the University of Wyoming and through the University of Montana/BLM Sage-Grouse Study. Several technical papers and dissertations have resulted from the work in progress.
- Several CBNG operating companies have performed mosquito control in light of the WNV outbreak of 2003. During 2004 and 2005, at least 26 CBNG produced water impoundments have been tested and treated. Work included identification and elimination of mosquito habitat and working with consulting biologists to identify mosquito species, quantify carrier species, and treat larvae.
- Oil and gas are certainly providing extensive but temporary surface disturbance for well and facility sites and for pipeline right-of-ways. Typically these disturbances are reclaimed and reseeded as soon as practical to take advantage of the limited

growing season and snow melt and rainfall. Industry works with the BLM and landowners to select proper seed types to ensure plants are appropriate and provide benefit to livestock and wildlife and prevent erosion. More and more, industry is including sage-grouse beneficial seed mixes in their reclamation plans. This practice should increase as regulators and surface owners acknowledge the benefit to sage-grouse. In 2005, the Northeast Wyoming Sage-Grouse LWG prepared, published and distributed a "Successful Seeding for Sage Grouse in Northeastern Wyoming" pamphlet as an aid in selecting seed mixes.

PILOT PROJECTS

LAKE DESMET CONSERV DISTRICT PROJECT

Description: Collaborative efforts between Lake DeSmet Conservation District, Bureau of Land Management, Fish and Wildlife Service, National Resource Conservation Service, Wyoming Game and Fish, and Northeast Wyoming Greater Sage-Grouse Local Working Group to establish a pilot project for sage-grouse habitat restoration. At this date over 227,000 acres on several ranchers in Johnson County, Wyoming, have been committed to modify grazing practices and enhance habitat

Funding: Various sources, including WGFD, BLM, USF&WS, NRCS, Lake DeSmet Conservation District, private in kind and cash donations, with funding approaching $1,300,000 to-date. A CBNG operator purchased and provided Lake DeSmet a Lawson aerator/seeder to be used for habitat restoration and improvement.

Long term goals:

This locally lead program has the following proposed strategies:

- Expand partnerships to support development and implementation of sage-grouse habitat restoration.
- Continue to improve development of mapping systems that assist with inventorying suitable/priority sage-grouse habitats.
- Purchase needed equipment.
- Seek project dollars to implement sagebrush restoration program within the mix of private, BLM, and State lands.
- Gain additional flexibility by creating a grass bank.
- Work with the Lake DeSmet Conservation District and their local working group to oversee the program.
- Develop a program-based approach using best management practices to be delivered to private landowners.
- BLM consolidated lands could also be targeted for restoration work.
- A commitment from the State of Wyoming could be pursued to implement best management practices on their State trust lands.
- Develop strategies and education opportunities that promote success stories, to gain broad-based support for the program.

BLUE BUTTE RANCH PILOT

Description: Small area (less than 10 acres) habitat enhancement pilot, in eastern Johnson County, to include old sage brush management, planting and irrigation of site specific and beneficial grasses, forbs and shrubs, and construction and maintenance of stock water tanks with sage-grouse ramps. Pilot project may include enhancement of existing reservoir. Currently in initial planning stage.

Funding: Currently to be funded by Williams Production RMT.

Long Term Goal: If successful, will evaluate plans to expand to other sites on Blue Butte Ranch.

LOWER MORGAN RESERVOIR DAM

Description: As part of the Storm Water Pollution Prevention Plan, SWPPP, approximately 5 acres of reclaimed land in southwestern Campbell County was planted and irrigated adjacent to a reservoir dam on the Rice/Mankin Ranch. Produced coalbed methane water from the Lower Morgan reservoir has been used to irrigate the sage-grouse beneficial species. The following species, at varying pounds per acre, were planted in mid-June 2005 and periodically irrigated by a ground sprinkler system: Fourwing Saltbush, Rabbitbrush, Winterfat, Silver Sage, American Vetch, Western Wheatgrass, Green Needlegras and Sandberg Bluegrass.

Expansion of the pilot area is pending inspection in the spring of 2006 to determine the success during the late 2005 growing season.

Funding: Currently funded by Williams Production RMT.

Long Term Goal: Establish forbs and shrubs in close proximity to Morgan Reservoir dam and potentially expand application to other reservoirs in the vicinity.

AG RESERVE RANCH

Description: Subirrigation project on 1,200 acres in northern Campbell County for various pilot projects including hybrid poplar tree farm, enhancement of existing and beneficial grasses and forbs, and water related projects. Produced coalbed methane water is used in the subirrigation project. SCADA will be used to monitor and control the entire subirrigation system including water rates and volumes. Project is to be online spring 2006.

Funding: Currently funded by Windsor Energy Group.

Long Term Goal: Establish beneficial grasses, forbs and shrubs in the subirrigation project.

LOWER PRAIRIE DOG CREEK

Description: Subsurface drip irrigation system in Sheridan County. Produced coalbed methane water is used to irrigate forage grasses and alfalfa. Project has been ongoing. Success of this drip system may result in expansion to other areas outside Lower Prairie Dog Creek.

Funding: Currently funded by J. M. Huber Corporation

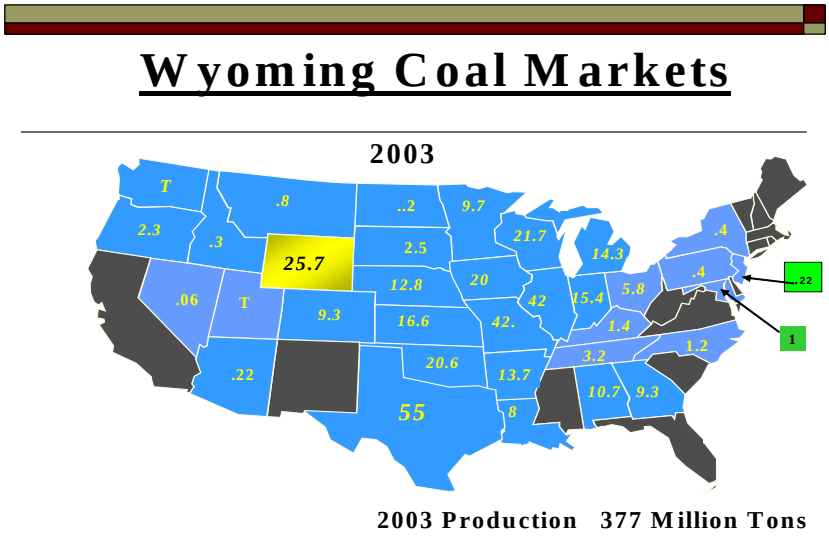
Long Term Goal: Establish beneficial grasses, alfalfa, in the subsurface irrigation project area.

Appendix IV - Coal Mining

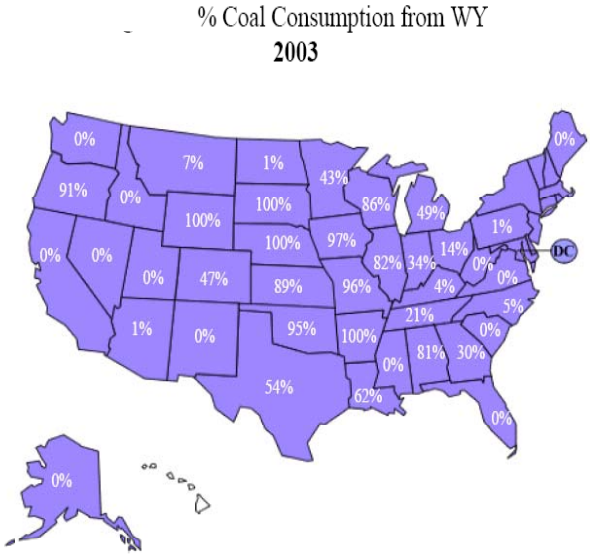
Coal Exploration, Mining and Reclamation

Background

The Northeast Wyoming Sage-grouse Working Group area of responsibility includes the Powder River Basin (PRB). The PRB is one of the most strategic and prolific coal fields in the world. This region produces well over 1/3 of the total coal produced in the United States and provides the fuel to generate electricity at power plants throughout the U.S. The national distribution of Wyoming coal which is dominated by coal produced in the Wyoming portion of the PRB is shown on the following map.



