

Wyoming

Sage-Grouse

Job Completion Report 2019

June 2019-May 2020

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# Wyoming Sage-Grouse Job Completion Report

Conservation Plan Area: **Statewide Summary**

Period Covered: **6/1/2019– 5/31/2020**

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## INTRODUCTION

Wyoming is home to more greater sage-grouse than any other state. About 37% of the rangewide sage-grouse population lives in Wyoming and 90% of estimated historic habitat in Wyoming is still occupied by the bird. There are about 1,800 known occupied sage-grouse leks in Wyoming. Department personnel and others surveyed 80% of these leks in the spring of 2020. Eighty percent is the lowest survey rate since 2002, because the Covid-19 pandemic grounded all flights for agency personnel in April 2020. Results of the survey indicate 997 leks were confirmed active, 339 confirmed inactive, and 81 unknown or unchecked. The average number of males observed on leks was 19.5/active lek, a 2.5% change from the 20/active lek observed in the spring of 2019, suggesting a small population decrease. However this figure is substantially higher than the low of 13/active lek reported in 1996.

Management of greater sage-grouse habitat in Wyoming is based on a “core area” strategy of limiting human disturbance in the most important sage-grouse habitats. This strategy is codified by a Governor’s executive order. The Executive Order and related materials are available at: <https://wgfd.wyo.gov/Habitat/Sage-Grouse-Management>. The Core Areas are shown in Figure 1.

In 2015 the U.S. Fish and Wildlife Service issued a decision of “not warranted” for listing greater sage-grouse as threatened or endangered under the Endangered Species Act. This means the State of Wyoming maintains management authority over sage-grouse in Wyoming and management emphasis focuses on implementation of the core area strategy. In its decision document, the Service specifically cited Wyoming’s core area strategy as a mechanism that, if implemented as envisioned, should ensure conservation of sage-grouse in Wyoming and therefore help preclude the need for a future listing. The Western Association of Fish and Wildlife Agencies planned to re-examine the issue in 2020 to ensure planned conservation efforts were implemented and the status of the species remains unwarranted for listing. WAFWA’s examination is not yet complete.

Since the mid-2000’s, the Wyoming Legislature biennially appropriated over \$1 million of General Funds to the sage-grouse program for the state’s 8 local sage-grouse working groups (LWGs) (Figure 2) to allocate to local projects. The 2017 Legislature returned budget responsibility of the sage-grouse program back to the Department due to state budget shortfalls. This action shifted the funding burden from the state as a whole, based largely on mineral severance taxes, to hunters and anglers, the primary funding source of the WGFD. A hunting license fee increase specifically crafted to replace legislative funding was

approved by the legislature and LWGs will maintain their existing role in recommending how funds will be allocated. The last of biennial legislative funds were allocated in FY 2017-2018.

The 2017 Legislature passed a bill allowing private bird farm operations to collect sage-grouse eggs from the wild for purposes of establishing a captive flock. The Department and Commission promulgated regulations in Chapter 60 to permit this activity. However, no sage-grouse eggs have been collected from the wild for this purpose as of April 2021.

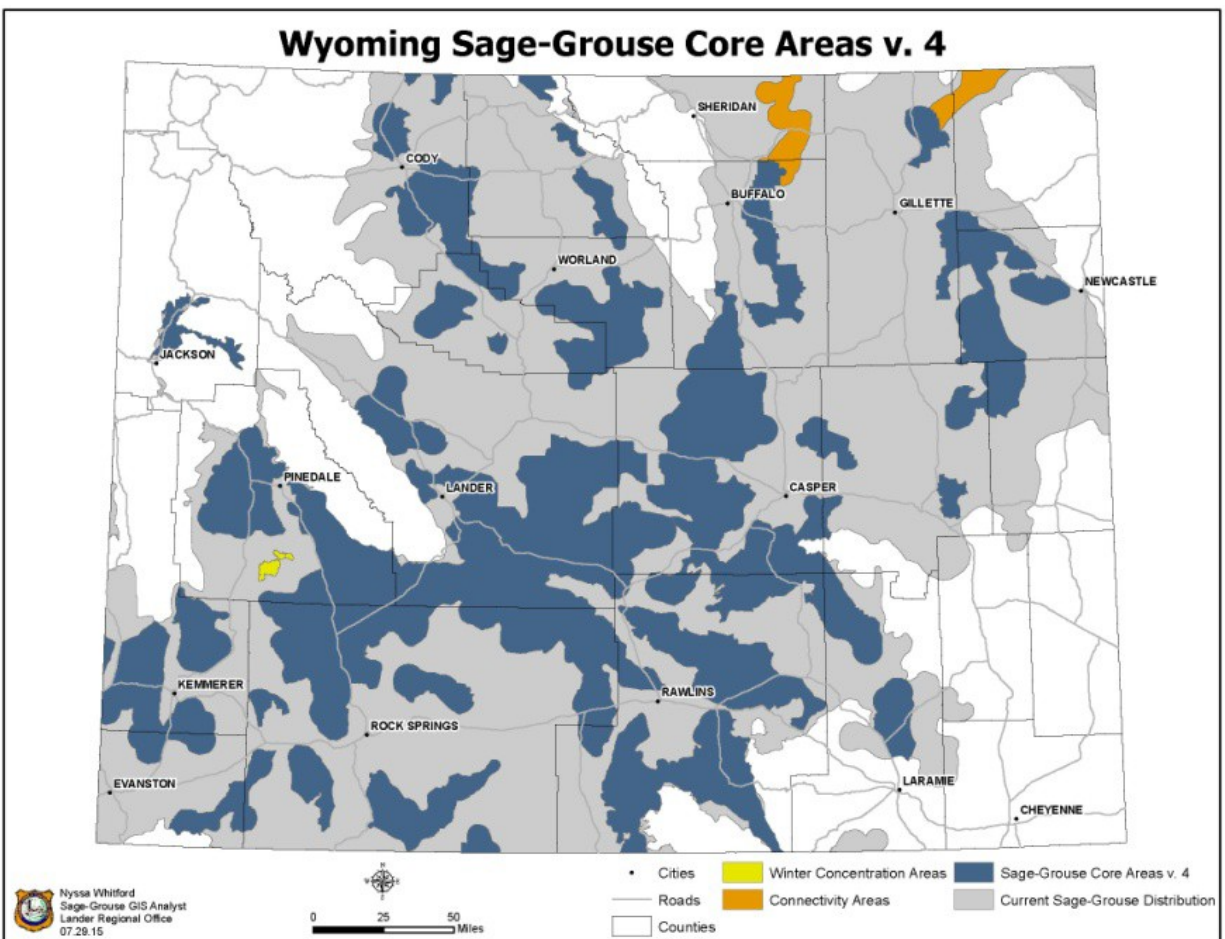


Figure 1. Wyoming Core Areas (version 4).



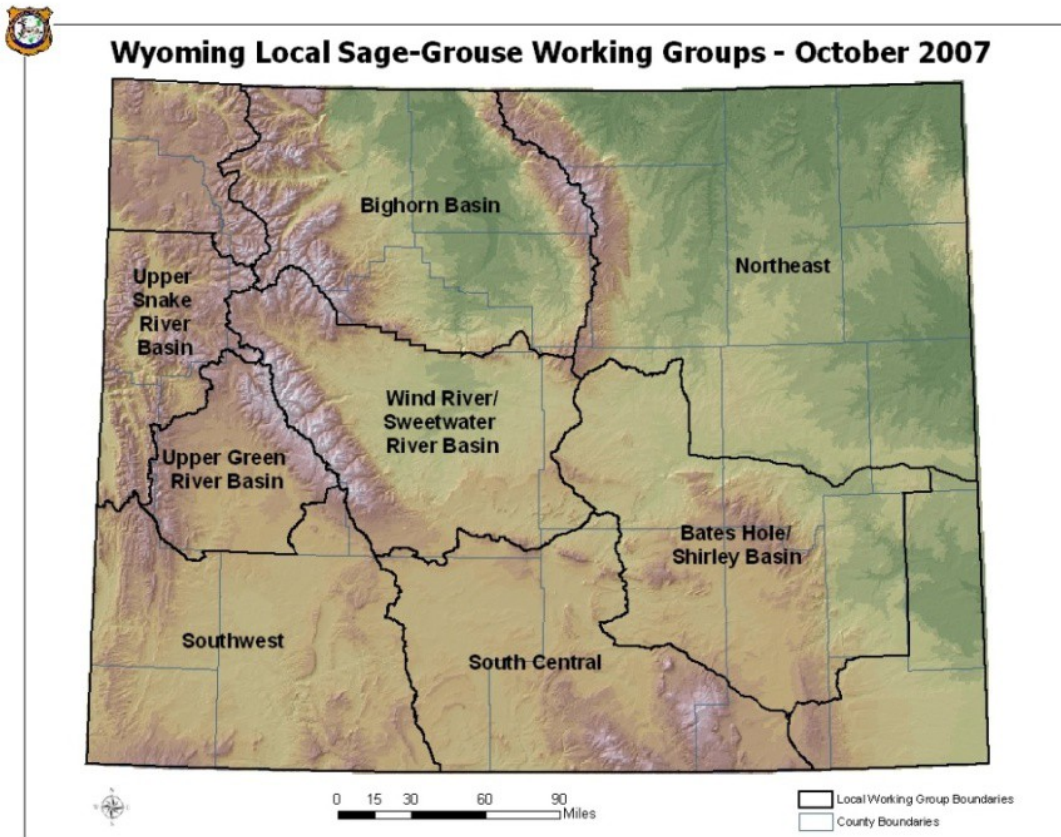


Figure 2. Wyoming Local sage-grouse working group boundaries.

## BACKGROUND

The greater sage-grouse is the largest species of grouse in North America and is second in size only to the wild turkey among all North American game birds. It is appropriately named due to its year-round dependence on sagebrush for both food and cover. Insects and forbs also play an important role in the diet during spring and summer and are critical to the survival of chicks. In general, the sage-grouse is a mobile species, capable of movements greater than 50 km between seasonal ranges. Radio telemetry studies conducted in Wyoming have demonstrated that individuals or sub-populations within most sage-grouse populations in the state are migratory to varying extent. Despite this mobility, sage-grouse appear to display substantial amounts of fidelity to seasonal ranges. Sage-grouse populations are characterized by relatively low productivity and high survival. This strategy is contrary to other game birds such as pheasants that exhibit high productivity and low annual survival. These differences in life history strategy have consequences for harvest and habitat management.

Greater sage-grouse once occupied parts of 12 states within the western United States and 3 Canadian provinces (Figure 3). Populations of greater sage-grouse have undergone long-term population declines. The sagebrush habitats on which sage-grouse depend

have experienced extensive alteration and loss. Consequently, concerns rose for the conservation and management of greater sage-grouse and their habitats resulting in petitions to list greater sage-grouse under the Endangered Species Act. Due to the significance of this species in Wyoming, meaningful data collection, analysis and management is necessary whether or not the species is a federally listed species.

Sage-grouse are relatively common throughout Wyoming, especially southwest and central Wyoming, because sage-grouse habitat remains relatively intact compared to other states (Figures 3 and 4). However, available data sets and anecdotal accounts indicate long-term declines in Wyoming sage-grouse populations over the last six decades.

Past management of sage-grouse in Wyoming has included:

- Population monitoring via lek counts and surveys, harvest statistics, and data derived from wing collections from harvested birds. Lek counts and surveys have been conducted in Wyoming since 1949.
- The protection of lek sites and nesting habitat on BLM lands by restricting activities within ¼ mile of a sage-grouse lek and restricting the timing of activities within a 2-mile radius of leks. The Core Area Strategy (CAS – described below) has expanded and strengthened these protections in core areas.
- The authorization and enforcement of hunting regulations.
- Habitat manipulations, including water development.
- Conducting and/or permitting applied research.

Prior to 2004, Job Completion Reports (JCRs) for greater sage-grouse in Wyoming were completed at the WGFD Regional or management area level. In 2003, the WGF Commission approved the Wyoming Greater Sage-Grouse Conservation Plan (State Plan) and a Sage-Grouse Program Coordinator position was created within the WGFD. The State Plan directed local conservation planning efforts to commence. In order to support the conservation planning efforts, JCRs across the State changed from reporting by Wyoming Game & Fish Dept. regional boundaries to those of the eight planning area boundaries (Figure 2). The 2004 JCR reviewed and summarized prior years' data in order to provide a historical perspective since that document was the first statewide JCR in memory. Additionally, Patterson (1952) provides an invaluable reference for sage-grouse, not only in Wyoming, but across the range of the species.

Sage-grouse data collection and research efforts across Wyoming began to increase in the early 1990s due to the increasing concerns for sage-grouse populations and their habitats (Heath et al. 1996, 1997). Monitoring results suggest sage-grouse populations in Wyoming were at their lowest levels ever recorded in the mid-1990s. From 1996-2006 however, the average size of leks increased to levels not seen since the 1970s. From 2006-2013, average lek size declined though not to levels recorded in the mid-1990s. Average lek size increased 112% from 2013 to 2016 but declined 44% from 2016 to 2019 (Figure 5).

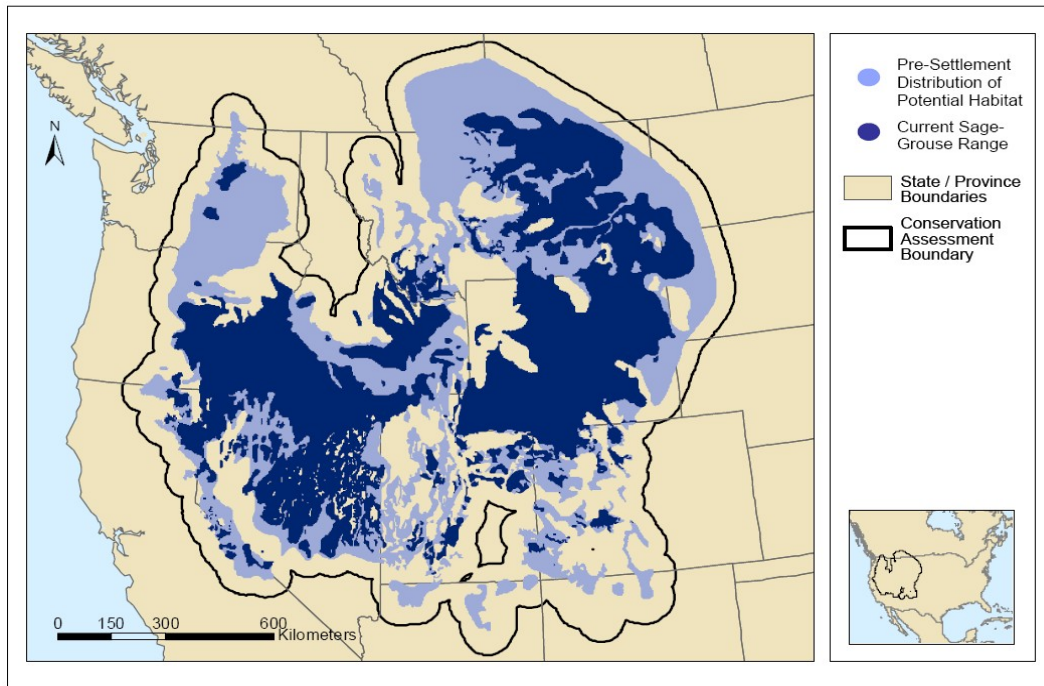


Figure 3. Current distribution of sage-grouse and pre-settlement distribution of potential habitat in North America (Schroeder 2004). For reference, Gunnison sage-grouse in SE Utah and SW Colorado are shown.

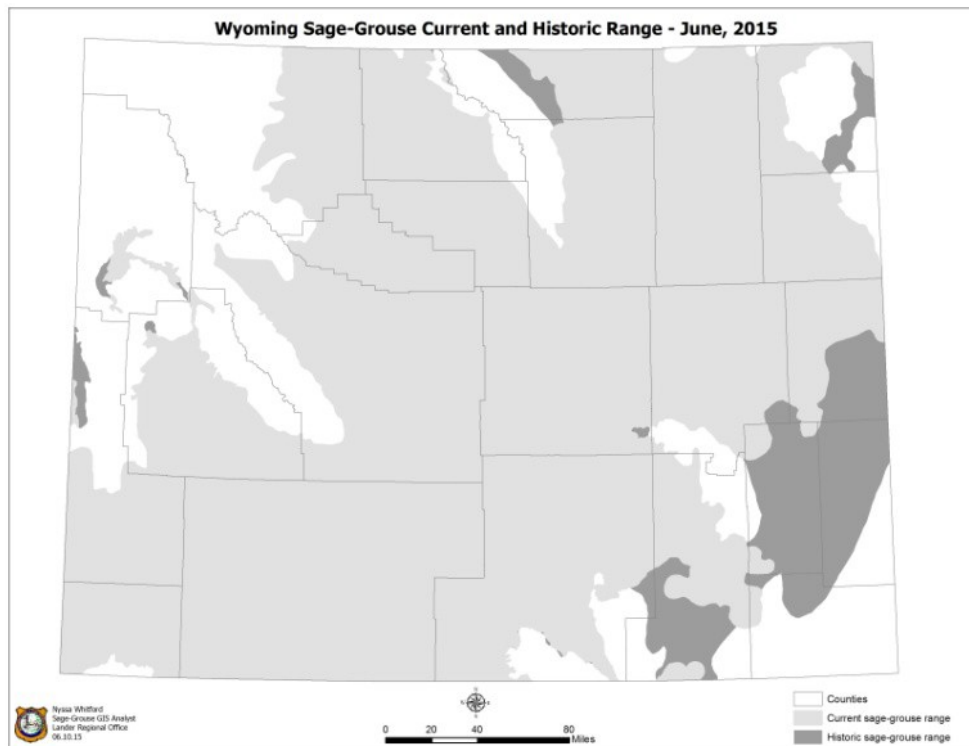


Figure 4. Sage-grouse range in Wyoming (updated 2015).

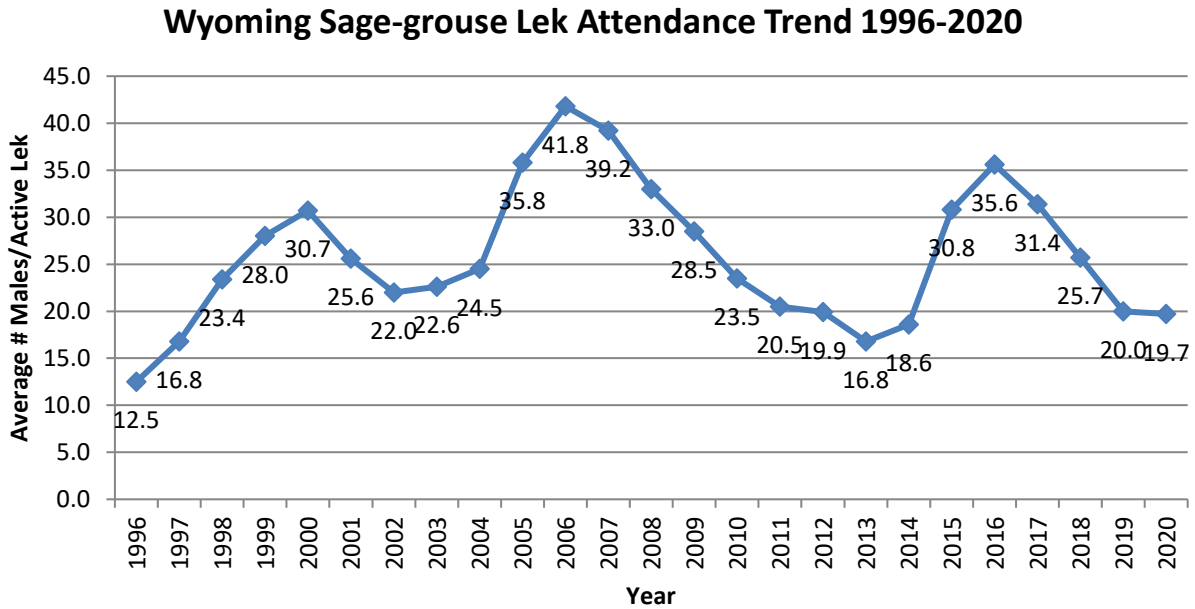


Figure 5. Wyoming Sage-grouse Lek Attendance Trend 1996-2020.

## METHODS

Methods for collecting sage-grouse data are described in the sage-grouse chapter of the WGFD Handbook of Biological Techniques (Christiansen 2012), which is largely based on Connelly et al (2003). The definitions used in lek monitoring are attached (Attachment A).

## RESULTS

### Lek monitoring

While lek counts and surveys have been conducted in Wyoming since 1948, the most consistent statewide data were not collected until the mid-1990s. The number of leks checked in Wyoming has increased markedly since 1949. However, data from the 1950s through the 1970s is unfortunately sparse and by most accounts this is the period when the most dramatic declines of grouse numbers occurred. Some lek survey/count data were collected during this period as the historical reports contain summary tables but the observation data for most individual leks are missing, making comparisons to current information difficult. Concurrent with increased monitoring effort over time, the number of grouse (males) also increased (Figure 6). The increased number of grouse counted was not necessarily a reflection of a population increase; rather it was resultant of increased monitoring efforts.

The average number of males counted/lek decreased through the 1980s and early 90s to an all time low in 1995, but then recovered to a level similar to the late 1970s in 2006 (Figure 7). Again, fluctuations in the number of grouse observed on leks are largely due to

survey effort not to changes in grouse numbers exclusively, but certainly the number of male grouse counted on leks exhibited recovery between 1995 and 2006 as the average size of leks increased and is generally interpreted to reflect an increasing population. The same cannot be said for the 2006-2013 period during which the average number of males observed on leks declined, though not to levels documented in the mid-1990s. From 2013-2016, average lek size increased 112%. In 2020, average lek size declined to an average of 19.5 males/active lek which is 22% lower than the 10-year (2010-2019) average of 24.3 males/active lek. Thus, there has been a long-term decline and short-term cyclic increases and decreases in the statewide sage-grouse population. The short-term trends in statewide populations are believed to be largely weather related. In the late 1990s, and again in 2004-05, timely precipitation resulted in improved habitat conditions allowing greater numbers of sage-grouse to hatch and survive. Drought conditions from 2000-2003 and again later in that decade are believed to have caused lower grouse survival leading to population declines. These trends are valid at the statewide scale. Trends are more varied at the local scale. 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.

Past analyses suggest Wyoming sage-grouse populations are cyclic (Fedy and Doherty 2010, Fedy and Aldridge 2011). While weather and climate undoubtedly influence sage-grouse population cycles, such influences have not been quantified and factors other than weather (predation, parasites) may also play a role. It is important to acknowledge and control for the cyclic nature of sage-grouse when conducting impact studies and monitoring grouse response to management.

Since only “occupied” leks are being reported on Table 1, it is important to consider trends in the numbers of active versus inactive leks in addition to the average size of active leks. During a period of population decline, the size of active leks typically declines and the number of inactive leks increases. The converse is typically true of an increasing population. Therefore the magnitude of both increases and decreases is usually greater than what is indicated by the average lek size alone.

Average female lek attendance is not reported since our data collection techniques are not designed to accurately capture these data and is therefore not a useful figure in assessing population trend.

Lek monitoring data for the 2020 breeding season are summarized in Tables 1a-d and Figures 7-

12. Department personnel and others checked 80% (1,417/1,762) of the known occupied leks in 2020 (Table 1-c). Male attendance at all leks visited (counts and surveys) averaged 19.5 males per lek during spring 2020, a 2.5% decrease from the 20.0 males/lek observed in 2019 and a 53% change below the 41.8 males/lek observed in 2006. For the 10-year period

(2011-2020), average male lek attendance ranged from 16.8 males/lek in 2013, the lowest average males per lek since 1997, to a high of 35.6 males/lek in 2016. The proportion of active, occupied leks dropped from 79.2% in 2019 to 74.6% in 2020.

In 2020, 2,776 fewer male sage-grouse were observed on 137 fewer active leks checked. Cumulatively, the lek attendance data suggest there were fewer grouse in bio-year 2019 than in 2020. It is important to note that the number of leks sampled increased over the 10-year period and the same leks were not checked from year to year. However leks that were checked consistently over the same period demonstrated the same trends except in some local areas as described in the local JCRs.

Small changes in the statistics reported between annual JCRs are due to revisions and/or the submission of data not previously available for entry into the database (late submission of data, discovery of historical data from outside sources, etc). These changes have not been significant on a statewide scale and interpretation of these data has not changed.

While a statistically valid method for estimating population size for sage-grouse has not yet been applied in Wyoming, monitoring male attendance on leks provides a reasonable index of relative change in abundance in response to prevailing environmental conditions over time. However, 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) not all leks have been located, 3) sage-grouse populations cycle, 4) the effects of unlocated or unmonitored leks that have become inactive cannot be quantified or qualified, and 5) lek locations may change over time. Both the number of leks and the number of males attending these leks must be quantified in order to estimate population size.

Five independent analyses have assessed changes in long-term sage-grouse populations at rangewide, statewide, population and sub-population levels in recent years (Connelly et al. 2004, WAFWA 2008, 2015, Garton et al. 2011, Nielson et al. 2015). The trends reflected by these analyses are generally consistent with each other and with that shown in Figure 7. In 2013, WAFWA contracted with the University of Montana to develop better sampling designs and population trend estimators. This contract resulted in the development of a generalized integrated population model to estimate annual abundance from counts of males at breeding leks (McCaffrey and Lukacs 2016). This tool will be further tested and implemented as appropriate in Wyoming.

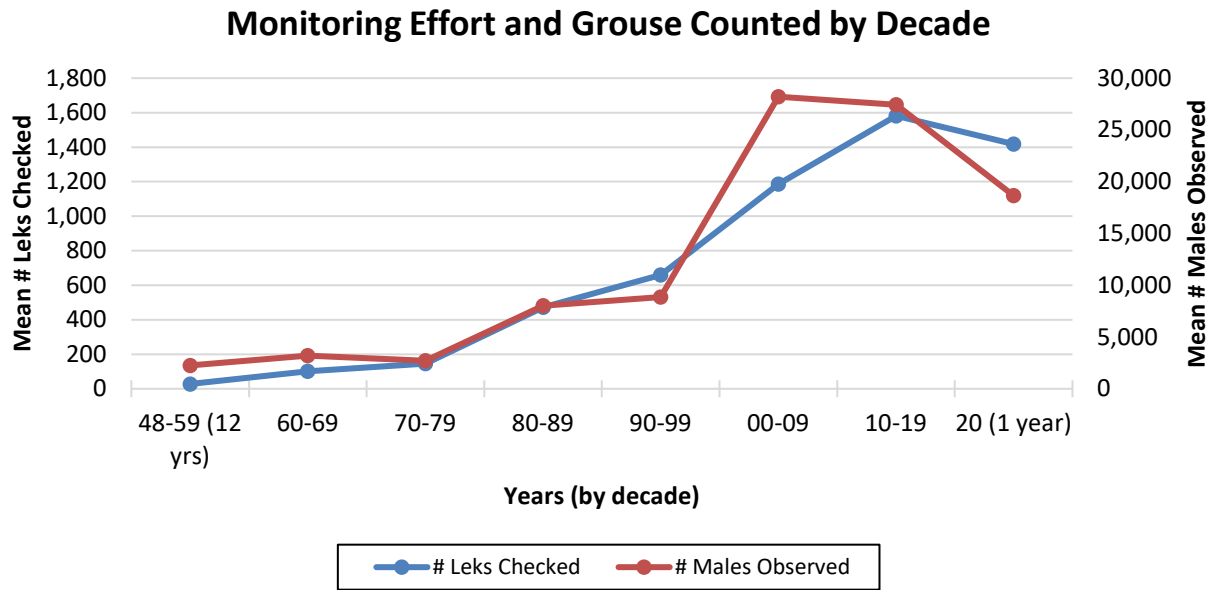


Figure 6. Mean annual numbers of leks checked (monitoring effort) and male grouse counted in Wyoming 1948-2020 by decade.

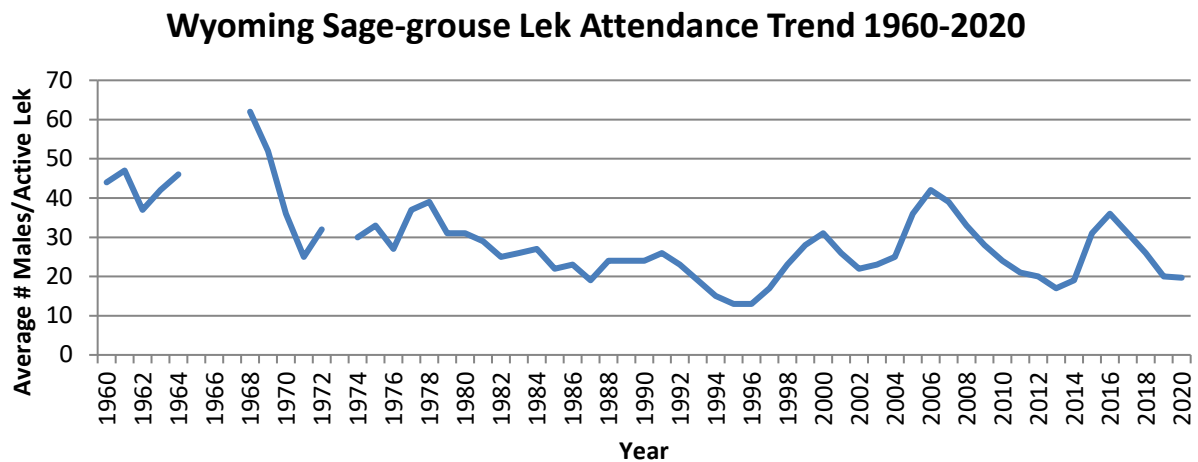


Figure 7. Average number of males per lek counted in Wyoming from 1960-2020 with a minimum of 100 leks checked each year.

**Table 1a. Leks Counted**

Year	Occupied	Counted	Percent Counted	Peak Males	Avg Males / Active Lek (2)
2011	1749	646	37	11308	22.5
2012	1782	715	40	12661	23.0
2013	1794	646	36	10617	20.7
2014	1797	772	43	11466	20.6
2015	1827	742	41	19505	34.2
2016	1843	733	40	23388	40.3
2017	1832	690	38	18701	35.4
2018	1821	801	44	17124	28.2
2019	1799	699	39	11884	21.9
2020	1762	779	44	12286	21.5

**Table 1b. Leks Surveyed**

Year	Occupied	Surveyed	Percent Surveyed	Peak Males	Avg Males / Active Lek (2)
2011	1749	835	48	10143	18.7
2012	1782	821	46	8647	16.7
2013	1794	930	52	7657	13.4
2014	1797	840	47	8604	16.5
2015	1827	882	48	17029	27.7
2016	1843	950	52	19884	31.3
2017	1832	961	52	17893	28.0
2018	1821	810	44	12441	22.8
2019	1799	873	49	9561	18.1
2020	1762	638	36	6383	16.7

**Table 1c. Leks Checked**

Year	Occupied	Checked	Percent Checked	Peak Males	Avg Males / Active Lek (2)
2011	1749	1481	85	21451	20.5
2012	1782	1536	86	21308	19.9
2013	1794	1576	88	18274	16.8
2014	1797	1612	90	20070	18.6
2015	1827	1624	89	36534	30.8
2016	1843	1683	91	43272	35.6
2017	1832	1651	90	36594	31.4
2018	1821	1611	88	29565	25.7
2019	1799	1572	87	21445	20.0
2020	1762	1417	80	18669	19.5

**Table 1d. Lek Status**

Year	Active	Inactive (3)	Unknown	Known Status	Percent Active	Percent Inactive
2011	1080	219	182	1299	83.1	16.9
2012	1120	246	170	1366	82.0	18.0
2013	1116	286	174	1402	79.6	20.4
2014	1105	352	152	1457	75.8	24.2
2015	1216	275	133	1491	81.6	18.4
2016	1260	276	147	1536	82.0	18.0
2017	1205	305	141	1510	79.8	20.2
2018	1179	303	129	1482	79.6	20.4
2019	1134	301	137	1435	79.0	21.0
2020	997	339	81	1336	74.6	25.4

<sup>1)</sup> Occupied - Active during previous 10 years (see official definitions)

<sup>2)</sup> Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented

<sup>3)</sup> Inactive - Confirmed no birds/sign present (see official definitions)



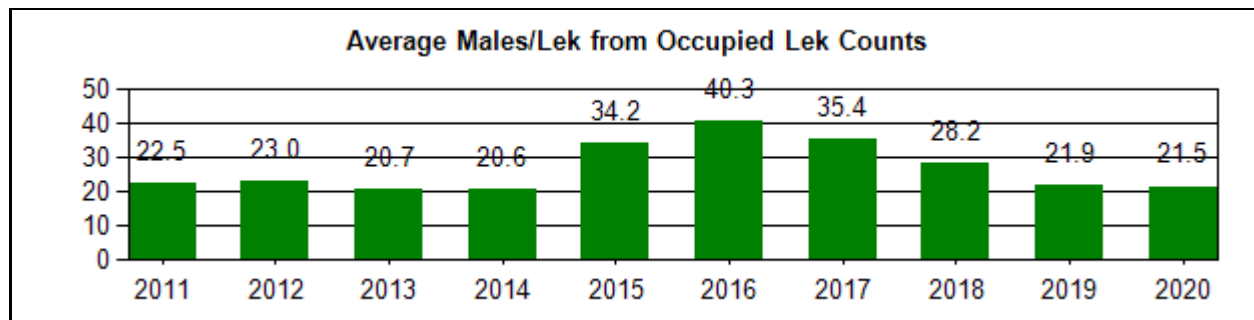


Figure 8. Average males/lek from occupied lek counts.

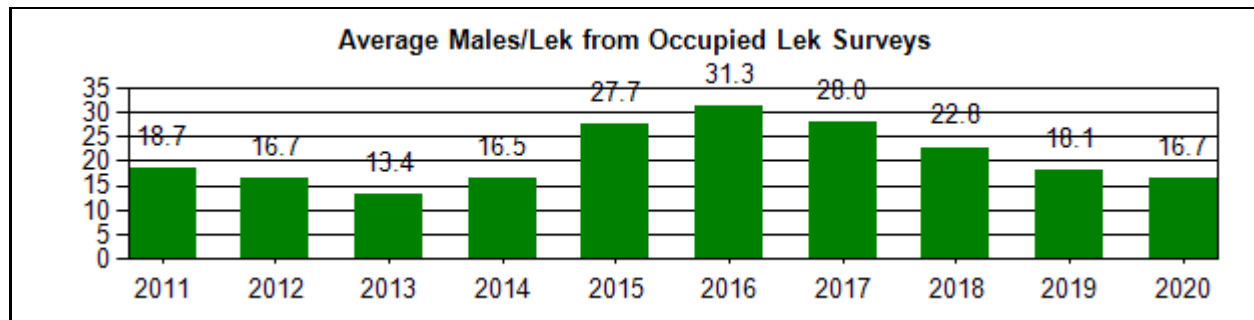


Figure 9. Average males/lek from occupied lek surveys.

