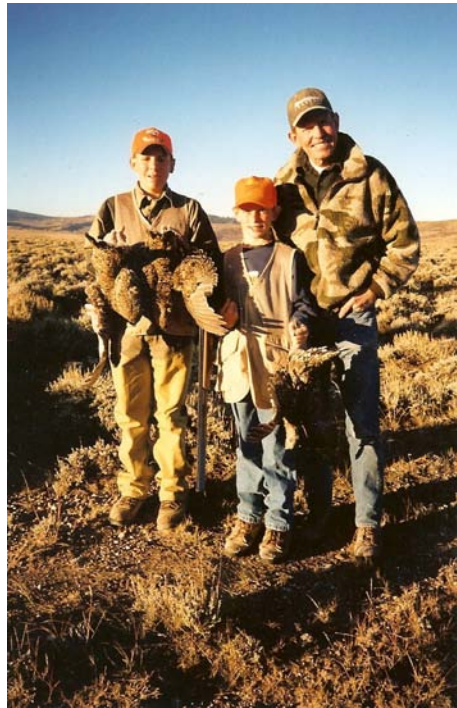


# Hunting and Sage-Grouse:

## A Technical Review of Harvest Management On a Species of Concern in Wyoming

Revised – September 2010



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## Executive Summary

On March 5, 2010 the U.S. Fish and Wildlife Service (USFWS) announced its determination that a range-wide listing of the greater sage-grouse (*Centrocercus urophasianus*) as threatened or endangered under the Endangered Species Act of 1973 was warranted, but precluded by higher priority listing actions. Therefore, sage-grouse are a “candidate” species under the Endangered Species Act, but remain a state-managed species. In light of this decision, concerns have been expressed about the potential impacts that hunting greater sage-grouse may have on their long-term conservation and annual status reviews conducted by the USFWS.

Harvest of greater sage-grouse currently occurs in 9 of the 11 states in which they reside. Wyoming boasts the largest and most widespread populations of grouse of any of the states. Sage-grouse hunting has generally become more conservative in Wyoming and across the West in recent decades in response to declining sage-grouse populations over the last half-century. Over the last 15 years however, the average number of males at leks has increased in Wyoming indicating an increasing statewide population. Local sub-populations more heavily influenced by anthropogenic impacts (sub-divisions, intensive energy development, large-scale conversion of habitat from sagebrush to grassland or agriculture, Interstate highways, etc.) have experienced declining populations or extirpation.

No studies have demonstrated hunting as the primary cause of reduced numbers of greater sage-grouse. However, sage-grouse are a relatively long-lived species whose existence is more dependent on survival rates than reproductive output. This strategy is different than many upland and small game species where long life and survival are sacrificed for high reproductive output. Sage-grouse demonstrate high over-winter survival, which limits the applicability of the concept of compensatory mortality with regard to hunter harvest. Therefore, the biology of sage-grouse suggests more conservative harvest management practices should be implemented compared to harvest strategies for species such as pheasants or partridges.

Changes made to hunting seasons in 1995 substantially reduced hunter participation and sage-grouse harvest rates in Wyoming. The fact that Wyoming, as a normal part of routine wildlife management, changed its hunting season strategy with the intent of better protecting hens with broods is not well understood by many in Wyoming. This action occurred prior to the species being petitioned for listing under the Endangered Species Act. The fact that the changes were made pro-actively prior to the widespread concern for sage-grouse has led to a perception that WGF has not responded to the concerns by closing hunting seasons or otherwise minimizing harvest effects. In addition to the changes made in 1995, more recent examples of increasingly restrictive hunting seasons include: 1) hunting season closures established in 2000 for northwest and southeast Wyoming, 2) shortened seasons with reduced bag limits in 2002, 3) emergency closure of three counties in 2003 due to a West Nile virus outbreak, 4) expansion of the southeast Wyoming closure in 2007 and 2008 into northeast Wyoming, and 5) increasingly conservative seasons for areas in northeast Wyoming still open for hunting. These actions were recommended by local WGF managers in response to local conditions and data.

In their March 2010 listing decision, the USFWS concluded that the key threats to the continued survival of sage-grouse are 1) habitat loss, fragmentation, and modification and 2) inadequacy of existing regulatory mechanisms, particularly in relation to energy and other development. The USFWS also evaluated the "utilization" (e.g. hunting) of sage-grouse and concluded that "the greater sage-grouse is not threatened by overutilization for commercial, recreational, scientific, or educational purposes now or in the foreseeable future".

This is similar to its January 2005 finding whereby the USFWS determined that hunting, as currently regulated by state wildlife agencies, was not a significant threat to the conservation of sage-grouse. The expert panel used by the USFWS to make this determination ranked hunting 17th out of 19 potential threats considered.

Regulated hunting is the cornerstone of the North American Model of Wildlife Conservation, a system that keeps wildlife a public and sustainable resource, scientifically managed by professionals. Many greater sage-grouse populations can, and do, support hunting under this model.