The following map shows the general reliance on PRB coal throughout the United States. It is noted that the Midwest in particular is highly dependent on PRB coal for low cost electricity and environmental (air quality) compliance.



Wyoming coal mines led the nation in 2004 for the 18th consecutive year, producing 396 million tons of coal. This production level outpaced the previous year's production by over 19 million tons. Tonnage increases were particularly pronounced in the PRB which produced 89% or 352 million tons of the state's 2004 coal production. The PRB's dominance is for several reasons: world-class coal seams, some over 80 feet thick; proximity of the coal to the surface; and a desirable low-sulfur composition. New estimates project that Wyoming production will surpass 400 million tons in 2005, about three years ahead of previous projections.

The coal industry is an important source of jobs and revenues for the state of Wyoming. This is particularly true in the PRB where 12 mines employed 3,967 people in 2004. It is estimated that each coal-mining job supports 3 related jobs in other sectors for a total of more than 11,901 coal related jobs in the NE Wyoming Local Sage-grouse Working Group Area of Responsibility. It is estimated that in 2004, coal contributed $516 million to state and local governments.

As of October 2005, the mines in the PRB held 136,086.32 acres of leased coal and 203,078.23 permitted acres. The permitted acres comprise 1.4% of the total acreage in the NE Wyoming Sage-grouse Working Group Area of responsibility.

Exploration

The coal mined in the PRB is almost completely federally-owned with a relatively small amount of state-owned coal – generally in Sections 16 and 36 of each Township. Coal operators must apply for an exploration license from the Bureau of Land Management and the U.S. Forest Service (in cases where the land surface is managed by this agency) or a state temporary use permit prior to exploration drilling. Cultural resource, wildlife and T&E species surveys must be completed, reviewed and approved by the appropriate agency or agencies as part of the exploration licensing process. Timing restrictions or other mitigation measures applicable to wildlife (including sage-grouse) are imposed where appropriate through exploration license stipulations.

Mining and Reclamation

Surface coal mining operations in the PRB are regulated through several federal and state laws. Following is a list of several of these applicable laws:

ENVIRONMENTAL LAWS APPLICABLE TO PRB MINING OPERATIONS	
• Clean Air Act • Clean Water Act • Safe Drinking Water Act • Resource Conservation and Recovery Act • Endangered Species Act • National Historic Preservation Act • Federal Land Management and Policy Act • Multiple-Use Sustained Yield Act • Mineral Leasing Act	• National Forest Management Act • Comprehensive Environmental Response, Compensation and Liability Act • Emergency Planning Community Right to Know Act • Wilderness Act • Toxic Substances Control Act • Surface Mining Control and Reclamation Act • WY Environmental Quality Act • National Environmental Policy Act

The State of Wyoming holds primacy to implement some of these laws – most notably the Surface Mining Control and Reclamation Act which is delegated for implementation to the Land Quality Division (LQD) of the Wyoming Department of Environmental Quality. In some cases, there are certain responsibilities and decisions that cannot be delegated to the State. In these cases, the Wyoming LQD has a signed "Working Agreement" with the Bureau of Land Management, U.S. Forest Service and federal Office of Surface Mining. Additionally, certain state agencies – notably the Wyoming Game and Fish Department and the Wyoming State Historic Preservation Office – provide direct review of relevant parts of mine and reclamation plans that deal with the resources under these agencies purview. Additionally, the U.S. Fish and Wildlife Service reviews raptor and migratory bird mitigation plans and provides Section 7 consultation on federal agency decisions (USFS, BLM, OSM).

Surface coal mines are required to develop and implement a highly detailed life-of-mine mine and reclamation plan. Federal and state laws are strictly enforced to ensure that all affected land is reclaimed. Furthermore, these laws require that reclamation be completed contemporaneously with the mining process. Surface coal mines in the PRB are reclaimed to a dual post-mine land use of livestock grazing and wildlife use.

Coal mines have been progressive in developing reclamation techniques for successful vegetation reestablishment. Grass and forb vegetation communities on reclaimed sites can provide sage-grouse summer foraging and brood-rearing habitat. Reclamation requirements include the establishment of sagebrush on mined lands. The early seral stage of sagebrush on surface coal mine reclamation is relatively unique as compared with older and generally decadent sagebrush stands in the native unaffected environment. As a result, reclaimed sagebrush frequently sees a significant amount of wildlife overuse. The mining industry is working to find an effective means of controlling wildlife use of these shrubs thereby allowing them to persist and eventually reach the necessary height and structure to provide for the nesting cover and winter habitat needs of sage-grouse. It should be noted that this process can take several years even in the absence of extensive wildlife use.

It should go without saying that surface coal mining operations will temporarily remove wildlife habitat during the mining process. This includes habitat used by sage-grouse. As of May 2006, eight leks within the PRB coal mine area were classified as destroyed due to coal mining activity. These situations are anticipated and mitigation plans are provided in approved permits to mine. For example an important component of a surface mine reclamation plan is the Wildlife Mitigation and Monitoring Plan. Following is an excerpt from one such agency-approved (USFS, DEQ-LQD, WY Game and Fish, USFWS) plan specific to sage-grouse:

"One active sage-grouse strutting ground has been identified in a playa in the north end of the permit area. . . The Mine and Reclamation Plan calls for restoration of three playas in this area. Sagebrush, Grasslands and associated Shrub Mosaics will be planted near the playas extending to the east permit boundary (where native sagebrush stands occur). Other shrub areas will be established to provide food, escape cover, nesting cover, and to maximize habitat interspersion. The operator may also participate in off-site mitigation strategies to maximize habitat."

Furthermore, ongoing sage-grouse monitoring is a surface coal mine permit requirement in the PRB.

Lek Searches

Coal operators are required to search all suitable lek habitat on the term-of-permit area and a 1-mile perimeter at least once each spring. Every third year, the lek searches will expand to cover the entire permit area and its one-mile perimeter.

Lek Attendance Surveys

At each known lek, a minimum of three (3) attendance counts will be conducted during April through early May.

Annual Reporting

Each annual reclamation report will include a complete record of the status and history of all leks, including those, which have been destroyed or have become inactive.

Summary

In summary, PRB coal mine reclamation efforts support wildlife in general and sage-grouse in particular by:

- Setting the conditions for post-mine climax communities
- Creating diverse habitats
- Sustaining data collection and reporting

Research

The Prairie Project

In 2001, an individual coal mine in the PRB voluntarily initiated a project designed to gather data on the status of Greater Sage-grouse populations using habitat in and adjacent to the mine area. The immediate goal of this ongoing study was to identify key habitats (nesting, brooding and wintering) so that the mine could adequately plan reclamation and/or mitigation strategies for this species. Secondly, vegetative data was collected to evaluate the quality of the available habitat. Third, reproductive data (nest fate, clutch size, chick survival and adult survival) was collected. Fourth, use of reclaimed mine lands was monitored. (Of particular note was the documented use of reclaimed lands at the initiating mine by hens and broods. The reclamation used by these grouse supported a diverse and prominent (>25% cover) mosaic of forbs).

The monitoring program initiated by this mine was expanded to neighboring mines and funded in 2003 through the Wyoming Abandoned Coal Mine Lands Research Program. Today, the initiating mine is continuing the project on a voluntary basis and has expanded it to a partnership with local landowners.