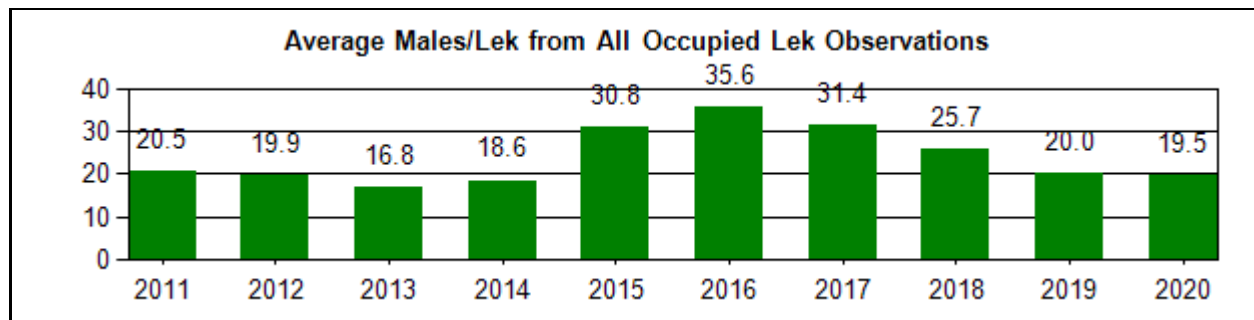


Figure 10. Average males/lek from all occupied leks checked (counts+surveys).

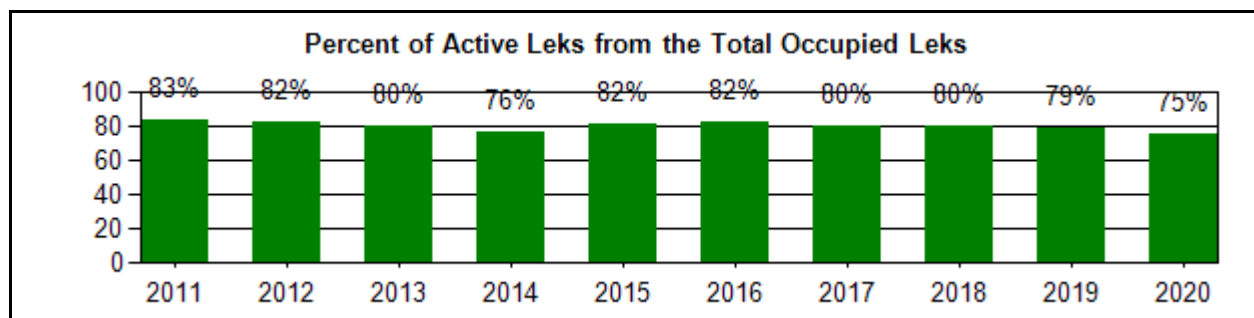


Figure 11. Percent active leks from the occupied leks checked with known status.

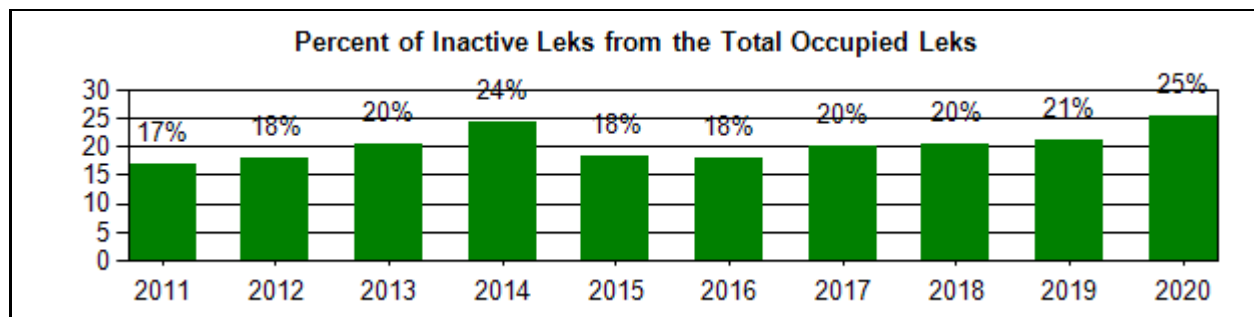
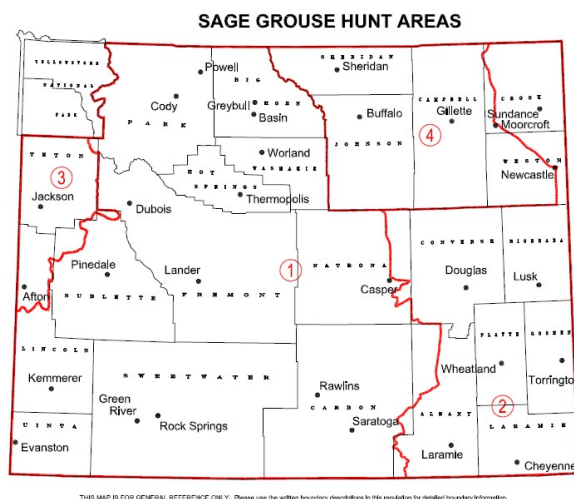


Figure 12. Percent inactive leks from the occupied leks checked with known status.

## Hunting season and harvest

As a result of concerns about the issue of hunting and its impact to sage-grouse, a white paper was prepared in 2008 then revised in 2010 (Christiansen 2010), presented to the WGF Commission and distributed through the WGF web page. The science and public policy basis for managing sage-grouse harvest in Wyoming are covered in detail within that document. Similarly, the Western Association of Fish and Wildlife Agency directors adopted a policy statement on the topic in the summer of 2010 (Attachment D in Christiansen 2010).

The 2019 hunting season (Figure 13, Table 2) for most of the state (Area 1) was 6 days shorter than 2018 due to the calendar effect of opening the season on the third Saturday of September. In 2018 the third Saturday was September 15, but in 2019 it was September 21.



Area	Season Dates	Daily/Poss. Limits	Falconry
1	Sept. 21-Sept. 30	2/4	Sept. 1-Mar. 1
2, 3	Closed	Closed	Closed
4	Sept. 21-Sept. 23	2/4	Sept. 1-Mar. 1

Figure 13 and Table 2. 2019 sage-grouse hunting season map and regulations.

Hunting seasons and harvest in Wyoming are shown in Tables 3a-b. Due to concerns over low populations, the statewide hunting season was shortened and the daily bag limit decreased to two sage-grouse in 2002 and has remained very conservative since that time. Two areas, eastern Wyoming and the Snake River Drainage in northwest Wyoming are closed to sage-grouse hunting (Figure 13).

Delaying and shortening the season and decreasing the bag limit dramatically decreased the numbers of sage-grouse hunters and their harvest. Hunters were also sensitive to the plight of grouse populations and did not take the opportunity to hunt sage-grouse as much as they had in the past. The data presented in Table 3b and Figures 14-17 indicate hunter

numbers and harvest decreased between 2018 (5,035 hunters/10,422 birds) and 2019 (4,229 hunters/7,615 birds). The number of birds harvested is estimated from a voluntary hunter survey.

**Tables 3 a-b. Sage Grouse Hunting Seasons and Harvest Data**

Year	Season Start	Season End	Length	Bag/Possession Limit
2010-1	Sep-18	Sep-30	13	2/4
2010-4	Sep-18	Sep-20	3	2/4
2011-1	Sep-17	Sep-30	14	2/4
2011-4	Sep-17	Sep-19	3	2/4
2012-1	Sep-15	Sep-30	16	2/4
2012-4	Sep-15	Sep-17	3	2/4
2013-1	Sep-21	Sep-30	10	2/4
2013-4	Sep-21	Sep-23	3	2/4
2014-1	Sep-20	Sep-30	11	2/4
2014-4	Sep-20	Sep-22	3	2/4
2015-1	Sep-19	Sep-30	12	2/4
2015-4	Sep-19	Sep-21	3	2/4
2016-1	Sep-17	Sep-30	14	2/4
2016-4	Sep-17	Sep-19	3	2/4
2017-1	Sep-16	Sep-30	15	2/4
2017-4	Sep-16	Sep-18	3	2/4
2018-1	Sep-15	Sep-30	16	2/4
2018-4	Sep-15	Sep-17	3	2/4
2019-1	Sep-21	Sep-30	10	2/4
2019-4	Sep-21	Sep-23	3	2/4

Year	Harvest	Hunters	Days	Birds/ Day	Birds/ Hunter	Days/ Hunter
2010	11057	4732	11434	1.0	2.3	2.4
2011	10290	4568	11186	0.9	2.3	2.4
2012	9869	4700	11342	0.9	2.1	2.4
2013	5726	3383	7672	0.7	1.7	2.3
2014	7094	3526	8642	0.8	2.0	2.5
2015	10498	4299	10231	1.0	2.4	2.4
2016	10526	4674	11476	0.9	2.3	2.5
2017	7817	3576	8646	0.9	2.2	2.4
2018	10422	5035	13092	0.8	2.1	2.6
2019	7615	4229	9473	0.8	1.8	2.2
Avg	9,091	4,272	10,319	0.9	2.1	2.4

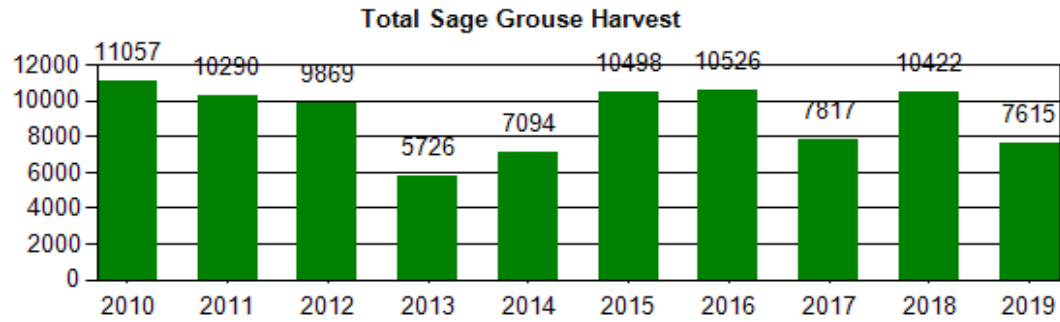


Figure 14. Wyoming statewide sage-grouse harvest 2010-2019.

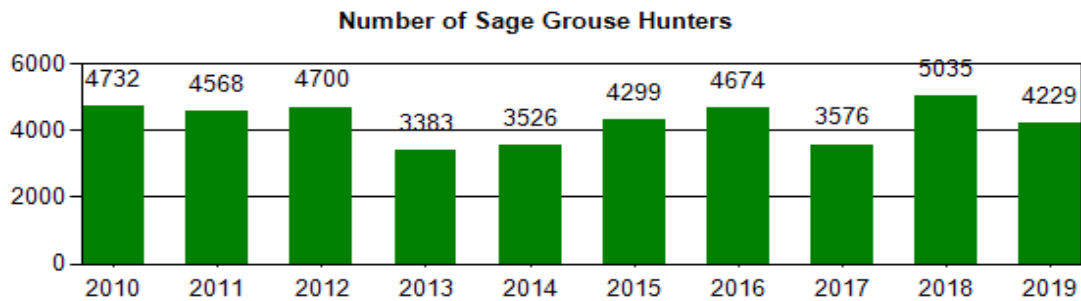


Figure 15. Wyoming statewide sage-grouse hunter numbers 2010-2019.

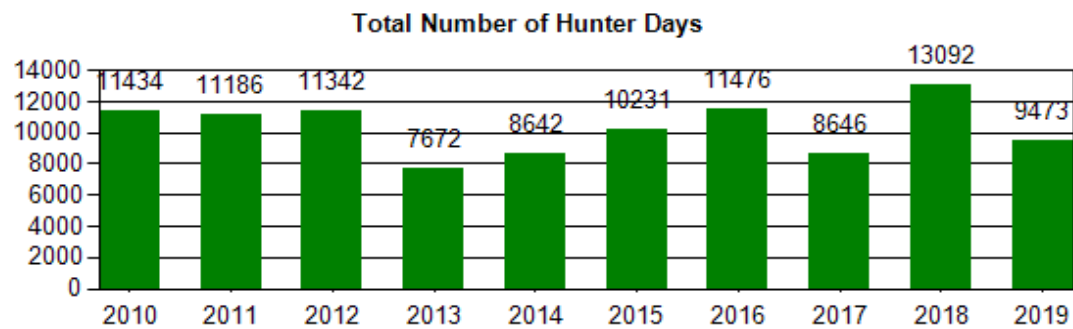


Figure 16. Wyoming statewide number of hunter days 2010-2019.

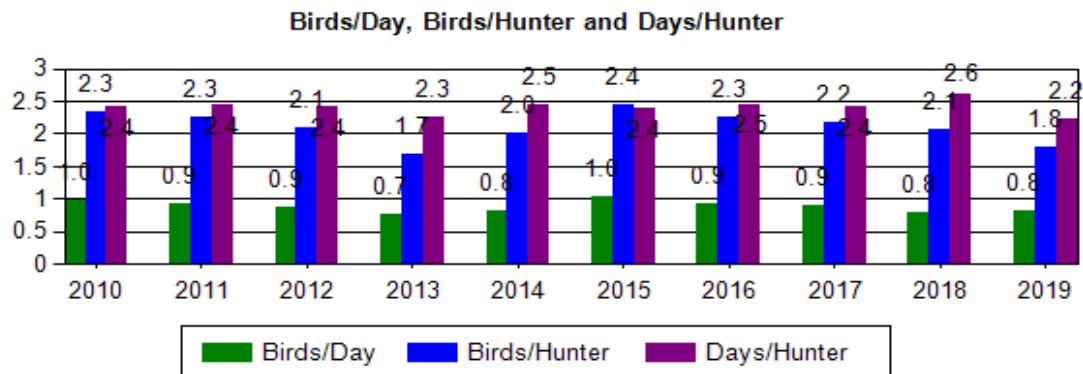


Figure 17. Wyoming statewide birds/day, birds/hunter and days/hunter 2010-2019.

The number of sage-grouse wings collected from hunters decreased by 26% in 2019. In 2019, 1,631 wings were recorded (Table 4), which is 21% of the estimated harvest. This is nearly equal to the 10-year average of 20% with most changes between years being minor.

The 2019 chick:hen ratio (based on harvested wing analysis) was 1.1 chicks per hen (Table 4 and Figure 17). This level of productivity is typically associated with a declining population. This is consistent with the 2020 lek data (all lek checks), which indicated a 2.5% decrease in the average numbers of males on leks (Figure 5). When 1997-2019 data are pooled, average male lek attendance declined an average of 12% when chick:hen ratios the previous fall were less than 1.4:1, were closer to 0% change (-6%) when chick:hen ratios the previous fall were 1.4 to 1.6:1 and increased an average of 32% when chick:hens ratios were 1.7:1 or higher. Additional data are required to strengthen the statistical basis of these analyses.

Prior to 1997, wing analysis results may be questioned in some parts of the state since most personnel were not well trained in techniques.

**Table 4. Composition of Harvest by Wing Analysis**

Year	Sample Size	Percent Adult		Percent Yearling		Percent Young		Chicks/Hens
		Male	Female	Male	Female	Male	Female	
2010	2169	10.1	39.8	2.6	5.9	11.2	16.6	0.9
2011	2425	8.9	31.2	4.0	5.6	21.3	29.0	1.4
2012	1938	13.4	36.6	4.5	8.8	15.5	21.2	0.8
2013	1258	12.0	35.8	2.3	6.5	18.8	24.4	1.0
2014	1533	9.5	23.9	2.5	7.8	28.8	27.5	1.8
2015	2300	12.7	25.8	3.6	5.4	24.8	27.7	1.7
2016	2097	16.9	33.0	4.5	7.6	16.7	21.2	0.9
2017	2047	13.8	31.7	3.3	6.0	20.7	24.6	1.2
2018	2112	14.2	32.4	6.2	11.3	13.9	22.0	0.8
2019	1631	10.4	31.5	3.2	9.7	14.9	30.3	1.1

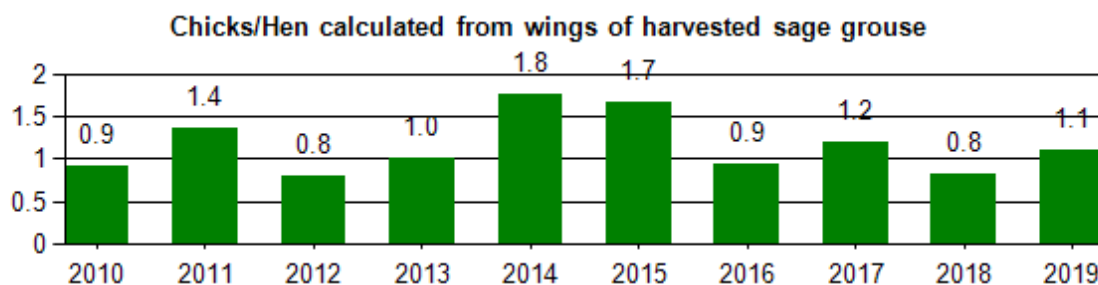


Figure 17. Chicks/Hen 2010-2019 based on wings from harvested grouse.

Table 5. Potential influence of chick production, based on wings from harvested birds, on population trend as measured by male lek attendance.

Year	Chicks:Hen (based on wings from harvested birds)	Change in male lek attendance the following spring
1997	1.9	+36%
1998	2.4	+21%
1999	1.8	+13%
2000	1.1	-20%
2001	1.6	-15%
2002	1.6	+3%
2003	1.5	+4%
2004	2.4	+57%
2005	2.0	+17%
2006	1.2	-5%
2007	0.8	-16%
2008	1.5	-16%
2009	1.1	-21%
2010	0.9	-13%
2011	1.4	-7%
2012	0.8	-16%
2013	1.0	+11%
2014	1.8	+66%
2015	1.7	+16%
2016	0.9	-11%
2017	1.2	-18%
2018	0.8	-21%
2019	1.1	-2.5%

### **Weather and Habitat**

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

Weather and climate have been linked to sage-grouse population trends (Heath et al. 1997, Blomberg et al 2014a/b, Caudill et al. 2014). Most of the Local Conservation Planning Area JCRs include sections on weather and sage-grouse relationships. In general, spring precipitation is positively linked to chick:hen ratios, which are in turn, linked to the following year's lek counts of males. However, periods of prolonged cold, wet weather may have adverse effects on hatching success, plant and insect phenology and production and chick survival. Untimely late snow storms in May and early June of 2009, 2010, and 2016 likely contributed to reduced nesting success and chick survival. Efforts to

quantify/qualify these effects in a predictable fashion over meaningful scales have largely failed.

Calendar year 2012 was the hottest, driest year documented in Wyoming since record keeping began 118 years previous (NOAA 2012). The lack of spring moisture in 2012 meant little production of important food plants and insects, therefore lower chick survival and more birds than usual were likely forced to move to either higher elevation or irrigated meadows and stream courses.

### **Habitat and seasonal range mapping.**

While we believe that most of the currently occupied leks in Wyoming have been documented, other seasonal habitats such as nesting/early brood-rearing and winter concentration areas have not been identified. Efforts to map seasonal ranges for sage-grouse will continue by utilizing winter observation flights and the on-going land cover mapping efforts of the USGS (Fedy et al. 2014), BLM, WGFD, the Wyoming Geographic Information Science Center (WYGISC) of the University of Wyoming and others.

## **CONSERVATION STRATEGIES**

### **Governor's Core Area Strategy (CAS) and Executive Order**

Management of greater sage-grouse habitat in Wyoming is based on a "core area" strategy of limiting human disturbance in the most important sage-grouse habitats. This strategy is codified by a Governor's executive order. The Executive Order and related materials are available at: <https://wgfd.wyo.gov/Habitat/Sage-Grouse-Management>

The Core Area Strategy is being implemented across the state under the guidance of a state/federal interagency team of specialists (Sage-grouse Implementation Team; SGIT) who meet on a regular basis to discuss issues related to implementation of the strategy. A key component of the strategy's implementation is the Density and Disturbance Calculation Tool (DDCT). This tool was developed by agency GIS specialists as an interactive, on-line application through the University of Wyoming's Geographic Information and Science Center. Training sessions are provided to industry and agency staff required to use the DDCT.

### **Conservation Planning**

In 2000, the WGFD formed a citizen/agency working group for the purpose of developing a statewide strategy for conservation of sage-grouse in Wyoming. The working group completed its task and in 2003 The Wyoming Greater Sage-Grouse Conservation Plan (WGFD 2003) was approved by the Wyoming Game and Fish Commission. The State Plan was largely reliant on implementation by local working groups. The state's eight LWGs all submitted final conservation plans between 2006 and 2008. In 2012, the local working

groups began the process of updating their plans with current information to make them consistent with the Wyoming Core Area Strategy, address the Service's 2010 listing decision and incorporate new science. The updated plans were presented to the Wyoming Game and Fish Commission in March 2014.

From 2005-2017, Local Working Groups were allocated approximately \$6.3 million to support implementation of local sage-grouse conservation projects. The source of this funding was the State of Wyoming General Fund as requested by the Governor and approved by the legislature. The 2016 Legislature appropriated another \$1.1 million for the 2017-18 biennium. Allocation of these funds began July 1, 2016. Subsequently, the 2017 legislature returned budget responsibility of the sage-grouse program back to the Department due to state budget shortfalls. This action shifted the funding burden from the state as a whole, based largely on mineral severance taxes, to hunters and anglers, the primary funding source of the WGFD. A hunting license fee increase specifically crafted to replace legislative funding was approved by the legislature and LWGs will maintain their existing role in recommending how funds will be allocated. The Wyoming Game and Fish Commission has allocated \$548,000 annually since FY2019 to fund local working group projects.

During Fiscal Year 2020, twenty-six (26) projects (Attachment B) were funded. Most of the projects are supported by multiple cost-sharing partners. Cumulatively, two-hundred-sixty-nine (269) projects have been approved since 2005. Projects include habitat treatments/restoration, improved range management infrastructure and grazing management plans, applied research, inventories, monitoring and public outreach.

## **OTHER ISSUES**

### **Wyoming to North Dakota Translocation Project**

In the spring of 2020 at the Bowman County, North Dakota study site, Utah State University (USU) researchers were actively monitoring  $n = 4$  males that were captured and translocated in 2019,  $n = 2$  females captured and translocated in 2018 ( $n = 1$  GPS PTT and  $n = 1$  VHF),  $n = 4$  GPS PTT females captured and translocated in 2019, and  $n = 2$  yearling males from the 2019 chicks that were recaptured and marked with adult VHF transmitters at 65 days old. USU added via translocation in 2020  $n = 19$  brood females marked with GPS PTT radios. One additional brood female was trapped but died due to capture myopathy. USU translocated 20 broods ( $n = 108$  chicks) with the brood hens. USU marked each chick with 1.3 g VHF transmitters. Broods were released at multiple locations in Bowman County based on available brood habitat (big sagebrush grasslands). Of the 108 chicks translocated in 2020, USU confirmed: 38 (35%) survived to  $> 50$  days (approximate age when chicks can survive independently), and 64 chicks (59%) died prior to 50 days. Six chicks were not able to be relocated after release. Of the 19 broods translocated to the Bowman County study site,



chicks from 15 broods survived to post 50 days and were still alive when researchers left in early August 2020. Due to COVID-19 restrictions during the spring of 2020, we did not translocate 20 males as planned (males are captured during the mating season and captures involve larger crews). At the end of the 2020 field season (August), in the Stewart Creek study area USU confirmed 18/25 (72%) marked females were still alive, including 4 broods. At the end of the 2020 field season in the Bowman County study site 4/20 (20%) males from the 2019 release were still alive, 2/40 (5%) yearlings translocated as chicks in 2019 were still alive (both males), 2/19 (11%) GPS PTT females from the 2019 release. The last two marked females from 2018 translocations went missing, likely due to radio failure. Additionally, 14/19 (73%) females and 38/108 (35%) chicks from the 2020 brood translocations were still alive.

Over the 4 years of this translocation project, initial thoughts by field managers are 1) translocations have had a positive impact for ND and little, if any, impacts to WY, but 2) translocations would need to occur on a longer time scale to ensure that translocations coincide with a rare “good” year, climate-wise and 3) brood translocations were the best hope and had the shortest dispersals and shortest time spent exploring the new habitat before settling into a localized behavior state; however 4) since hens did not explore when translocated with a brood, choosing a high-quality brood-rearing site is critical.

### **Sage-grouse Bird Farm Legislation**

The 2017 state legislature passed a bill allowing private bird farm operations to collect sage-grouse eggs from the wild for purposes of establishing a captive flock. The Department and Commission promulgated regulations in Chapter 60 to permit this activity. One permit was issued to a facility in January 2019 and again in January 2020. The permittee searched for eggs in 2020 using dogs and a drone equipped with an infrared camera. However, the permittee did not collect sage-grouse eggs from the wild in 2019 or 2020.

### **West Nile Virus**

West Nile virus (WNV) was first confirmed in sage-grouse in 2003 in the northern Powder River Basin and is considered a *potential* threat to sage-grouse populations. Research efforts have resulted in several published papers and theses that describe the disease and its potential impact to sage-grouse populations (Walker and Naugle 2011 and references therein).

Monitoring efforts in 2019 again included: 1) intensive monitoring of radio-collared sage-grouse during the late summer on study sites across Wyoming, 2) WGF field personnel were directed to collect late summer sage-grouse mortalities and submit them for testing, and 3) press releases were distributed requesting the general public, especially landowners, to report late summer sage-grouse mortalities. No West Nile virus mortality was documented during this reporting period.

### **Energy Development**

The issue of energy development and its effects to sage-grouse and sagebrush habitats continues to be a major one in many portions of the state. The topic is of major interest in Local Working Group efforts and the JCRs for the local conservation areas contain additional detail on the issue. Research efforts continue on oil and gas development impacts. One area of research need identified during the 2015 Core Area Strategy revision is identifying natural gas development impact thresholds relative to sage-grouse winter concentration areas. That topic is being pursued by the SGIT. Research relative to wind energy development also continues. The results of these research efforts inform and guide management actions associated with the Wyoming Core Area Strategy.

## **RESEARCH AND PUBLICATIONS**

See Attachment C for a compilation of current sage-grouse research being conducted in Wyoming. Attachment D is a listing of Wyoming-based research reports and peer-reviewed publications to date.

## **MANAGEMENT RECOMMENDATIONS**

- 1) Implement Wyoming Governor's Sage-Grouse Executive Order and Core Area Strategy.
- 2) Continue to implement local conservation plans in all 8 planning areas.
- 3) Test the sage-grouse population model developed by Paul Lukacs at the University of Montana in cooperation with USFWS and WAFWA.
- 4) Continue to refine and de-bug the sage-grouse database and Job Completion Report intranet program.
- 5) Continue to map lek perimeters and integrate these data into the WGF lek database. Priority for this effort should be based on the lek size of lek and impending development actions that may impact leks.
- 6) Personnel monitoring leks should review and consistently follow established lek monitoring protocol each year.
- 7) Map seasonal habitats (nesting/early brood rearing, winter concentration areas) for sage- grouse using data from the on-going land cover mapping project and sage-grouse observations.
- 8) Regulate and enforce the sage-grouse bird farm law (House Enrolled Act No. 91 of the 64<sup>th</sup> Legislature of the State of Wyoming) in a manner that is compliant with the intent of the law and protects wild populations of sage-grouse to the extent possible. Monitor and document the outcomes and implications of the law and regulations and report results to policy makers and the public.

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**Attachment A:**  
**Wyoming Sage-Grouse Lek Definitions:**  
(Revised November 2012)

The following definitions have been adopted for the purposes of collecting and reporting sage-grouse lek data. See the sage-grouse chapter of the Wyoming Game and Fish Department's Handbook of Biological Techniques for additional technical details and methods.

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

**Satellite Lek** – A relatively small lek (usually less than 15 males) within about 500 meters of a large lek often documented during years of relatively high grouse numbers. Locations of satellite leks should be encompassed within lek perimeter boundaries. Birds counted on satellite leks should be added to those counted on the primary lek for reporting purposes.

**Lek Perimeter** – The outer perimeter of a lek and associated satellite leks (if present). Perimeters of all leks should be mapped by experienced observers using accepted protocols (Section 1.b.v below); larger leks should receive higher priority. Perimeters may vary over time as population levels or habitat and weather conditions fluctuate. However, mapped perimeters should not be adjusted unless grouse use consistently (2+ years) demonstrates the existing perimeter is inaccurate. The lek location must be identified and recorded as a specific point **within** the lek perimeter. This point may be the geographic center of the perimeter polygon calculated through a GIS exercise, or a GPS waypoint recorded in the field, which represents the center of breeding activity typically observed on the lek.

**Lek Complex** - A cluster of leks within 2.5 km (1.5 mi) of each other, between which male sage-grouse may interchange from day to day.

**Lek Count** - A census technique that documents the number of male sage-grouse observed attending a particular lek, lek complex, or leks along a lek route based on repeated observation.

- Conduct lek counts at 7-10 day intervals over a 3-4 week period after the peak of mating activity. Although mating typically peaks in early April in Wyoming, the number of males counted on a lek is usually greatest in late April or early May when attendance by yearling males increases.
- Conduct lek counts only from the ground. Aerial counts are not accurate and are not comparable to ground counts.

- Conduct counts from ½ hour before sunrise to 1 hour after.
- Count attendance at each lek a minimum of three times annually during the breeding season.
- Conduct counts only when wind speeds are less than 15 kph (~10 mph) and no precipitation is falling.
- All leks within a complex should be counted on the same morning.

**Lek Count Route** – A lek route is a group of leks in relatively close proximity that represent part or all of a discrete breeding population/sub-population. Leks should be counted on routes to facilitate replication by other observers, increase the likelihood of recording satellite leks, and account for shifts in distribution of breeding birds. Lek routes should be set up so an observer following criteria described under “Lek Count” can count all leks within 1.5 hours.

**Lek Survey** - A monitoring technique designed primarily to determine whether leks are active or inactive. Obtaining accurate counts of males attending is secondary.

- Ideally, all sage-grouse leks would be counted annually. However, some breeding habitat is inaccessible during spring because of mud and snow, or the location of a lek is so remote it cannot be routinely counted. In other situations, topography or vegetation may prevent an accurate count from any vantage point. In addition, time and budget constraints often limit the number of leks that can be visited. Where lek counts are not feasible for any of these reasons, surveys are the only reliable means to monitor population trends. Lek surveys are designed principally to determine whether leks are active or inactive, requiring as few as one visit to a lek. Obtaining accurate counts of the numbers of males attending is not essential. Lek surveys involve substantially less effort and time than lek counts. They can also be done from a fixed-wing aircraft or helicopter. Lek surveys can be conducted from the initiation of strutting in early March until early-mid May, depending on the site and spring weather. When large numbers of leks are surveyed (50+) the resulting trends of lek attendance over time mirror that of lek counts.

**Annual status** – Lek status is assessed annually based on the following definitions:

- **active** – Any lek that has been attended by male sage-grouse during the strutting season. Acceptable documentation of grouse presence includes observation of birds using the site or signs of strutting activity.
- **inactive** – Any lek where sufficient data indicates no strutting activity took place throughout a strutting season. Absence of strutting grouse during a single visit is not sufficient documentation to establish a lek is inactive. This designation requires documentation no birds were present on the lek during at least 2 ground surveys separated by at least 7 days. The surveys must be conducted under ideal conditions (site visits between April 1 and May 7, no precipitation, light or no wind, ½ hour before to 1 hour after sunrise) or a ground check of the exact lek location late in the strutting season (after 4/15) during which sign (droppings/feathers) of strutting

activity is not found. Data collected by aerial surveys cannot be used to designate inactive status.

- **unknown** – Leks for which active/inactive status has not been documented during the course of a strutting season. Excepting leks not scheduled to be checked in a particular year, the “unknown” status designation should be applied only in rare instances. Each lek should be checked enough times to determine whether it is active or not. It is preferable to conduct two good field checks every other year and confirm the lek is “inactive” rather than check it once every year and have it remain in “unknown” status.

**Management status** - Based on its annual status, a lek is assigned to one of the following categories for management purposes:

- **occupied lek** – A lek that has been active during at least one strutting season within the prior ten years. Occupied leks are protected through prescribed management actions during surface disturbing activities.
- **unoccupied lek** – Two classifications of unoccupied leks are “destroyed” and “abandoned” (defined below). Unoccupied leks are not protected during surface disturbing activities.
  - **destroyed lek** – A formerly active lek site and surrounding sagebrush habitat that has been destroyed and is no longer suitable for sage grouse breeding. A lek site that has been strip-mined, paved, converted to cropland or undergone other long-term habitat type conversion is considered destroyed. Destroyed leks are not monitored unless the site has been reclaimed to suitable sage-grouse habitat.
  - **abandoned lek** – A lek in otherwise suitable habitat that has not been active during a period of 10 consecutive years. To be designated abandoned, a lek must be “inactive” (see above criteria) in at least four non-consecutive strutting seasons spanning the ten years. The site of an “abandoned” lek should be surveyed at least once every ten years to determine whether it has been reoccupied by sage-grouse.
- **undetermined lek** – Any lek that has not been documented as active in the last ten years, but survey information is insufficient to designate the lek as unoccupied. Undetermined lek sites are not protected through prescribed management actions during surface disturbing activities until sufficient documentation is obtained to confirm the lek is occupied. This status should be applied only in rare instances (also see “unknown” above).