Harvest of greater sage-grouse provides population data not easily obtained except through costly radio-telemetry studies of specific populations. Wings from hunter-harvested birds are used to determine the ratio of hens to chicks, which provides an index to annual chick production. In conjunction with population trend counts, these data contribute to understanding the dynamics of sage-grouse populations.

Hunting creates a constituency of sage-grouse advocates who are interested in seeing the needs of grouse populations are met and license fees provide revenue for management. Wyomingites are generally supportive of a multiple-use management philosophy on public lands. Regulated hunting, as recommended by state and local conservation plans, is a sustainable multiple-use activity similar to well-managed grazing and energy development. Eliminating hunting would also eliminate an ally, the hunter-conservationist, in the on-going efforts to prevent the need for listing sage-grouse under the Endangered Species Act.

Sage-grouse hunting regulations take into account biology, formal public involvement via state and local planning efforts, and informal public perceptions. Consequences of varying greatly from established guidelines and conservation plans could undermine local sage-grouse conservation efforts in Wyoming. Closing hunting seasons where biological data do not justify such a management decision would create a public perception that sage-grouse populations in Wyoming may indeed require protection under the Endangered Species Act. Conversely, not recognizing real, but biologically unfounded, concerns about hunting impacts could threaten voluntary industry-led conservation initiatives and/or generate resistance to comply with state and federal land use stipulations/regulations. Efforts to inform all stakeholders of the issues associated with sage-grouse hunting should be increased in addition to continuing generally conservative sage-grouse hunting seasons.

## **Purpose**

On March 5, 2010 the U.S. Fish and Wildlife Service (USFWS) announced its determination that a range-wide listing of the greater sage-grouse (*Centrocercus urophasianus*) as threatened or endangered under the Endangered Species Act of 1973 was warranted, but precluded by higher priority listing actions (USFWS 2010). Therefore, sage-grouse are a “candidate” species under the Endangered Species Act, but remain a state-managed species. In light of this decision, concerns have been expressed about the potential impacts of hunting greater sage-grouse may have on their long-term conservation and annual status reviews conducted by the USFWS.

## **Background**

Greater sage-grouse have been hunted throughout human history in the western United States and populations were heavily exploited by commercial and sport hunting in the late 1800s and early 1900s (Patterson 1952, Autenrieth 1981). Because of concerns about sage-grouse populations (Hornaday 1916, Girard 1937), many states prohibited harvest in the 1930s (Patterson 1952, Autenrieth 1981). By the 1950s, populations had recovered in many areas and hunting seasons were again instituted in most portions of the species’ range (Patterson 1952, Autenrieth 1981). In response to generally declining sage-grouse populations over the last half-century, sage-grouse hunting has generally become more conservative in recent decades. In the mid-1990s, after obtaining new information on sage-grouse vital rates, Idaho and Wyoming reduced harvest on sage-grouse (Reese and Connelly *in press*). Other states have recently reduced harvest opportunities to minimize the possibilities that hunting may have a negative impact on greater sage-grouse populations (Reese and Connelly *in press*). Harvest of greater sage-grouse currently occurs in 9 of the 11 western states in which they reside. The states of Washington and North Dakota prohibit harvest as do the Canadian provinces of Alberta and Saskatchewan; areas characterized by small populations in fragmented, marginal habitats. North Dakota’s current closure began in 2008 after West Nile virus presumably decreased that state’s already precarious sage-grouse population below levels that could support harvest mortality.

## **Wyoming Population Status and Trends**

Wyoming boasts the largest and most widespread populations of greater sage-grouse. Wyoming supports about 1/3 to 1/2 of the range-wide population depending on the analytical tool used. Sage-grouse populations have declined in Wyoming and across the West over the last half-century. Over the last 15 years however, the average number of males at leks has increased in Wyoming indicating an increasing statewide population. Thus, there have been long-term declines but more recent increases in sage-grouse populations in Wyoming (Figure 1). Over 44,500 sage-grouse cocks were observed on leks in Wyoming in 2006.

These trends are valid at the statewide scale. Trends are more varied at the local scale. Local sub-populations more heavily influenced by anthropogenic impacts (sub-divisions, intensive energy development, large-scale conversion of habitat from sagebrush to grassland or agriculture, Interstate highways, etc.) have experienced declining populations or extirpation.