Research and Development: Reclamation practices to establish Wyoming big sagebrush on reclamation in a consistent manner.

An individual surface coal mine is working voluntarily to develop procedures that, once developed, will establish reclamation areas that meet regulatory reclamation requirements. Sagebrush is considered to be a key structural habitat component for several wildlife species, including sage-grouse.

Study: Recovery of Belowground Ecosystem Components Under Different Plant Communities on Reclaimed Coal Mine Lands

Two surface coal mines in the PRB are working on this project in cooperation with the University of Wyoming. The project is examining the recovery of belowground ecosystem components (nutrient cycling, microbial community structure, and soil structure) under different plant communities found on reclaimed coal mine lands.

Cheatgrass Study

An individual surface coal mine is working on a project, the purpose of which is to evaluate grazing management practices for the control of cheatgrass. This will potentially lead to increased diversity of desirable forage and habitat species.

Study: Sagebrush Establishment on WY Coal Mined Lands

Long-Term Survival of Direct Seeded Wyoming Big Sagebrush Seedlings on a Reclaimed Mine Site by Schuman and Belden. This study evaluated the effects of

topsoil management, mulch and grass seeding rate on sagebrush survival after eight years, and also discussed effects of wildlife browse on sagebrush.

Establishing *Artemisia tridentata* spp. *Wyomingensis* on Mined Lands: Science and Economics. This paper provides a summary of sagebrush establishment and practically discusses economics of seeding and transplanting of sagebrush as establishment methods.

Study: Designing Sagebrush Habitat on WY Coal Mined Lands

In 1997, the United States Department of Agriculture – Ag. Research Station (USDA-ARS) in Cheyenne, Wyoming initiated a study at several surface coal mines in the PRB. The USDA-ARS continues to monitor the study which compares varying methods of establishing big sagebrush (Artemesia tridentata).

Wyoming Abandoned Mine Lands Research Program

The Abandoned Coal Mine Land Research Program (ACMLRP) is the result of the 1989 agreement between the University of Wyoming and the Abandoned Mine Land Division of the Department of Environmental Quality (DEQ). Funding for the program has been provided through the Abandoned Mine Land Fee paid by Wyoming coal companies.

The ACMLRP is intended to stimulate applied research and development projects related to underground and surface mine reclamation techniques, in order to increase transfer of information on state-of the art technology and to increase the exchange of research information and expertise between the academic, state agency, engineering, mining, and construction communities.

Since its inception, several research projects on issues affecting wildlife in general and sage-grouse in particular have been funded and completed. These projects are listed below:

- Strategies for Establishment of Big Sagebrush
  - Schuman, Booth
- Influence of Post-Harvest and Preplanting Seed Treatment on Sagebrush Seeding Vigor
  - Booth, Roos
- Climatic Control of Sagebrush Survival for Mined Land Reclamation
  - Perryman, Olson, Hild
- The Effects of Variable Topsoil Replacement Depth on Various Plant Parameters within Reclaimed Areas
  - Schladweiler, Wolden, Munn, Haroian
- Grass Competition and Sagebrush Seeding Rates: Influence Sagebrush Seedling Establishment

    - Schuman, Hild
- Effects of Variable Topsoil Replacement Depth on Plant Community Development and Soil Ecosystem Development after 24 Years
    - Olson, Schuman, Ingram
- Impacts of Wildlife Utilization on Big Sagebrush Survival in Reclaimed Mine Lands
    - Olson
- Ecology of the greater sage-grouse in the coal mining landscape of Wyoming's Powder River Basin
    - Clayton, Brown
- The Effects of Seed Mix Species Composition and Seedling Rates on Attaining Species Diversity for Reclaimed Areas.
    - McDonald, Howlin, Lack, Bilbrough
- Evaluation of Previously Collected Coal Mine Related Wildlife Data
    - McDonald, Strickland, Johnson, Derby

- Study: Influence of Reclamation Management on Carbon Accumulation and Soil Fertility on Coal Mine Lands

  An individual mine is working on this project in cooperation with the University of Wyoming and the Wyoming Department of Environmental Quality – Land Quality Division. The project is funded through the Wyoming Abandoned Coal Mine Research Program. The project will examine the influence of a number of reclamation management practices on carbon accumulation, organic nutrient pools and soil fertility in reclaimed lands. Results of this study are expected to highlight techniques to promote efficient and sustainable reclamation/rehabilitation of surface mine lands as well as enhancement of soil quality through maximizing carbon sequestration and building up greater organic nutrient pools required for enhanced plant productivity and contribute to mitigation of CO_2 in the atmosphere

Volunteer Conservation Efforts Affecting Sage-grouse

Thunder Basin Grassland Prairie Ecosystem Association

Two coal companies are contributing members of the Thunder Basin Grassland Prairie Ecosystem Association (Association). The Association is a non-profit organization established to provide private landowner leadership in developing a responsible, science-based approach to long-term management of the lands of its members. Members in the Association include ranchers and energy production companies within a designated 931,000-acre landscape in eastern Wyoming. The Association has focused its efforts on developing an ecosystem management plan that will address the habitat needs of all native species within the landscape while balancing those needs with sustainable economic and social activities.

Other Volunteer Efforts

An individual PRB surface coal mine has provided the following list of voluntary efforts that it has incorporated into its operation (Note: Not all PRB mines have the flexibility or approved reclamation and land use plans that would allow the implementation of all of these efforts at one site. However, several of these types of efforts do occur to a certain degree at more than one mine site.)

- Reclaim more than 50% of grazing land to shrub patches.
- Reclaim 2.5 times more wetlands than impacted.
- Increase the acreage of alfalfa fields in reclamation
- Restrict cutting of alfalfa fields until after the early brood rearing season
- Fence out permanent stockponds and install piped stock tanks (include wildlife escape ramps)
- Restrict spraying of insecticides in reclaimed areas
- Design seed mixes to support sage-grouse
- Do not salvage topsoil during the sage-grouse nesting and early brood rearing season.

PRB Coal Mine Recommended Management Practices (RMP's)
(NOTE: Many- but not all – of these RMP's are based, in part, on those stated in the Wyoming Greater Sage-Grouse Conservation Plan that may have applicability for PRB surface coal mines. It should be noted that site specific situations and conditions should be acknowledged and accounted for when considering the practicability of these RMP's for coal mine operations.)

1) Evaluate and address the needs of sage-grouse when siting mines, and mining-related infrastructure. Impacts to sage-grouse should be minimized where practicable.
2) Tailor reclamation to replace or augment sage-grouse habitat to the extent practicable in instances where such habitat is adversely affected.
3) Evaluate fence design, location and visibility to reduce hazards to flying grouse.
4) Manage water production to enhance or maintain sage-grouse habitat
5) Control dust from roads
6) Control mosquito larvae, to the extent practicable and feasible, in mine-related surface water impoundments
7) Install wildlife escape ramps in mine reclamation-related livestock watering facilities (tanks)
8) Continue sage-grouse and sage-grouse habitat-related research and monitoring efforts
9) Remove only that amount of topsoil necessary to support continued mining operations on an annual basis or otherwise manage topsoil removal operations to minimize the impact on sage-grouse.
10) .Consider alternative mitigation measures for mining impacts on known sage-grouse habitat. This may include, but not be limited to, implementing offsite

mitigative measures for enhancing sage-grouse habitat to offset the temporary impacts of coal mine surface disturbing activities.

11) When feasible and practicable, new or expanded exploration within two miles of active leks should occur prior to March 15th or after July 15th. Following initiation of mining (i.e. topsoil removal) this recommendation will not be applicable.
12) When feasible and practicable, plan to avoid new surface occupancy or disturbance activities on or within ¼ mile of the perimeter of known active lek sites from March 1 to May 15. Following initiation of mining (i.e. topsoil removal) this recommendation will not be applicable.
13) Continue the effort to establish Wyoming big sagebrush, to meet shrub density requirements.