## Attachment B: Wyoming sage-grouse projects funded by Wyoming Game & Fish Commission in FY2020

Project Name	Fiscal Year	Local Working Group	Total Cost	SG \$	Project Description	Partners	Status
244-Devil's Slide Green Strip Maintenance Herbicide	2020	Bighorn Basin	\$6,000	\$3,000 approved/spent	Decrease seedcrop of annual bromes to maintain a firebreak	BLM	Complete
245- Effect of Livestock, Predators, and Habitat on Sage-grouse Demography	2020	Bighorn Basin	\$387,587	\$51,000 approved/spent	Research on the interactive effects of rotational livestock grazing, predator presence, and habitat on sage-grouse demography	BLM Cody Field Office, Oregon State University, private landowners	Complete
246-Park County Cheatgrass Management	2020	Bighorn Basin	\$96,000	\$10,000 approved/spent	Aerial cheatgrass treatments	BLM, Park County WP	Complete
247-Response of SG to Sagebrush Treatments	2020	Bighorn Basin, Bates Hole/Shirley Basin, Southwest, Wind River/Sweetwater River, South-Central	\$1,558,223	\$76,392 approved/spent	Continuing research to determine sage-grouse demographic and habitat use response to sagebrush treatments	University of Wyoming, Kelly Ornith. Research Fund, BLM, WY Reclamation & Restoration Center, WWNRT	On-going
248-Reducing Grass Competition for Sagebrush Seedlings	2020	Northeast	\$150,000	\$24,750 approved; \$0 spent	Research on herbicides that reduce cheatgrass to open the sagebrush establishment window	University of Wyoming Sheridan Research and Extension Center	On-going
249-Audubon Citizen Science and Education	2020	Bates Hole/Shirley Basin	\$40,500	\$12,000 approved/spent	Provide educational materials and field trips to families in the sagebrush ecosystem	BLM, Audubon Rockies	Complete

## Attachment B: Wyoming sage-grouse projects funded by Wyoming Game & Fish Commission in FY2020

250-Garrett Ranch Stock Water Development	2020	Bates Hole/Shirley Basin	\$34,000	\$18,000 approved/spent	Develop livestock watering systems to distribute livestock for rangeland health	NRCS, Medicine Bow Conservation District, private landowner	Complete
251-Bates Juniper-Posvar Treatment	2020	Bates Hole/Shirley Basin	\$250,000	\$20,000 approved; \$0 spent	Remove encroaching juniper in SG breeding and nesting habitat	BLM Casper Field Office, RMEF, WWNRT, Muley Fanatics, private landowner	Complete
252-Natrona Cheatgrass Treatment	2020	Bates Hole/Shirley Basin	\$240,000	\$15,000 approved/spent	Aerial cheatgrass treatments	BLM, Natrona Co. Weed & Pest, Grazing lessees	Complete
253-South Hudson-Government Draw Noxious Weeds	2020	Wind River/Sweetwater River	\$45,000	\$15,000 approved/spent	Aerial and ground treatment of leafy spurge, cheatgrass, Dalmation toadflax, and Scotch thistle	Fremont County Weed & Pest, BLM, WWNRT, USFS, WYDOT, private landowners	Complete
254-Avian & Mammalian Predators in Core vs. Non-core	2020	Southwest, South-Central, Wind River/Sweetwater River	\$238,880	\$23,980 approved; \$23,844 spent	Continuing research to evaluate avian and mammalian predators relative to core vs. non-core and anthropogenic disturbance	Oregon State University	On-going
255-Resource Selection Overlap with Co-occurring Species	2020	Southwest, South-Central, Wind River/Sweetwater River	\$674,595	\$25,430 approved; \$24,665 spent	Research of how resource selection of sage-grouse compares with feral horses, pronghorn, and Columbian sharp-tailed grouse.	University of Wyoming-Agricultural Experiment Station, BLM, WGFD, WY Dept of Agriculture, USFS	On-going

## Attachment B: Wyoming sage-grouse projects funded by Wyoming Game & Fish Commission in FY2020

256-Free-roaming horse impacts on SG nests	2020	South-Central, Southwest, Wind River/Sweetwater	\$1,926,029	\$35,650 approved; \$23,542 spent	Research on how free-roaming horses affect SG nest site selection and success and how relative horse presence affects SG	University of Wyoming, BLM	On-going
257-Sugar Loaf Well Conversion #2	2020	Upper Green River Basin	\$16,500	\$12,000 approved/spent	Convert a windmill to solar to reduce raven perching structures	Sublette County Conservation District, Grazing permittee	Complete
258-Coad Mountain Spring Development	2020	South-Central	\$20,000	\$15,000 approved; \$0 spent	Develop a fenced livestock watering systems to distribute livestock for rangeland health	Saratoga, Encampment, Riverside Cons. Dist., private landowner	On-going
259-Albert Creek Wet Meadow Restoration 2	2020	Southwest	\$56,000	\$15,000 approved; \$0 spent	Restore channelized and degraded streambed to historic channel	USFWS Partners, Uinta County CD, Anadarko, grazing permittees	On-going
260-Sublette County Cheatgrass	2020	Upper Green River	\$456,454	\$56,500 approved; \$56,454 spent	Aerial and ground-based cheatgrass treatments within the Hold-the-Line project area	Sublette County Weed & Pest, NRCS	Complete
261-Pinedale Winter Concentration Area Modeling	2020	Upper Green River Basin	\$6,500	\$6,500 approved/spent	Updated winter concentration area statistical models	Wyoming Game and Fish Dept.	Complete
262-Powder River Basin Winter SG Flight	2020	Northeast	\$5,000	\$5,000 approved/spent	Aerial survey to locate wintering flocks of SG	Wyoming Game and Fish Dept.	Complete

## Attachment B: Wyoming sage-grouse projects funded by Wyoming Game & Fish Commission in FY2020

263-Buffalo Core Area Invasive Weeds	2020	Northeast	\$65,500	\$25,250 approved; \$23,588 spent	Treatment of invasive weeds with control transects in the Buffalo Core Area in response to wildfire	Clear Creek Conservation District, NRCS, Johnson County Weed and Pest	Complete
264-Thunder Basin Sagebrush Planting	2020	Northeast	\$121,800	\$20,000 approved; \$0 spent	Growing sagebrush and planting for restoration	Wy Dept of Agriculture, WGBGLC, USFS, WGFD	On-going
265-Southwest LWG Project Monitoring and Maintenance	2020	Southwest	\$11,550	\$10,500 approved/spent	Since 2005, SW LWG implemented projects that received maintenance 15 years later	Wyoming Wildlife Federation	Complete
266-Grizzly WHMA Sagebrush Mowing	2020	South-Central	\$38,509	\$3,509 approved; \$0 spent	Equipment rental to mow dense sagebrush on Grizzly WHMA	Wyoming Game and Fish Dept., SE Muley Fanatics	On-going
267-Bennet Peak Juniper Removal	2020	South-Central	\$140,000	\$14,037 approved/spent	Remove encroaching juniper in Core Area, and provide a fuel break	Saratoga, Encampment, Riverside Cons. Dist., BLM	Complete
268-Musk Thistle Treatment	2020	Southwest	\$16,500	\$11,500 approved; \$7,634 spent	Aerial and ground-based treatment of musk thistle	Lincoln County Conservation District, private landowner	On-going
269-Jackson Translocation	2020	Upper Snake River	\$23,000	\$23,000 approved; \$8,057 spent	Have funding in place in the event WGFD approves a translocation of SG into the Jackson Core Area in response to low numbers	Teton Raptor Center	On-going

**Project Title:** Sage-Grouse Geophagy, Winter Habitat, and Movements (33-1084)

**Principal Investigator(s):** David Dahlgren, Utah State University

**Status:** Ongoing

**Start Date – End Date:** 2016 - 2020

**Research Type:** Habitat selection, Movement, Reproduction, Wildlife Health, Other

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To research the ecology and effects of sage-grouse demonstrating geophagy during the winter and to better understand sage-grouse winter habitat selection, movements, and vital rates including reproduction.

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**Project Title:** Sage-Grouse Reaction to Mine Disturbance (33-1116)

**Principal Investigator(s):** William Vetter, Precision Wildlife Resources, LLC

**Status:** Completed

**Start Date – End Date:** 2017 - 2018

**Research Type:** Habitat selection, human disturbance

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To study range, habitat selection, and movement of sage-grouse relative to mine disturbance.

---

**Project Title:** Monitor and Evaluate Sage-Grouse Throughout Translocation to North Dakota (33-1101)

**Principal Investigator(s):** David Dahlgren, Utah State University

**Status:** Ongoing

**Start Date – End Date:** 2017 – 2020

**Research Type:** Monitor, evaluate transplant

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** Monitor source population for North Dakota translocation project to evaluate the efficacy of sage-grouse translocation for future conservation and management activities. Will also provide monitoring of the Stewart Creek greater sage-grouse populations.

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**Project Title:** Sage-Grouse Nesting and Brood Rearing in relation to Raven Nests (33-1054)

**Principal Investigator(s):** Steffen Cornell, Meeteetse Conservation District

**Status:** Completed

**Start Date – End Date:** 2017 - 2019

**Research Type:** Predator control, reproductive success

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To assess how greater sage-grouse nesting and brood-rearing success can be improved via removal/control of common raven nests.

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**Project Title:** Restoration Efforts for Sage-Grouse After Energy Development (33-899)

**Principal Investigator(s):** Melanie Murphy, University of Wyoming

**Status:** Completed

**Start Date – End Date:** 2017 - 2018

**Research Type:** DNA

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To aid in prioritizing restoration efforts related to energy development for conservation of sage-grouse in Wyoming.

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**Project Title:** Sage-Grouse Response to Sagebrush Habitat Treatments and Diet (33-801)

**Principal Investigator(s):** Jeffrey Beck, University of Wyoming

**Status:** Ongoing

**Start Date – End Date:** 2017 - 2019

**Research Type:** Demographics, habitat treatments, diet

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To evaluate the demographic response of sage-grouse to habitat treatments in Wyoming big sagebrush communities, and via stable isotope analysis, determine diet composition through carbon and nitrogen rations deposited in feather tissue.

---

**Project Title:** Sage-Grouse Habitat, Seasonal Movements, and Use of Enhanced Areas (33-649)

**Principal Investigator(s):** Chad Olson, HWA Wildlife Consulting, LLC

**Status:** Ongoing

**Start Date – End Date:** 2017 - 2019

**Research Type:** Critical habitat, seasonal movements, habitat selection

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To identify critical brood-rearing habitat, monitor seasonal movements, the selection of associated habitats, and examine the use of local habitat enhancement areas.

---

**Project Title:** Sage-Grouse Breeding, Acoustics, and Potential Impacts by Human Activities (33-405)

**Principal Investigator(s):** Gail Patricelli, University of California--Evolution & Ecology

**Status:** Completed

**Start Date – End Date:** 2017 - 2018

**Research Type:** Breeding behavior, communication, human impacts

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To study greater sage-grouse breeding behaviors, acoustic communication, and the impact of human activities on greater sage-grouse populations; development of methodologies and field test equipment that may be used in the future to examine the effects of noise from energy exploration and development on breeding biology.

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**Project Title:** Sage-Grouse Response to Gas Development Project Area (33-1209)

**Principal Investigator(s):** Jeffrey Beck, University of Wyoming

**Status:** Ongoing

**Start Date – End Date:** 2018 - 2020

**Research Type:** Disturbance response

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To understand the dynamics of the Greater Sage-Grouse in terms of their fidelity to the area, variability in flock sizes, and general use of the Normally Pressured Lance (NPL) natural gas development project area.

---

**Project Title:** Sage-Grouse Avoidance Distances in Wind Energy Developed Landscape (33-1171)

**Principal Investigator(s):** Chad LeBeau, West Inc.

**Status:** Ongoing

**Start Date – End Date:** 2018 - 2020

**Research Type:** Movement, wind energy effects

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To identify movement patterns of sage-grouse to expand understanding of the actual response of the birds in a wind energy developed landscape (e.g., identify potential avoidance distances).

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**Project Title:** Columbian Sharp-Tailed Grouse Genetics, Habitat, and Demographics (33-1098)

**Principal Investigator(s):** Jeffrey Beck, University of Wyoming

**Status:** Ongoing

**Start Date – End Date:** 2018 - 2020

**Research Type:** Habitat selection, genetics, demographics

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To obtain information on genetics, habitat selection, seasonal space use, and demographic rates within the extent of the species range in Carbon County, Wyoming

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**Project Title:** Ruffed and Dusky Grouse Digestion of Toxic Plant Materials (33-1085)

**Principal Investigator(s):** Brian Schmidt, Smithsonian Institution - Div of Birds

**Status:** Completed

**Start Date – End Date:** 2018 - 2018

**Research Type:** Digestion, toxic material

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To investigate the intestinal microbes of the cecum and large intestine of the dusky grouse and ruffed grouse to better understand the adaptations that permit grouse to thrive on toxic plant materials.

---

**Project Title:** Sage-Grouse Habitat Selection in Northeast Wyoming (33-1079)

**Principal Investigator(s):** Brad Fedy, University of Waterloo

**Status:** Ongoing

**Start Date – End Date:** 2018 - 2020

**Research Type:** Habitat management

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** Understanding sage-grouse habitat selection patterns in Northeast Wyoming to maintain, restore, and/or enhance sage-grouse habitat.

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**Project Title:** Sage-Grouse Response to Gravel Pit (33-1062)

**Principal Investigator(s):** Bryan Bedrosian, Teton Raptor Center

**Status:** Completed

**Start Date – End Date:** 2018 - 2019

**Research Type:** Sage-grouse response to habitat alteration

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To study the potential effects of gravel extraction operations at the Spread Creek gravel pit (operated within the Bridger-Teton National Forest) on the movements, habitat use, and nesting demography of sage-grouse.

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**Project Title:** Identifying potential sage-grouse winter concentration areas and management recommendations (33-1160)

**Principal Investigator(s):** Jeffrey Beck, University of Wyoming

**Status:** Ongoing

**Start Date – End Date:** 2018 - 2020

**Research Type:** Winter concentration area management

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To address research questions detailed by the Wyoming Sage-Grouse Implementation Team (SGIT) Winter Concentration Area (WCA) Sub-Group to generate management guidelines for sage-grouse winter concentration areas in Wyoming, and use existing data in south-central Wyoming to identify potential WCAs.

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**Project Title:** Sharp-Tailed Grouse Subspecies Status (33-1214)

**Principal Investigator(s):** Jeffrey Beck, University of Wyoming

**Status:** Ongoing

**Start Date – End Date:** 2019 - 2020

**Research Type:** Taxonomy

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To better understand the subspecies status of sharp-tailed grouse located in Carbon County, Wyoming by comparing blood and feather samples from Columbian sharp-tailed grouse to Plains sharp-tailed grouse.

---

**Project Title:** Sage-Grouse and Predator Interactions With Livestock Grazing (33-1216)

**Principal Investigator(s):** Jonathan Dinkins, Oregon State University

**Status:** Ongoing

**Start Date – End Date:** 2019 - 2020

**Research Type:** Predator/prey interactions

**Funding Source(s):**

**Brief Description of Project / Research Objectives:** To understand the indirect effects of predator interactions with livestock grazing on sage-grouse.

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**Project Title:** Sage-Grouse Dispersal and Habitat Use in a Wind Farm (33-1218)

**Principal Investigator(s):** Jenn Hess, HWA Wildlife Consulting, LLC

**Status:** Ongoing

**Start Date – End Date:** 2019 - Ongoing

**Research Type:** Wind farm habitat, landscape scale habitat map

**Funding Source(s):**

**Brief Description of Project / Research Objectives:**

1. Investigate natal dispersal while also examining brood-rearing habitat use, fecundity, survival, and second year use by chicks in wind farm areas.
2. Quantify multi-scale resource selection/avoidance in sage-grouse within the wind farm;
3. Generate data-driven high-resolution maps of seasonal habitat (nesting, late brood-rearing/summer, and winter) at the landscape scale.

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**Project Title:** Sage-Grouse Habitat, Migration Patterns, and Survival (33-1220)

**Principal Investigator(s):** Chad Olson, HWA Wildlife Consulting, LLC

**Status:** Ongoing

**Start Date – End Date:** 2019 - Ongoing

**Research Type:** Habitat, migration, survival

**Funding Source(s):**

**Brief Description of Project / Research Objectives:**

1. Quantify multi-scale resource selection/avoidance in sage-grouse near Kemmerer, WY;
2. Generate data-driven high-resolution maps of critical seasonal habitat at the landscape scale, including specifically nesting, late brood-rearing/summer, and winter habitat;
3. Investigate winter habitat use, seasonal migration patterns, and whether winter concentration areas occur within the study area; and
4. Explore the potential effects of a range of other landscape characteristics, including other natural (e.g., raptor and raven nests) and anthropogenic features on habitat use, survival, and movement patterns.

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**Project Title:** Multi-Scale Statewide Wyoming Greater Sage-Grouse Trends Determined by Population Viability Analysis

**Principal Investigator(s):** Dr. David Edmunds, Colorado State University

**Status:** Completed

**Start Date – End Date:** 2018-2019

**Research Type:** Population trends at multiple scales

**Funding Source(s):** U.S. Geological Survey and Wyoming Landscape Conservation Initiative through USGS.

**Brief Description of Project / Research Objectives:** We are investigating trends for Wyoming Greater Sage-grouse populations at multiple scales and management boundaries using population viability analysis (PVA) to determine local- and metapopulation dynamics. Our objective was to use lek count data provided by the WGFD to determine the population growth rate ( $\lambda$ ) statewide, by local Working Group Areas, Core Areas, Core Areas by Working Group Areas, and at nine nested spatial scales based on lek clusters.

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**Project Title:** Greater Sage-Grouse Responses to Future Cumulative and Interacting Climate and Energy Development in Wyoming

**Principal Investigator(s):** Dr. Julie Heinrichs, Colorado State University

**Status:** Completed

**Start Date – End Date:** 2018-2019

**Research Type:** Landscape maps created based on possible future stressors

**Funding Source(s):** U.S. Geological Survey and Wyoming Landscape Conservation Initiative through USGS

**Brief Description of Project / Research Objectives:** The abundance and distribution of Greater Sage-grouse in Wyoming depends on future habitat changes, including oil and gas development and climate-induced changes in habitat. Yet, we have a poor understanding of the potential magnitude of these effects and how these stressors may shape future sage-grouse habitats and populations. We developed a series of future landscape maps for the Wyoming Landscape Conservation Initiative (WLCI) area of southwestern Wyoming.

---

**Project Title:** Assessing Greater Sage-Grouse Responses to Transmission Line Development Projects in Wyoming

**Principal Investigator(s):** Dr. Julie Heinrichs, Colorado State University

**Status:** Completed

**Start Date – End Date:** 2017-2018

**Research Type:** GIS analysis predicting impacts

**Funding Source(s):** U.S. Geological Survey

**Brief Description of Project / Research Objectives:** Wind energy is rapidly developing in Wyoming and the BLM is facilitating the development of new transmission line projects in sensitive grouse habitats in southern Wyoming. Although impact assessments were conducted for the Gateway South, West, and

TransWest Express projects, little is known about how transmission line infrastructure could directly and indirectly impact sage-grouse populations through time.

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**Project Title:** Hierarchical Clustering of Greater Sage-Grouse Leks to Improve Upon the Detection of Population Persistence, Sinks, and Sources

**Principal Investigator(s):** Michael O'Donnell, USGS

**Status:** Completed

**Start Date – End Date:** 2018-2020

**Research Type:** Population monitoring techniques

**Funding Source(s):** U.S. Geological Survey and the Bureau of Land Management

**Brief Description of Project / Research Objectives:** Population monitoring is vital to conservation and management of wildlife; yet, population survey data are commonly limited to single geographic extents and rarely accounts for processes occurring across spatial and temporal scales. To support a statistically repeatable and hierarchical framework for long-term monitoring, we developed a method to construct hierarchically nested groupings of similar habitats represented as spatial boundaries of population structures.

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**Project Title:** The Complexities of Sage-Grouse Long-Term Monitoring Database Systems

**Principal Investigator(s):** Michael O'Donnell, USGS

**Status:** Completed

**Start Date – End Date:** 2018-2020

**Research Type:** Population monitoring analysis

**Funding Source(s):** U.S. Geological Survey and Wyoming Landscape Conservation Initiative through USGS

**Brief Description of Project / Research Objectives:** The Wyoming Game and Fish Department (WGFD) maintains a database of Greater Sage-grouse lek locations and annual lek counts. Because of the importance of these data and repetitive use by researchers and managers for population trend monitoring, we developed program R code to use these data for long-term monitoring based on policies defined in the WGFD Handbook of Biological Techniques (Chapter 12; Christiansen 2012; p. 12-8).

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**Project Title:** Predicting Post-Disturbance Recovery of Sagebrush Ecosystems Using Remote Sensing Products

**Principal Investigator(s):** Dr. Adrian Monroe, Colorado State University

**Status:** Completed

**Start Date – End Date:** 2017-2018

**Research Type:** Habitat recovery timelines

**Funding Source(s):** U.S. Geological Survey, the Bureau of Land Management, and the Wyoming Landscape Conservation Initiative through USGS

**Brief Description of Project / Research Objectives:** The historic loss of vegetation and subsequent recovery trajectories after disturbances in sagebrush ecosystems are not well understood at broad spatial and temporal scales. Establishing rates of sagebrush recovery and estimating time to recovery will aid in characterizing restoration and management efforts and inform effective sagebrush restoration strategies.

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**Project Title:** Probing the Sage-Grouse Genome for Signatures of Adaptive Genetic Variation

**Principal Investigator(s):** Kevin Oh, USGS

**Status:** Completed

**Start Date – End Date:** 2017-2019

**Research Type:** Adaptive genetics

**Funding Source(s):** U.S. Geological Survey

**Brief Description of Project / Research Objectives:** Identifying and maintaining genetic adaptations to environmental variation is key for developing sound conservation and management strategies. Genomics can greatly augment our ability to precisely characterize the genetic basis of important adaptations within extant populations. We have generated the first high-quality genome assemblies for both Gunnison and greater sage-grouse.

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**Project Title:** Sound Levels at Greater Sage-Grouse Leks in the Pinedale Anticline Project Area

**Principal Investigator(s):** Skip Ambrose, Sandhill Company

**Status:** Completed

**Start Date – End Date:** April 2013 - 2018

**Research Type:** Sound monitoring

**Funding Source(s):** Pinedale Anticline Project Office, Bureau of Land Management, Pinedale, Wyoming

**Brief Description of Project / Research Objectives:** The objective of this project was to monitor sound levels at greater sage-grouse leks in and near the PAPA area south of Pinedale, WY.

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**Project Title:** Resource Selection Overlap Between Greater Sage-Grouse and Co-Occurring Species

**Principal Investigator(s):** Jeffrey Beck, University of Wyoming

**Status:** Ongoing

**Start Date – End Date:** 2017-2019

**Research Type:** Resource overlap and competition

**Funding Source(s):** Bureau of Land Management; University of Wyoming–Agricultural Experiment Station; Wyoming Game and Fish Department; South-Central, Southwest, and Wind River/Sweetwater River Local Sage-Grouse Working Groups; Wyoming Governor’s Big Game License Coalition; Wyoming Wildlife Federation; and U.S. Forest Service.

**Brief Description of Project / Research Objectives:** Our project aims to address how resource selection and space use of greater sage-grouse compares with three co-occurring species: feral horses (*Equus ferus caballus*), pronghorn (*Antilocapra americana*), and sharp-tailed grouse (*Tympanuchus phasianellus*) in Southern Wyoming.

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**Project Title:** Response of Greater Sage-Grouse to Treatments in Wyoming Big Sagebrush

**Principal Investigator(s):** Jeffrey Beck, University of Wyoming

**Status:** Ongoing

**Start Date – End Date:** 2014 - Ongoing

**Research Type:** Response to habitat treatments



**Funding Source(s):** Wyoming Game and Fish Department, Wyoming Sage-grouse Conservation fund; Bates Hole/Shirley Basin, Bighorn Basin, South-Central, Southwest, Upper Green River, Upper Snake River and Wind River/Sweetwater River Local Sage-grouse Working Groups; Wyoming Reclamation and Restoration Center; Wyoming Wildlife and Natural Resource Trust; Land Field Office-Bureau of Land Management; and Margaret and Sam Kelly Ornithological Research Fund.

**Brief Description of Project / Research Objectives:** Wyoming big sagebrush (*Artemisia tridentata* wyomingensis) has been treated through chemical application, mechanical treatments, and prescribed burning to increase herbaceous forage species released from competition with sagebrush overstory. Originally intended to provide more forage for livestock, these techniques have been applied to improve habitat for sagebrush wildlife species including greater sage-grouse (*Centrocercus urophasianus*) and to rejuvenate sagebrush plants and increase herbaceous production. Studies evaluating habitat treatments have reported varied results and generally lack the replication necessary for evaluation of demographic rates and fine-scale habitat use of sage-grouse in response to treatments.

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**Project Title:** Comparison of Avian and Mammalian Predators in Sage-Grouse Core and Non-Core Areas: Assessing Predator Abundance and Responses to Anthropogenic Features

**Principal Investigator(s):** Jonathan Dinkins, Oregon State University

**Status:** Completed

**Start Date – End Date:** 2017-2020

**Research Type:** Predators, response to anthropogenic features

**Funding Source(s):** Bates Hole/Shirley Basin, Big Horn Basin, South-Central, Southwest, and Wind River/Sweetwater River Wyoming Sage-Grouse Local Working Groups; and Oregon State University

**Brief Description of Project / Research Objectives:** While human development influences sage-grouse demographic rates and habitat selection, development also provides an increased number of perch and nesting structures used by avian predators—including ravens that can negatively influence sage-grouse nest success. Wyoming's Sage-grouse Core Areas were developed to add protections to important habitat for sage-grouse by reducing human development within Core Areas. Core Areas have maintained higher sage-grouse trends compared to Non-Core Areas, which could be partially explained by reduced predation rates.

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**Project Title:** Statewide Genetic Connectivity for Greater Sage-Grouse in Wyoming

**Principal Investigator(s):** Brad Fedy, University of Waterloo

**Status:** Completed

**Start Date – End Date:** 2015-2017

**Research Type:** Genetics, population connectivity

**Funding Source(s):** U.S. Bureau of Land Management, Wyoming Game and Fish Department, U.S. Geological Survey.

**Brief Description of Project / Research Objectives:** Greater sage-grouse population connectivity has been identified as a priority management issue by multiple state and federal management agencies. We are working on a large-scale project to assess levels of population connectivity using genetic approaches.

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**Project Title:** Using Emerging Hotspots Analysis to Identify Sage-Grouse Source Sink Dynamics in Wyoming

**Principal Investigator(s):** Andrew J. Gregory, Bowling Green State University

**Status:** Completed

**Start Date – End Date:** 2016-2018

**Research Type:** Hotspot/coldspot analysis

**Funding Source(s):** Wyoming Wildlife and Natural Resource Trust and Bowling Green State University

**Brief Description of Project / Research Objectives:** Greater sage-grouse have been subject to land-use change and habitat destruction throughout the Intermountain West, contributing to long-term population declines. However, recent evidence suggests that some sage-grouse populations might be stabilizing. We investigated population variability in sage-grouse productivity across Wyoming using hotspot/coldspot analysis to identify spatially varying patterns of locations where sage-grouse lek attendance is higher than average or lower than average (putatively sources versus sinks) across Wyoming. Our research focused on answering three questions:

1. Are there spatial regions across Wyoming that have consistently high sage-grouse populations?;
  2. What factors influence the persistence and stability of areas with consistently high sage-grouse populations?; and
  3. What, if any, contribution do Core Areas have in maintaining higher than average sage-grouse counts?
- 

**Project Title:** Evaluation of the Response of Greater Sage-Grouse to Wind Development Activities Associated with the Chokecherry and Sierra Madre Wind Energy Project in Carbon County, Wyoming

**Principal Investigator(s):** Jon Kehmeier, SWCA Environmental Consultants

**Status:** Ongoing

**Start Date – End Date:** 2010-Ongoing

**Research Type:** Before and after control impact(s)

**Funding Source(s):** Power Company of Wyoming

**Brief Description of Project / Research Objectives:** Power Company of Wyoming (PCW) has proposed to construct the 1,000 turbine, 3,000 megawatt Chokecherry and Sierra Madre Wind Energy Project (CCSM Project) south of Rawlins, Wyoming. A before-and-after control impact (BACI) design is being used to evaluate the impacts of wind energy development on greater sage-grouse.

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**Project Title:** Spatial Variability of Soil Climate and Moisture Budgets Within Sagebrush Ecosystems: An Enhancement of Resistance and Resilience to Improve Conservation

**Principal Investigator(s):** Michael O'Donnell, USGS

**Status:** Completed

**Start Date – End Date:** 2016-2018

**Research Type:** Habitat management

**Funding Source(s):** U.S. Geological Survey, Ecosystems Program, science support for the Wyoming Landscape Conservation Initiative

**Brief Description of Project / Research Objectives:** Understanding the drivers defining sagebrush ecosystem distributions and dynamics is important for habitat management, restoration, and mitigation. Resistance and resilience concepts (R&R), based on the Natural Resources Conservation Service's soil temperature and moisture classifications, provide a useful framework for understanding and applying this information.

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**Project Title:** Characterizing Greater Sage-Grouse Nesting Habitat at Wyoming's Eastern Range Edge

**Principal Investigator(s):** Dave Pellatz, Thunder Basin Grasslands Prairie Ecosystem Association

**Status:** Completed

**Start Date – End Date:** 2017-2019

**Research Type:** Nesting habitat

**Funding Source(s):** Peabody Energy, NE Wyoming Sage-grouse Working Group, Great Plains Wildlife Consulting, Inc., Thunder Basin Grasslands Prairie Ecosystem Association, and USDA-Agricultural Research Service

**Brief Description of Project / Research Objectives:** This proposal facilitates a cooperative effort among the Association, Peabody Energy, and other partners to investigate and pursue opportunities to pool existing and additional near-term data for collaboration on a peer-reviewed paper characterizing sage-grouse nesting habitat in northeastern Wyoming.

**Attachment D:**  
**Wyoming Sage-Grouse Research Reports (through May 31, 2020)**

**Part I.** Final research reports from Wyoming sage-grouse research or theses and dissertations from university research efforts. It does not include annual agency monitoring reports or popular press articles.

**Part II.** Wyoming sage-grouse research articles published in peer-reviewed journals or books.

Only research reports concerning Wyoming sage-grouse are included. Studies on related subjects, (e.g. sagebrush, cheatgrass, other geographical areas) are important, but too numerous to include in this attachment.

**Part I. Research theses, dissertations and reports.**

Bedrosian, B. and D Craighead. 2010. Jackson Hole sage grouse project completion report: 2007-2009. Craighead Beringia South. Kelly, Wyoming. Includes 4 appended reports: A: Common raven activity in relation to land use in western Wyoming: Implications for greater sage grouse reproductive success. B: Critical winter habitat characteristics of greater sage-grouse in a high altitude environment. C: Sage grouse baseline survey and inventory at the Jackson Hole Airport. D: Sage-grouse chick survival rates in Jackson Hole, Wyoming.

Brooks, M.L., J.R. Matchett, D.J. Shinneman and P.S. Coates. 2015. Fire patterns in the range of greater sage-grouse, 1984–2013 - Implications for conservation and management: U.S. Geological Survey Open-File Report 2015-1167, 66 p., <http://dx.doi.org/10.3133/ofr20151167>.

Brown, K. G. and K. M. Clayton. 2004. Ecology of the greater sage-grouse (*Centrocercus urophasianus*) in the coal mining landscape of Wyoming's Powder River Basin. Final Technical Report. Thunderbird Wildlife Consulting, Inc. Gillette, WY.

Bui, T.D. 2009. The effects of nest and brood predation by common ravens (*Corvus corax*) on greater sage-grouse (*Centrocercus urophasianus*) in relation to land use in western Wyoming. Thesis. University of Washington, Seattle.

Cagney J., E. Bainter, B. Budd, T. Christiansen, V. Herren, M. Holloran, B. Rashford, M. Smith and J. Williams. 2010. Grazing influence, objective development, and management in Wyoming's greater sage-grouse habitat. University of Wyoming College of Agriculture Extension Bulletin B-1203. Laramie. Available on-line at: <http://www.wyomingextension.org/agpubs/pubs/B1203.pdf>

- Chambers, J.C., J.L. Beck, S. Campbell, J. Carlson, T.J. Christiansen, K.J. Clause, J.B. Dinkins, K.E. Doherty, K.A. Griffin, D.W. Havlina, K.E. Mayer, J.D. Hennig, L.L. Kurth, J.D. Maestas, M. Manning, B.A. Meador, C. McCarthy, M.A. Perea and D.A. Pyke. 2016. Using resilience and resistance concepts to manage threats to sagebrush ecosystems, Gunnison sage-grouse, and greater sage-grouse in their eastern range—A strategic multi-scale approach: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-356, 143p. <https://www.fs.fed.us/rmrs/publications/using-resilience-and-resistance-concepts-manage-threats-sagebrush-ecosystems-gunnison>.
- Christiansen, T. 2006. Monitoring the impacts and extent of West Nile virus on sage-grouse in Wyoming – final report. Wyoming Game and Fish Department, Cheyenne.
- Christiansen, T. 2010. Hunting and sage-grouse: a technical review of harvest management on a species of concern in Wyoming. Wyoming Game and Fish Department, Cheyenne.
- Christiansen, T.J. (*in press*). Wyoming's approach to sage-grouse Conservation – a shotgun wedding of science and policy. Transactions of the 82<sup>nd</sup> North American Wildlife and Natural Resources Conference. Wildlife Management Institute.
- Clarke, L. F., H. Rahn and M.D. Martin. 1942. Seasonal and sexual dimorphic variations in the so-called “air sacs” region of the sage grouse. Sage Grouse Studies Part II. Wyoming Game and Fish Department Bulletin No. 2. Wyoming Game and Fish Department, Cheyenne.
- Courtemanch, A., G. Chong and S. Kilpatrick. 2007. A remote sensing analysis of sage-grouse winter habitat in Grand Teton National Park and Bridger-Teton National Forest, Wyoming.
- Crist, M.R., S. T. Knick and S. E. Hanser. 2015, Range-wide network of priority areas for greater sage-grouse—A design for conserving connected distributions or isolating individual zoos?: U.S. Geological Survey Open-File Report 2015-1158, 34 p., <http://dx.doi.org/10.3133/20151158>.
- Daniel, J. 2007. Spring precipitation and sage grouse chick survival. Thesis. Department of Statistics – University of Wyoming, Laramie.
- Deibert, P. A. 1995. Effects of parasites on sage-grouse mate selection. Dissertation. University of Wyoming, Laramie.
- Dinkins, J.B. 2013. Common raven density and greater sage-grouse nesting success in southern Wyoming: potential conservation and management implications. Dissertation. Utah State University, Logan.