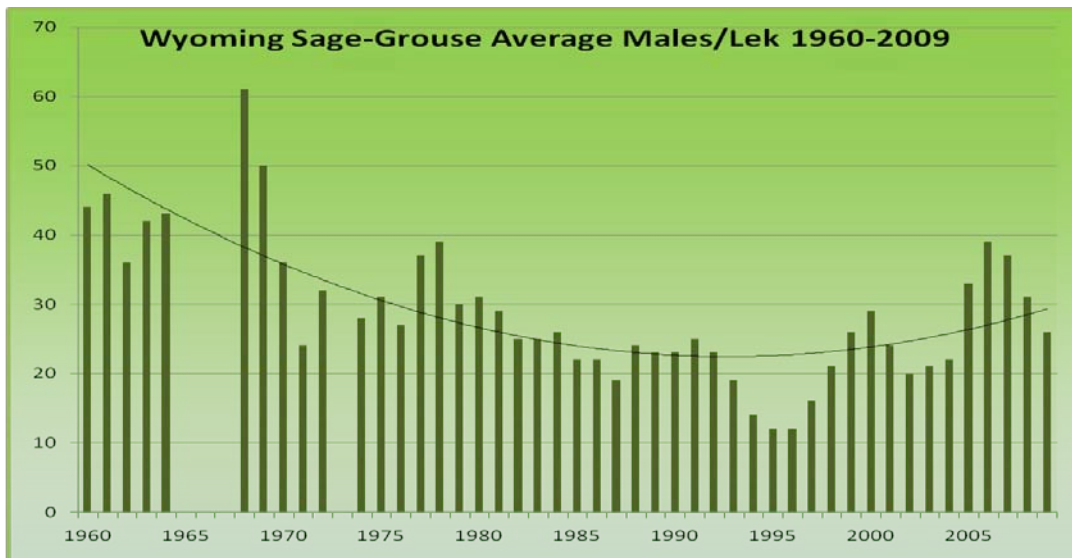


Figure 1. Sage-grouse Ave. Males/Lek in Wyoming 1960-2009 (Min 100 leks checked each year).

**Biological Considerations of Sage-Grouse Hunting** [see also Reese and Connelly (*in press*)]

The general approach to harvest management of upland game was developed during the 1930s and 1940s (Wing 1951, Allen 1962, Dasmann 1964). This approach was based on evidence that showed small game populations produce a large number of young each year, most of which are available for harvest because they do not survive the winter adding to the next season’s breeding population. Reproductive characteristics and effects of exploitation were believed to be the same for all species of upland game (Allen 1962, Strickland et al. 1994). Under this approach hunting is a “compensatory” form of mortality; which means that a large portion of a small game population can be harvested each fall because if not taken by hunters, they will die prior to the next breeding season from other causes. By the mid-1970s to early 1980s many western states standardized and often liberalized sage-grouse seasons compared to those held in the 1950s and 1960s. This approach was supported by studies suggesting hunting had minimal impact on sage-grouse populations (June 1963, Crawford 1982, Braun and Beck 1985, Braun 1987).

Evidence began to accumulate during the 1980s and 1990s suggesting that, under some circumstances, harvesting of some species of game birds may have an “additive” effect (Gregg 1990, Robinette and Doer 1993, Dixon et al. 1996). Additive hunting mortality results in a spring breeding population lower than if harvest had not occurred because some of the birds harvested are in addition to those that die naturally through disease, starvation, accidents or predation. Robertson and Rosenberg (1988) addressed the issue of compensatory and additive mortality and concluded that in natural populations hunting mortality usually falls between the 2 extremes of being totally additive or totally compensatory.

Life history characteristics of greater sage-grouse differ from those of many other upland game birds. Many of these other species exhibit a life history characterized by high

fecundity and large clutch sizes of 10-17 eggs, high annual rates of natural mortality, especially over winter (40-70%), and short life spans of 1-2 years. Greater sage-grouse, however, exhibit a life history characterized by relatively low productivity with clutch sizes of 6-9 eggs, low overwinter mortality rates of 2-20%, and long life spans of 3-6 years (Schroeder et al. 1999). Liberal hunter harvest has little impact on species exhibiting high reproductive potential (compensatory mortality) but can be additive for species like sage-grouse with lower reproductive potential (Anderson 2002:55).

Researchers in the 1970s and 1980s largely concluded hunting had little impact on sage-grouse populations (Crawford 1982, Crawford and Lutz 1985, Braun and Beck 1985), although Zunino (1987) found fall densities to be higher on un hunted study sites but populations increased on both hunted and un hunted areas. Some recent research has suggested that sage-grouse harvest mortality may not be totally compensatory (Johnson and Braun 1999, Connelly et al. 2000a, Connelly et al. 2003, Gibson *in press*). Nevertheless, research conducted to date has not demonstrated hunting as the primary cause of reduced numbers of greater sage-grouse. Greater sage-grouse do however experience low mortality over winter (Beck and Braun 1978, Connelly et al. 2000a, Remington and Braun 1988, Sherfy 1992, Wik 2002, Zablan et al. 2003, Sika 2006). Recognizing the typically low over-winter mortality of sage-grouse is vital to understanding impacts of harvest.