Appendix V – Local Government

The Role of Local Government in Sage Grouse Conservation

Actions of local government that affect, or can affect, sage grouse populations are often overlooked simply because they are not specifically earmarked as conservation efforts. That notwithstanding, many local government entities play, or could play, a significant role in conservation through actions regularly undertaken. The purpose of this discussion is to identify, at the county level, those organizations that are routinely engaged in activities that affect sage grouse conservation, identify those activities, and provide action plans to optimize sage grouse conservation at the local government level. Communication with residents is an important step for conservation success. Keeping conservation issues in front of county residents in a positive and educational fashion will help conservation efforts at the grass roots level.

County Commissioners

The commissioners can support, through resolution and funding, if appropriate, initiatives specifically designed to enhance sage grouse conservation. The first step in the process is to communicate with the commissioners about the Northeast Wyoming Sage-grouse Working Group (NEWSGWG) and petition their support for the efforts of the working group.

Current Action Plan:

- Make presentations to commissioners of those counties constituting the NEWSGWG area of responsibility.
- Explain the composition and focus of the group.

Ask for permission to visit with other county entities regarding their involvement in activities that affect sage grouse conservation.

During March, April, and May of 2006, presentations were made to commissioners of Weston, Crook, Campbell, Johnson, Sheridan, and Niobrara Counties. Sheridan County was helpful in identifying aspects of their growth management plan with implications for sage grouse. Johnson County commissioners recognized that the Johnson County Road and Bridge Department was already attempting to incorporate lek activity in their construction and maintenance programs. The Converse County Commissioners were particularly helpful and supportive, and offered to write a formal letter of introduction of the sage grouse conservation topic to other county agencies, soliciting their support in identifying activities on the part of those agencies that could affect sage grouse conservation. All of the counties contacted expressed interest and support of sage grouse conservation, although there was concern in Crook County that formal action taken at the local government level, particularly developing a conservation plan, might be construed as commitments on the part of local government that might prove burdensome in the future. The Crook County Commissioners were concerned about the possibility of listing and what effect it might have on county activities in the future.

All commissioners will receive a draft of this "white paper" as part of the preparation process, and will receive a copy of the NEWSGWG Conservation Plan for their consideration and feedback.

Proposed Action Plan:

- Keep the commissioners advised of communications and education efforts with other agencies.

It is important to keep the commissioners abreast of activities so they can be supportive, or in the least, not non-supportive of conservation activities in their county.

County Conservation Districts

The county conservation districts are one of the most important local government organizations for sage grouse conservation. The districts have regular communication with rural county residents and have many programs designed to assist those residents.

Proposed Action Plan:

- Make a presentation to the Conservation District staff and supervisors in each county on the status of NEWSGWG activities
- Ask for their review of the Conservation Plan
- Ask to prepare an article for inclusion in their county newsletter

County Assessor

The county assessor is the best source of information for growth areas within the county, including the types of activity and growth and the extent of that growth. Sharing that knowledge with the WGF could help identify target areas of conservation planning.

Proposed Action Plan:

- Prepare a brief life history brochure for sage grouse with a discussion regarding the interaction of sage grouse and humans, including specific actions that can be taken for sage grouse conservation
- Meet with the county assessor in each county for education purposes and present the brochure for review.
- Ask them to share their knowledge of development patterns in the county with an annual letter to WGF.

County Weed and Pest

Because forbs, sagebrush, and certain insects are essential ingredients for Sage grouse conservation, the actions taken by the County Weed and Pest Department are crucial with respect to use of herbicides and pesticides, conversion of rangeland, and control of noxious weeds.

Proposed Action Plan:

- Prepare a brief life history brochure for sage grouse with discussion regarding the interaction of sage grouse and humans, including specific actions that can be taken for sage grouse conservation
- Meet with the County Weed and Pest Supervisor in each county for education purposes and to present the brochure for review
- Provide the Weed and Pest with a lek location map to aid them in their application efforts The goal would be to have a short section on sage grouse conservation included in the annual certification training for applicators
- Ask the Board for an annual letter to WGF identifying areas of noxious weed invasion and control to assist in WGF conservation planning efforts.

County Planner

While not all counties have a county planner specifically, there are individuals in each county charged with varying amounts of control over development. In the case of Campbell County, there is a County Engineer who fulfils some of the tasks of a county planner. The understanding and support of these individuals would help conservation efforts, not because development would be controlled by sage grouse conservation, but simply because knowledge and awareness on the part of the planners could aid in knowledge and awareness on the part of the developers.

Proposed Action Plan:

- Prepare a brief life history brochure for sage grouse with a discussion regarding the interaction of sage grouse and humans, including specific actions that can be taken for sage grouse conservation
- Meet with the County Planner in each county for education purposes and present the brochure for review
- Plan to make a presentation at one of the County Planner Association meetings
- Provide Planners with a current map of lek locations
- Ask them to submit a letter annually to the WGF regarding development patterns and issues with regard to sage grouse in their county

County Animal Control

Feral animal control is a positive factor for sage grouse conservation. Where a county has a specific department for animal control, education of that department would help show how important their efforts are for grouse conservation. Emphasis on enforcement of licensing laws in the counties would play a part in improving sage grouse populations.

Proposed Action Plan:

- Prepare a brief life history brochure for sage grouse with a discussion regarding the interaction of sage grouse and humans, including specific actions that can be taken for sage grouse conservation

- Meet with the County Planner in each county for education purposes and present the brochure for review
- Plan to make a presentation at one of the County Planner Association meetings
- Provide Planners with a current map of lek locations
- Ask them to submit a letter annually to the WGF regarding development patterns and issues with regard to sage grouse in their county

County Sheriff

The Sheriff Department plays a role in feral animal control in those counties that do not have a separate animal control department. In addition, sheriff deputies play a role in control of illegal hunting. It is important that department staff is knowledgeable about the need for sage grouse conservation efforts in their county.

Proposed Action Plan:

- Prepare a brief life history brochure for sage grouse with a discussion regarding the interaction of sage grouse and humans, including specific actions that can be taken for sage grouse conservation
- Meet with the Sheriff in each county for education purposes and present the brochure for review
- Ask to make a presentation at one of the County Sheriff Association meetings to talk about sage grouse conservation and how law enforcement plays a role in conservation

County Road and Bridge

The County Road and Bridge Department operates county-wide and has a better opportunity than most to identify activities and actions that influence sage grouse conservation. In addition, their field activities such as signage, dust control, and construction and maintenance during the breeding season can all affect sage grouse conservation. So too can roadside mowing, and culvert and fence installation.

Proposed Action Plan:

- Prepare a brief life history brochure for sage grouse with a discussion regarding the interaction of sage grouse and humans, including specific actions that can be taken for sage grouse conservation
- Meet with the County Road and Bridge Supervisor in each county for education purposes and present the brochure for review
- Ask to make a presentation at one of the County Road and Bridge group training or meeting sessions
- Provide Departments with a current map of lek locations
- Ask them to submit a letter annually to the WGF regarding Road and Bridge activities they feel might affect sage grouse conservation.

County Predator Control

Control of predators, particularly non-native invasive species, can have a significant effect on sage grouse conservation. In addition, the role of predator control in general for sage grouse conservation merits further discussion by interested parties.

Proposed Action Plan:

- Prepare a brief life history brochure for sage grouse with a discussion regarding the interaction of sage grouse and predators, including specific actions that can be taken for sage grouse conservation
- Meet with the Predator Board in each county for education purposes and present the brochure for review
- Initiate a dialogue with the Predator Boards regarding optimization of predator control for sage grouse conservation
- Provide Boards with a current map of lek locations
- Ask them to submit a letter annually to the WGF regarding Predator Board activities to aid in interpreting predator pressure on sage grouse

County Fire Department

Sagebrush communities are vital to sage grouse. When significant areas of sagebrush are burned by wildfire, this can change the distribution and success of sage grouse both positively and negatively. The understanding and support of county fire departments would help conservation efforts, not because wildfire control is necessary for sage grouse conservation, but simply because knowledge and awareness on the part of the departments could help in the exchange of information between departments.