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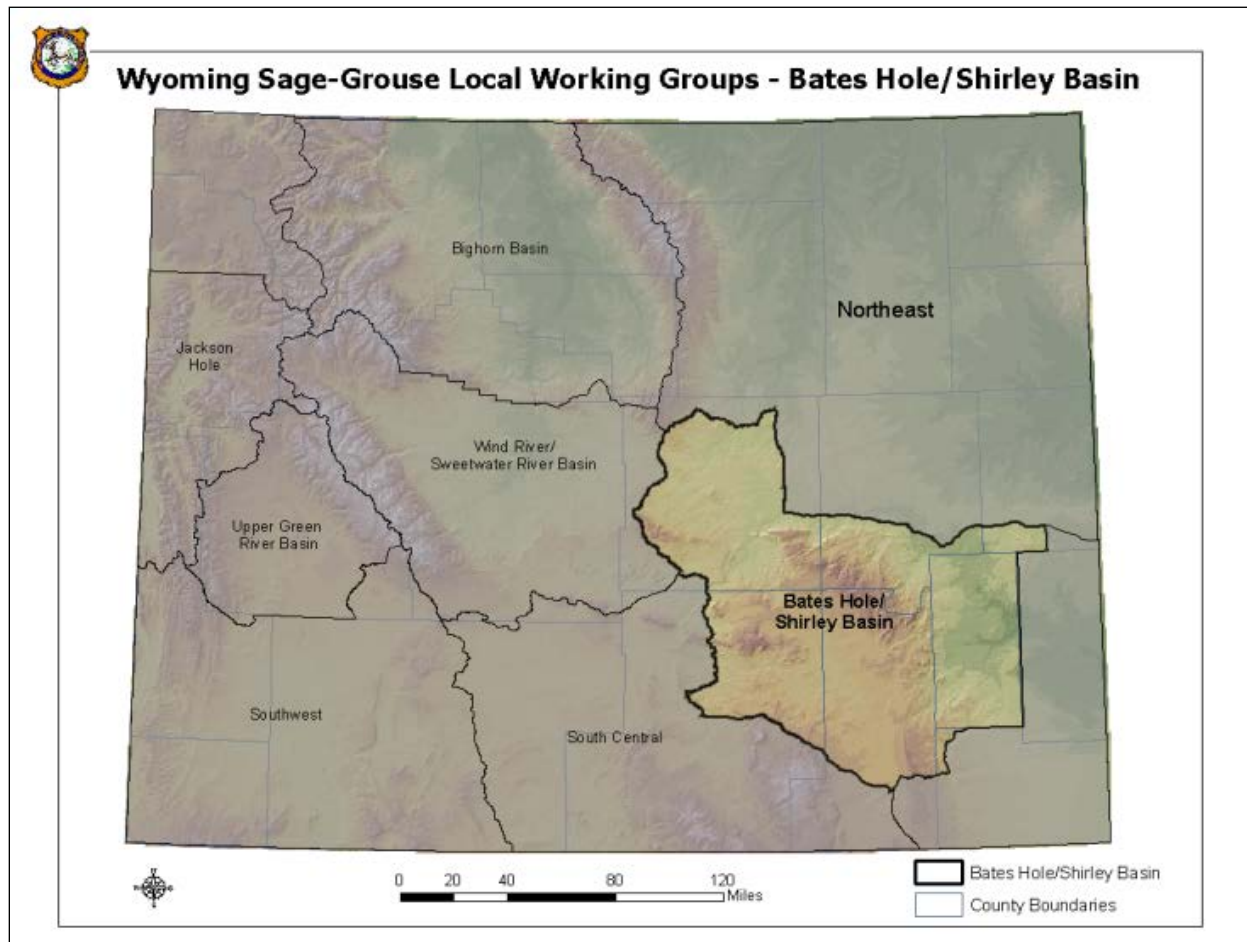
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## Bates Hole – Shirley Basin Conservation Area Job Completion Report

**Species:** Greater Sage-grouse  
**Management Area(s):** F – (portions of Casper and Laramie Regions)  
**Period Covered:** June 1, 2019 – May 31, 2020  
**Prepared By:** Justin Binfet, Casper Wildlife Management Coordinator





## Sage Grouse Lek Characteristics

### Working Group: Bates Hole

Region	Number	Percent
Casper	127	40.1
Lander	2	0.6
Laramie	188	59.3

Classification	Number	Percent
Occupied	212	66.9
Undetermined	16	5.0
Unoccupied	89	28.1

Biologist	Number	Percent
Casper	118	37.2
Douglas	8	2.5
Laramie	109	34.4
Saratoga	72	22.7
Sinclair	2	0.6
Wheatland	8	2.5

County	Number	Percent
Albany	77	24.3
Carbon	108	34.1
Converse	10	3.2
Laramie	2	0.6
Natrona	113	35.6
Niobrara	1	0.3
Platte	6	1.9

Management Area	Number	Percent
F	317	100.0

Working Group	Number	Percent
Bates Hole	317	100.0

BLM Office	Number	Percent
Casper	127	40.1
Lander	2	0.6
Newcastle	1	0.3
Rawlins	187	59.0

Warden	Number	Percent
Cheyenne	2	0.6
Douglas	3	0.9
East Casper	38	12.0
East Rawlins	2	0.6
Elk Mountain	69	21.8
Glenrock	7	2.2
Lusk	1	0.3
Medicine Bow	71	22.4
North Laramie	40	12.6
West Casper	78	24.6
Wheatland	6	1.9

Land Status	Number	Percent
BLM	108	34.1
BOR	1	0.3
Private	181	57.1
State	27	8.5

Lek Status	Number	Percent
Active	149	47.0
Inactive	130	41.0
Unknown	38	12.0

# Sage Grouse Job Completion Report

Year: 2011 - 2020, Working Group: Bates Hole

## 1. Lek Attendance Summary (Occupied Leks) (1)

### a. Leks Counted

Year	Occupied	Counted	Percent Counted	Peak Males	Avg Males / Active Lek (2)
2011	216	103	48	1670	19.9
2012	216	77	36	1222	20.0
2013	221	77	35	969	16.4
2014	222	86	39	1261	19.4
2015	223	102	46	2869	33.0
2016	224	86	38	2893	40.2
2017	225	79	35	2213	35.7
2018	220	109	50	1944	24.0
2019	218	89	41	1474	21.1
2020	214	116	54	1513	18.2

### b. Leks Surveyed

Year	Occupied	Surveyed	Percent Surveyed	Peak Males	Avg Males / Active Lek (2)
2011	216	93	43	895	14.9
2012	216	90	42	779	13.0
2013	221	99	45	814	14.0
2014	222	121	55	928	13.4
2015	223	94	42	1677	26.6
2016	224	103	46	2298	31.9
2017	225	124	55	2143	29.0
2018	220	80	36	1105	20.5
2019	218	99	45	1060	20.4
2020	214	57	27	639	18.8

1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

3) Inactive - Confirmed no birds/sign present (see official definitions)

# Sage Grouse Job Completion Report

Year: 2011 - 2020, Working Group: Bates Hole

## 1. Lek Attendance Summary (Occupied Leks) (1)

Continued

### c. Leks Checked

Year	Occupied	Checked	Percent Checked	Peak Males	Avg Males / Active Lek (2)
2011	216	196	91	2565	17.8
2012	216	167	77	2001	16.5
2013	221	176	80	1783	15.2
2014	222	207	93	2189	16.3
2015	223	196	88	4546	30.3
2016	224	189	84	5191	36.0
2017	225	203	90	4356	32.0
2018	220	189	86	3049	22.6
2019	218	188	86	2534	20.8
2020	214	173	81	2152	18.4

### d. Lek Status

Year	Active	Inactive (3)	Unknown	Known Status	Percent Active	Percent Inactive
2011	157	32	7	189	83.1	16.9
2012	131	25	11	156	84.0	16.0
2013	123	40	13	163	75.5	24.5
2014	138	48	21	186	74.2	25.8
2015	154	33	9	187	82.4	17.6
2016	146	22	21	168	86.9	13.1
2017	148	45	10	193	76.7	23.3
2018	137	44	8	181	75.7	24.3
2019	132	37	19	169	78.1	21.9
2020	123	39	11	162	75.9	24.1

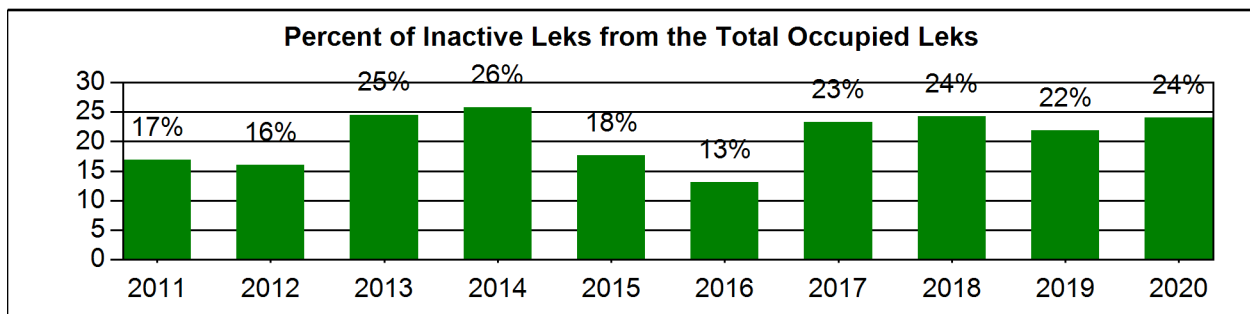
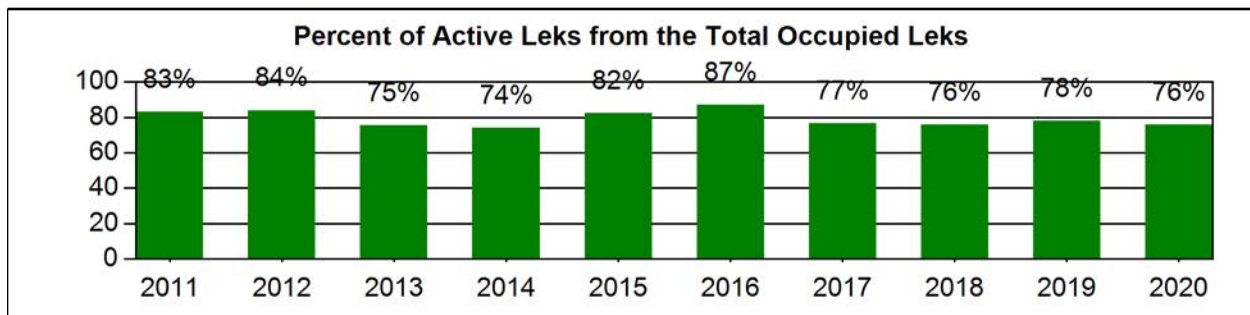
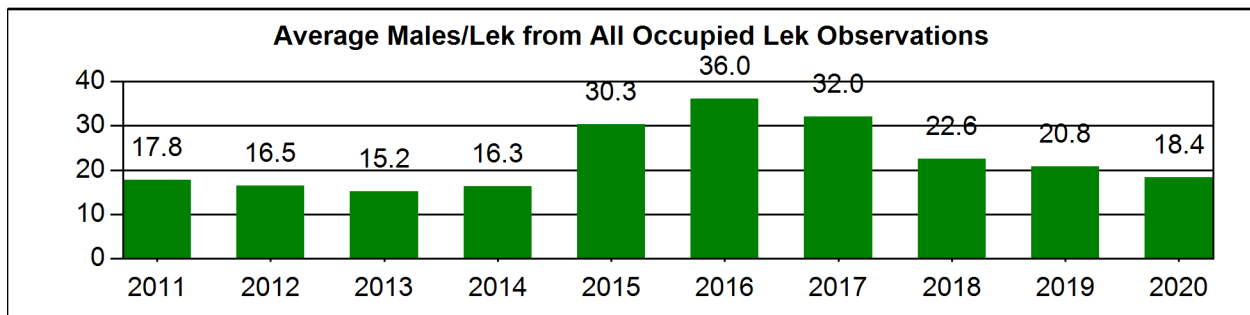
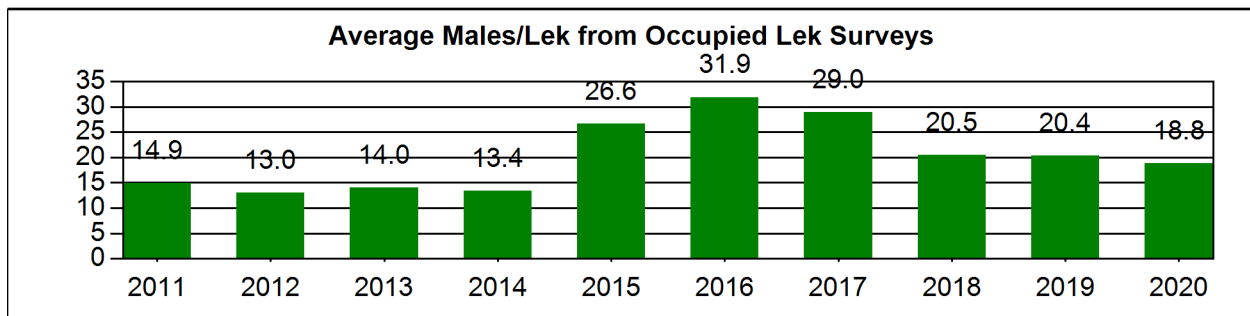
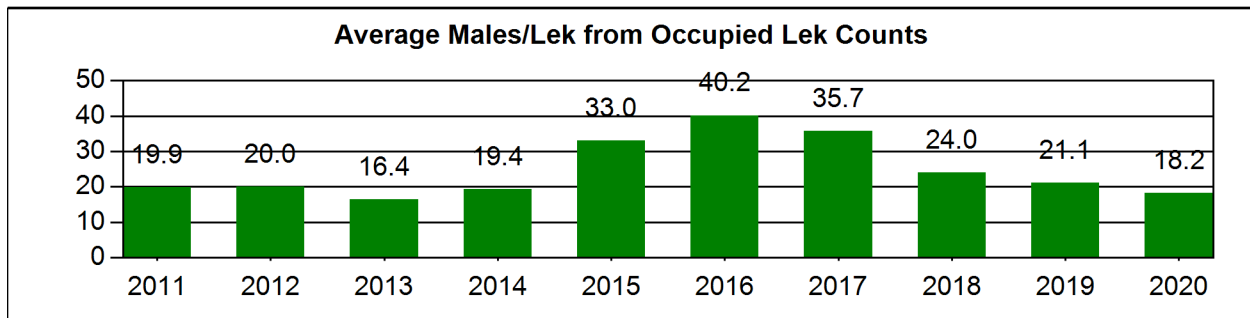
1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

3) Inactive - Confirmed no birds/sign present (see official definitions)

# Sage Grouse Occupied Lek Attendance Summary

Year: 2011 - 2020, Working Group: Bates Hole



## Sage Grouse Job Completion Report

Year: 2011 - 2020, Working Group: Bates Hole

### 3. Sage Grouse Hunting Seasons and Harvest Data

#### a. Season

Year	Season Start	Season End	Length	Bag/Possesion Limit
2011	Sep-17	Sep-30	14	2/4
2012	Sep-15	Sep-30	16	2/4
2013	Sep-21	Sep-30	10	2/4
2014	Sep-20	Sep-30	11	2/4
2015	Sep-19	Sep-30	12	2/4
2016	Sep-17	Sep-30	14	2/4
2017	Sep-16	Sep-30	15	2/4
2018	Sep-15	Sep-30	16	2/4
2019	Sep-21	Sep-30	10	2/4

#### b. Harvest

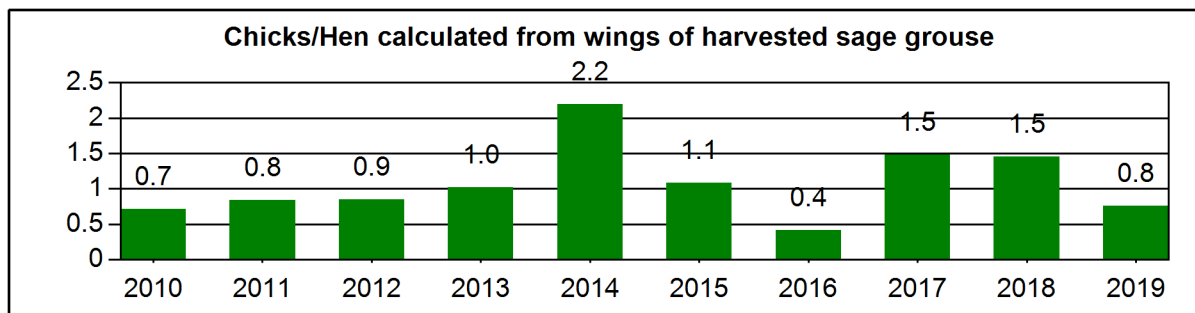
Year	Harvest	Hunters	Days	Birds/ Day	Birds/ Hunter	Days/ Hunter
2011	1117	514	981	1.1	2.2	1.9
2012	688	415	852	0.8	1.7	2.1
2013	488	399	670	0.7	1.2	1.7
2014	588	352	804	0.7	1.7	2.3
2015	837	380	889	0.9	2.2	2.3
2016	869	466	869	1.0	1.9	1.9
2017	621	315	688	0.9	2.0	2.2
2018	805	464	993	0.8	1.7	2.1
2019	723	403	736	1.0	1.8	1.8
Avg	748	412	831	0.9	1.8	2.0

# Sage Grouse Job Completion Report

Year: 2010 - 2019, Working Group: Bates Hole

## 4. Composition of Harvest by Wing Analysis

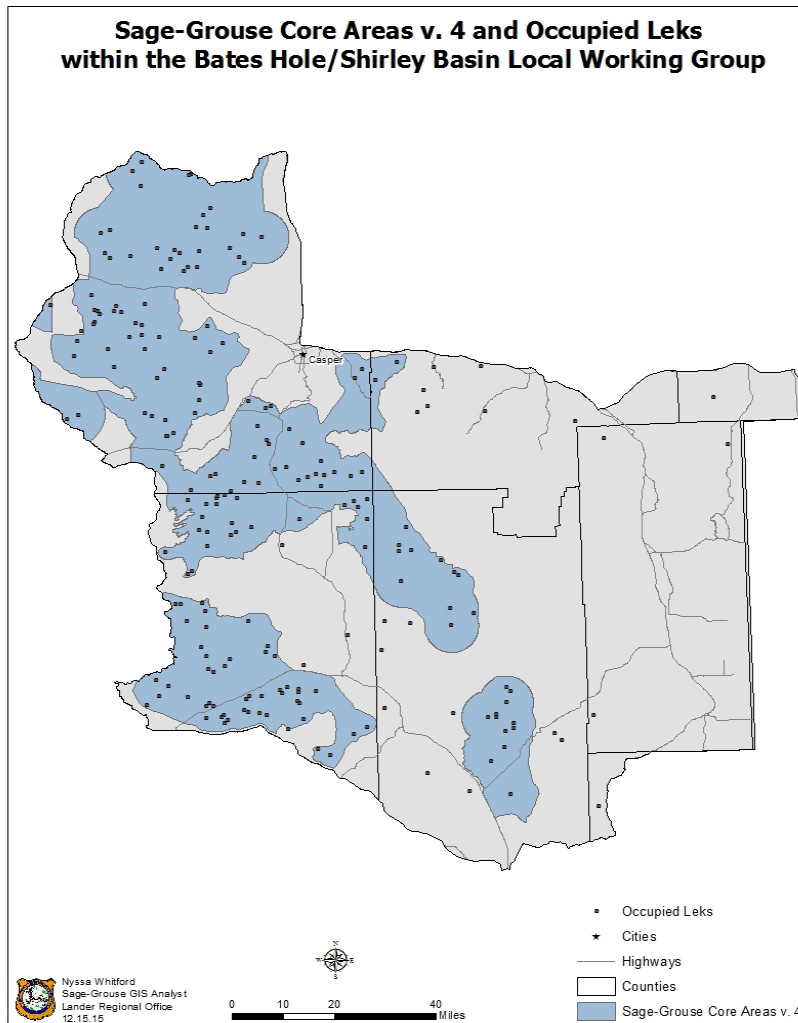
Year	Sample Size	Percent Adult		Percent Yearling		Percent Young		Chicks/ Hens
		Male	Female	Male	Female	Male	Female	
2010	284	13.0	35.2	5.6	12.3	13.4	20.4	0.7
2011	224	17.9	34.8	4.9	7.1	15.6	19.6	0.8
2012	145	20.7	33.8	1.4	8.3	19.3	16.6	0.9
2013	187	9.1	26.2	4.3	16.6	24.1	19.8	1.0
2014	190	10.5	16.8	2.1	10.5	30.5	29.5	2.2
2015	253	14.6	31.6	5.5	6.7	22.9	18.6	1.1
2016	217	19.4	33.2	10.1	16.6	11.5	9.2	0.4
2017	145	20.0	23.4	4.8	6.9	20.0	24.8	1.5
2018	168	15.5	25.0	4.2	7.7	19.0	28.6	1.5
2019	212	13.2	32.5	3.8	14.6	12.3	23.6	0.8



## Lek Monitoring

Sage-grouse, and therefore occupied leks, are well distributed throughout most of the BHSBLWG area, although much of the Laramie Range does not provide suitable habitat and most of the historic range in Platte County is no longer occupied due to large scale conversions of sagebrush grasslands to cultivated fields (Figure 1). The Wyoming Game and Fish Department summarizes lek monitoring data each year. As of spring 2020, there are 212 known occupied leks, 89 unoccupied leks, and 16 leks of an undetermined classification within the BHSBLWG area. Lek definitions are presented each year in the statewide Job Completion Report and are included in the monitoring protocol (Christiansen 2012). Undoubtedly, there are leks within the BHSBLWG area that have not yet been identified, while other un-discovered leks have been abandoned or destroyed. The majority of leks classified as “undetermined” lack sufficient data to make a valid status determination. In these cases, historic data indicates these leks were viable at one point, with the leks subsequently being either abandoned or moved. However, location data is either generic or suspect in many of these cases, further confounding the ability to determine the status of these leks.

Figure 1. Sage-grouse lek distribution and core areas within the BHSBLWG area, 2015.



Lek counts and lek surveys have been conducted within the area since the late 1950's, although historically on only a small number of leks. Since 2000, lek monitoring effort has expanded significantly, resulting in increasing numbers of leks being monitored over time and enabling meaningful comparisons of current sage-grouse data to a running 10-year average. In 2020, WGFD personnel, BLM personnel, volunteers and consultants combined efforts to check 173 of the 214 (81%) known occupied leks in the BHSBLWG area. A total of 116 occupied leks were counted while 57 were surveyed, with annual status being confirmed on 162 occupied leks in 2020. Of these, 123 (76%) were active and 39 (24%) were inactive.

It is important to consider trends in the numbers of active versus inactive leks in addition to average male lek attendance when analyzing population trend. During a period of population decline, male lek attendance decreases while the number of inactive leks typically increases. The converse occurs with an increasing population. The percentage of active occupied leks (that were checked) generally decreased in the BHSBLWG area as sage-grouse numbers declined from 2006-2013. Conversely, the percentage of active occupied leks increased for three consecutive years from 2014-2016 as this population grew. In addition, some new leks were discovered during this timeframe while other smaller leks again became active after periods of inactivity. Following a recent population peak in 2016, the percentage of active occupied leks declined through 2018 and has since remained stable. Generally declining trends in the percentage of occupied leks being active, coupled with declines in male lek attendance, suggest sage-grouse numbers are continuing to trend downward within the BHSBLWG area.

There is always some variation in the annual percentage of occupied leks being active. This variation can be attributed to both population fluctuations and survey effort. Survey effort has been relatively consistent over the past 10 years in the BHSBLWG area, with the total number of occupied leks checked ranging from 212 – 225. However, leks that are not checked in some years tend to be smaller, more difficult to access, or have been compromised in some manner (e.g. due to disturbance). Both disturbed and smaller leks have a higher probability of becoming inactive during a population nadir, such as that of 2013. Regardless, it is important to continue to monitor as many leks as possible, including smaller and marginal leks, to ensure they are classified appropriately (i.e. occupied, unoccupied or undetermined). Where sufficient monitoring data has shown a lek is no longer occupied, it is reclassified as unoccupied as per established protocol.

## **Population Trend**

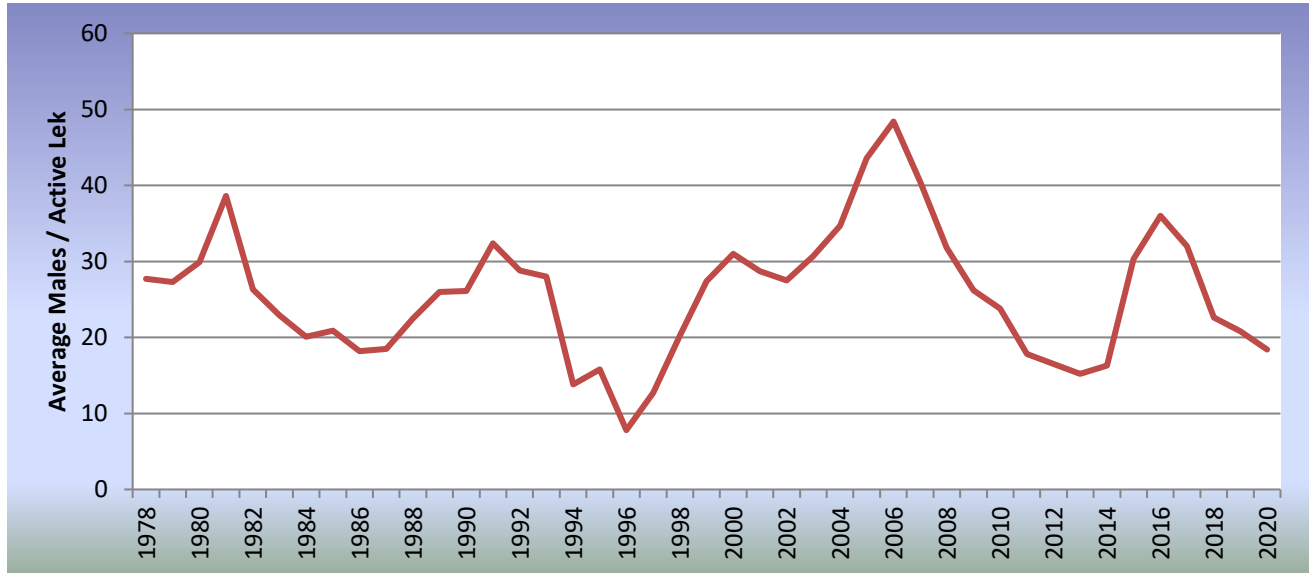
Monitoring male attendance on leks provides a reasonable index of sage-grouse population trend over time. Nevertheless, these data must be interpreted with caution for several reasons: 1) the survey effort and the number of leks surveyed/counted has varied over time; 2) it is assumed that not all leks in the area have been located; 3) sage-grouse populations exhibit cyclic patterns (Fedy and Doherty 2010); 4) the effects of unlocated or unmonitored leks that have become inactive cannot be quantified; and 5) lek sites may change over time. Both the number of active leks and the number of males attending these leks must be quantified over time to estimate population trend. Fluctuations in the number of grouse observed on leks over time are not exclusively a function of changing grouse numbers. These data also reflect changes in lek survey effort due to weather conditions dictating access to monitor leks.

Despite the aforementioned considerations regarding the interpretation of male lek attendance data, average peak male lek attendance obtained through surveys are strongly correlated with those obtained via lek counts in years when sample sizes exceed 50 leks (Fedy and Aldridge 2011). Since 1978, a minimum of 50 leks have been checked within the BHSBLWG area in all but 4 years (1992-1995) to



determine annual population trend. The average number of males observed per active surveyed lek has fluctuated substantially over that time frame within the BHSBLWG area (Figure 2).

Figure 2. Mean number of peak males per active lek checked within the BHSBLWG area, 1978 – 2020.



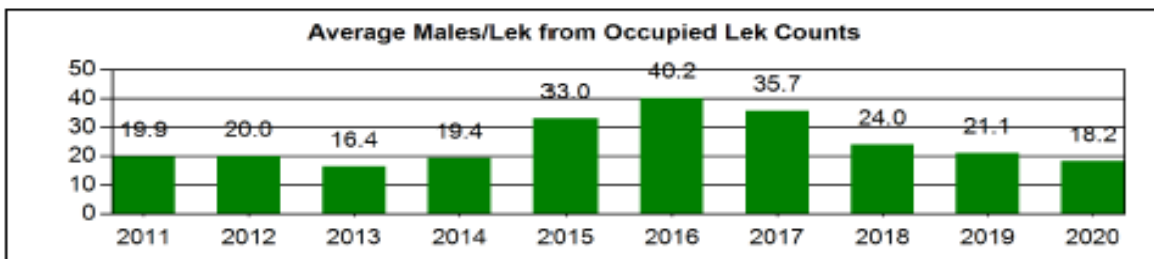
\*From 1978-1990, an average of 86 leks were checked each year.

\*From 1991-1999, an average of 54 leks were checked each year.

\*From 2000-present, an average of >160 leks were checked each year.

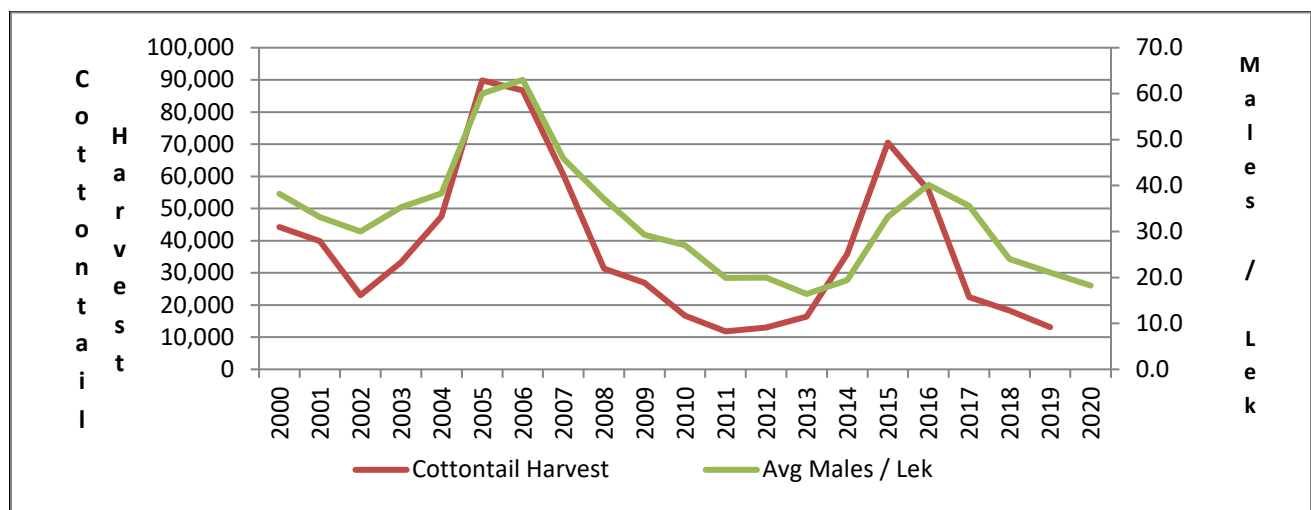
Based on the mean maximum number of males observed per counted lek, sage-grouse populations declined considerably from 2006 through 2013 in the BHSBLWG area (Figure 3). In fact, the 2013 nadir was the lowest average recorded male lek attendance since intensive lek monitoring began in 2000. However, male lek attendance increased significantly through 2016, which marked a cyclical peak with a mean maximum number of males per counted lek increasing to 40.2. Male lek attendance has since declined sharply over the past four years, with an average of 18.2 in 2020. This steep decline was likely a function of declining chick production and/or survival in 2015 and 2016, followed by only moderate chick production in 2017 and 2018, and another year of poor production in 2019. Based on long-term cyclical trends in male lek attendance in the BHSBLWG area (and for sage-grouse populations in general), the current decline in male lek attendance will likely continue, although this population should be nearing its nadir within the long-term cycle.

Figure 3. Mean number of peak males per count lek within the BHSBLWG area, 2011 – 2020.



The recent decline in sage-grouse lek attendance is also strongly correlated with the substantial downturn in cottontail rabbit populations throughout most of the BHSBLWG area. There is a strong likelihood that some prey shifting occurs whereby predation pressure on sage-grouse increases during cottontail population downturns and decreases during periods of high cottontail densities. Sage-grouse population cycles are highly correlated with those of cottontail rabbits over a long period of time (Fedy and Doherty 2010). The only cottontail rabbit data now collected in Wyoming is the estimated annual statewide harvest, which is highly correlated with cottontail densities and therefore serves as a reasonable indicator of population trend. When comparing statewide cottontail harvest data to the following spring's lek attendance data in the BHSBLWG area, there is a 78% correlation. Within the BHSBLWG area over the past ten years, both sage-grouse populations and cottontail rabbit densities (inferred through statewide cottontail harvest) increased through 2015-2016, but subsequently declined through 2019 (2020 cottontail harvest data is not yet available) (Figure 4). Anecdotal observations of rabbit densities from WGFD field personnel corroborate this, as there has been a noticeable decline in cottontail densities over the past three years.

Figure 4. Statewide Wyoming Cottontail Harvest and Average Males/Lek (BHSBLWG), 2000 – 2020.



\*Statewide cottontail harvest and male lek attendance the following spring are 78% correlated.

## Productivity

Classifying wings based on sex and age from harvested sage-grouse provides a meaningful indicator of annual sage-grouse chick productivity. During fall hunting seasons, hunters predominantly select for hens and chicks, and typically do not differentiate between the two. Sampling bias is therefore assumed to be minimal when analyzing the ratio of chicks per hen in hunter harvested sage-grouse wings. However, hunter selectivity and sage-grouse habitat use do result in adult and yearling males being under-represented in the harvest compared to their proportion of the population. Summer brood surveys are also conducted periodically, but do not provide as reliable an indicator of chick productivity given they are not conducted in a systematic and repeatable manner and sample sizes are low. In addition, many observations of sage-grouse occur along riparian areas during summer brood surveys, which may under-represent the number of barren hens occurring on uplands, thus biasing the actual chick:hen ratio. Brood survey data will therefore not be discussed here.

In general, chick/hen ratios of about 1.5:1 result in relatively stable lek counts the following spring, while chick/hen ratios of 1.8:1 or greater result in subsequent increased lek attendance and ratios below 1.2:1

result in decline (WGFD 2007). These thresholds do not seem to directly apply in the BHSBLWG area as sage-grouse populations increased from 2013-2016 despite relatively poor chick production (as measured by wing data) in all but one year. Obviously, additional factors must be considered when assessing changes in population trend such as fluctuations in adult female survival, changes in predation, sample size of hunter-harvested wings, etc. In addition, as populations are increasing, relatively less chick production is needed to fuel continued population growth. Over the last 10 years, estimated productivity from wing-barrel data has fluctuated between 0.4 and 2.2 chicks per hen within the BHSBLWG area, although this ratio has only exceeded 1.5 in one of the past 10 years. Reasons for continued relatively low chick production (as measured by wing data) in the BHSBLWG area are unknown. Spring / early summer weather conditions have been relatively normal, and have not experienced any unusual cold, wet conditions that can cause widespread elevated chick mortality following hatch.