Connelly et al. (2003) conducted an experimental study of greater sage-grouse response to harvest. They used lek counts to assess response to 3 levels of harvest. All lek routes were in areas with the same harvest regulations in 1996 (30-day season, 3 bird bag, 6 in possession). In 1997 and continuing through 2001, regulations changed to either no hunting, a restrictive 7-day season with 1 bird bag, 2 in possession, or a moderate 23-day season with 2 bird bag, 4 in possession. Lek routes were also categorized as being in lowland areas close (< 1.5 hours drive) to major cities and towns or in high elevation mountain valleys farther from urban centers. After reducing harvest opportunities, areas that remained open to hunting had lower rates of population increase than did areas with no hunting (Connelly et al. 2003). Both the moderate and restrictive hunting seasons produced harvests that apparently slowed population recovery (Connelly et al. 2003). Populations in low elevation habitats, close to urban centers and isolated because of habitat fragmentation, may be less able to withstand a harvest rate that has little or no effect on populations in more extensive, contiguous, remote, or mesic areas (Gibson 1998, Connelly et al. 2003). Connelly et al. (2000b) guidelines suggested that no more than 10% of the autumn population be removed through harvest. Similarly, Sedinger et al. (2010) reported that harvest of less than 11% of the fall population is unlikely to have an important influence on local population dynamics of sage-grouse.

In Wyoming studies Heath et al. (1997) reported more hens were harvested when the hunting season opened on September 1 than during years with a mid-September opening date. When precipitation was at or above normal and the season commenced on or after September 15, hens and chicks dispersed away from wet sites and scattered into the uplands, and hen harvest was reduced (Heath et al. 1997). The delayed season also greatly reduced hunter numbers thereby reducing harvest (Heath et al. 1997, Table 1,

Figure 3). During a subsequent two-year study only 1 radio-collared hen was harvested out of 53 that were marked (Heath et al. 1998). Slater (2003) reported that of 105 collared birds, 50 died over a three-year period and 9 of these were attributed to hunting. Most of these occurred during an extremely dry year (2000). The hunting season began on September 16 that year but the author attributed the high harvest rate to drought conditions concentrating the birds near wet sites making them more vulnerable to harvest.

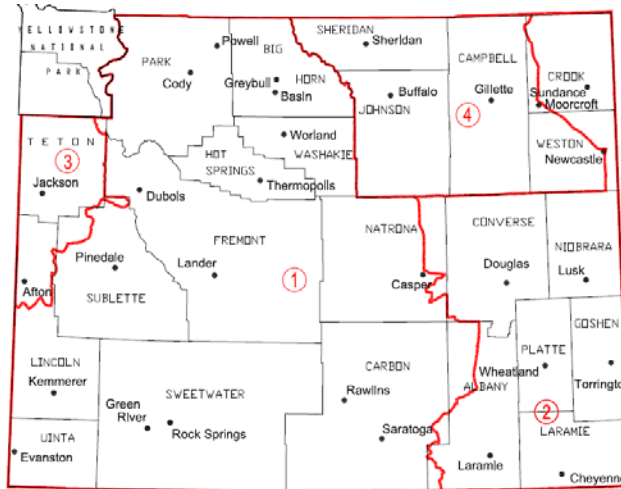
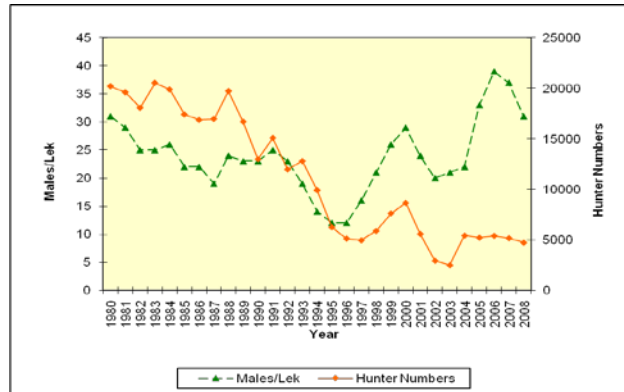


Figure 2. Wyoming Sage-Grouse Hunt Area Map (2008-2010). Areas 2 & 3 are closed.

Year	Season Dates	Season Length	Bag Limit Daily/Poss.	Hunters	Harvest	Males/Lek
1991	Aug 31-Sep 30	31	3/6	15,087	47,918	25
1992	Sep 1-30	30	3/6	11,976	34,388	23
1993	Sep 1-30	30	3/6	12,800	30,469	19
1994	Sep 1-30	30	3/6	9,928	26,458	14
1995	Sep 16-30	15	3/6	6,259	13,975	12
1996	Sep 21-Oct 4	14	3/6	5,138	13,192	12
1997	Sep 20-Oct 5	16	3/6	4,969	11,551	16
1998	Sep 19-Oct 4	16	3/6	5,899	16,787	21
1999	Sep 18-Oct 3	16	3/6	7,625	21,556	26
2000	Sep 16-Oct 1	16	3/6	8,667	20,685	29
2001	Sep 22-Oct 7	16	3/6	5,593	12,742	24
2002	Sep 28-Oct 6	9	2/4	2,947	4,835	20
2003	Sep 27-Oct 5	9	2/4	2,504	5,666	21
2004	Sep 23-Oct 3	11	2/4	5,436	11,783	22
2005	Sept 23-Oct 3	11	2/4	5,231	13,176	33
2006	Sep 23-Oct 3	11	2/4	5,412	12,920	39
2007	Sep 22-Oct 2	11	2/4	5,180	10,378	37
2008	Sep 20-30 (Area 1) Sep 20-26 (Area 4)	11 7	2/4	4,745	10,302	31
2009	Sep 19-30 (Area 1) Sep 19-25 (Area 4)	12 7	2/4	Not Available	Not Available	26
2010	Sep 18-30 (Area 1) Sep 18-20 (Area 4)	13 3	2/4	Not Available	Not Available	Not Available