Proposed Action Plan:

- Prepare a brief life history brochure for sage grouse with a discussion regarding the interaction of sage grouse and humans, including specific actions that can be taken for sage grouse conservation
- Meet with the County Fire Cheif in each county for education purposes and present the brochure for review
- Ask to make a presentation at one of the County Fire Department group training or meeting sessions
- Provide Departments with a current map of lek locations
- Ask them to submit a letter annually to the WGF regarding wildfire locations to aid in interpreting habitat pressure on sage grouse

County School Districts

Education is the single most important tool available for sage grouse conservation. The county schools provide an excellent opportunity to educate residents about sage grouse.

Proposed Action Plan:

- Prepare a CD presentation about sage grouse populations in the county, what supports them, what has a negative effect on them, and general life history information
- Meet with county school boards to engage their support, get feedback, and then have them support making the presentation available to teachers for their classes
- Investigate the possibility of field trips for school classes, possibly selected high school science classes

County Public Health

As we have seen with West Nile Virus, there sometimes arise situations where a disease may affect both humans and sage grouse. In situations such as this, epidemiological information such as extent, severity, and, especially, control methods employed can have relevance for sage grouse conservation. The West Nile Virus is not the only disease likely to be of significance to grouse populations. Bird flu is of possible concern in the future.

Proposed Action Plan:

- Prepare a brief life history for sage grouse with a discussion regarding the interaction of sage grouse and humans, including specific actions that can be taken for sage grouse conservation
- Meet with the public health nurse in each county for education purposes and present the brochure for review. The goal would be to have the brochure displayed as other brochures are displayed at the Public Health facility.

General

All counties are required by law to have a development plan. In Sheridan County, for example, the plan is called Vision 2020 Sheridan County Growth Management Plan. In counties that are zoned, this plan forms the basis for growth management. Even counties that are not zoned, however, still identify growth opportunities for their county by means of this required plan.

Proposed Action Plan:

- Review county plans and identify areas that could affect sage grouse conservation
- Work with the county commissioners to incorporate sage grouse conservation as a plan objective.

Appendix VI – Northeast Working Group Correspondence

2 November 2004

Governor's Office
Governor Dave Freudenthal
State Capitol, 200 West 24th Street
Cheyenne, WY 82002-0010

Dear Governor Freudenthal:

The Northeast Wyoming Sage-Grouse Local Working Group has been meeting since March 2004 with the mission of "Working Cooperatively to Benefit Sage-Grouse." The working group is composed of 13 individuals representing affected interest groups cooperating to develop a local sage-grouse conservation plan. During our meetings, we have begun to identify areas where improvements can be made for the conservation of sage-grouse and their habitats.

One area that we have identified is the lack of protection for sage-grouse leks and nesting habitat on state owned lands. We understand that the state presently does not require state land users (including mineral developers, recreationists, and grazing lessees) to follow the recommended management practices (RMPs) developed by the State of Wyoming Sage-Grouse Working Group and approved within the Wyoming Greater Sage-Grouse Conservation Plan.

We are writing to request that the State Land Board consider formally adopting the State Working Group's RMPs to benefit sage-grouse conservation on State of Wyoming lands. Adoption of these guidelines will also indicate to the U.S. Fish and Wildlife Service that Wyoming is serious about sage-grouse conservation and is doing everything in its power to ensure the species survival.

Our group recognizes that some state land users already follow these guidelines as general operating procedure, however others may not, and this does not allow for consistent practices or a level playing field. Although many users are good stewards of the land, some are not. There also does not seem to be an effective method of enforcing existing regulations, let alone any newly adopted ones. We therefore recommend the State Land Board develop means to effectively implement the RMPs.

We also recommend the use of best management practices for the treatment of disturbed soils by protecting the topsoil and replanting with seed mixtures beneficial for livestock and wildlife. Failure to protect and properly replace topsoil during excavation and reclamation has resulted in diminished forage potential for livestock and wildlife,

thereby reducing revenue available for Wyoming schools. We believe this recommendation is critical to ensuring the productivity of state owned land for future generations.

We look forward to meeting with the State Land Board on these recommendations and identifying, and implementing habitat improvements on state owned land to benefit sage-grouse.

Sincerely,

Thomas L. Maechtle
Chairman, NE Wyoming Sage-Grouse Local Working Group

P.O. Box 207
Sheridan, Wyoming 82801

Enclosure:
Wyoming Greater Sage-Grouse Conservation Plan

Distribution:

Dave Freudenthal, Governor
Joseph B. Meyer, Secretary of State
Cynthia Lummis, State Treasurer
Max Maxfield, State Auditor's Office
Dr. Trent Blankenship, Superintendent of Public Instruction

Ms. Lynne Boomgaarden, Director
Office of State Lands and Investments
122 W. 25th Street, Herschler Building 3W
Cheyenne, Wyoming 82002

20 January 2005

Dear Ms. Boomgaarden:

On behalf of the Northeast Wyoming Sage-Grouse Working Group, I have enclosed copies of two letters recognizing good stewardship of wildlife resources on state owned lands. The actions detailed in these letters will help ensure the continued productivity of sage-grouse and other sagebrush dependent wildlife species within the described areas.

We hope you will share the enclosed letters with the board and your staff. Our local working group also looks forward to a response regarding our letter to the board dated 2 November 2004.

Sincerely,

Tom Maechtle, Chairman
NE Wyoming Sage-Grouse Working Group

NORTHEAST WYOMING
SAGE-GROUSE WORKING GROUP

Mr. Chuck Harlan
22695 Thirty-Three Mile Road
Kaycee, Wyoming 82639

14 January 2005

Dear Mr. Harlan:

The Northeast Wyoming Sage-Grouse Working Group would like to recognize your good stewardship of state owned lands and Bureau of Land Management grazing allotments for the conservation of sagebrush habitat benefiting sage-grouse and other wildlife species.

Winter surveys conducted the past three years on your leases along 33 Mile Road have shown consistent use by sage-grouse with flocks often numbering 100 individuals within areas as small as 2 square miles. Your grazing strategy on these lands appears to be consistent with the needs of sage-grouse. Positive attributes noted on your state leases include mixed age sagebrush plants and residual grasses from the past growing season.

The Northeast Wyoming Sage-Grouse Working Group is comprised of 13 individuals representing agencies and interest groups, including agriculture, working cooperatively to benefit sage-grouse. Our group also assists interested parties in designing habitat enhancements compatible with both sage-grouse conservation and livestock management.

Sincerely,

Thomas Maechtle

Thomas Maechtle
Chairman

cc:

Bureau of Land Management (BFO and CFO)
Wyoming Game and Fish Department
Wyoming Office of State Lands and Investments

NORTHEAST WYOMING
SAGE-GROUSE WORKING GROUP

Paul McKelvery
Bill Barrett Corporation
1901Energy Court, Suite 170
Gillette, WY 82718-5574

14 January 2005

Dear Mr. Mc Kelvery:

The Northeast Wyoming Sage-Grouse Working Group would like to recognize Bill Barrett Corporation for its attention to sage-grouse with its Beaver Creek state minerals project. While planning the Beaver Creek project, Barrett discussed sage-grouse protection with their biological consultant, Big Horn Environmental Consultants, and the Bureau of Land Management in order to minimize impacts to sage grouse on Wyoming State lands.