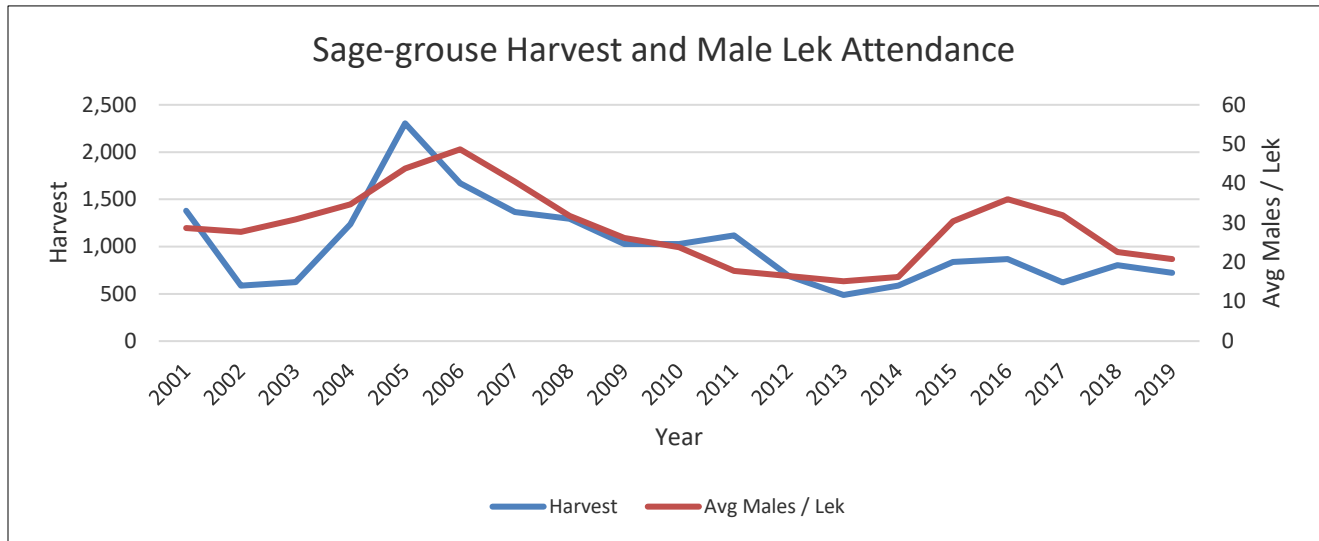
Based on wing data within the BHSBLWG area, moderate to poor sage-grouse juvenile recruitment over the past five years has resulted in continued population decline as evidenced by declining male lek attendance. Chick productivity/survival was excellent in 2014 with an observed 2.2 chicks per hen, which allowed for significant population increase, but has since declined. The chick:hen ratio of 0.4 (using wing data) in 2016 was the lowest chick/hen ratio ever recorded within the BHSBLWG area dating back to 1976. While chick production/survival increased to moderate levels in 2017 and 2018 (1.5 chicks/hen), chick production was again poor in 2019 at 0.8 chicks/hen.

## **Harvest**

Hunter and harvest statistics provide insight into trends in wildlife populations. Typical of upland game bird populations, there is typically a direct correlation between sage-grouse population levels and hunter effort/harvest when hunting seasons are consistent over time. As sage-grouse numbers decrease, hunter harvest generally declines. Conversely, when populations increase, sage-grouse hunting effort and harvest generally increases. Harvest data specific to the BHSBLWG area was obtainable starting in 1982. Prior to 1982, harvest data was recorded by county and not by management areas. Since 1982, overall sage-grouse harvest has declined considerably within the BHSBLWG area.

Harvest peaked in 1983 at ~14,200 birds and subsequently declined to an historic low of 488 in 2013. Following a period of steadily increasing harvest from 2013-2016, sage-grouse harvest has since remained relatively static in the BHSBLWG area over the past three years, averaging 716. Over the past 20 years, trends observed in harvest data generally mirror those observed in male lek attendance within the BHSBLWG area (Figure 5). However, it is interesting to note that harvest over the past two years (2018-19) was similar to that of 2016 (N=869) during the last population peak. Despite an uptick in sage-grouse populations through 2016, hunter harvest did not increase commensurately as compared to the previous population peak in 2006. Although there has been a long history of hunter effort being correlated with sage-grouse population trends, the recent disparate gap between hunter harvest and sage-grouse population trend over this past cycle may be signifying a waning overall general interest in sage-grouse hunting. Hunter numbers have declined considerably over the long-term, which is also due to conservative seasons being implemented over the past two decades. Hunter participation and harvest declined dramatically in Wyoming when the Wyoming Game and Fish Commission moved the hunting season to later in September in 1995, and then reduced the bag limit and shortened the hunting season in 2002 (WGFD 2008). This reduced hunter harvest occurred in spite of a concurrent sage-grouse population increase (based on males/lek), demonstrating the effects increasingly conservative hunting seasons have had on hunter participation in recent years.

Figure 5. Total sage-grouse harvested per year and the average number of males per active lek checked within the BHSBLWG area, 2001 – 2019.



Managers are unable to quantify population response to changes in harvest levels within the BHSBLWG area. Research suggests harvest pressure can be an additive source of mortality within small isolated sage-grouse populations, but is generally compensatory at levels under 11% of the preseason population (Braun and Beck 1985, Connelly et al. 2000, Sedinger et al. 2010).

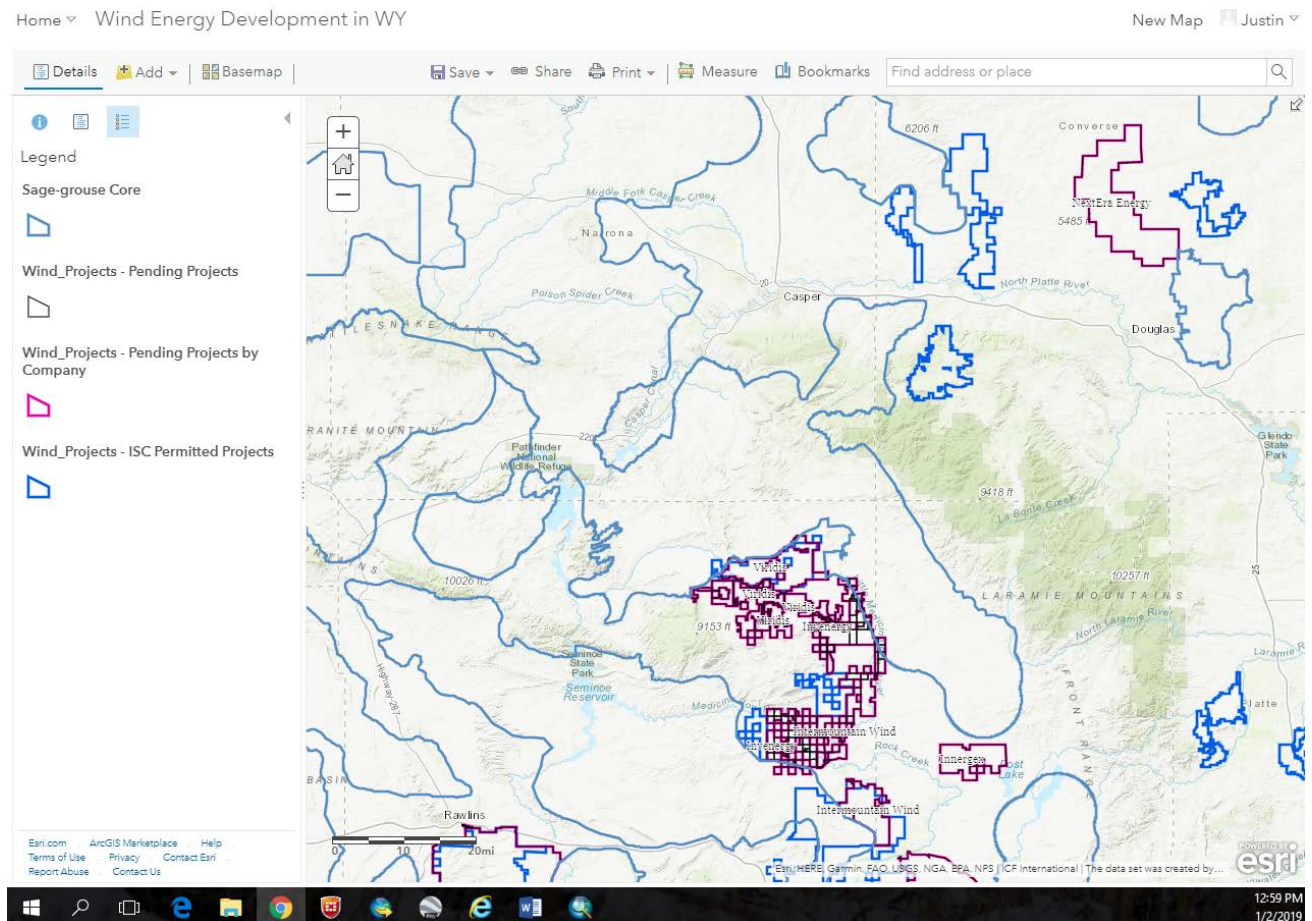
## Habitat

There is little doubt sage-grouse habitat quality has declined over the past several decades throughout the BHSBLWG area. Increased human-caused disturbance (i.e., oil/gas, coal, uranium, and wind energy development), improper grazing by livestock and wildlife, sagebrush eradication programs, and long-term drought have all combined to negatively impact sage-grouse and their habitats. As the level of concern for sage-grouse and sagebrush ecosystems has risen, large-scale sagebrush eradication programs have been largely abandoned, and significant portions of the landscape are now enrolled in grazing systems which are designed to be sustainable and promote healthy rangelands. In addition, various habitat improvement projects have been planned and/or implemented throughout the BHSBLWG area. However, there is much debate among wildlife managers, habitat biologists, researchers, and rangeland specialists as to the efficacy of various forms of habitat treatments within sagebrush ecosystems. Given the long timeline required to reestablish sagebrush following treatment and the difficulty in measuring sage-grouse population level response to such treatments, habitat projects designed to improve sagebrush ecosystem function should be conducted with extreme caution, especially in xeric sagebrush stands or in habitats containing isolated sage-grouse populations.

Of particular concern to sage-grouse within the BHSBLWG area is the substantial expansion of large-scale industrial wind development within Shirley Basin. Several new projects are currently in various stages of permitting, with construction ongoing for one large wind farm in eastern Shirley Basin, and more being planned for additional new wind developments over the next two years (Figure 6). Should all or most of these projects come to fruition, they could cumulatively result in the installation of several thousand new wind turbines throughout Shirley Basin. Some of the larger proposed developments are slated to occur within sage-grouse habitat, and could pose significant cumulative impacts to sage-grouse over a large landscape depending upon project scale and siting. Although the current Executive Order

(2015-4) prohibits wind development within core areas pending further research, some substantial sage-grouse habitats within Shirley Basin were not included within the most recent version (Version 4) of core areas as wind development was already in the permitting stage. Much of the proposed development is immediately adjacent to core areas.

Figure 6. Existing and proposed (in permitting process) wind development within the BHSBLWG area, 2018.



## Disease

There were no confirmed cases of West Nile virus (WNV) in sage-grouse within the BHSBLWG area during this reporting period. Normal monitoring efforts were in place. These consisted of requesting researchers with radio-marked birds to monitor for mortality in late summer and attempt to recover and submit carcasses of dead birds to the Wyoming State Vet Lab for necropsy. WGFD field personnel, other agency personnel and the public (via press release), especially ranchers and hay farmers, were also asked to report dead sage-grouse in a timely fashion. The extent of WNV infection and its effects on sage-grouse populations throughout the BHSBLWG area is unknown, but potentially significant in years when outbreaks occur.

## Bates Hole / Shirley Basin LWG Conservation Plan Addendum

The BHSBLWG Conservation Plan was updated to reflect major state and federal policy changes in 2013. A Conservation Plan Addendum was completed in July 2013 and is available on the Wyoming Game and Fish Department website at:

[https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/Sage%20Grouse/SG\\_BSBASIN\\_CONSVPLAN.pdf](https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/Sage%20Grouse/SG_BSBASIN_CONSVPLAN.pdf).

## Special Studies

The following special studies have been or are currently being conducted within the reporting period within the BHSBLWG area:

In addition to a 2016 completion report, Western EcoSystems Technology, Inc. provided two reports on the effects of wind energy development on sage-grouse habitat selection, survival and population demographics for the Simpson Ridge Wind Energy Project, Carbon County, Wyoming (LeBeau et al. 2016, LeBeau et al. 2017a, LeBeau et al. 2017b). In summary, the consulting firm was hired to conduct a long-term research project to evaluate the impacts to sage-grouse from wind energy development within a defined core area. A technical committee was assembled to define research methodology and objectives. The committee included representation from state and federal agencies as well as reputable sage-grouse researchers. This research was partially funded from local sage-grouse working group funds. Field work was initiated in 2009 and continued through 2015. In addition, a master's thesis was completed summarizing male lek attendance, seasonal habitat selection, and survival within this study area (LeBeau 2012). Some results from this thesis were also published in a peer-reviewed journal (LeBeau 2014) with additional publications that followed.

The following two abstracts were included in the "Greater Sage-grouse Research Conducted in Wyoming in 2019" summary compiled by Dr. Jeff Beck from the University of Wyoming:

### 1. RESPONSE OF GREATER SAGE-GROUSE TO TREATMENTS IN WYOMING BIG SAGEBRUSH

Kurt T. Smith<sup>1</sup>, Jeffrey L. Beck<sup>1</sup>, Jason LeVan<sup>1</sup>, Anna D. Chalfoun<sup>2</sup>, Jason D. Carlisle<sup>3</sup>, Jen S. Forbey<sup>4</sup>, Stan Harter<sup>5</sup>, and Leah Yandow

<sup>1</sup>University of Wyoming, Department of Ecosystem Science and Management, 1000 East University Avenue, Laramie, WY 82071

<sup>2</sup>University of Wyoming, Department of Zoology and Physiology, USGS Wyoming Cooperative Fish and Wildlife Research Unit, 1000 East University Avenue, Laramie, WY 82071

<sup>3</sup>Western Ecosystems Technology, Inc., 200 South 2nd St., Suite B, Laramie, WY 82070

<sup>4</sup>Boise State University, Department of Biological Sciences, Boise, Idaho 83725

<sup>5</sup>Wyoming Game and Fish Department, Lander Regional Office, 260 Buena Vista Drive, Lander, Bureau of Land Management, Lander Field Office, 1335 Main Street, Lander, WY 82520



Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) has been treated through chemical application, mechanical treatments, and prescribed burning to increase herbaceous forage species released from competition with sagebrush overstory. Originally intended to provide more forage for livestock, these techniques have been applied to improve habitat for sagebrush wildlife species including greater sage-grouse (*Centrocercus urophasianus*). Treatments are intended to rejuvenate sagebrush plants and increase herbaceous production. Studies evaluating habitat treatments have reported varied results and generally lack the replication necessary for evaluation of demographic rates and fine-scale habitat use of sage-grouse in response to treatments. Our study, centered near Jeffrey City, Wyoming is designed as a Before-After Control-Impact study with 3 years of pre-treatment and 6 years of post-treatment data comparing demographic rates and habitat selection patterns within treated and non-treated sites. We initiated our study in spring 2011 by capturing female sage-grouse and affixing VHF necklace-mounted or GPS rump-mounted transmitters to measure nest and brood-rearing success, and adult female survival. During winter 2014, we mowed 489 ha (1,208 acres) of sagebrush habitats across 2 mowing treatment areas and applied tebuthiuron to 607 ha (~1,500 acres) across 2 herbicide treatment areas in May 2014. We have monitored demographic parameters from n = 625 marked females. Identifying sage-grouse demographic and habitat use responses will aid in determining the efficacy of habitat treatments intended to enhance habitat for sage-grouse and other species associated with the sagebrush biome. Our field study was funded through summer 2019; we will perform final analyses during 2020.

## 2. GREATER SAGE-GROUSE MOVEMENT PATTERNS NEAR AN EXISTING WIND FARM

Jennifer Hess<sup>1</sup>, Chad Olson<sup>1</sup>, Darren Long<sup>2</sup>

<sup>1</sup>HWA Wildlife Consulting, LLC, 2308 South 8<sup>th</sup> Street, Laramie, Wyoming 82070

<sup>2</sup> Bureau of Land Management, Wyoming State Office, Cheyenne, Wyoming

Existing peer-reviewed research on the potential effects of wind energy on greater sage-grouse is fairly limited. Currently there is little to no information on site fidelity, recruitment or dispersal of sage-grouse in relation to energy development, specifically wind energy. Adult sage-grouse are known to have a high site fidelity, which can limit their ability to adapt to changes in their environment. But no information exists for sage-grouse movement from natal to initial breeding areas. For our research project, the specific objectives were to: (1) quantify multi-scale resource selection/avoidance in sage-grouse within the wind farm, (2) generate data-driven high-resolution maps of seasonal habitat (nesting, late brood-rearing/summer, and winter) at the landscape scale, and (3) investigate natal dispersal while also examining brood-rearing habitat use, fecundity, survival, and second year use by chicks in wind farm areas.

Female sage-grouse were captured by nocturnal spot-lighting in spring 2019. We equipped female greater sage-grouse with solar-powered ARGOS/GPS transmitters in and around the wind farm near Hanna, Wyoming. Following successful hatching and chicks surviving to 75 days, a total of were outfitted with a 6g ARGOS/GPS transmitter. The project is currently ongoing and we hope future funding will allow us to create several peer-reviewed publications from the research work.

## Recommendations

1. Enhance understanding of *long-term* impacts to sage-grouse from large-scale industrial wind through continued research in addition to the research that was conducted within the 7-Mile Hill / Simpson Ridge wind development areas (LeBeau et al., 2016).
  - a. NOTE: As of Dec. 2020, Dr. Jeff Beck (along with WEST, Inc.) is proposing to conduct a thorough analysis of potential long-term impacts to sage-grouse populations from industrial wind developments.
2. Continue efforts to document seasonal habitat use throughout the BHSBLWG area, with emphasis on nesting, early-brood rearing, and winter habitats.
3. Continue efforts to document sage-grouse use in ephemeral / mesic drainages where sagebrush has been removed to enhance herbaceous grass and forb production for the benefit of early and late brood rearing habitats.
4. The BHSBLWG should continue to solicit conservation projects that will benefit sage-grouse. These include but are not limited to projects designed to enhance sagebrush understory herbaceous vegetation production, riparian corridor protection, wind energy related research, water development, livestock grazing management planning, etc.
5. Ensure monitoring of all count leks is conducted properly and consistently as per WGFD protocol on an annual basis (WGFD 2010). In addition, maximize overall lek monitoring efforts (including lek surveys) each year to ensure lek sample sizes are significant enough to adequately detect population change.
6. If possible, attempt to survey all leks each year while maintaining counts on all designated count leks. Encourage the public, volunteers, and especially landowners to report lek activity and assist with lek surveys and counts.
7. Continue to monitor inactive or unoccupied leks to adjust classification designation as appropriate.
8. Continue to update and refine UTM coordinates (using NAD83) of leks and map lek perimeters where needed.
9. Continue to inventory abandoned leks to ensure they are appropriately classified and determine whether or not they should continue to remain in the database as per protocol.



## Relevant Research

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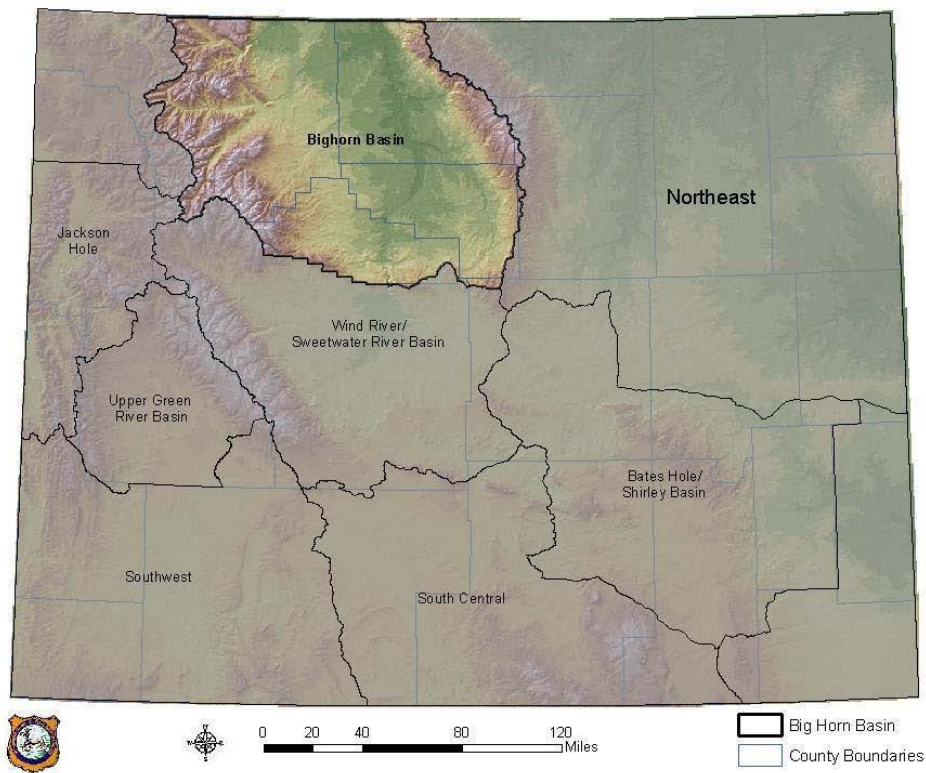
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# Cody Region Sage-Grouse Job Completion Report

Conservation Plan Area: **Big Horn Basin**

Period Covered: **6/1/2019 – 5/31/2020**

Prepared by: **Sam Stephens**



## Sage Grouse Lek Characteristics

### Working Group: Big Horn Basin

Region	Number	Percent
Cody	309	100.0

Classification	Number	Percent
Occupied	219	70.9
Undetermined	49	15.9
Unoccupied	41	13.3

Biologist	Number	Percent
Cody	85	27.5
Greybull	52	16.8
Worland	172	55.7

County	Number	Percent
Big Horn	48	15.5
Hot Springs	61	19.7
Park	104	33.7
Washakie	96	31.1

Management Area	Number	Percent
B	309	100.0

Working Group	Number	Percent
Big Horn Basin	309	100.0

BLM Office	Number	Percent
Cody	114	36.9
Worland	195	63.1

Warden	Number	Percent
Greybull	23	7.4
Lovell	31	10.0
Meeteetse	32	10.4
North Cody	24	7.8
Powell	13	4.2
South Cody	28	9.1
Ten Sleep	52	16.8
Thermopolis	48	15.5
Worland	58	18.8

Land Status	Number	Percent
BLM	205	66.3
BOR	3	1.0
Private	82	26.5
State	19	6.1

Lek Status	Number	Percent
Active	159	51.5
Inactive	118	38.2
Unknown	32	10.4

# Sage Grouse Job Completion Report

Year: 2011 - 2020, Working Group: Big Horn Basin

## 1. Lek Attendance Summary (Occupied Leks) (1)

### a. Leks Counted

Year	Occupied	Counted	Percent Counted	Peak Males	Avg Males / Active Lek (2)
2011	231	64	28	905	16.2
2012	234	53	23	815	17.0
2013	236	42	18	501	12.5
2014	233	68	29	823	14.4
2015	243	53	22	1108	26.4
2016	249	86	35	2258	30.5
2017	251	56	22	1636	34.8
2018	242	60	25	1115	24.2
2019	241	58	24	873	17.1
2020	233	69	30	863	16.6

### b. Leks Surveyed

Year	Occupied	Surveyed	Percent Surveyed	Peak Males	Avg Males / Active Lek (2)
2011	231	121	52	989	12.8
2012	234	126	54	777	8.8
2013	236	148	63	749	8.2
2014	233	90	39	517	9.2
2015	243	141	58	2297	20.3
2016	249	140	56	2053	23.3
2017	251	175	70	2286	19.2
2018	242	153	63	1434	14.2
2019	241	139	58	835	9.6
2020	233	125	54	604	7.8

1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

3) Inactive - Confirmed no birds/sign present (see official definitions)

## Sage Grouse Job Completion Report

Year: 2011 - 2020, Working Group: Big Horn Basin

### 1. Lek Attendance Summary (Occupied Leks) (1)

Continued

#### c. Leks Checked

Year	Occupied	Checked	Percent Checked	Peak Males	Avg Males / Active Lek (2)
2011	231	185	80	1894	14.2
2012	234	179	76	1592	11.7
2013	236	190	81	1250	9.5
2014	233	158	68	1340	11.9
2015	243	194	80	3405	22.0
2016	249	226	91	4311	26.6
2017	251	231	92	3922	23.6
2018	242	213	88	2549	17.3
2019	241	197	82	1708	12.4
2020	233	194	83	1467	11.4

#### d. Lek Status

Year	Active	Inactive (3)	Unknown	Known Status	Percent Active	Percent Inactive
2011	130	12	43	142	91.5	8.5
2012	143	10	26	153	93.5	6.5
2013	132	9	49	141	93.6	6.4
2014	115	23	20	138	83.3	16.7
2015	156	27	11	183	85.2	14.8
2016	173	26	27	199	86.9	13.1
2017	171	35	25	206	83.0	17.0
2018	152	34	27	186	81.7	18.3
2019	148	42	7	190	77.9	22.1
2020	135	57	2	192	70.3	29.7

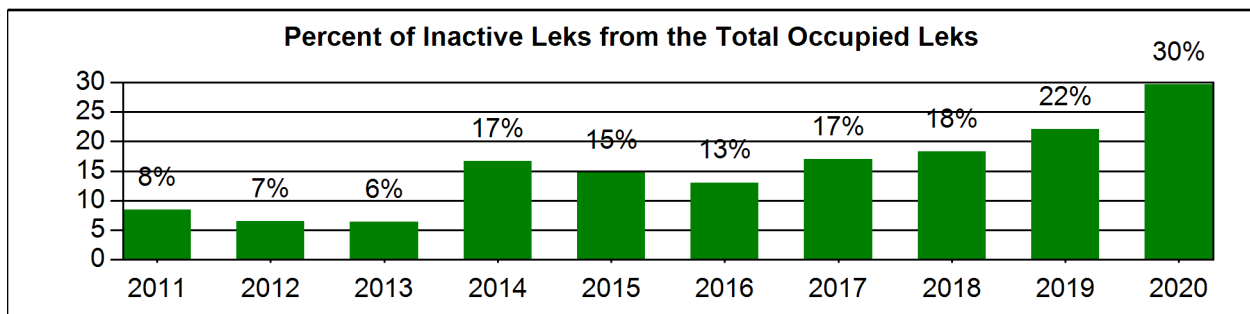
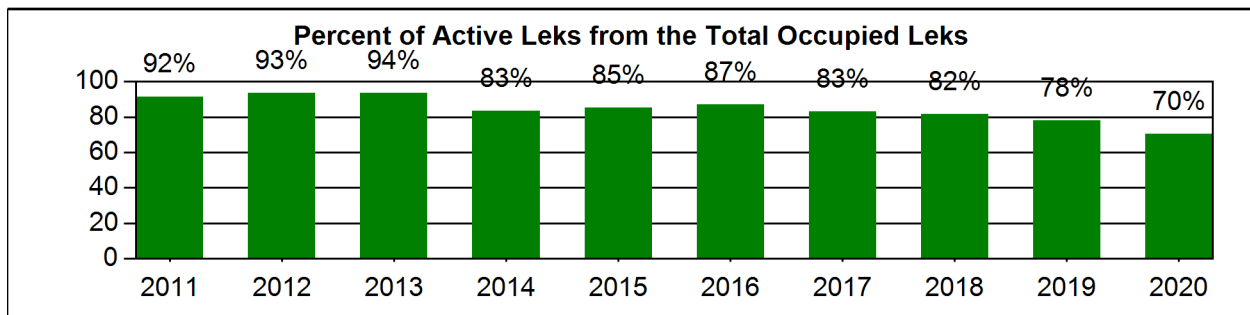
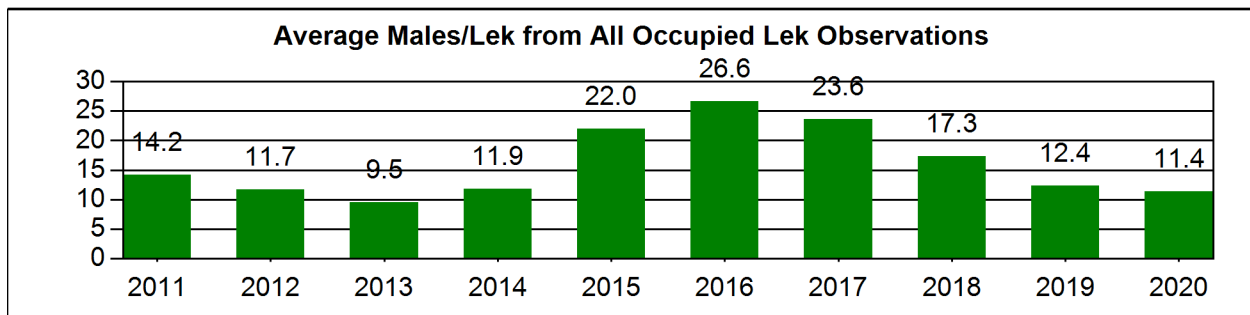
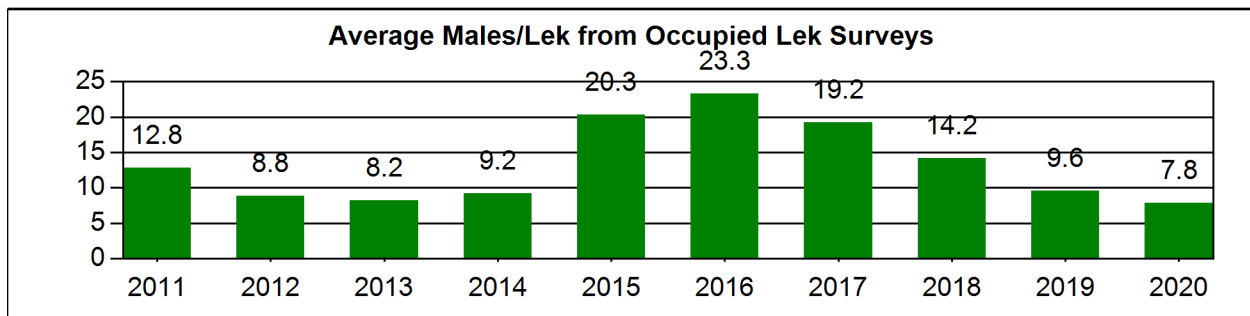
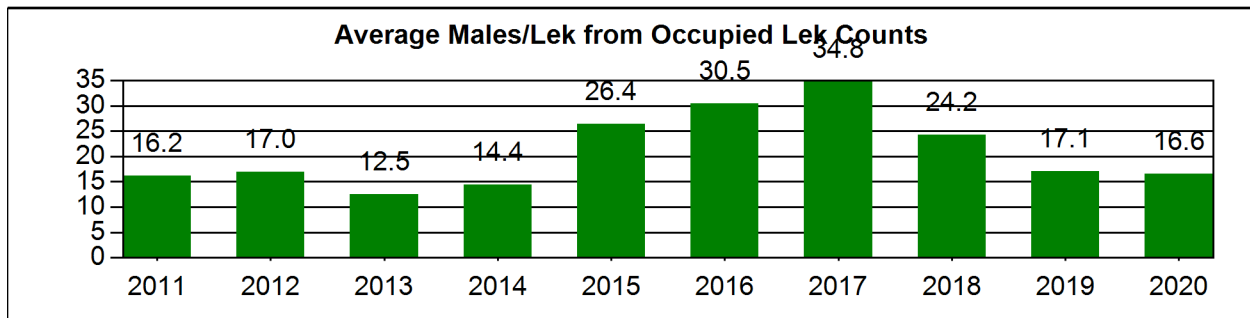
1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

3) Inactive - Confirmed no birds/sign present (see official definitions)

# Sage Grouse Occupied Lek Attendance Summary

Year: 2011 - 2020, Working Group: Big Horn Basin



## Sage Grouse Job Completion Report

Year: 2011 - 2020, Working Group: Big Horn Basin

### 3. Sage Grouse Hunting Seasons and Harvest Data

#### a. Season

Year	Season Start	Season End	Length	Bag/Possession Limit
2011	Sep-17	Sep-30	14	2/4
2012	Sep-15	Sep-30	16	2/4
2013	Sep-21	Sep-30	10	2/4
2014	Sep-20	Sep-30	11	2/4
2015	Sep-19	Sep-30	12	2/4
2016	Sep-17	Sep-30	14	2/4
2017	Sep-16	Sep-30	15	2/4
2018	Sep-15	Sep-30	16	2/4
2019	Sep-21	Sep-30	10	2/4

#### b. Harvest

Year	Harvest	Hunters	Days	Birds/ Day	Birds/ Hunter	Days/ Hunter
2011	354	294	867	0.4	1.2	2.9
2012	457	290	609	0.8	1.6	2.1
2013	206	206	513	0.4	1.0	2.5
2014	524	303	708	0.7	1.7	2.3
2015	729	411	947	0.8	1.8	2.3
2016	594	302	868	0.7	2.0	2.9
2017	635	300	745	0.9	2.1	2.5
2018	648	418	1351	0.5	1.6	3.2
2019	312	244	463	0.7	1.3	1.9
Avg	495	308	786	0.6	1.6	2.5



### Lek Monitoring

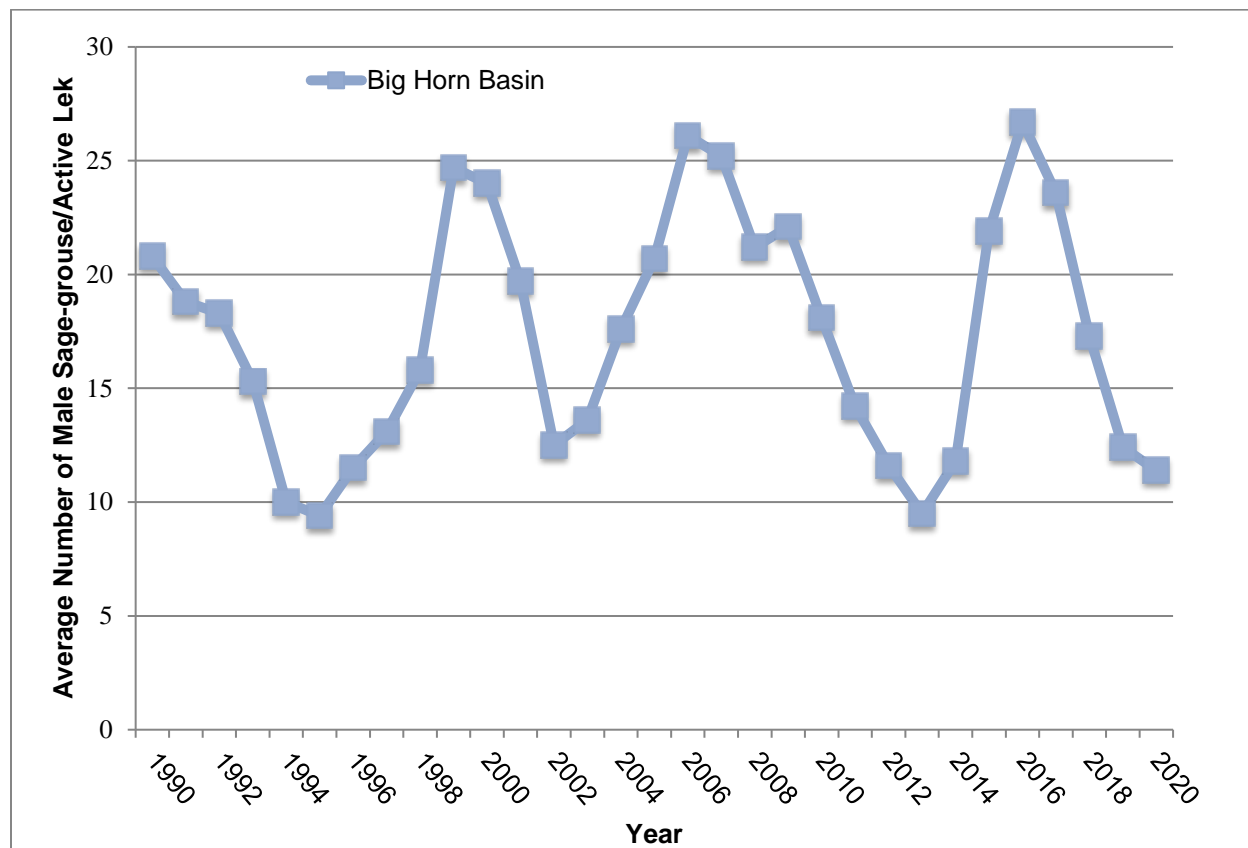
In spring 2020, 69 leks were counted in the Basin, resulting in an average of 16.6 males per lek (Table 2a). We surveyed 125 leks (2011-20 average=136; Table 2b), for a total of 194 leks checked during the 2020 season (2011-20 average=197; Table 2c). To evaluate long-term population trends, we combine and average survey and count lek data since the count protocol was not used during the late 1980s and early 1990s. Fortunately, long-term data sets from Wyoming and neighboring states indicate similar trends from both counts and surveys (Fedy and Aldridge 2011; Figure 2).