Table 1. Wyoming sage-grouse harvest and males/lek statistics, 1991-2010.





**Figure 3. Wyoming sage-grouse hunter numbers compared to sage-grouse males/lek 1980-2008.**

Length of sage-grouse hunting seasons is less important than timing. Harvest rates are dramatically reduced during the middle and later portions of the season. Of the 3,500+ wings collected in the WGFD Green River Region between 2003 and 2007, 60% were taken before the end of the opening weekend (WGFD unpublished data). Longer seasons allow the opportunity to hunt with minimal impact to the grouse population. Montana has historically allowed 60-90 day seasons with no population effects being documented. However, in response to public concern, season length in Montana was shortened in recent years from 90 to 60 days and the daily bag reduced from 4 to 2.

Hunter participation is affected by season structure, grouse population trends and hunter perceptions. When Wyoming hunting season dates were changed from a September 1 opener in 1994 to mid-September in 1995, hunter participation was reduced in half (Table 1, Figure 3). The later date was coupled with historically low populations. In this regard hunters were self-regulating as fewer hunters participated when hunting was more difficult due to lower grouse populations. Moreover, fewer hunters may have participated when there was merely a perception that grouse numbers were declining. Recent concerns for sage-grouse across their range has resulted in lower hunter participation even though populations across much of Wyoming are as high as they have been in 30 years (as indexed by average male lek attendance) (Table 1, Figure 3).

Changes made to hunting seasons in 1995 substantially reduced hunter participation and sage-grouse harvest rates in Wyoming. The fact that Wyoming, as a normal part of routine wildlife management, changed its hunting season strategy with the intent of better protecting hens with broods is not well understood by many in Wyoming. This action occurred prior to the species being petitioned for listing under the Endangered Species Act. The fact that the changes were made pro-actively prior to the widespread concern for sage-grouse has led to a perception that WGFD has not responded to the concerns by closing hunting seasons or otherwise minimizing harvest effects. In addition to the changes made in 1995, more recent examples of increasingly restrictive hunting seasons include: 1) hunting season closures established in 2000 for northwest and southeast Wyoming, 2) shortened seasons with reduced bag limits in 2002, 3) emergency closure of three counties in 2003 due to a West Nile virus outbreak, 4) expansion of the southeast Wyoming closure in 2007 and 2008 into northeast Wyoming (Figure 2), and 5) shortening the length of the hunting season from 11 days to 3 days for areas in northeast

Wyoming still open for hunting (Table 1, Figure 2). These actions were recommended by local WGF managers in response to local conditions and data.

Falconry harvest is essentially inconsequential. In 2006, a total of 180 sage-grouse were harvested by falconers statewide. But falconers, via the Wyoming Falconers Association and the North American Grouse Partnership, are highly engaged in Wyoming's sage-grouse conservation efforts via their participation on several local working groups.

Conservative hunting seasons now in place in those portions of Wyoming with open seasons, maintain harvest rates at a level projected to be well below 10% of the sage grouse available during the fall hunting season, a harvest level that should not effect sage grouse numbers each spring (Sedinger et al. 2010). In summary, recent investigations support hunting seasons that result in harvest rates low enough to allow populations to increase if habitat quality is not limiting population numbers.

### **Benefits of Sage-Grouse Hunting**

Regulated hunting is the cornerstone of the North American Model of Wildlife Conservation, a system that keeps wildlife a public and sustainable resource, scientifically managed by professionals. Many greater sage-grouse populations can, and do, support hunting under this model.

Sage-grouse hunting provides recreational, cultural and economic values (Wyoming Sage-Grouse Working Group 2003 and Local Working Groups 2006-2008). Harvest of greater sage-grouse provides population data not easily obtained except through costly radio-telemetry studies of specific populations (Reese and Connelly *in press*). Wings from hunter-harvested birds are used to determine the ratio of hens to chicks, which provides an index to annual productivity (Wyoming Sage-Grouse Working Group 2003 and Local Working Groups 2006-2008, Reese and Connelly *in press*). In conjunction with population trend counts, these data contribute to understanding the dynamics of sage-grouse populations (Reese and Connelly *in press*).