Being a state minerals project, Barrett was under no obligations to protect sage-grouse habitat; however, Barrett delayed project implementation until after the nesting season, avoided sagebrush habitats while siting wells and other infrastructure, and re-routed an overhead power line to avoid a lek site. We also support Barrett's intentions to monitor future lek attendance.

The Northeast Wyoming Sage-Grouse Working Group is comprised of 13 individuals representing agencies and interest groups, including the coalbed natural gas industry, working cooperatively to benefit sage-grouse.

Sincerely,

Thomas Maechtle

Thomas Maechtle
Chairman

Cc:
Media
Big Horn Environmental Consultants
Bureau of Land Management
Petroleum Association of Wyoming
Powder River Energy Corporation
Wyoming Department of Environmental Quality
Wyoming Game and Fish Department
Wyoming Oil and Gas Commission
Wyoming Office of State Lands and Investments

NORTHEAST WYOMING
SAGE-GROUSE WORKING GROUP

Alan Vrooman
Petro Canada
1099 18th St Ste 400
Denver, CO 80202

14 January 2005

Dear Mr. Vrooman:

The Northeast Wyoming Sage-Grouse Working Group would like to recognize Petro Canada for its attention to sage-grouse with its Montgomery Draw operations. During analysis of an adjacent federal minerals project, the Bureau of Land Management (BLM) notified Petro Canada that a proposed reservoir servicing federal and private minerals would flood a sage-grouse lek site.

After discussing the situation with the BLM, Petro Canada redesigned the reservoir to avoid the lek. We understand Petro Canada intends to monitor lek attendance in 2005 before finalizing the reservoir design and implementing construction. We also support Petro Canada's intentions to monitor lek attendance before and following reservoir construction and to enhance sage-grouse habitat within the project area. The Northeast Wyoming Sage-Grouse Working Group would like to offer our assistance in designing habitat enhancements.

The Northeast Wyoming Sage-Grouse Working Group is comprised of 13 individuals representing agencies and interest groups, including the coalbed natural gas industry, working cooperatively to benefit sage grouse.

Sincerely,

Thomas Maechtle

Thomas Maechtle
Chairman

Cc:
Media
Bureau of Land Management
Hayden-Wing Associates Environmental Consultants
Petroleum Association of Wyoming
Wyoming Department of Environmental Quality
Wyoming Game and Fish Department

Dave Freudenthal, Governor

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

John Corra, Director

August 25, 2005

Tom Maechtle
Chairman, NE WY Sage-grouse Working Group
P.O. Box 207
Sheridan, Wyoming 82801

Re: Introduction of mosquito controlling minnows into CBM reservoirs.

Dear Mr. Maechtle:

First, I would like to apologize for the extreme delay in answering your request for information on the above-referenced issue and I appreciate your patience. Specifically, you are interested in whether changes will occur in the classification and regulation of discharges to those waters after the introduction of mosquito controlling minnows.

The simple answer to your question is that the introduction of minnows into waters created by CBM discharges would not result in more stringent requirements on the quality of those discharges. Though there are a variety of circumstances under which a water classification might change because of the introduction of fish, it is difficult to see how the introduction of mosquito control fish species would ever result in more stringent discharge limits.

For example, some CBM discharges are to class 4B or 4C waters. Under the current regulations, the artificial introduction of fish would not result in a change in either of those classifications. Chapter 1 is currently undergoing revision and the new proposed rules would create 2 new categories of effluent-dependant waters, classes 2D and 3D. These new classes are intended to replace the existing class 4C. If the new rules are adopted, the classifications of existing and future effluent-dependant waters would be changed to either 2D or 3D and ambient-based water quality criteria would be calculated and applied for each water. This criteria would be based on ambient water quality conditions, not on the type of resident biological community, so it would not matter at all if the mosquito control species were introduced or not.

Other CBM discharges currently occur on class 3 waters. We would not normally change the classification of a class 3 water to a class 2 simply because of the introduction of mosquito control fish. Even if we did change the classification in order to protect the introduced fish, we would have to conclude that the water into which they were introduced is sufficient to support their existence and would not require a change in discharge water quality.

Herschler Building • 122 West 25th Street • Cheyenne, WY 82002 • http://deq.state.wy.us

ADMIN/OUTREACH	ABANDONED MINES	AIR QUALITY	INDUSTRIAL SITING	LAND QUALITY	SOLID & HAZ. WASTE	WATER QUALITY
(307) 777-7758	(307) 777-3145	(307) 777-7391	(307) 777-7369	(307) 777-7756	(307) 777-7752	(307) 777-7781
FAX 777-3610	FAX 777-3462	FAX 777-5616	FAX 777-6937	FAX 777-5864	FAX 777-5973	FAX 777-5973

Finally, if the mosquito control species are introduced into waters already designated as class 2, there would be no regulatory change whatsoever since those waters already receive the highest level of protection and regulatory control.

I hope this explanation is useful to you and again I apologize for its lateness. If in your negotiations with industry or other partners, you believe it would be helpful for me to meet in person to further discuss the water quality standards implications, I would be happy to do so.

Sincerely,

Bill DiRienzo
Environmental Program Supervisor
Water Quality Division

Note: Additional letters supporting the Northeast Wyoming Sage-grouse Working Group's efforts to fund research on the efficacy of using fish for West Nile virus vector (mosquito larva) control were received from the Bureau of Land Management, Buffalo Field Office and the U.S. Forest Service, Douglas Ranger District.

P.O. Box 207
Sheridan, WY 82801

January 31, 2006

Mr. Terry Cleveland
Director
Wyoming Game and Fish Department
5400 Bishop Boulevard
Cheyenne, Wyoming 82006

Dear Mr. Cleveland,

Northeast Wyoming supports an extensive diversity of wildlife, sage-grouse included. However, the northeast Wyoming sage-grouse population had the lowest annual males/lek attendance of any working group area over the last ten years. Improving habitat is key to sage-grouse recovery. Given the predominance of private land in our area, we believe the reestablishment of the habitat extension biologist position in northeast Wyoming is paramount to achieving significant habitat improvement. Seventy-nine percent of our working group area is private/state land. The two existing Wyoming Game and Fish Department habitat biologists in the working group area (Sheridan and Casper) have proportionately more private land than other habitat biologists in the state.

Tracy Pinter, Northeast Wyoming Sage-grouse Working Group member, last filled the northeast Wyoming habitat extension biologist position. She unequivocally states that there is a high demand for extension services in this area of the state. Many landowners come to the Natural Resources Conservation Service and their local Conservation Districts for advice and funding of conservation practices on private and state lands. For instance, the Lake DeSmet Conservation District and Buffalo NRCS office have initiated a sagebrush restoration program in cooperation with our LWG and the WGFD. This program will restore over 270,000 acres of sage-grouse habitat in northern Johnson County. We feel this strategy can be duplicated in the other Conservation Districts within the working group area. A habitat extension biologist would ensure that this happens.

The Northeast Wyoming Sage-grouse Working Group believes that reestablishing the habitat extension biologist position is vital to implementing the Northeast Wyoming Sage-grouse Conservation Plan. Our working group is requesting your financial support for this position in a permanent capacity to limit the employee turnover that has plagued this position in the past. We believe Gillette would be the best location for this position as it is centrally located, and Campbell County provides habitat for 43% (211 leks) of the sage-grouse leks in our working group area. We understand that the USDA, Natural Resources Conservation Service may be willing to provide partial funding for the position, and that Farm Bill programs could provide much of the funding needed for conservation planning and implementation of projects.

The Northeast Wyoming Sage-grouse Working Group was formed in 2003 to develop and facilitate implementation of a local conservation plan for the benefit of sage-grouse, their habitats, and whenever feasible, other species that use sagebrush habitats. Our working group mission statement is "Working Cooperatively to Benefit Sage-grouse." Our team appreciates the support you and the Wyoming Game and Fish Department have given to sage-grouse conservation. We welcome the opportunity to serve on the working group, and we take seriously the responsibility of developing and implementing projects that will benefit sage-grouse. To date, we are nearing completion of our draft conservation plan and have assisted implementing habitat improvement and research projects.