The average number of male sage-grouse on both counted and surveyed leks declined from the

2019 average peak male count of occupied leks of 12.4 to 11.4 in 2020 (Table 2c), indicating a continued suppression in the population (Figure 2). Sage-grouse populations cycle on approximate

7 to 10-year intervals (Fedy and Doherty 2010; Figure 2). During a suppression in population performance, we would expect an increase in the number of inactive leks. In 2020 the number of

inactive leks increased from 42 in 2019 to 57. With 3 years of data indicating a reduction in sage-grouse abundance, the positive trend from 2014-2017 has been reversed (Figure 2).



### Production Surveys

Four sage-grouse broods were documented in 2020 (Table 4). Low sample sizes are likely a product of lack of effort by field personnel, because sage-grouse brood data is opportunistically collected while performing other duties during July and August. A direct connection between effort (time spent surveying for broods) and number of broods observed was presented in previous Job Completion Reports.

**Table 4. Brood survey data collected by Wyoming Game & Fish Department personnel in the Bighorn Basin, 2010-19.**

Year Observed	Broods	Chicks	Hens	Chicks/brood	Chicks/hen
2010	17	64	17	3.8	3.8
2011	N/A	N/A	N/A	N/A	N/A
2012	8	26	8	3.3	3.3
2013	8	30	9	3.8	3.3
2014	6	31	27	5.2	1.1
2015	13	69	24	5.3	2.9
2016	8	21	5	2.6	4.2
2017	5	32	7	6.4	4.6
2018	5	22	6	4.4	3.7
2019	4	15	4	3.8	3.8
2020	4	22	4	5.5	5.5
<b>2010-20 average</b>	<b>7.8</b>	<b>33.2</b>	<b>11.1</b>	<b>4.4</b>	<b>3.6</b>

### Harvest

Average (1982-1994) annual harvest in the Basin was 3,756 sage-grouse taken by 1,300 hunters during 3,118 hunter days (2.8 birds/hunter, 2.4 days/hunter). During 1995-2001 an average of 549 hunters took 1,056 sage-grouse during 1,567 days of hunting (1.9 birds/hunter, 2.8 days/hunter). During the most recent period (2011-2019), hunters averaged 1.6 birds/hunter and 2.5 days/hunter. In 2019, 244 hunters in the Big Horn Basin harvested 312 sage-grouse (1.3 birds/hunter); spending 463 hunter-days afield (1.9 days/hunter) during the 10-day hunting season (Table 3). The significant decrease in sage grouse harvest from 2018 to 2019 is likely an artifact of a shortened hunting season in addition to reduced sage grouse abundance. The shortened season likely contributed to fewer hunters seen in 2019 than in 2018: 244 to 418 respectively (Table 3b).

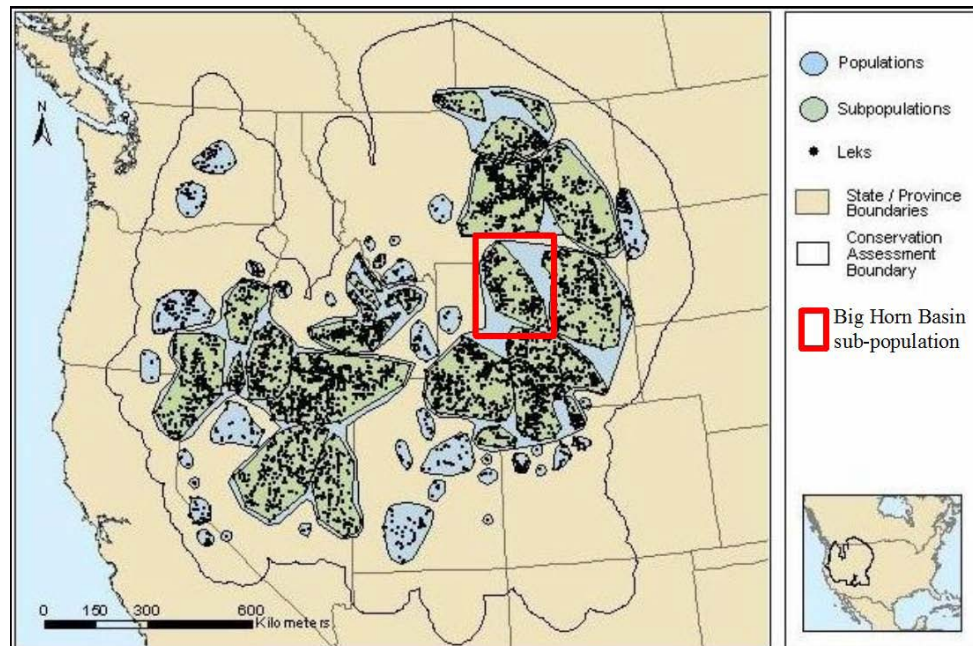
### Habitat

Sage grouse habitat within the Bighorn Basin exists predominantly in low precipitation zones ranging from 5-9" to 7-12" annually. Vegetation communities within the Basin are diverse and vary according to soil type, annual precipitation, and elevation. Major vegetation communities in the Basin include sagebrush steppe, saltbush badlands, irrigated agricultural lands, cottonwood dominated riparian corridors, mixed mountain shrub, and mixed conifer forests with interspersed aspen stands at higher elevations.

Connelly et al. (2004) recognized sage-grouse in the Basin as a distinct sub-population (Figure 3). Mountain ranges to the east and west restrict most sage-grouse movement due to unsuitable habitat. There are several leks near the Wyoming/Montana state line with movement between states occurring. Copper Mountain, the Owl Creek Mountains, and the southern Bighorn Mountains provide suitable habitat serving as travel corridors to adjacent populations.

In 2020, 309 sage-grouse leks are known to occur in the conservation area with 219 leks known to be occupied and 41 leks known to be unoccupied (Table 1). Undetermined leks (n=49) need additional observations before being reclassified as occupied or unoccupied. A majority of leks (66%) occur on BLM managed land and 27% of leks occur on private land (Table 1). There are potentially other leks in the Basin not yet discovered.

Figure 3. Discrete populations and subpopulations of sage-grouse in western North America, with the Big Horn Basin sub-population surrounded by the red rectangle. (Adapted from Connelly et. al. 2004).



### Conservation Planning

The BHBLWG was formed in September 2004 to develop and implement a local conservation plan for sage-grouse and sagebrush habitats. The BHBLWG's mission statement is, *"Through the efforts of local concerned citizens, recommend management actions that are based on the best science to enhance sagebrush habitats and ultimately sage-grouse populations within the Big Horn Basin."*

The BHBLWG's local plan identifies factors and impacts that may influence sage-grouse populations in the Basin, and outlines goals and objectives to address habitats, populations, research and education. Strategies and commitments in the local plan are designed to improve sage-grouse habitats and populations in the Basin. The local plan was updated in 2013 and highlights completed and ongoing projects in the Basin in addition to summarizing state- and nation-wide policy and programs. The updated plan can be viewed at the WGFD website: <https://wgfd.wyo.gov/Habitat/Sage-Grouse-Management>.

Most recently, the BHBLWG met in August of 2020 to discuss project funding allocation to sage grouse research and habitat improvement projects. The group agreed to grant the \$75,000 amongst

multiple habitat improvement and research projects which included: \$15,000 to the Hot Springs County Weed and Pest District for cheatgrass treatment in the Kirby Creek watershed, \$55,000 to Oregon State University and the USDA for research conducted in Park County investigating the interactive effects of livestock, predators, and habitat on sage-grouse demography, and \$5,000 to the University of Wyoming to continue research investigating the response of sage-grouse to treatments in Wyoming Big Sagebrush.

### **Conclusions and Recommendations**

For the 2019 biological year sage grouse populations in the Bighorn Basin appear to continue on a downward trend from the previous two years. Although the sample size is limited the 2020 brood count survey data suggest that for the 2020 biological year, sage grouse populations in the Bighorn Basin could reverse course from the sustained decline. Sage-grouse in the Basin face threats, but are not in danger of foreseeable extirpation, and on-going conservation efforts are intended to mitigate some anthropogenic impacts. Research and monitoring are important to help identify limiting factors, important habitats, and to track populations.

- Formalize winter use area mapping in coordination with Worland and Cody BLM offices
- Serve an advisory role to the Bighorn Basin Sage Grouse Local Working Group in their annual efforts to review and determine whether soft or hard triggers have been tripped in accordance with Adaptive Management practices outlined in the Wyoming State Executive Order 2019-3.
- Continue to be WGFD liaison for ongoing and new research projects, as much as possible.
- Work closely with local ranchers, farmers, energy companies, and other landowners whenever possible on sage-grouse habitat (especially early brood-rearing) and riparian enhancement projects.
- Assist the Shoshone National Forest, Bighorn National Forest and Bureau of Land Management Bighorn Basin/Wind River District with prescribed burning plans targeting sage-grouse habitats in the Basin.

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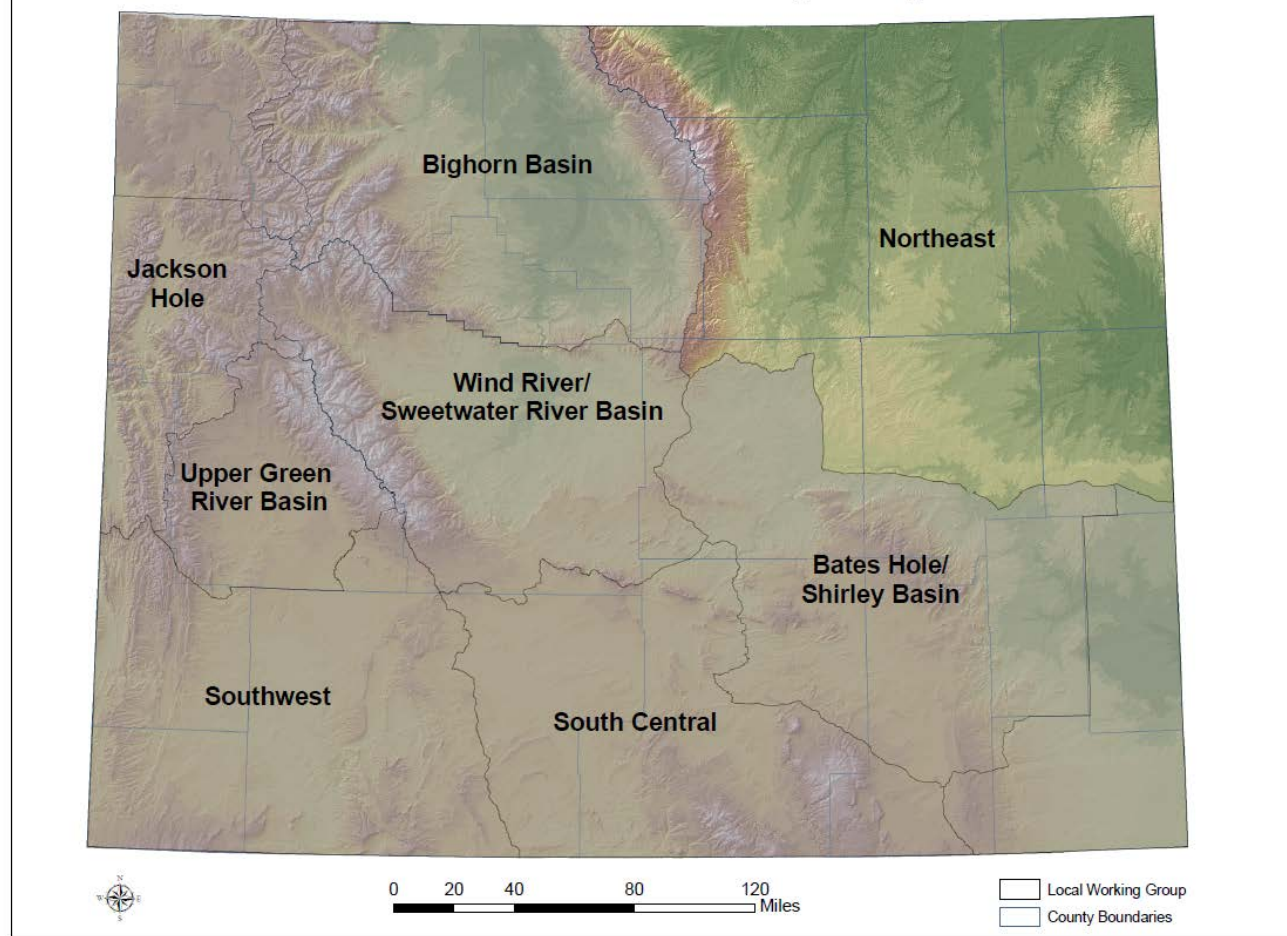
# Northeast Conservation Area

## Job Completion Report

SPECIES: **Sage-grouse**  
DAU NAME: **Northeast Wyoming Working Group; Area C**  
Period Covered: **6/1/2019 – 5/31/2020**  
Prepared by: **Leslie Schreiber, Sage-grouse/Sagebrush Biologist**



### Northeast Local Working Group



# Sage Grouse Job Completion Report

Year: 2011 - 2020, Management Area: C

## 1. Lek Attendance Summary (Occupied Leks) (1)

### a. Leks Counted

Year	Occupied	Counted	Percent Counted	Peak Males	Avg Males / Active Lek (2)
2011	412	173	42	1134	11.7
2012	416	240	58	1860	13.0
2013	408	107	26	713	10.5
2014	405	197	49	932	9.7
2015	397	189	48	1933	16.2
2016	393	168	43	1962	20.2
2017	376	165	44	1845	20.1
2018	371	176	47	1376	13.8
2019	363	152	42	1112	12.5
2020	352	161	46	1531	15.8

### b. Leks Surveyed

Year	Occupied	Surveyed	Percent Surveyed	Peak Males	Avg Males / Active Lek (2)
2011	412	189	46	652	8.2
2012	416	148	36	499	9.8
2013	408	249	61	940	8.5
2014	405	162	40	700	10.0
2015	397	147	37	1065	16.1
2016	393	179	46	1708	19.2
2017	376	163	43	1375	16.4
2018	371	108	29	654	12.3
2019	363	144	40	833	11.3
2020	352	69	20	434	16.1

1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

3) Inactive - Confirmed no birds/sign present (see official definitions)

## Sage Grouse Job Completion Report

Year: 2011 - 2020, Management Area: C

### 1. Lek Attendance Summary (Occupied Leks) (1)

Continued

#### c. Leks Checked

Year	Occupied	Checked	Percent Checked	Peak Males	Avg Males / Active Lek (2)
2011	412	362	88	1786	10.1
2012	416	388	93	2359	12.2
2013	408	356	87	1653	9.3
2014	405	359	89	1632	9.8
2015	397	336	85	2998	16.2
2016	393	347	88	3670	19.7
2017	376	328	87	3220	18.3
2018	371	284	77	2030	13.3
2019	363	296	82	1945	11.9
2020	352	230	65	1965	15.8

#### d. Lek Status

Year	Active	Inactive (3)	Unknown	Known Status	Percent Active	Percent Inactive
2011	183	111	68	294	62.2	37.8
2012	200	114	74	314	63.7	36.3
2013	180	120	56	300	60.0	40.0
2014	168	134	57	302	55.6	44.4
2015	188	94	54	282	66.7	33.3
2016	192	109	46	301	63.8	36.2
2017	179	101	48	280	63.9	36.1
2018	157	98	29	255	61.6	38.4
2019	165	81	50	246	67.1	32.9
2020	125	91	14	216	57.9	42.1

1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

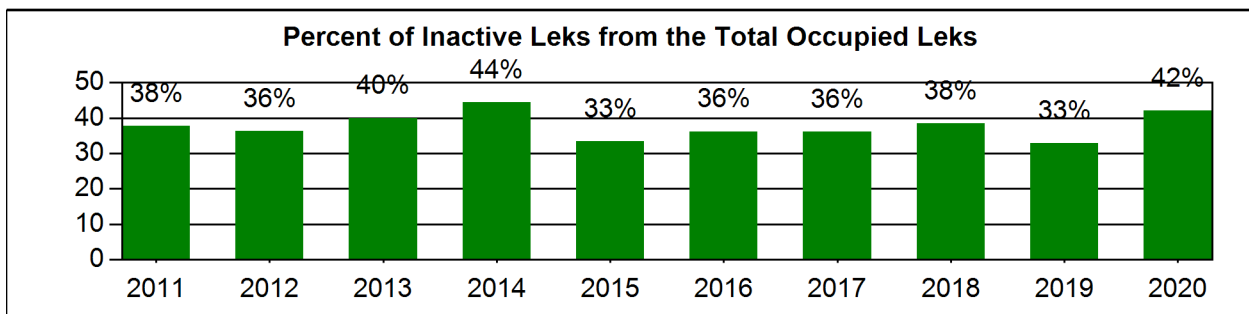
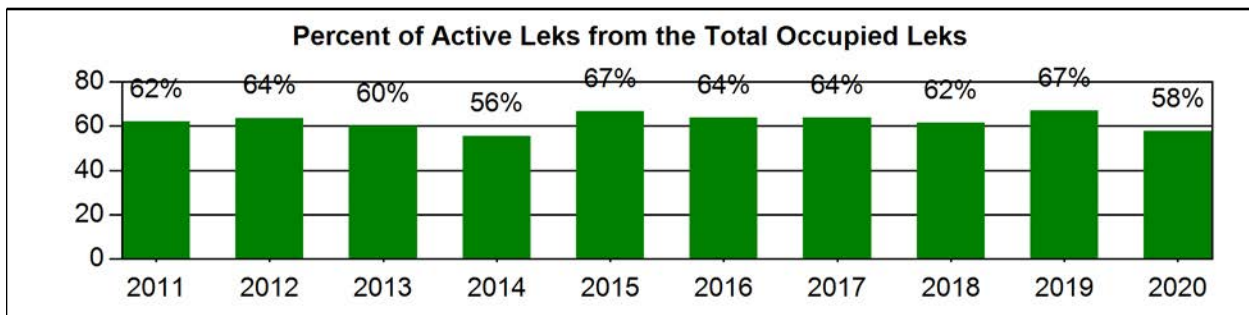
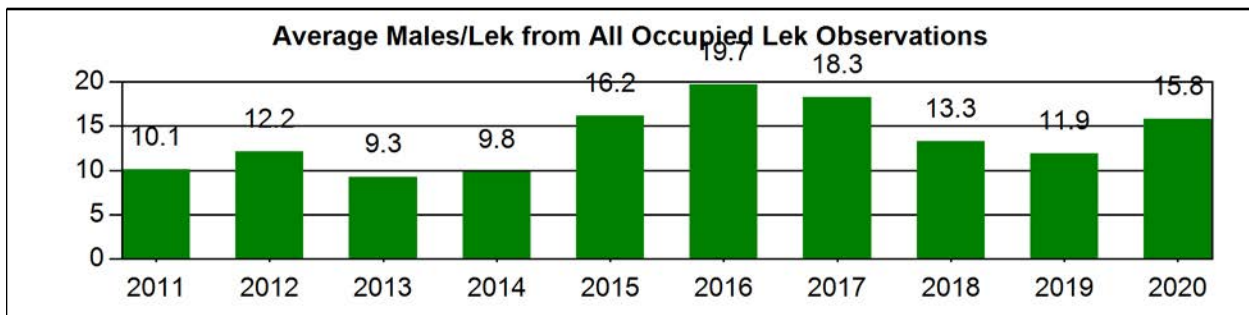
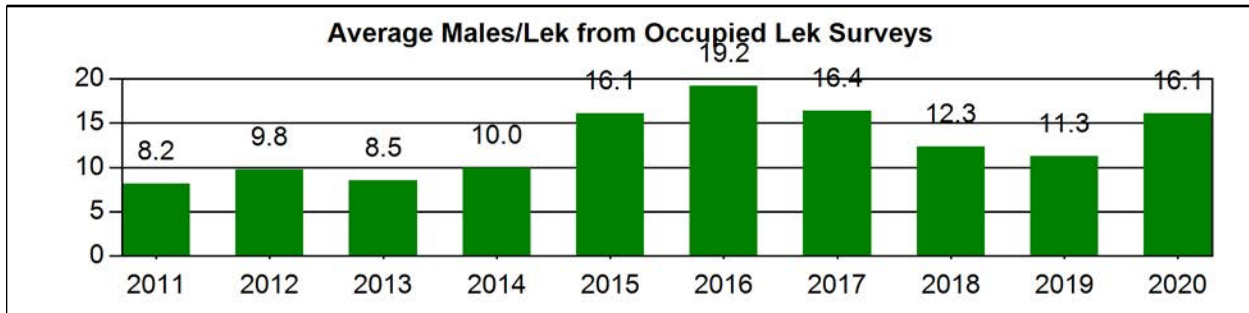
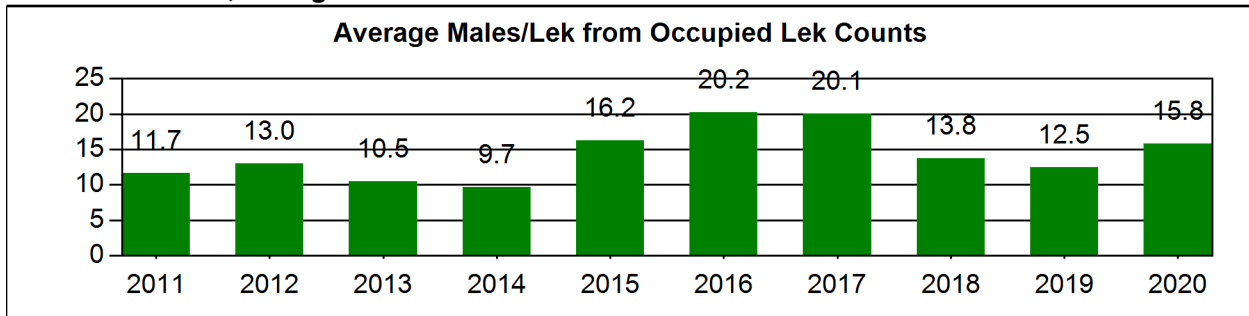
3) Inactive - Confirmed no birds/sign present (see official definitions)



**Figure 1:**

**Sage Grouse Occupied Lek Attendance Summary**

Year: 2011 - 2020, Management Area: C



## Sage Grouse Job Completion Report

Year: 2010 - 2019, Management Area: C

### 3. Sage Grouse Hunting Seasons and Harvest Data

#### a. Season

Year	Season Start	Season End	Length	Bag/Possesion Limit
2010	Sep-18	Sep-30	13	2/4
2011	Sep-17	Sep-30	14	2/4
2012	Sep-15	Sep-30	16	2/4
2013	Sep-21	Sep-30	10	2/4
2014	Sep-20	Sep-30	11	2/4
2015	Sep-19	Sep-30	12	2/4
2016	Sep-17	Sep-30	14	2/4
2017	Sep-16	Sep-30	15	2/4
2018	Sep-15	Sep-30	16	2/4
2019	Sep-21	Sep-30	10	2/4

#### b. Harvest

Year	Harvest	Hunters	Days	Birds/ Day	Birds/ Hunter	Days/ Hunter
2010	129	117	202	0.6	1.1	1.7
2011	158	124	173	0.9	1.3	1.4
2012	405	218	404	1.0	1.9	1.9
2013	27	82	249	0.1	0.3	3.0
2014	123	137	242	0.5	0.9	1.8
2015	314	228	400	0.8	1.4	1.8
2016	89	129	265	0.3	0.7	2.1
2017	118	145	344	0.3	0.8	2.4
2018	245	200	479	0.5	1.2	2.4
2019	129	122	203	0.6	1.1	1.7
Avg	174	150	296	0.6	1.1	2.0

## Lek Monitoring

Northeast Wyoming has one of the lowest average male lek attendance rates in the state, averaging 16 males per active lek in 2020 compared to the statewide average of 20 males per active lek. Most leks in northeast Wyoming are small with less than 20 males. In years when grouse are at the peak of their population cycle less than 10% of the active leks have greater than 50 males at peak count. Four leks exceeded 50 males in 2020. The ability of observers to visit leks to count male sage-grouse was significantly hampered by COVID-19. Many leks are on private land where access might be difficult to attain. A significant portion of leks in Northeast Wyoming are checked using a helicopter or fixed-wing plane. However, because of COVID-19 very few lek flights occurred in Spring 2020.

Average male lek attendance in northeast Wyoming has decreased significantly over the years. Average male attendance has decreased by more than one-half over the last thirty years. A slight upswing occurred from 2015-2017, however, the long-term trend remains a concern.

Lek monitoring efforts increased substantially beginning in 2000 due to concerns over range wide declines in sage-grouse populations. Additionally, coalbed natural gas (CBNG) development in the Powder River Basin resulted in extensive survey work to meet federal permitting requirements. The WGFD, BLM, U.S. Forest Service, private consultants, landowners and volunteers participate in ground and aerial monitoring of leks. Sage-grouse lek monitoring efforts are accomplished through lek counts, lek surveys and searches for new leks.

During the 2020 breeding season, 161 leks were counted, representing 46% of known occupied leks (Table 1a). Following the 2020 lek monitoring period, there are 586 documented leks in the NEWLWGA distributed over various land ownership and management authority boundaries (Table 3). Of this total, 349 are classified as occupied leks. The 349 occupied leks is less than the 586 total leks because unoccupied leks (abandoned or destroyed) are not considered potentially active and undetermined leks have had no documented activity in the past 10 years. The average number of males per active lek from lek counts was 15.8, above the 12.5 males/active lek in 2019 and well below the 20.2 males/active lek in 2016. The 2020 lek count suggests the sage-grouse population decreased after peaking in 2016 and 2017. The previous cycle peaked at 28.0 males/active lek in 2006.

Lek count routes were established in 2000 to better document the actual number of male sage-grouse attending leks. Lek counts consist of at least three ground visits to a lek following a stringent protocol to ensure accurate counts of male sage-grouse at lek sites. Department lek count data, along with the lek counts from the BLM, private consultants and volunteers, significantly improve the opportunity to better evaluate population trends.

Table 3. Northeast Wyoming Working Group Area Sage-grouse Lek Characteristics for the 586 known leks in 2020.

Region	Number	Percent
Casper	153	26.1
Sheridan	433	73.9

Classification	Number	Percent
Occupied	349	59.6
Undetermined	81	13.8
Unoccupied	156	26.6

Biologist	Number	Percent
Buffalo	74	12.6
Casper	14	2.4
Douglas	62	10.6
Gillette	269	45.9
Newcastle	77	13.1
Sheridan	90	15.4

County	Number	Percent
Big Horn, MT	1	0.2
Campbell	208	35.5
Carter, MT	1	0.2
Converse	57	9.7
Crook	27	4.6
Johnson	141	24.1
Natrona	15	2.6
Niobrara	23	3.9
Powder River, MT	1	0.2
Sheridan	35	6.0
Weston	77	13.1

Working Group	Number	Percent
Northeast	586	100.0

BLM Office	Number	Percent
Buffalo	386	65.9
Casper	72	12.3
Newcastle	128	21.8

Warden	Number	Percent
Buffalo	75	12.8
Dayton	24	4.1
Douglas	26	4.4
East Casper	5	0.9
Glenrock	30	5.1
Kaycee	59	10.1
Lusk	23	3.9
Moorcroft	78	13.3
Newcastle	62	10.6
North Gillette	68	11.6
Sheridan	13	2.2
South Gillette	116	19.8
Sundance	6	1.0
West Casper	1	0.2

Land Status	Number	Percent
BLM	55	9.4
Private	456	77.8
State	40	6.8
USFS	35	6.0

Management Area	Number	Percent	Lek Status	Number	Percent
C	586	100.0	Active	184	31.4
			Inactive	245	41.8
			Unknown	157	26.8

The number of known occupied leks checked by lek counts and lek surveys combined was 230 leks, or 65% of the known occupied leks (Table 1c), below the objective of 80% of occupied leks checked. This low percentage of leks checked is likely a product of COVID-19 grounding flights. The average number of males/active lek was 15.8 compared to 11.9 males/active lek in 2019. For the 10-year period, 2011-2020, the number of males/active lek has ranged from 9.3 in 2013 to 19.7 in 2016. These numbers and trends are comparable to the lek count data. One-hundred-twenty-five leks were documented as active with peak male attendance ranging from 1 to 96 males. No lek has exceeded 100 males since 2007.

Since only “occupied” leks are being reported in Table 1, it is important to consider trends in the numbers of active versus inactive leks, in addition to the average size of active leks. During a period of population decline, the size of active leks typically declines and the number of inactive leks increases. The converse is typically true of an increasing population. Therefore, the magnitude of both increases and decreases is usually greater than what is indicated by average lek size alone.

Lek status as determined from lek counts and lek surveys shows 216 leks with confirmed lek status. Fifty-eight percent of the leks (n=125) with confirmed status were determined to be active (Table 1d), meaning strutting males or sign of lekking activity (feathers/droppings) were observed at the lek site. Ninety-one leks (42%) were determined to be inactive based on multiple ground visits and/or checks for sign (feathers/droppings) late in the strutting season. In 2020, the percentage of active leks decreased while the number of males per active lek increased notably providing conflicting evidence about a population trend. Further complicating population trend is the significantly reduced amount of flights that took place. While the increase in average males per active lek is promising, common sense dictates that another year of data is collected (including aerial work) before making inferences on population trend. Fourteen leks have an unknown activity status. This category includes leks that were surveyed but had no strutting activity. For a lek to be considered inactive, two ground visits separated by 7 days and conducted under ideal conditions, or a ground check of the exact lek site late in the strutting season that fails to find sign is needed. Many leks were checked one or more times but protocol to confirm inactivity was not met. A list of sage grouse definitions is available in the statewide JCR and the Biological Techniques Manual (Christiansen 2012).

Comparisons of core and non-core area lek monitoring results shows that core areas have a slightly higher number of males per active lek (16.9 vs 14.6), and confirmed lek activity is higher in core areas (63 vs. 52%). This suggests the core area policy may be successful at maintaining lek persistence. However, it should be noted that core areas in Northeast Wyoming do not encompass all priority habitats. Some inconsistencies remain in complying with monitoring protocol and monitoring some leks on a regular basis. Some leks have not been documented as active in many years which may be due to inaccurate locations based on legal descriptions. Continued efforts at determining the exact location and status of these leks are needed. As birds on a lek are observed, UTM coordinates are recorded using GPS. GPS locations for lek sites should make future surveys more efficient even with changes in personnel. Furthermore, with the high amount of activity around leks in areas of energy development, caution must be taken to ensure that strutting activity represents an actual lek and not birds displaced from established leks.

No reliable or cost effective method for estimating the sage-grouse population for the NEWLWGA exists at this time. However, the number of males/active lek provides a reasonable index of abundance of the population over time in response to environmental conditions and other influences. However, it must be noted that 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 lek sites may change over time. Both the number of leks and the number of males attending these leks must be quantified in order to estimate population size.

Figure 2. Northeast Wyoming Working Group male sage-grouse lek attendance for all leks checked 1967-2020.