Harvest is also an incentive for conservation (Sika 2006). Hunting creates a constituency of sage-grouse advocates who are interested in seeing the needs of grouse populations are met (Wyoming Sage-Grouse Working Group 2003 and Local Working Groups 2006-2008) and license fees provide revenue for management. Wyomingites are generally supportive of a multiple-use management philosophy on public lands. Regulated hunting, as recommended by state and local conservation plans, is a sustainable multiple-use activity similar to well-managed grazing and energy development. Eliminating hunting would also eliminate an ally, the hunter-conservationist, in the on-going efforts to prevent the need for listing sage-grouse under the Endangered Species Act.

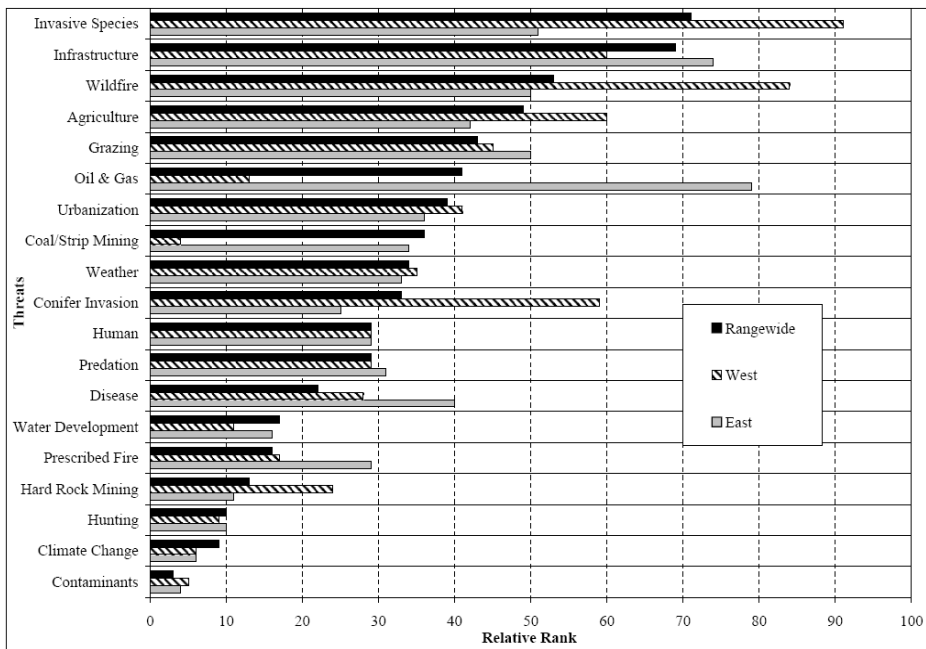
The number of hunters is declining (USFWS 2006). Recruitment of hunters has been cited as a critical need for the future of hunting and support for conservation in Wyoming (WGFD 2007). Sage-grouse provide an excellent quarry for a beginning hunter in Wyoming because they are spread across much of the state, are locally abundant, and usually allow close approach – often being seen prior to flushing allowing the novice

hunter time to prepare to shoot. Only cottontail rabbits provide a greater combination of characteristics favorable to young or beginning hunters.

### Sage-Grouse Hunting and the Endangered Species Act

In their March 2010 listing decision, the U. S. Fish and Wildlife Service concluded that the key threats to the continued survival of sage-grouse are 1) habitat loss, fragmentation, and modification and 2) inadequacy of existing regulatory mechanisms, particularly in relation to energy and other development. The USFWS also evaluated the "utilization" (e.g. hunting) of sage-grouse and concluded that "the greater sage-grouse is not threatened by overutilization for commercial, recreational, scientific, or educational purposes now or in the foreseeable future" (USFWS 2010 p. 77). The "Summary of Factor B" section of this document is appended (Appendix A).

The USFWS also examined the effects of hunting on greater sage-grouse in an earlier status review of the species. In its 2005 finding the USFWS determined that hunting as regulated by state wildlife agencies was not a significant threat to the conservation of sage-grouse (USFWS 2005). The expert panel used by the USFWS to make this determination ranked hunting 17th out of 19 potential threats considered (Figure 4).



Notes:

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

**Figure 4. Threats to sage-grouse as ranked by an expert panel convened by the U.S. Fish & Wildlife Service in 2004. The rationale for these rankings can be found in the final listing decision document (U.S. Fish & Wildlife Service, 2005).**

Similarly, Wyoming's sage-grouse LWGs have not identified hunting as a high priority issue in their plans but do provide concrete recommendations for how hunting should be managed. In addition, Governor Freudenthal's Sage-Grouse Implementation Team did not mention hunting in either their 2007 or 2010 recommendations they believed would contribute to the stabilization of sage-grouse populations and long-term conservation of sagebrush habitat in Wyoming (Wyoming Governor's Office 2007, 2010.)