We look forward to your response.

Sincerely,

Tom Maechtle

Chairman

Northeast Wyoming

Sage-Grouse Working Group

cc: Governor Dave Fruedenthal
Adolfo Perez, State Conservationist, USDA Natural Resources Conservation Service, Casper WY
Cindy Sarles, Chairman, Campbell County Conservation District, Gillette WY
Tim Kellogg, District Conservationist, USDA Natural Resources Conservation Service, Gillette WY

WYOMING GAME AND FISH DEPARTMENT

5400 Bishop Blvd. Cheyenne, WY 82006

Phone: (307) 777-4600 Fax: (307) 777-4810

Web site: http://gf.state.wy.us

GOVERNOR
DAVE FREUDENTHAL

DIRECTOR
TERRY CLEVELAND

COMMISSIONERS
LINDA FLEMING – President
RON LOVERCHECK – Vice President
CLARK ALLAN
JERRY GILLES
CLIFFORD KIRK
KERRY POWELL
BILL WILLIAMS, DVM

March 27, 2006

Tom Maechtle
Chairman, Northeast Wyoming
Sage Grouse Working Group
P.O. Box 207
Sheridan, WY 82801

Dear Tom,

Thank you for your letter dated January 31, 2006. I postponed responding to your request awaiting our fiscal year 2007 budget assessment and request for positions. I appreciate your support for an additional habitat extension biologist in northeast Wyoming. My staff and I are currently working with NRCS to develop funding mechanisms for additional positions.

As you may be aware, Brian Jensen was recently hired as a Habitat Extension Biologist. He is currently working at the NRCS Casper Office and one of his duties is to assist the NE and Bates Hole-Shirley Basin Sage Grouse Working Groups. He is coordinating his activities with our Sheridan and Casper Habitat Biologists, Bert Jellison and Keith Schoup, as well as our Landowner Incentive Program, Terrestrial Coordinator, Bryce Krueger and Statewide Sage Grouse Coordinator, Tom Christiansen.

I am sure you can appreciate the statewide demands for additional technical specialists and more personnel to provide assistance to private landowners, the NRCS, conservation districts, local sage grouse working groups and other land managers and non-governmental organizations to benefit the state's wildlife resources.

My staff and I will continue to coordinate and work with NRCS to develop long-term, consistent funding mechanisms to address wildlife resource concerns and staffing needs. I appreciate your interest and ask that you contact Gary Butler, Terrestrial Habitat Program Supervisor, to discuss ideas for funding additional positions.

Sincerely,

Terry Cleveland
Director

TC/bp
cc: Governor, Dave Freudenthal
Adolfo Perez, State Conservationist, USDA natural Resources Conservation Service, Casper, WY
Cindy Sarles, Chairman, Campbell County Conservation District, Gillette WY
Tim Kellogg, District Conservationist, USDA natural Resources Conservation Service, Gillette, WY

"Conserving Wildlife - Serving People"

[redacted]

NORTHEAST WYOMING
SAGE-GROUSE WORKING GROUP

16 June 2006

Adolfo Perez, State Conservationist
Natural Resources Conservation Service
100 East B Street, Po Box 33124
Casper, WY 82602

Mr. Perez,

The Northeast Wyoming Sage Grouse Working Group (NEWSGWG) is charged with producing a conservation plan for sage-grouse in northeast Wyoming. Although the U.S. Fish and Wildlife Service (USFWS) has deemed the listing of the greater sage-grouse under the Endangered Species Act as not warranted at this time, petitions for listing can be submitted at any time. We must continue in our efforts to produce a useful and usable conservation plan. We will need the help of the NRCS, and other government agencies, and private entities to implement the plan in an effort to provide local conservation of sage-grouse and preclude the need for federal listing.

We would like to encourage the continuation of Wyoming's Environmental Quality Incentives Program Grazing Land Initiative (EQIP-GLI). We believe that it has proven to be a useful tool to encourage land managers to think of wildlife habitat and conservation (specifically sage-grouse) and livestock grazing as compatible uses. This program has played an integral part in the Lake DeSmet Conservation District Sage-grouse Restoration Project.

One of the visions of our working group is to see this type of cooperative project implemented in other northeast Wyoming counties. We feel strongly that programs such as EQIP-GLI and the Wildlife Habitat Incentives Program (WHIP), supported by adequate personnel and funding to implement them, are critical. Thank you for your consideration and support.

Sincerely,

Thomas L. Maechtle

Thomas L. Maechtle, Chairperson
NE Wyoming Sage-Grouse Working Group
c/o P.O. Box 207
Sheridan, Wyoming 82801

Appendix VII – Northeast Wyoming Seeding Brochure

TIPS FOR SUCCESS

- Minimize disturbed areas. Narrow corridors where topsoil has not been disturbed may not need seeding with sagebrush as it will come in from adjacent areas.
- Save and replace topsoil whenever possible, or as required. It is a great seed resource.
- Use certified Pure Live Seed (PLS) with as high a purity as possible and **recent** testing of "live."
- Seed as soon as possible after disturbance, but avoid times that are likely to be followed by extended dry, hot weather or when frost kill of young seedlings is likely.
- Create a smooth and firm seedbed minimizing rocks, litter, and large clods. On the other hand, a rough, pitted seedbed can sometimes help to establish shrubs and forbs.
- Establish good seed-to-soil contact. A culti-packer or a roller works for good contact.
- Use a specialty drill or special practices to seel small and fluffy forb and shrub seed. A Truax or a Brillion drill is designed for forb and shrub seeds, but a grain drill can work. Separate the box into compartments with cardboard inserts and put the small fluffy seeds into their own compartment. Let the seed tubes dangle, add a little oats or millet to help the seed flow, and make sure the packer wheels are working.
- Restrict grazing where possible for two seasons after planting. Controlled grazing can help establish grasses, but may deter forb and shrub establishment if care is not taken with length of grazing time.
- Use amendments like fertilizer and mulch should with care, as they may enhance grass production, but not forb or shrub production.
- Spot spray for weeds, as blanket spraying may kill what you are trying to plant – especially forbs and shrubs!!

TIPS FOR SUCCESS

- Your agency contact may have additional requirements – this brochure is not meant to substitute for them. Landowners should visit with the NRCS and local conservation district for best practices in rangeland seeding.
- Mowing can stimulate and diversify decadent sagebrush stands. Use this tool when practicable.
- This brochure was designed for northeast Wyoming and may not apply to other areas.

SAGE GROUSE NEED

<u>FORBS IN SUMMER FOR FOOD</u>

SAVE MONEY – SEED IN PATCHES AND MOSAICS

SUCCESSFUL SEEDING

for

SAGE GROUSE

in Northeastern Wyoming

Prepared by

The Northeast Wyoming Sage Grouse Working Group

"Working Cooperatively to Benefit Sage Grouse"

Spring 2005

A NATIVE SEEDMIX THAT MEETS BLM AND USFS GUIDELINES

AND A CONSIDERATION FOR PRIVATE LANDOWNERS

Grasses

Western Wheatgrass	3# pls
Green Needlegrass	2# pls
Bluebunch Wheatgrass*	2# pls
Needle and Thread*	1# pls

Shrubs and Sub-shrubs

Big sagebrush**	.5# pls
Fourwing saltbush	.5# pls

Forbs**

American Vetch	1# pls
Purple Prairie Clover	1# pls
Prairie Coneflower	1# pls
Total Pure Live Seed	12 #

* May be possible to substitute Blue Grama, Slender Wheatgrass, Little Bluestem, or Prairie Sandreed – check with your contact or use your own discretion.