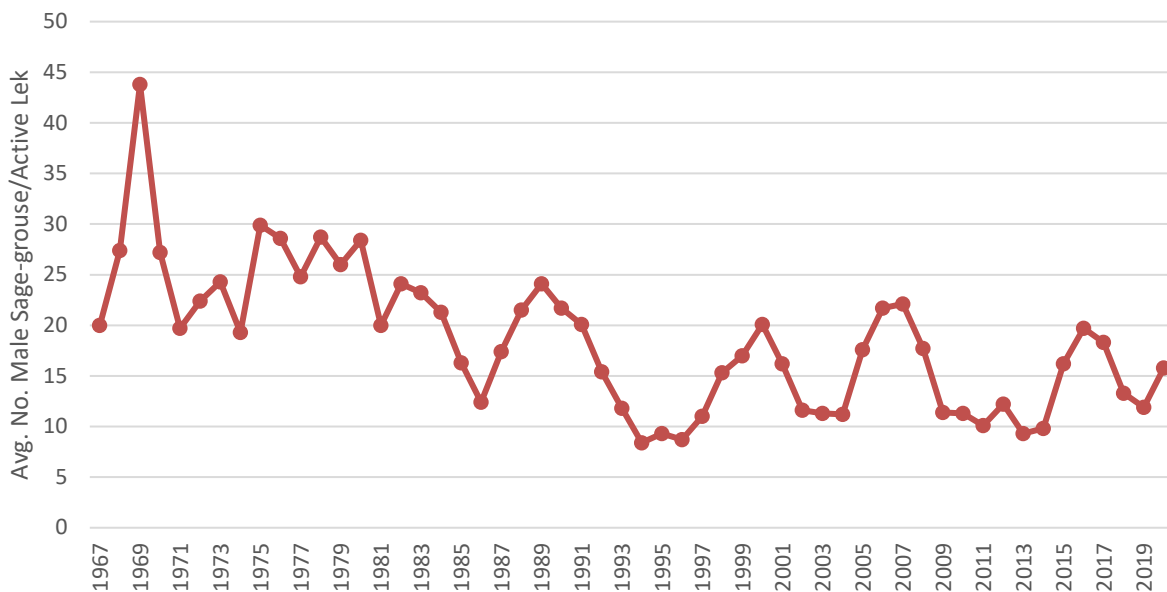


Figure 2 shows the average number of males/active lek for all lek monitoring (counts and surveys) combined from 1967 to 2020 for the NEWLWGA. If the average number of males/active lek is reflective of the population, the trend suggests about a 10-year cycle of periodic highs and lows. Of concern, however, is that with the exception of the 2006 peak, subsequent peaks in the average male lek attendance are usually lower, or similar, to previous peaks. Likewise, periodic lows in the average male attendance are generally lower, or similar, to the previous low. The long-term trend suggests a steadily declining population through the late 1980's followed by a more stable population. Sage-grouse numbers most recently peaked in 2016 and 2017, followed by a decrease in 2018 and 2019, then the most recent increase in 2020.

The number of known leks increased from 2000 to 2010 primarily due to increased survey effort associated with CBNG activities. However, even with the increased number of known leks, the percentage of active leks remains well below that observed in the past. While the number of leks present historically cannot be known, recent monitoring confirms the number and proportion of active leks has declined.

### Harvest

The Northeast Working Group area is comprised of Hunt Area 4 and portions of Hunt Areas 1 and 2 (Figure 3). A very small amount of Hunt Area 1 occurs in the southwestern most extent of the area while Hunt Area 2 is closed to hunting. In Hunt Area 4, a very conservative hunting season was implemented beginning in 2010 due to continuing concerns of decreasing lek attendance trends.

Although sage-grouse numbers have decreased long-term, an adequate population exists to support the conservative hunting season. Over 1,900 males were observed during 2020 lek monitoring efforts with most of these birds in the portion of the NEWLWGA included in Hunt Area 4. This number far exceeds the 100 male minimum threshold recommended to support a hunting season in the sage-grouse management guidelines (Connelly, et. al 2000). In 2010, the Department produced a white paper on the implications of harvest strategies on sage-grouse in Wyoming, *Hunting and Sage-grouse: A Technical Review of Harvest Management on a Species of Concern in Wyoming* (Christiansen 2010).

The 2019 harvest survey estimated 129 sage-grouse were harvested by 122 hunters who spent a total of 203 days hunting during the Hunt Area 4 three day season. The average number of birds harvested per hunter day was 0.6. The average number of sage-grouse harvested per hunter was 1.1 and the average number of days hunted was 1.7.

The 2019 sage-grouse harvest was about half the 245 birds harvested in 2018. Recent low harvest levels have been attributed to the three day season, private land access and publicity about lower bird numbers and the bird's plight which likely reduces hunter interest. The ten-year average (2010-2019) is 174 birds, with harvest ranging from a low of 27 birds in 2013 to a high of 405 birds in 2012. More than 2,500 birds were harvested as recently as 2000 when a 16 day season was in place. Hunter days more than halved from the 479 days hunted in 2018, but remains well below the 1,649 days logged in 2005. It should be noted that statistical variance for harvest data is likely high given the limited number of hunters in this hunt area and varying response rates.

Figure 3. Northeast Wyoming Sage-grouse Hunt Areas.



In past years a limited number of sage-grouse wings were collected during the hunting season, primarily in the eastern portion of the Area. Sample sizes were small due to the low harvest and the difficulty to strategically placing enough collection barrels along the many roads and highways within the area. Composition of the harvest as determined by analysis of wings deposited by hunters in wing barrels can provide insight into current year's chick production, although in most years the sample was too small to allow for reliable interpretation of the sample. No wings were collected during the 2019 hunting season.

### Report Notice

Variation in this report from previous years' reports is expected because of new data added to the lek database. Old records are added each year as data become available and newly discovered leks are added to the database. New lek count routes may also be added. Data adjustments should be taken into consideration when the current report and tables are compared to previous editions.

### Disease

No West Nile virus (WNV) mortality was reported for northeast Wyoming in 2020 and no major mortality events have been documented since 2003 when WNV was first documented in sage-grouse in the Powder River Basin. However, there are fewer radio-marked sage-grouse being monitored by researchers which decreases the likelihood of finding mortalities. Based on human diagnosed cases of WNV, outbreaks occurred in 2003 and 2007. Sage-grouse in North and South Dakota were reported to have suffered large losses to WNV in 2007 and there may have been undetected impacts in Wyoming. Because of the difficulty in monitoring WNV in sage-grouse, human and livestock cases can provide an indication of WNV prevalence in a given year. Zero mosquito pools, humans, and animals tested positive for WNV in 2020.



Taylor et al. (2012) predicted that the low elevation population of northeast Wyoming is susceptible to West Nile virus outbreaks which can decrease a population by more than 50%. Furthermore, even with no additional energy development the authors predict that some local populations may be one outbreak year away from extirpation.

### Habitat Impacts

Most occupied habitat for sage-grouse is held in private ownership. Approximately 75 percent of known leks are found on private land with the remaining 25 percent found on Bureau of Land Management, U.S. Forest Service and State owned lands. Because most sage-grouse are found on private land, little direct control exists to protect important habitats, including breeding and nesting areas, brood rearing areas, and major wintering areas.

The primary economic uses of lands currently or historically providing sage-grouse habitat are agriculture and energy. Livestock grazing, mainly cattle along with limited sheep production, is the primary agriculture use. Some crop production occurs as irrigated and dry land hay and some small grains. Historically, large parcels of sagebrush habitat were converted either to grasslands or crops. Limitations of remote sensing technology have prevented quantifying and mapping these conversions.

Vast coal reserves are being developed with surface pit mines in eastern Campbell County and northern Converse County.

Oil and natural gas production has occurred in portions of the area since the early 20<sup>th</sup> century. An unprecedented energy boom began in the Powder River Basin in the late 1990's with the exploration and development of CBNG reserves. The BLM predicted 51,000 wells could be drilled in the Powder River Basin Oil and Gas Project Record of Decision (BLM 2003). At the peak of the CBNG play, more than 18,300 wells were in production (August 2008) with production peaking in January 2009 at 49,459,629 Mcf of methane gas (WOGCC 2019). Much of the development in the energy play involves federal minerals with private surface. Wells, roads, power lines, produced water, activity and dust are components of development which affect sage-grouse habitat at a broad scale. Since 2009, development and production has declined as CBNG leases have been drilled and natural gas prices decreased. In May 2019, the Wyoming Oil and Gas Conservation Commission reported that 4,779 producing wells yielded 7,969,012 Mcf of methane gas (WOGCC 2019). Federal mineral leases provided for 73% of the production while fee leases accounted for 20% and State leases 7%. In addition to producing wells there are 4,503 shut in wells. This compares to May 2018 when 5,349 producing wells yielded 9,881,365 Mcf of methane gas. Nearly 72,000 permits to drill have been issued, although many have expired. Many wells drilled early in the play have completed the production phase of development and are now being plugged and abandoned. Furthermore, low gas prices currently hamper the economic viability of CBNG production operations. Drilling new wells is occurring primarily to hold existing leases.

Deep well oil and gas development has increased in recent years with new technologies enabling horizontal and directional drilling. While CBNG activity decreased, the interest in deep drilling has fluctuated with inconsistent oil prices. In 2019, counties comprising the NEWLWGA had 304 oil wells started (spud) including 250 horizontal wells, 16 directional wells and 38 conventional wells (WOGCC 2019). One natural gas well was started. The vast majority of the drilling is occurring in Converse and Campbell Counties. Exploration utilizing horizontal drilling has increased markedly from 10 wells in 2007 to 365 wells in 2014 after which activity decreased to 118 wells in 2016. Deep wells require large well pads and large amounts of truck traffic to deliver water, sand, etc for drilling and fracking.

Considerable debate occurred on the effects of energy development on sage-grouse. Peer reviewed research findings show significant impacts (Walker et al. 2007, Doherty et al. 2008, Doherty et al. 2010, Harju et al. 2010 and others). These findings have yet to be accepted by some people and this has contributed to uncertainty in the public and political arenas as to the real effects of energy development. Furthermore, many continue to blame predation while some in the energy industry point to continued hunting of the species given that they are being asked for increased mitigation measures in areas of development.

A population viability analysis by Taylor et al. (2012) found that energy development had the greatest influence on male grouse lek attendance within 12.4 miles of a lek. At 8 wells per section (80 acre spacing), only 39% of males persisted while the number of large leks significantly decreased. Subjecting suppressed populations in developed areas to West Nile virus outbreaks or other stressors threatens local populations with extirpation.

#### Northeast Local Working Group Threats Identification

Sage-grouse are influenced by many factors, both individually and cumulatively. Habitat loss and fragmentation, direct mortality and disturbance affect sage-grouse populations. In 2006, the NEWLWG identified and ranked 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. Nearly all top ranking factors were directly related to, or indirectly related to, habitat. The working group felt oil, gas, and 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 in benefiting sage-grouse.

Core areas (Figure 4) were designated with the objective of identifying habitats that supported most of Wyoming's sage-grouse. Statewide, core areas account for approximately 36% of the current sage-grouse range while encompassing leks with 78% of the 2012-2014 peak males. However, in the NEWSGLWGA, core areas were designated based on CBNG development patterns along with lek density data thereby encompassing leks supporting only 49% of the 2012-2014 peak males.

Gamo and Beck (2017) determined 72% of development projects located within Wyoming core areas were in compliance with the executive order. Non-compliant projects were generally operating under valid, existing rights and therefore not subject to provisions of the executive order. Those projects were reviewed further, and operators often agreed to implement mitigation practices that included locating structures within previously disturbed sites, site-specific avoidance of sage-grouse habitat, and habitat restoration. Gamo and Beck's analysis demonstrated that the CAS has been generally effective at conserving sage-grouse populations by managing anthropogenic disturbances. However, it also indicated additional actions are needed to conserve sage-grouse in northeast Wyoming where many developments were in place or permitted prior to the implementation of the CAS (Gamo and Beck 2017).

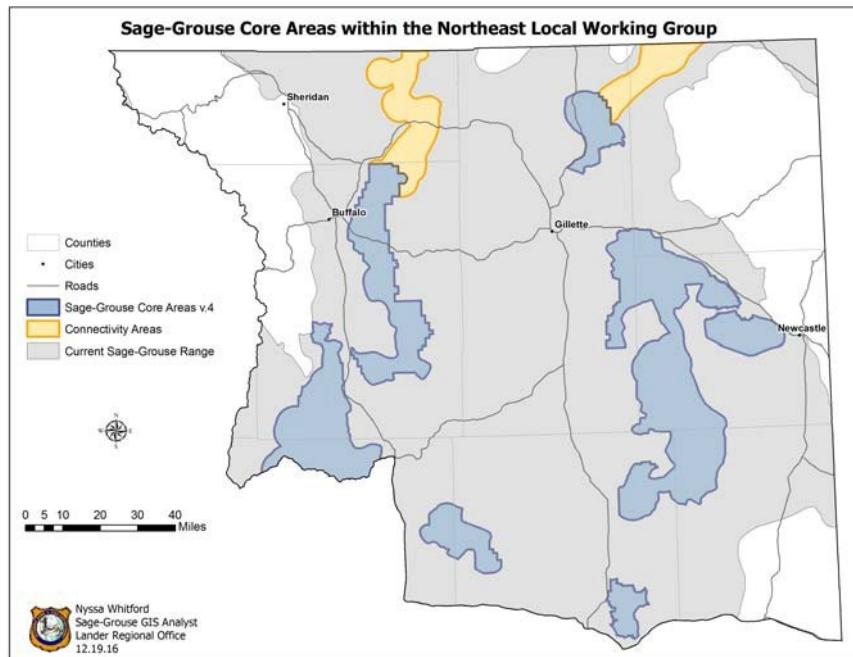


Figure 4. Northeast Wyoming Sage-grouse Core Area and Connectivity Areas (version 4).

### Douglas Core Area

Sage-grouse peak lek attendance within the Douglas Core Area (DCA) totaled 18 males in 2020. This was two less than the peak male count in 2019, and still showing a significant reduction from the 2017 count of 43 males. Two of the six occupied leks were active, which is one less than in 2019. There have been no changes in lek classifications since 2016.

The DCA has experienced a substantial increase in energy development over the past several years. Due to the high density of oil and gas development coupled with a large wildfire that eliminated sagebrush cover over the landscape, all permitted disturbance within the DCA exceeds thresholds established by Wyoming Governor's Sage-grouse Executive Order. Because the majority of the permitted activities are being developed under valid and existing rights secured prior to core area designation, development has continued to occur despite exceeding disturbance thresholds. To mitigate this, the Wyoming Governor's Office, the Department and other partners have worked closely with industry to identify a plan of development and establish a large industry funded restoration effort guided by a multi-disciplinary restoration team. The plan of development, which was renewed in 2018 and is valid until 2022, includes practices such as avoiding key habitat areas, minimizing disturbance and significantly reducing traffic during breeding and nesting seasons. The Restoration Team has identified, and is currently implementing, multiple projects beneficial to sage-grouse within the DCA including sagebrush restoration, cheatgrass control and a West Nile virus management program. Additionally, the team has sponsored multiple research projects through two graduate research students with the goal of developing best management practices for sagebrush restoration. The team has recently been working to disseminate results from these projects. To date, the team has planted over 100,000 sagebrush plants and has leveraged additional partner funds to continue sagebrush restoration, cheatgrass management and mesic habitat improvement work. Lastly, the team refined the disturbance data layer for the DCA by documenting suitable habitat per the 2015 Executive Order guidelines.

### Local Conservation Planning

The Local Working Group (LWG) schedule was scaled back following completion of the conservation plan addendum in 2013. The plan and other LWG information is available on the WGFD website at <https://wgfd.wyo.gov/Habitat/Sage-Grouse-Management/Sage-Grouse-Local-Working-Groups>. However, the LWG is meeting more often recently as they engage with adaptive management triggers.

The LWG met multiple times during the reporting period to elect a new chair, discuss new wildfires, and to finalize a document identifying the group's concerns regarding the Buffalo Connectivity adaptive management trigger. This document was forwarded to the Technical Team for information purposes. Many LWG members attend the Technical Team meetings to stay up-to-date, and be a resource, if needed. The LWG allocated their entire \$75,000 from FY 2021 to the Clear Creek Conservation District to treat invasive weeds in sage-grouse core areas post-wildfire.

### Sage-grouse Research

On-going research conducted by Dr. Brad Fedy and Chris Kirol of the University of Waterloo, Alberta continues with support from the BLM State Office and BLM Buffalo Field Office. The four-year study, Improving Success in Habitat Restoration for Sage-grouse and Other Sagebrush Birds, is being conducted northeast of Buffalo in a mix of areas including active CBNG energy development, reclaimed CBNG fields, and non-developed habitat (CORE). Specific to sage-grouse, the research aims to quantify the influence of reclamation on seasonal habitat use, nest success, brood survival and movements.

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## RECOMMENDATIONS

1. Continue to participate in the Northeast Wyoming Local Working Group. The Group has developed a conservation plan for the species and designed and implemented projects that benefit sage-grouse. The Department representative will continue to assist with implementing projects to benefit sage-grouse.
2. Continue to assist the BLM with developing and implementing the sage-grouse monitoring program as prescribed by the Powder River Basin CBNG EIS Record of Decision (April 2003).
3. Annually monitor 80% of the occupied leks in the local working group area.
4. Continue WNV monitoring.
5. Continue to assist the BLM with coordinating sage-grouse population monitoring efforts with the private consultants doing work for energy development companies.
6. Use any additional flight money from the BLM in 2021 for lek searches and surveys. All leks should be checked at least once every three years. All leks should be recorded in UTM's (NAD 83) using GPS.
7. The sage-grouse database should be maintained and used to store and report sage-grouse data. Any old records that have not been included should be added to the database. Current records should be reviewed to eliminate leks without adequate documentation to support a lek designation.
8. The Working Group should continue to solicit habitat projects on private lands that will have benefit for sage-grouse.
9. The WGFD Regions should continue to recommend protection of occupied sage-grouse leks during environmental commenting and promote their protection on private land projects.
10. Additional effort is needed to document the status of undetermined leks. Encourage reporting of lek activity from the public and in particular landowners.
11. Better document wintering sage-grouse locations and develop a seasonal range map for sage-grouse for the Working Group Area.
12. Continue to map lek perimeters to ensure adequate buffer distance in protecting leks.

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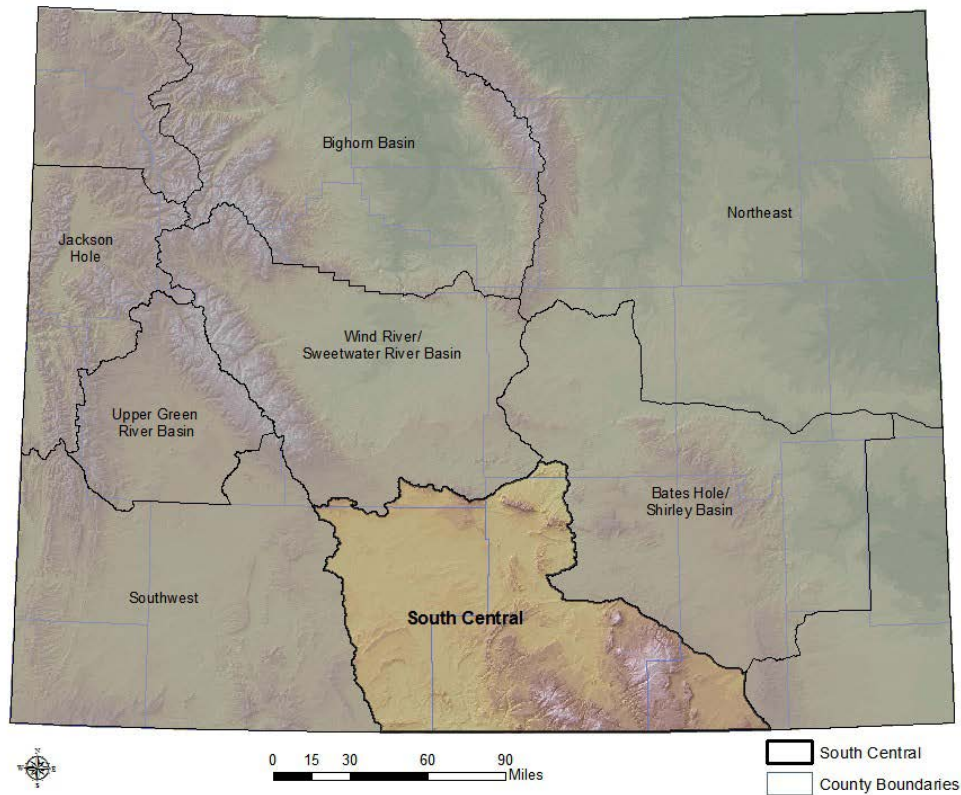
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## South-Central Conservation Area Job Completion Report

**Species:** Greater Sage-grouse  
**Mgmt. Areas:** H  
**Period Covered:** June 1, 2019- May 31, 2020  
**Prepared by:** Teal Cufaude, Saratoga Wildlife Biologist



### Wyoming Sage-Grouse Local Working Groups - South Central



## Sage Grouse Lek Characteristics

### Management Area: H, Working Group: South Central

Region	Number	Percent
Green River	135	33.7
Lander	210	52.4
Laramie	56	14.0

Classification	Number	Percent
Occupied	256	63.8
Undetermined	64	16.0
Unoccupied	81	20.2

Biologist	Number	Percent
Baggs	122	30.4
Green River	14	3.5
Laramie	5	1.2
Saratoga	51	12.7
Sinclair	194	48.4
South Lander	15	3.7

County	Number	Percent
Albany	5	1.2
Carbon	264	65.8
Fremont	13	3.2
Natrona	2	0.5
Sweetwater	117	29.2

Management Area	Number	Percent
H	401	100.0

Working Group	Number	Percent
South Central	401	100.0

BLM Office	Number	Percent
Casper	2	0.5
Lander	26	6.5
Rawlins	356	88.8
Rock Springs	17	4.2

Warden	Number	Percent
Baggs	121	30.2
East Rawlins	105	26.2
Elk Mountain	6	1.5
Lander	2	0.5
Rock Springs	14	3.5
Saratoga	45	11.2
South Laramie	5	1.2
West Rawlins	103	25.7

Land Status	Number	Percent
BLM	227	56.6
LocalGov	1	0.2
Private	144	35.9
State	28	7.0
USFWS	1	0.2

Lek Status	Number	Percent
Active	180	44.9
Inactive	183	45.6
Unknown	38	9.5

## Sage Grouse Job Completion Report

Year: 2011 - 2020, Management Area: H, Working Group: South Central

### 1. Lek Attendance Summary (Occupied Leks) (1)

#### a. Leks Counted

Year	Occupied	Counted	Percent Counted	Peak Males	Avg Males / Active Lek (2)
2011	262	49	19	1272	31.0
2012	273	55	20	1490	28.1
2013	278	94	34	1662	21.9
2014	281	100	36	1607	21.4
2015	282	89	32	1915	32.5
2016	286	72	25	2381	39.0
2017	286	95	33	2176	29.4
2018	285	113	40	2210	24.6
2019	279	131	47	2419	22.0
2020	272	147	54	2584	22.7

#### b. Leks Surveyed

Year	Occupied	Surveyed	Percent Surveyed	Peak Males	Avg Males / Active Lek (2)
2011	262	157	60	2460	22.0
2012	273	179	66	2214	19.3
2013	278	159	57	1564	14.9
2014	281	176	63	2016	17.8
2015	282	170	60	3224	27.8
2016	286	192	67	3707	28.1
2017	286	162	57	2465	22.6
2018	285	153	54	2005	21.3
2019	279	127	46	1081	16.6
2020	272	99	36	835	19.0

1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

3) Inactive - Confirmed no birds/sign present (see official definitions)

## Sage Grouse Job Completion Report

Year: 2011 - 2020, Management Area: H, Working Group: South Central

### 1. Lek Attendance Summary (Occupied Leks) (1)

Continued

#### c. Leks Checked

Year	Occupied	Checked	Percent Checked	Peak Males	Avg Males / Active Lek (2)
2011	262	206	79	3732	24.4
2012	273	234	86	3704	22.0
2013	278	253	91	3226	17.8
2014	281	276	98	3623	19.3
2015	282	259	92	5139	29.4
2016	286	264	92	6088	31.5
2017	286	257	90	4641	25.4
2018	285	266	93	4215	22.9
2019	279	258	92	3500	20.0
2020	272	246	90	3419	21.6

#### d. Lek Status

Year	Active	Inactive (3)	Unknown	Known Status	Percent Active	Percent Inactive
2011	160	24	22	184	87.0	13.0
2012	177	32	25	209	84.7	15.3
2013	193	44	16	237	81.4	18.6
2014	198	71	7	269	73.6	26.4
2015	185	53	21	238	77.7	22.3
2016	198	53	13	251	78.9	21.1
2017	188	54	15	242	77.7	22.3
2018	192	53	21	245	78.4	21.6
2019	189	49	20	238	79.4	20.6
2020	170	69	7	239	71.1	28.9

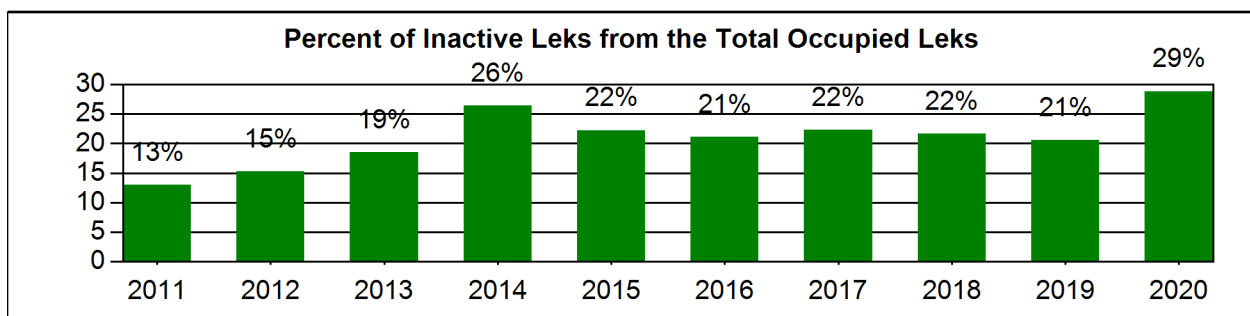
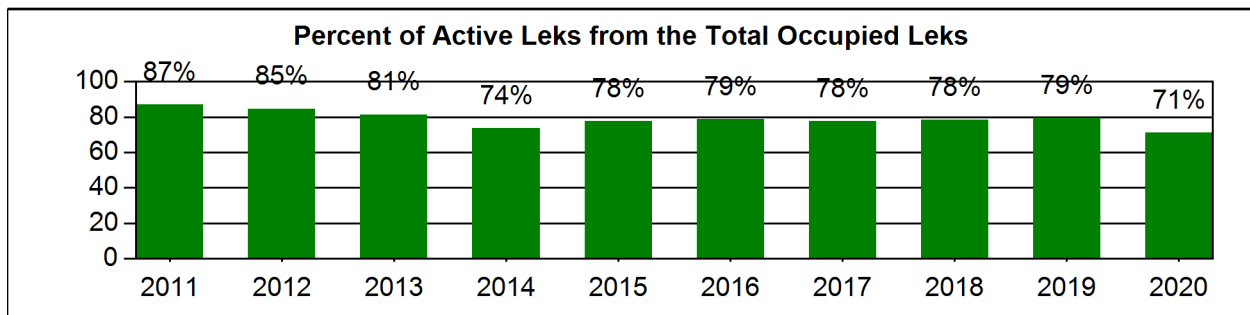
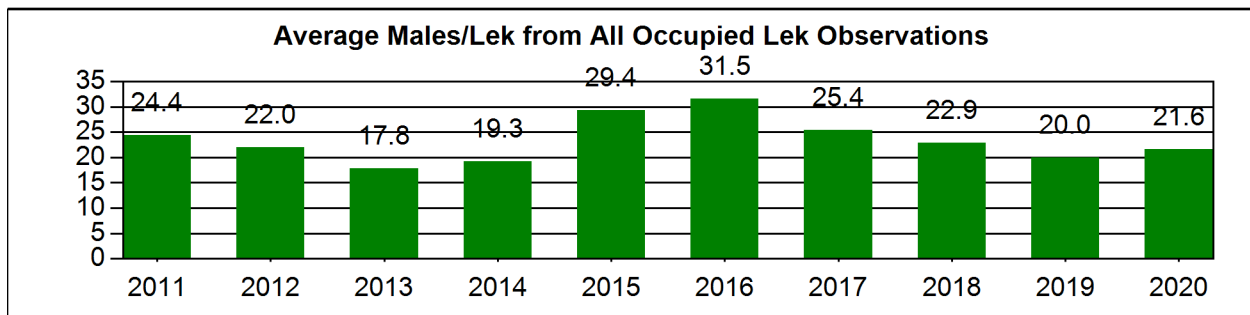
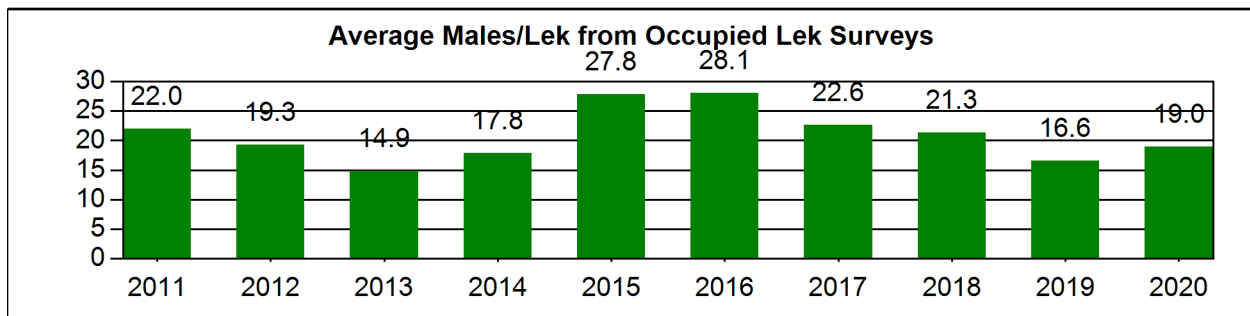
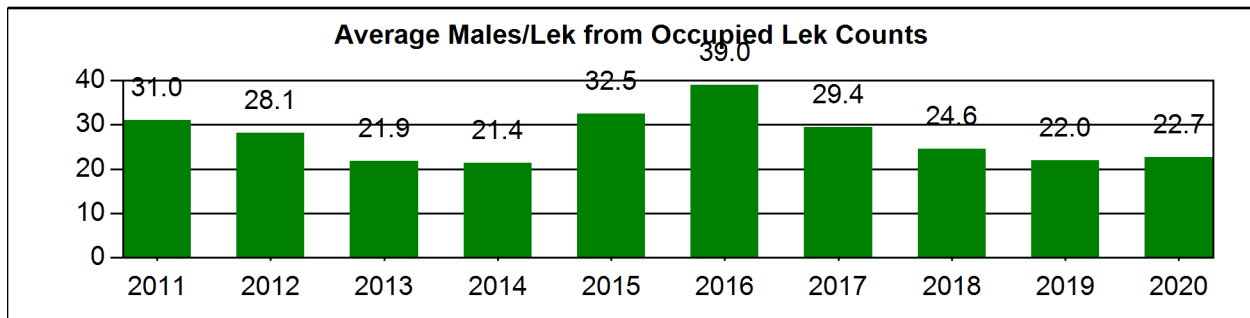
1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

3) Inactive - Confirmed no birds/sign present (see official definitions)

# Sage Grouse Occupied Lek Attendance Summary

Year: 2011 - 2020, Management Area: H, Working Group: South Central



## Sage Grouse Job Completion Report

Year: 2010 - 2019, Management Area: H, Working Group: South Central

### 3. Sage Grouse Hunting Seasons and Harvest Data

#### a. Season

Year	Season Start	Season End	Length	Bag/Possesion Limit
2010	Sep-18	Sep-30	13	2/4
2011	Sep-17	Sep-30	14	2/4
2012	Sep-15	Sep-30	16	2/4
2013	Sep-21	Sep-30	10	2/4
2014	Sep-20	Sep-30	11	2/4
2015	Sep-19	Sep-30	12	2/4
2016	Sep-17	Sep-30	14	2/4
2017	Sep-16	Sep-30	15	2/4
2018	Sep-15	Sep-30	16	2/4
2019	Sep-21	Sep-30	10	2/4

#### b. Harvest

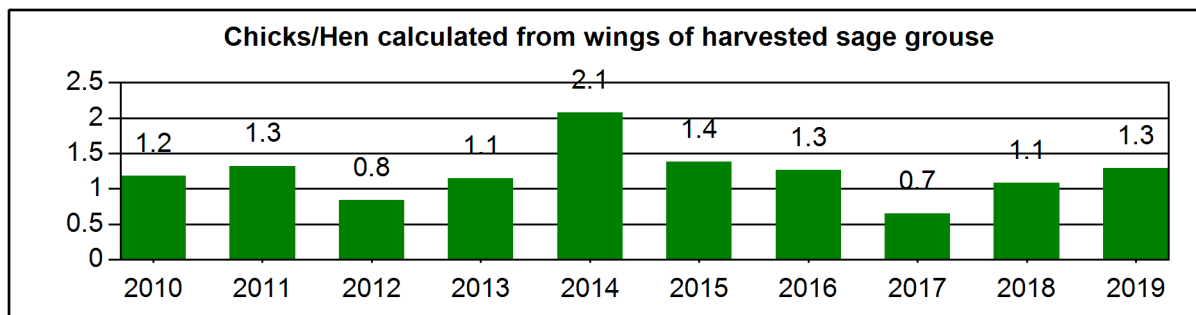
Year	Harvest	Hunters	Days	Birds/ Day	Birds/ Hunter	Days/ Hunter
2010	1126	487	1165	1.0	2.3	2.4
2011	1261	591	1483	0.9	2.1	2.5
2012	1194	636	1382	0.9	1.9	2.2
2013	624	437	928	0.7	1.4	2.1
2014	612	391	934	0.7	1.6	2.4
2015	776	457	963	0.8	1.7	2.1
2016	911	477	1162	0.8	1.9	2.4
2017	501	363	846	0.6	1.4	2.3
2018	903	500	1245	0.7	1.8	2.5
2019	1052	584	1186	0.9	1.8	2.0
Avg	896	492	1,129	0.8	1.8	2.3

# Sage Grouse Job Completion Report

Year: 2010 - 2019, Management Area: H, Working Group: South Central

## 4. Composition of Harvest by Wing Analysis

Year	Sample Size	Percent Adult		Percent Yearling		Percent Young		Chicks/ Hens
		Male	Female	Male	Female	Male	Female	
2010	230	10.4	33.9	1.3	6.5	13.0	22.2	1.2
2011	271	11.8	29.2	3.0	7.4	20.7	27.7	1.3
2012	220	10.0	38.2	5.5	7.7	15.5	23.2	0.8
2013	107	14.0	36.4	1.9	1.9	15.9	27.1	1.1
2014	146	10.3	23.3	3.4	4.8	30.8	27.4	2.1
2015	192	10.4	30.7	2.6	5.7	24.5	26.0	1.4
2016	174	21.8	27.0	4.0	5.7	16.1	25.3	1.3
2017	123	13.8	39.8	5.7	8.9	16.3	15.4	0.7
2018	131	20.6	26.7	6.1	8.4	20.6	17.6	1.1
2019	196	13.8	25.0	6.6	9.7	13.8	31.1	1.3





## Lek Monitoring

For biological year 2019, 401 sage-grouse leks were known to occur in the South-Central Conservation Area (SCCA). In the SCCA, the majority of known leks (56%) occur on Bureau of Land Management (BLM) managed lands and 36% occur on private land. There are likely other occupied leks in the SCCA that have not yet been documented (Fig. 1).