### **General Harvest Recommendations**

The peer-reviewed "Guidelines to Manage Sage Grouse Populations and Their Habitats" (Connelly et al. 2000b) and Wyoming's state and local conservation plans have recommended management practices that recognize the biological concepts discussed above. The WGFD supports these guidelines and recommendations as reflected in hunting regulations.

The Wyoming Sage Grouse Working Group's Greater Sage-Grouse Conservation Plan (2003) top three recommended management practices (RMPs) for hunting are:

- 1) In stable to increasing populations (based on lek count information) maintain a 2 to 4 week hunting season with a 3-bird bag limit beginning no earlier than September 15.
- 2) If populations are declining (for 3 or more consecutive years based on lek count information) implement more conservative regulations that might include: reduced bag limits, adjusted season dates, limited quota seasons or closed seasons.
- 3) Populations should not be hunted where less than 300 birds comprise the breeding populations. (i.e. less than 100 total males are counted on the population's leks)

Wyoming's eight local conservation plans contain similar language.

Based on a review of the literature, the Connelly et al. (2000b) guidelines suggested that no more than 10% of the autumn population be removed through harvest. Similarly, Sedinger et al. (2010) reported that harvest of less than 11% of the fall population is unlikely to have an important influence on local population dynamics of sage-grouse. Harvest up to 10% of the autumn population may be appropriate, but assumes detailed and specific knowledge of population size in September or October. Unfortunately, at present it is not possible to accurately and precisely estimate sage-grouse numbers for populations without the benefit of intensive research on vital rates and lek attendance rates, but rough estimates have been made as a check on potential harvest rates.

While the lack of a statistically reliable technique to estimate sage-grouse population size does not allow for a precise estimate of harvest rates, it is apparent that harvest rates have declined over the last 30 years in Wyoming. Admittedly crude population estimates together with harvest data suggest harvest rates have declined from perhaps as high as 20% of the fall population in the late 1970s and early 1980s to below 5% in recent years.

In July 2010, the Western Association of Fish and Wildlife Agency (WAFWA) directors accepted the WAFWA Sage and Columbian Sharp-tailed Grouse Technical Committee

recommendations that: 1) the states continue to adjust hunting seasons adaptively at the population level, using the best available science and guidelines, current sage-grouse population data (e.g. lek counts, productivity estimates from wing data or brood counts, survival estimates from local radio-telemetry studies), and local circumstances that can change annually (e.g., West Nile virus, drought, or habitat loss due to wildfire), 2) the social aspects, as well as biological implications of changes to harvest seasons, should be thoughtfully considered as hunting regulations are developed, and 3) the states should critically evaluate harvest survey techniques and adjust accordingly to ensure results are sufficiently accurate and precise.

During the recent (2004-2007) upward population trend, average lek attendance rates were similar to those last documented in the late 1970s (Figure 1). Even so, Wyoming sage-grouse hunting seasons for 2007 (Table 1) were more conservative than that recommended by the state and local conservation plans (RMP #1 above). However, until there is wider awareness and acceptance of these recommendations and guidelines, more conservative hunting season structures are likely. The sage-grouse hunting seasons in recent years reflect that reality as well as the biology.

### **Sage-Grouse Hunting Season Regulations for Northeast Wyoming**

Because of heightened concern for sage-grouse numbers and potential effects of hunting in northeast Wyoming, additional restrictions have been imposed in this area.

Beginning in 2008 sage-grouse hunting was closed on an additional 5.9 million acres across northeastern Wyoming (Figure 2). These areas contain generally island populations of sage-grouse characterized by naturally and anthropogenically fragmented habitats. This closure is consistent with Northeast Local Sage-Grouse Conservation Plan, the state conservation plan and published sage-grouse management guidelines (Connelly et al. 2000b), all of which recommend sage-grouse populations not be hunted where less than 300 birds comprise the breeding populations (i.e. less than 100 total males are counted on the population's leks). Also in 2008, the WGFD established a new hunt area (Area 4) in northeast Wyoming (Table 1, Figure 2) that has a more conservative season structure (3-7 days including one weekend) than the other areas open to hunting (11-13 days with two weekends). This recommendation was based on research results (Lyon and Anderson 2003, Holloran 2005, Kaiser 2006, Aldridge and Boyce 2007, Holloran et al. 2007, Walker et al. 2007, Doherty et al. 2008 and others) that have demonstrated impacts from natural gas development. Concurrently, industry officials argued for more restrictive hunting seasons to minimize mortality in these areas. Because hunter access is highly restricted in northeast Wyoming due to the largely private land ownership, harvest is already minimal and population level effects (i.e. increases) are not anticipated to result from the closure and more conservative season.