** Very small-seeded and/or fluffy

OPTIONS AND ADDITIONS

Grasses or Grass-like

Blue Grama	2# pls
Slender Wheatgrass	2# pls
Canby Bluegrass	1# pls
Junegrass	1# pls
Side Oats Grama	1# pls
Sun Sedge	1# pls
Pasture Timothy***	1# pls

Shrubs and Sub-shrubs

Winterfat	1# pls
Snowberry	1# pls
Silver Sagebrush	1# pls
Silverleaf Buffalo Berry	1# pls
Skunkbrush	1# pls
Wax currant	1# pls

Forbs (the more the better)

Alfalfa***	2# pls
Aster	1# pls
Blue Flax	1# pls
Dandelion***	.5# pls
False Dandelion	1# pls
Hairy Golden Aster	1# pls
Native Daisy	1# pls
Penstemon	1# pls
Sunflower***	1# pls
Falcata Alfalfa***	1# pls
Yellow Sweet Clover***	1# pls

***Introduced species are not approved for use by BLM/USFS, but they may be very handy in your situation. Some introduced species may outcompete desirable native species.

SITE SPECIFIC OPTIONS

Clayey Sites

Buffalo Grass	2# pls
Gardner Saltbush	2# pls
Golden Banner	1# pls

Sandy Sites

Prairie Sand Reed	1# pls
Big Bluestem	1# pls
Little Bluestem	1# pls
Prairie Rose	1# pls
Indian Rice Grass	1# pls

Moist Sites

Alfalfa	1# pls
Bluegrass	2# pls
Milkweed	.5# pls
Snowberry	1# pls
Basin Wildrye	1# pls
Garrison Creeping Foxtail***	1# pls

======

REVEGETATION REFERENCES

Handbook of Western Reclamation Techniques

Sharing Solutions for Successful Plantings in the Northern Great Plains

SAGE GROUSE NEED SAGEBRUSH IN WINTER FOR FEED AND COVER

SAGE GROUSE DO NOT EAT GRAINS OR SEEDS!!

CONTACT THE NRCS OR YOUR CONSERVATION DISTRICT FOR MORE INFORMATION

Appendix VIII – Stocktank Wildlife Escape Ramp Design Brochure

Introduction

Water sources for livestock and more recently, water from coal bed natural gas production can play an important role in providing water for wildlife. The benefits of water tanks include less concentration around natural water sources and possibly reducing predation and spread of disease in wildlife species. In dry areas, the presence of these water sources can make a difference in the survival of young animals of the year. The benefits however, can be lost if wildlife drown because properly designed wildlife escape ramps are not integrated in the water troughs.

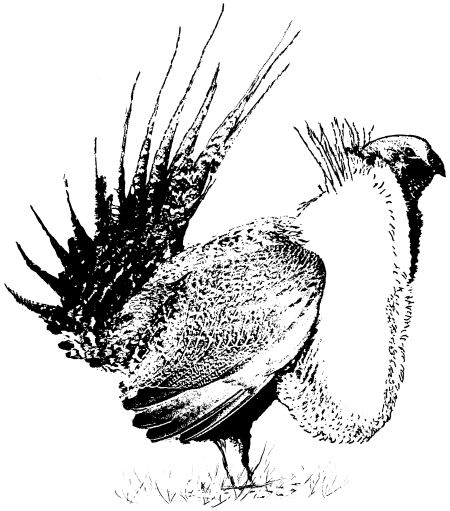
We provide a few examples of water escape ramps here. The recommendations in this brochure are from an Idaho Bureau of Land Management Bulletin number 89-4 dated November 1989.

More information is available from the Buffalo Field Office of the BLM or from the following website: www.id.blm.gov/techbuls/index.htm

Dan Thiele
Wildlife Biologist
Wyoming Game & Fish Department
42 Longhorn Drive
Buffalo, WY 82834
Phone (307) 684-2801

Wildlife Watering and Escape Ramps on Livestock and Coal Bed Natural Gas Water Developments: Suggestions and Recommendations for Maintaining Clean Water for Livestock and Reducing Wildlife Loss

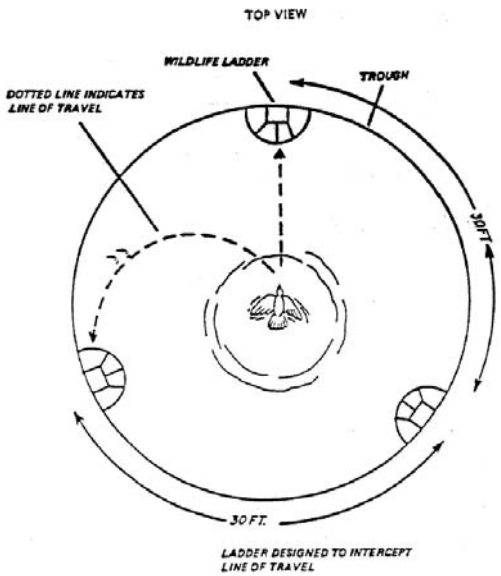
Provided by the Northeast Wyoming Sage-Grouse Working Group



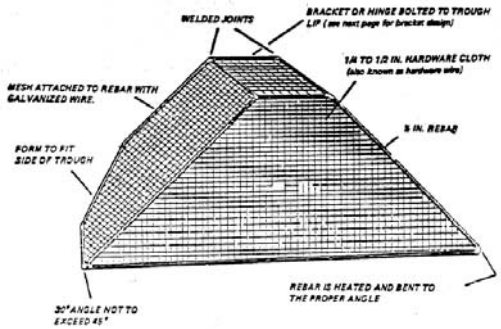
Working Cooperatively to Benefit Sage-Grouse

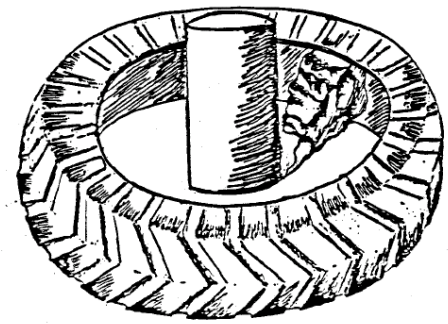
General Considerations:

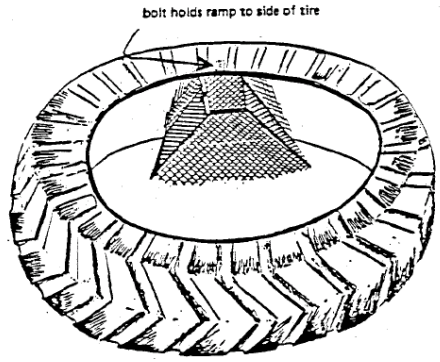
- Young deer and antelope cannot use watering facilities that exceed 20 inches above ground level. Wherever ground level water sources are not provided the height of the trough should not exceed 20 inches. This height also ensures that a young deer or antelope can stand on the ground in the event they accidentally fall or are pushed by other crowding animals into the trough.
- Wildlife species such as small rodents and birds will generally swim the circumference of a tank as they try to find a way out. Escape ramps must be constructed to intercept this line of travel.
- Wildlife ladders must be securely hinged to the trough to facilitate cleaning and prevent their removal. Ladders should have a minimum slope of 30 degrees and a maximum slope of 45 degrees.
- Wildlife ladders can also serve the additional benefit of protecting float valves in livestock troughs.
- The use of wildlife escape ladders promotes the survival of wildlife by preventing drowning and benefits livestock producers by maintaining clean water for stock.
- While many landowners place a scrap piece of lumber in tanks to allow some small animals to escape, the designs shown here are significantly more successful.



This drawing depicts probable swimming patterns from an animal falling into a circular trough. The wildlife ladders are properly installed. A minimum of one ladder per 30 ft. of trough perimeter is recommended.







expanded metal wildlife escape ramps and float protector