In 2009, 2,274 male sage-grouse were counted on leks in northeast Wyoming. Excluding birds from the Casper, Douglas and Hulett areas already closed to hunting, about 1,900 male sage-grouse were counted in Hunt Area 4 in 2009; far above the 100 male threshold. A case could be made that habitat fragmentation has resulted in two populations in Area 4 (basically split by the Powder River). If that assumption is true,

about 900 male sage-grouse were counted west of the Powder River and about 1,000 east of the Powder River. Based on these roughly derived estimates, neither area population approaches the threshold for closing the hunting season for biological reasons.

From 2002-2007 an average of 333 sage-grouse were harvested in northeast Wyoming. When the hunting season was shortened and a portion of the area closed in 2008, the harvest declined to 101 birds. This is less than 1% of the 2008 estimated fall population of over 10,000 birds for the area that is open to hunting. This estimate is based on:

- documented 2008 lek attendance of 3,000 plus males
- a ratio of 2:1 females to males
- average mortality
- lower than average reproduction (since lek counts declined between 2008 and 2009)

Very limited hunting access and hunter self-regulation has resulted in low sage-grouse harvest in northeast Wyoming. When hunters perceive low numbers, they reduce their own harvest or quit hunting altogether. Further reductions in harvest and hunting opportunity will have no real or measureable impact to population trends.

If habitat fragmentation in the Powder River Basin continues to isolate areas creating smaller distinct populations, the WGFD will evaluate each of these populations as they relate to the threshold of 100 males counted. Based on our history and cautious approach, the WGFD will likely recommend closing the sage-grouse hunting season prior to reaching this threshold.

### **Summary**

Hunting opportunity for greater sage-grouse has been reduced in response to general population declines of known (e.g., disease and habitat loss) and unknown origin. While hunting has not been demonstrated as the primary cause of decline in greater sage-grouse populations, the cautionary recommendations outlined in the sage-grouse management guidelines (Connelly et al. 2000*b*) remain appropriate.

Sage-grouse hunting regulations take into account biology, formal public involvement via state and local planning efforts, and informal public perceptions. Consequences of varying greatly from established guidelines and conservation plans could undermine local sage-grouse conservation efforts in Wyoming. Closing hunting seasons where biological data do not justify such a management decision would create a public perception that sage-grouse populations in Wyoming may indeed require protection under the Endangered Species Act. Conversely, not recognizing real, but biologically unfounded, concerns about hunting impacts could threaten voluntary industry-led conservation initiatives and/or generate resistance to comply with state and federal land use stipulations/regulations. Efforts to inform all stakeholders of the issues associated with sage-grouse hunting should be increased in addition to continuing generally conservative sage-grouse hunting seasons.

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## Appendix A.

U. S. Fish and Wildlife Service (2010 *p.* 77) Summary of Factor B (overutilization for commercial, recreational, scientific, or educational purposes):

Greater sage-grouse are not used for any commercial purpose. In Canada, hunting of sage-grouse is prohibited in Alberta and Saskatchewan. In the United States, sage-grouse hunting is regulated by State wildlife agencies and hunting regulations are reevaluated yearly. We have no information that suggests any change will occur in the current situation, in which hunting greater sage-grouse is prohibited in Washington and allowed elsewhere in the range of the species in the U.S. under State regulations, which provide a basis for adjustments in annual harvest and emergency closures of hunting seasons. We have no evidence suggesting that gun and bow sport hunting has been a primary cause of range-wide declines of the greater sage-grouse in the past, or that it currently is at level that poses a significant threat to the species. However, although harvest as a singular factor does not appear to threaten the species throughout its range, negative impacts on local populations have been demonstrated and there remains a large amount of uncertainty regarding harvest impacts because of a lack of experimental evidence and conflicting studies. Significant habitat loss and fragmentation have occurred during the past several decades, and there is evidence that the sustainability of harvest levels depends to a large extent upon the quality of habitat and the health of the population. However, recognition that habitat loss is a limiting factor is not conclusive evidence that hunting has played no role in population declines or that reducing or eliminating harvest will not have an effect on population stability or recovery.

Take from poaching (illegal hunting) appears to occur at low levels in localized areas, and there is no evidence that it contributes to population declines. The information on non-consumptive recreational activities is limited to lek viewing, the extent of such activity is small, and there is no indication that it has a negative impact that contributes to population declines. Harvest by Native American tribes, and mortality that results from handling greater sage-grouse for scientific purposes appears to occur at low levels in localized areas and thus we do not consider these to be a significant threat at either the rangewide or local population levels. We know of no utilization for educational purposes. We have no reason to believe any of the above activities will increase in the future.

We do not believe data support overuse of sage-grouse as a singular factor in rangewide population declines. We note, however, that in light of present and threatened habitat loss (Factor A) and other considerations (e.g. West Nile virus outbreaks in local populations), continued close attention will be needed by States and tribes to carefully manage hunting mortality, including adjusting seasons and allowable harvest levels, and imposing emergency closures if needed.

In sum, we find that this threat is not significant to the species such that it causes the species to warrant listing under the Act.