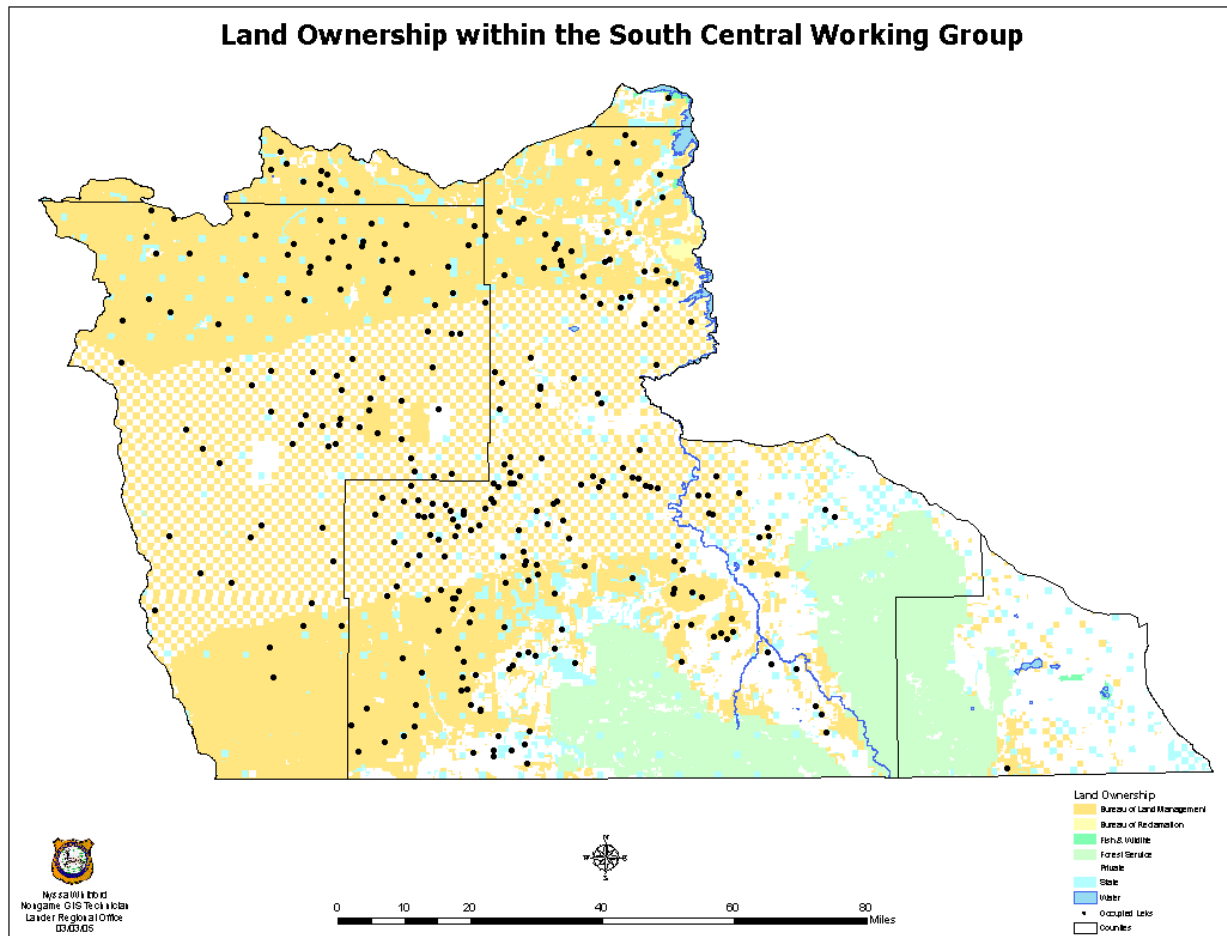


Figure 1. Landownership and sage-grouse lek locations within the SCCA, Wyoming.

Leks in the SCCA are monitored by Wyoming Game and Fish Department (WGFD), United States Forest Service (USFS) and BLM personnel, environmental consultants, and volunteers. Lek monitoring techniques are described in Christiansen (2012). During the 2020 lekking season, 246 leks were monitored. This represented checking 90% of the occupied status leks in the SCCA. This rate of effort was 2% less than in 2019; and was the same 10-year average rate of effort (Table 1c)<sup>1</sup>.

A total of 147 leks were *counted* in the SCCA, resulting in an average of 22.7 males per lek. A total of 99 leks were *surveyed* resulting in an average of 19 males per lek. In some portions of the SCCA late snowmelt hindered lek monitoring and more leks were *surveyed* rather than *counted*.

<sup>1</sup> Table 1c does not include "Unknown" lek observations.

However across the SCCA, more leks were monitored with *count* protocol and fewer were monitored with *survey* protocol. To evaluate long-term population trends, average lek *survey* and *count* data are combined, because the more stringent count protocol was not used during the late 1980s and early 1990s. Fortunately, long-term data sets from Wyoming and neighboring states indicate similar trends from both *counts* and *surveys* (Fedy and Aldridge 2011). In 2020, the peak male lek attendance totaled 3,419 males in the SCCA. This was a 2% decrease from 2019. The average number of male sage-grouse on both *counted* and *surveyed* leks increased slightly from 20 in 2019 to 21.6 in 2020. Figure 2 illustrates the trends in average peak males per lek for all sage-grouse conservation areas in Wyoming, as well as the statewide average. Sage-grouse populations in Wyoming cycle on approximately 6 to 8-year intervals (Row and Fedy 2017). During a downswing in the population, we would expect an increase in the number of inactive leks. The proportion of occupied leks which were considered inactive increased from 21% in 2019 to 29% in 2020. In 2020, the management status for 7 leks (2.8%) was unknown because they were not monitored (Table 1a-d).

The increase in the male per lek average along with the observed chick per hen ratios in hunter submitted wings may have indicated a stable to slightly increasing sage-grouse population across the SCCA. However, the increase in the number of inactive leks, and decrease in peak male lek attendance indicated that the sage-grouse population in the SCCA had not increased substantially during this reporting period.

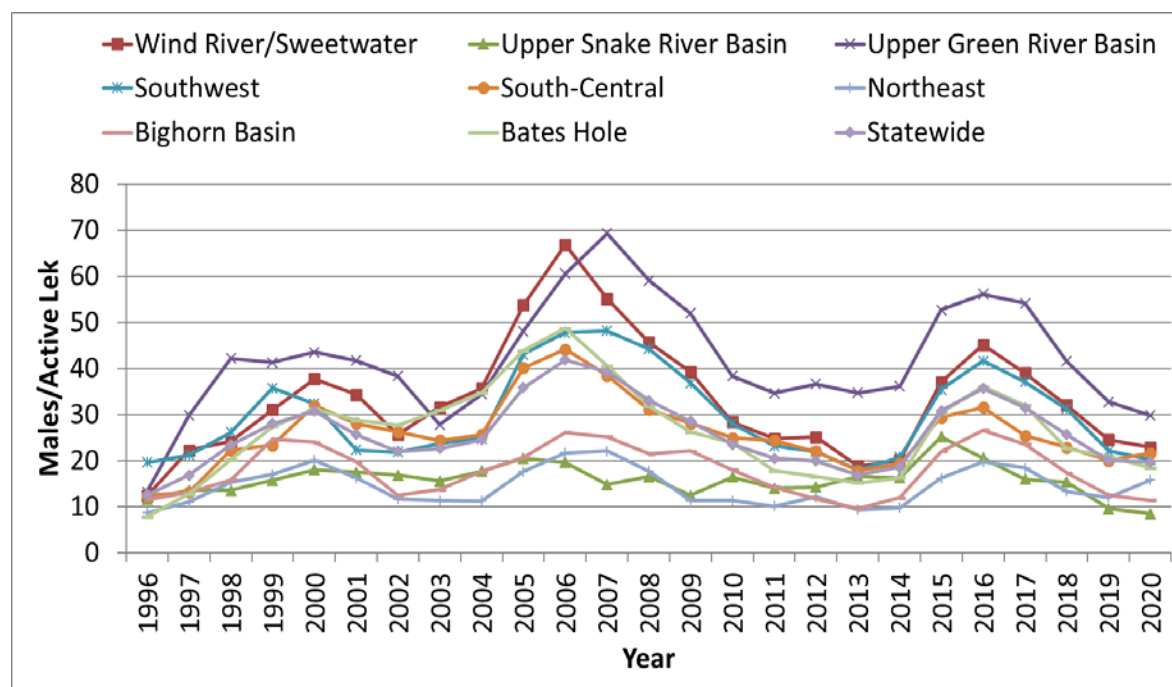


Figure 2. 1996-2020 Average peak male sage-grouse lek attendance, by Conservation Area and Statewide, Wyoming.

## **Harvest**

The 2019 sage-grouse hunting season in the SCCA, was from 21 September to 30 September (10 days), and allowed for the harvest of 2 sage-grouse per day and 4 in possession (Table 3a). The 2019 upland harvest survey indicated 584 hunters spent 1,186 days to harvest 1,052 sage-grouse in the SCCA. This equals approximately 0.9 birds/day, 1.8 birds/hunter, and 2 days/hunter (Table 3b). Birds/hunter rates increased slightly from the 2018 hunting season indicating hunters were generally more successful. Compared to the 2018 season, when hunting regulations were similar with the exception of 6 more days in the 2018 season length; 2019 hunter numbers increased by 17%, the birds/day increased by 27%, and the days/hunter decreased by 20%. Generally, during the past 10 years, overall harvest appeared to be correlated to both hunter numbers and sage-grouse abundance.

Hunter-harvested sage-grouse wings have been collected annually and are used for estimating productivity. Wings were collected in barrels set out at major road junctions where hunters are most likely to pass, and can provide a relatively consistent source of productivity data. Wings are gathered and then aged/sexed by molt patterns, and numbers of chicks per hen are calculated and used as a measure of productivity. While there are biases associated with the hunter selectivity of different age/sex groups of sage-grouse, trends still provide yearly comparisons of relative chick production. During the 2019 hunting season, WGFD collected 196 wings from wing barrels within the SCCA, which was 18% of the estimated harvest of 1,052 birds. This was a 49% increase in the total number of wings when compared to the 131 wings collected in 2018. Age and sex composition of the wings indicated the proportion of chicks per hen increased from 1.1 in 2018 to 1.3 in 2019 (Table 4). Statewide analyses of wing data from harvested sage-grouse have suggested chick per hen ratios of 1.4-1.7 typically results in relatively stable populations as determined by lek counts the following year.

## **Habitat**

Much of the sage-grouse habitat in the SCCA is comprised of a relatively intact sagebrush ecosystem, which is trending toward older age classes. The short-term condition of these sagebrush communities is primarily dependent on the type, amount, and timing of annual precipitation. Although mature sagebrush are important to sage-grouse for both forage and cover, especially in the winter, a monoculture of older and decadent stands may lead to lower nutrient content within this important forage source. Additionally, we continue to see the proliferation of cheatgrass throughout sagebrush communities within the SCCA, reducing native plant density and diversity as well as increasing the risk of large fires that have the potential to devastate sage-grouse habitats. Livestock grazing is a predominate use of sage-grouse habitat in the SCCA. In the first half of the 20th century, much of the sage-grouse habitat in the SCCA provided winter grazing for hundreds of thousands of both domestic sheep and cattle. In the later part of the last century, sheep numbers declined dramatically while cattle became the primary species of livestock using the SCCA. Improved grazing management on both public and private lands during the last few decades has generally led to improved habitat for sage-grouse and other sagebrush obligates. Feral horses continue to inhabit the western and northern portions of the SCCA. The BLM recently removed over 1,000 horses from the Red Desert Complex which overlaps the SCCA. Additional gathers are anticipated to remove approximately 2,000 horses from the Red Desert Complex in 2020.

Energy development and mineral extraction are secondary uses of sage-grouse habitat within the SCCA. A majority of the energy development is associated with producing natural gas from both deep gas and coalbed methane sources. Oil and gas activity decreased substantially during this reporting period. Large-scale wind farm developments have begun over the past few years in the northern part of the SCCA, introducing new challenges within sage-grouse habitat. Access road and turbine pad construction for the Chokecherry Sierra Madre Wind Energy Project continued through 2019 and 2020. Turbine installation is anticipated to begin in 2022. Past and present uranium mining has also contributed to reducing sage-grouse habitat in the SCCA. In March 2019, the BLM approved the expansion of the Lost Creek uranium *in-situ* recovery project, an existing uranium mine in Sweetwater County. This authorized Lost Creek to expand uranium recovery into the next deeper layer of minerals and onto 5,751 additional surface acres for a total project area of 10,005 acres. Construction of the Energy Gateway West Aeolus-Jim Bridger powerline, which coincides with the EO 2019-3 Transmission Corridor, was completed in 2020. Energy development has directly and indirectly reduced the functionality of sage-grouse habitat in portions of the SCCA.

The Interstate 80/UPRR transportation corridor bisects the SCCA east to west and is a major cause of habitat fragmentation. Additionally, continued urban/rural development within sagebrush communities continues to fragment sage-grouse habitat.

The 2019 growing season precipitation (April – July) within the SCCA was normal. Annual vegetation monitoring in the area showed adequate grass and forb production, correlating with the normal growing season precipitation. Forbs are an extremely important part of the sage-grouse diet in the spring and throughout the summer, especially for juveniles. Although grasses don't make up a significant part of the sage-grouse diet, good grass production provides better hiding cover from predators. Good vegetation production in 2019 could have improved sage-grouse nutrition and survival. South-central Wyoming experienced cooler than average spring with late snowstorms and residual snowpack. Temperatures for the remainder of the summer season were normal, with no extended periods of high temperatures. Winter weather arrived early on the plains with significant snowfall in mid-October.

In an effort to mitigate habitat issues related to cheatgrass in sage grouse habitats extensive large-scale, aerial herbicide treatments continued to be conducted throughout the SCCA. During this reporting period, juniper removals, brush mowing, fence conversions, and fence marking were implemented in the SCCA to improve sage-grouse habitat.

### **Disease**

There were no cases of West Nile Virus in sage-grouse, or other diseases detrimental to sage-grouse documented within the SCCA in biological year 2019.

### **Conservation Planning**

The South Central Local Working Group (SCLWG) was established in September of 2004 and they completed their Sage-grouse Conservation Plan (Plan) in 2007. In 2014, the SCLWG adopted an addendum to their Plan which is available at <https://wgfd.wyo.gov/Habitat/Sage-Grouse-Management/Sage-Grouse-Local-Working-Groups>. This addendum documented conservation action such as research and habitat projects the SCLWG had supported since their Plan was

completed, as well as how these projects addressed the goals and action items identified in the Plan.

The SCLWG held two meetings during this reporting period. In July 2019, the SCLWG received updates on the new Wyoming EO 2019-3. The SCLWG also allocated FY 2020 funds provided by the Wyoming Sage-Grouse Conservation Fund. The SCLWG awarded a total of \$75,000 to following conservation projects:

1. Response of greater sage-grouse to treatments in Wyoming big sagebrush
2. Comparison of avian and mammalian predators to sage-grouse core and non-core areas: assessing predator abundance and responses to anthropogenic features
3. Resource selection overlap between greater sage-grouse and co-occurring species
4. Free-roaming horse impacts on sage-grouse nest site selection and success
5. Coad Mountain spring development
6. Grizzly Wildlife Habitat Management Area Equipment Rental
7. Bennet Peak Juniper Encroachment Removal

### **Special Projects**

The North Dakota Greater Sage-Grouse Translocation Project was completed in biological year 2019. During the spring of 2020, researchers captured sage-grouse near Stewart Creek, in the northern portion of the SCCA, and translocated them to southwest North Dakota. Crews were able to capture and translocate 20 brooding hens. This translocation effort was done in an effort to supplement North Dakota's remnant sage-grouse population. Translocation success and the impacts to the Stewart Creek source population are being studied by Utah State University and U.S. Geological Survey researchers.

### **Management Recommendations for the SCCA**

1. Continue to monitor a minimum of 80% of the occupied leks in the SCCA.
2. Update all lek observers on WGFD survey protocols, and familiarize them with standardized datasheets.
3. Expand lek searches to ensure all active leks within the SCCA have been identified.
4. Support WGFD and BLM efforts to address mitigation and reclamation issues.
5. Support research efforts to identify seasonal habitats, especially winter concentration habitat.
6. Coordinate with BLM and USFS to ensure development and habitat treatments in sage-grouse Core area comply with WY-EO-2019-3.
7. Continue to build partnerships with private landowners to maintain or improve sage-grouse habitat on private lands through mutually beneficial habitat projects.

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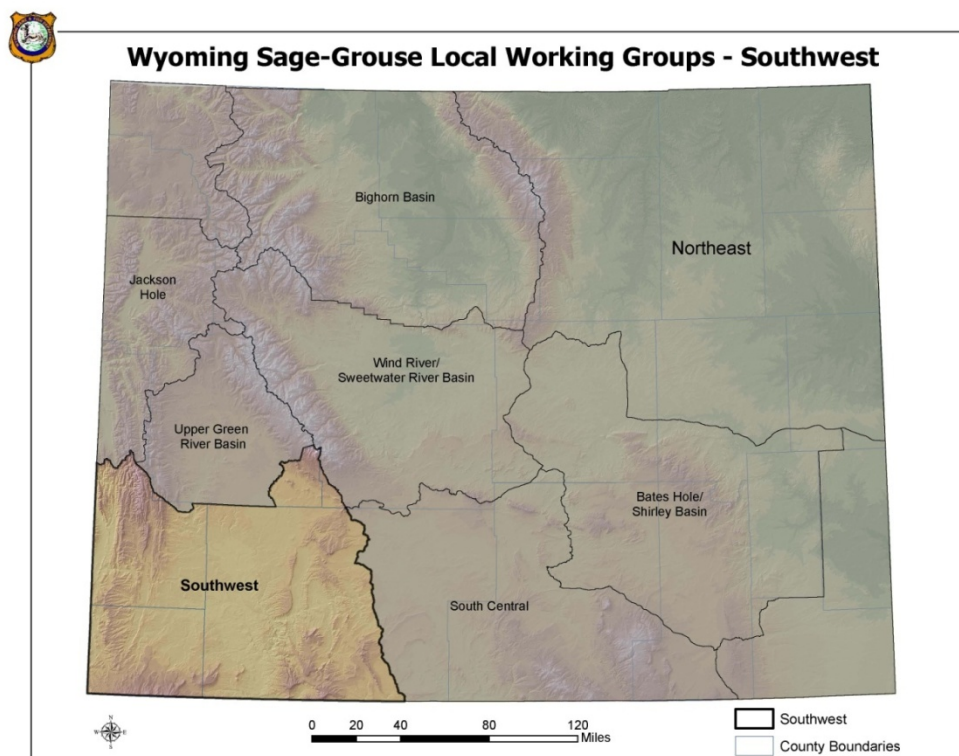
## Southwest Conservation Area Job Completion Report

**Species:** Greater Sage-grouse

**Management Areas:** G, Green River Region

**Biological Year:** June 1, 2019 – May 31, 2020

**Prepared by:** Patrick Burke, Green River Wildlife Biologist



## Sage Grouse Lek Characteristics

### Working Group: Southwest

Region	Number	Percent	Working Group	Number	Percent
Green River	400	88.3	Southwest	453	100.0
Pinedale	53	11.7			
Classification	Number	Percent	BLM Office	Number	Percent
Occupied	331	73.1	Kemmerer	199	43.9
Undetermined	10	2.2	Pinedale	14	3.1
Unoccupied	112	24.7	Rawlins	4	0.9
			Rock Springs	236	52.1
Biologist	Number	Percent	Warden	Number	Percent
Green River	169	37.3	Cokeville	56	12.4
Mountain View	230	50.8	Evanston	36	7.9
Pinedale	53	11.7	Green River	75	16.6
South Lander	1	0.2	Kemmerer	71	15.7
			Mountain View	51	11.3
			Rock Springs	111	24.5
			South Pinedale	53	11.7
County	Number	Percent	Land Status	Number	Percent
Fremont	4	0.9	BLM	312	68.9
Lincoln	137	30.2	BOR	15	3.3
Sublette	34	7.5	National Park	2	0.4
Sweetwater	211	46.6	Private	107	23.6
Uinta	67	14.8	State	16	3.5
			USFS	1	0.2
Management Area	Number	Percent	Lek Status	Number	Percent
G	453	100.0	Active	264	58.3
			Inactive	85	18.8
			Unknown	104	23.0

# Sage Grouse Job Completion Report

Year: 2011 - 2020, Working Group: Southwest

## 1. Lek Attendance Summary (Occupied Leks) (1)

### a. Leks Counted

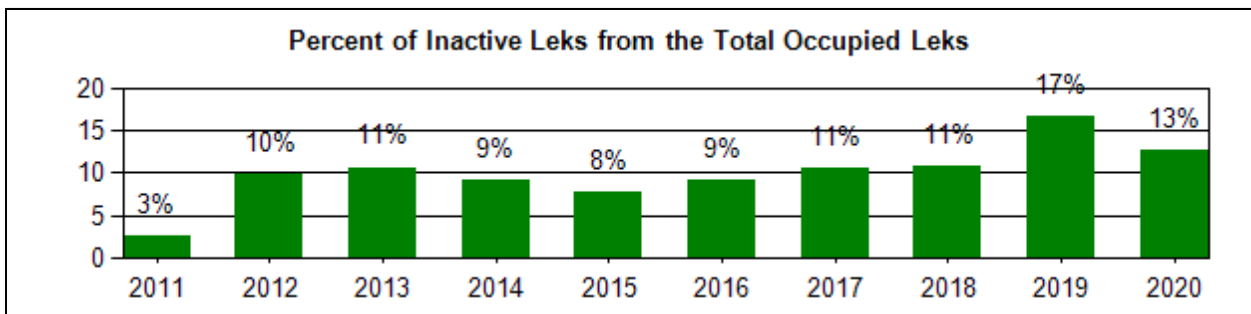
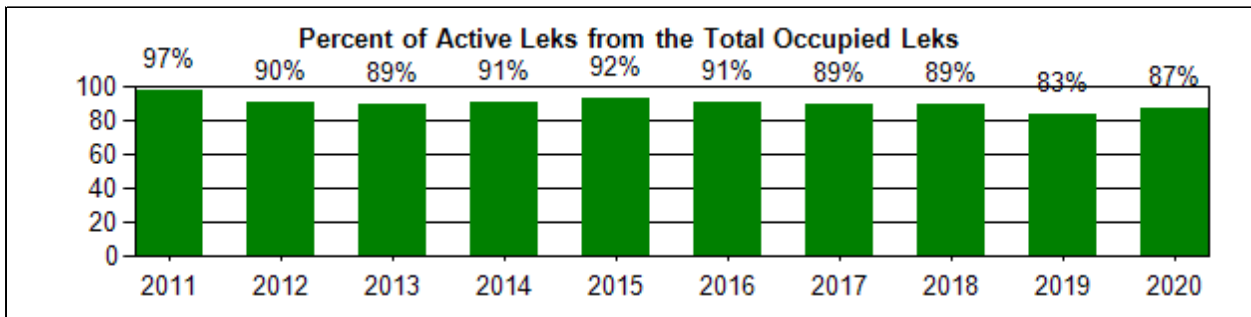
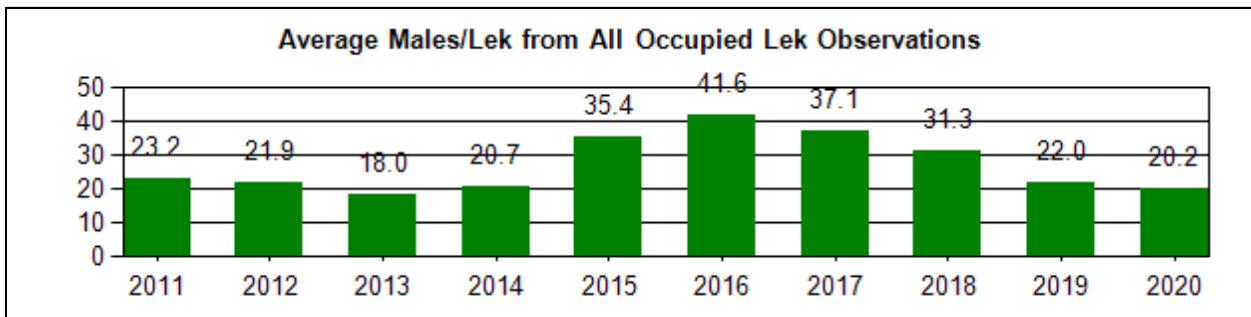
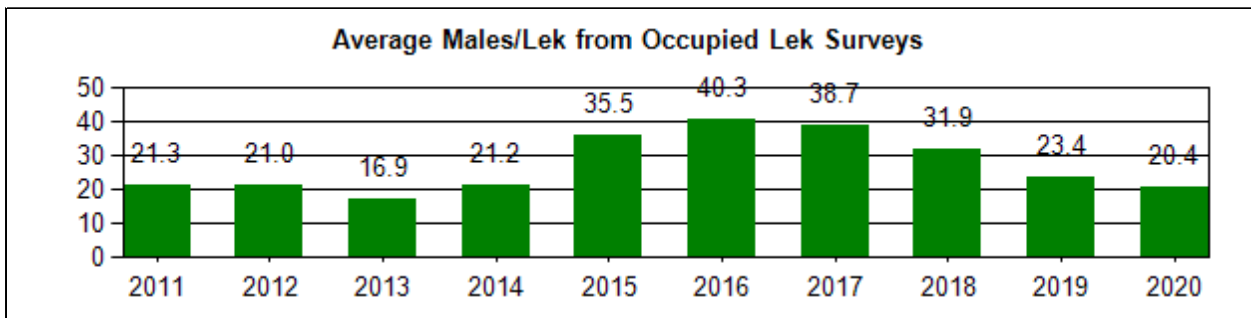
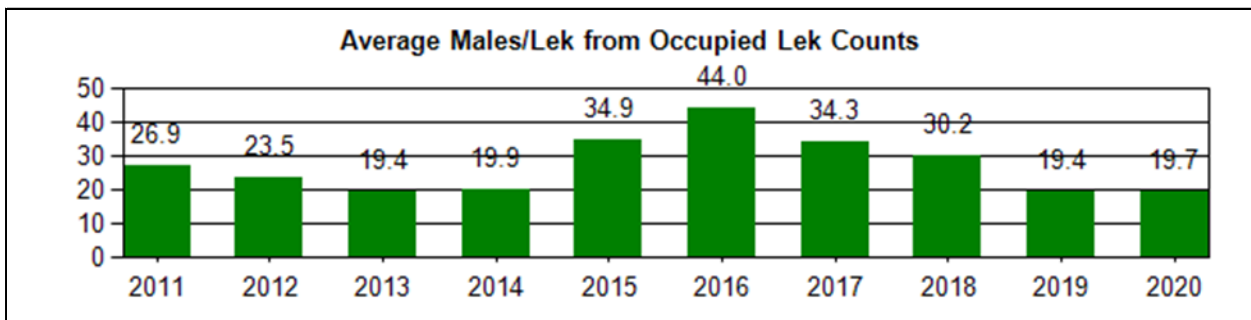
Year	Occupied	Counted	Percent Counted	Peak Males	Avg Males / Active Lek (2)
2011	297	73	25	1855	26.9
2012	303	81	27	1719	23.5
2013	310	116	37	1955	19.4
2014	312	96	31	1613	19.9
2015	318	70	22	2197	34.9
2016	327	94	29	3744	44.0
2017	336	97	29	2950	34.3
2018	340	102	30	2654	30.2
2019	339	87	26	1433	19.4
2020	337	66	20	1044	19.7

### b. Leks Surveyed

Year	Occupied	Surveyed	Percent Surveyed	Peak Males	Avg Males / Active Lek (2)
2011	297	165	56	2893	21.3
2012	303	183	60	2871	21.0
2013	310	177	57	2254	16.9
2014	312	191	61	3177	21.2
2015	318	224	70	6256	35.5
2016	327	213	65	6488	40.3
2017	336	204	61	5991	38.7
2018	340	212	62	5357	31.9
2019	339	202	60	3068	23.4
2020	337	181	54	2669	20.4

## Sage Grouse Occupied Lek Attendance Summary

Year: 2011 - 2020, Working Group: Southwest



# Sage Grouse Job Completion Report

Year: 2010 - 2019, Working Group: Southwest

## 3. Sage Grouse Hunting Seasons and Harvest Data

### a. Season

Year	Season Start	Season End	Length	Bag/Possesion Limit
2010	Sep-18	Sep-30	13	2/4
2011	Sep-17	Sep-30	14	2/4
2012	Sep-15	Sep-30	16	2/4
2013	Sep-21	Sep-30	10	2/4
2014	Sep-20	Sep-30	11	2/4
2015	Sep-19	Sep-30	12	2/4
2016	Sep-17	Sep-30	14	2/4
2017	Sep-16	Sep-30	15	2/4
2018	Sep-15	Sep-30	16	2/4
2019	Sep-21	Sep-30	10	2/4

### b. Harvest

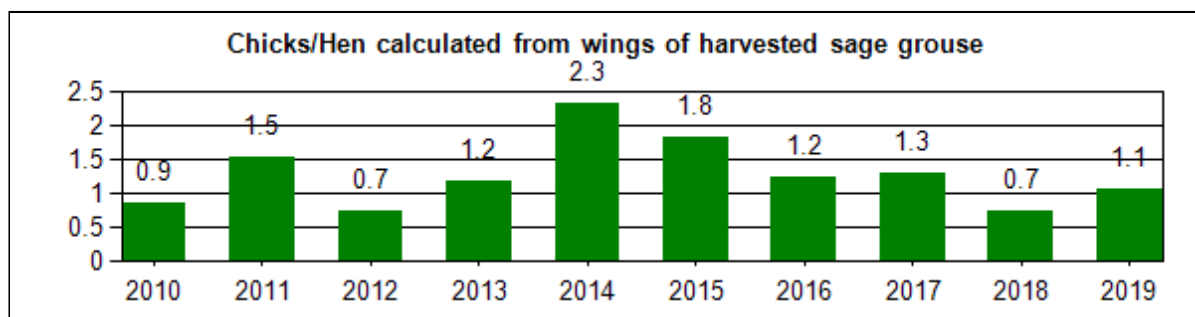
Year	Harvest	Hunters	Days	Birds/ Day	Birds/ Hunter	Days/ Hunter
2010	4225	1788	4048	1.0	2.4	2.3
2011	3901	1709	4276	0.9	2.3	2.5
2012	3737	1775	4503	0.8	2.1	2.5
2013	2513	1307	3139	0.8	1.9	2.4
2014	2645	1165	2835	0.9	2.3	2.4
2015	4479	1586	4057	1.1	2.8	2.6
2016	4163	1672	4036	1.0	2.5	2.4
2017	3590	1421	3675	1.0	2.5	2.6
2018	3410	1630	3873	0.9	2.1	2.4
2019	2821	1514	3746	0.8	1.9	2.5
Avg	3,548	1,557	3,819	0.9	2.3	2.5

# Sage Grouse Job Completion Report

Year: 2010 - 2019, Working Group: Southwest

## 4. Composition of Harvest by Wing Analysis

Year	Sample Size	Percent Adult		Percent Yearling		Percent Young		Chicks/ Hens
		Male	Female	Male	Female	Male	Female	
2010	696	2.6	51.0	0.6	0.9	2.9	3.6	0.9
2011	998	6.1	31.9	2.9	4.3	23.9	30.9	1.5
2012	581	10.0	38.9	4.6	10.3	16.5	19.6	0.7
2013	390	9.2	38.5	1.5	2.3	20.5	27.9	1.2
2014	517	5.6	20.7	2.3	7.0	33.5	30.9	2.3
2015	860	13.5	25.1	3.1	4.3	27.4	26.5	1.8
2016	949	15.2	30.5	4.2	5.6	19.9	24.7	1.2
2017	813	9.5	31.0	2.8	7.0	22.6	27.1	1.3
2018	827	12.0	33.4	6.5	13.4	13.1	21.6	0.7
2019	570	7.9	37.5	2.1	6.3	14.4	31.8	1.1



## Lek Monitoring

A total of 337 occupied leks were known to exist in the SWSGCA during the 2020 lekking season. Of these 337 occupied leks, 247 of them were checked, with 66 of those checks being lek counts with three or more visits during the breeding season, with the remaining 181 checks consisting of lek surveys where less than three lek visits were made during the breeding season. In 2019, 86% of the known leks were checked at least once during the lekking season; in 2020, however, that percentage decreased to 74% of the known leks being checked. The lower visitation rate in 2020 can be attributed to a decrease in the number of people that were available to check leks due to the Covid-19 restrictions that were put in place in the spring of 2020.

Of the 453 known lek sites in the SWSGCA in 2020, 264 of them were documented as being active, 85 were classified as being inactive and 104 leks were of unknown or undetermined status. All lek monitoring data from 2020, along with data from the past ten years for comparison are summarized in Tables 1 a-d.

Because of the quantity of leks in the SWSGCA, data collection efforts have focused on lek surveys, which involved at least one visit to the lek during the breeding season over lek counts, which are more labor intensive and involve three or more visits during the breeding season. Fedy and Aldridge (2011) determined that population trends demonstrated by lek surveys are the same as those indicated by lek counts as long as the number of leks surveyed exceeds 50 leks in an area.

Since only “occupied” leks are being reported on Tables 1 a-d, it is important to consider trends in the numbers of active versus inactive leks in addition to the average size of active leks. During a period of population decline, the size of active leks typically declines and the number of inactive leks increases. The converse is typically true of an increasing population. Therefore the magnitude of both increases and decreases is usually greater than what is indicated by the average lek size alone. The proportion of known status leks that were active in the SWSGCA has remained relatively steady over the 10-year reporting period varying from 83-97% active. The proportion active for the 2020 lekking season, was more in line with typical values with 87% of the checked leks being active.

Monitoring the total number of males on a lek is used as an index of trend, but these data should be viewed with caution for several reasons: 1) the survey effort and the number of leks surveyed/counted has varied over time, 2) it can be safely assumed that not all leks in the area have been located, 3) sage-grouse populations can exhibit cyclic patterns over approximately a decade long period, 4) the effects of un-located or un-monitored leks that have become inactive cannot be quantified or qualified, and 5) lek sites may shift over time. Both the number of leks and the number of males attending these leks must be quantified in order to estimate population trend.

The average number of males per active lek for all leks checked (both counted and surveyed) during the 2020 lekking season was 20.2 males per active lek. This is down from the high observations of 31 to 41 males per active lek observed from 2015 to 2018. The 2020 average number of males per active lek is also below the 10 year average of 27.9 males per active lek. The average number of males in attendance on the 66 count leks in 2020 was 19.7 males per lek. This number is below the 10 year average of 28.1 males per lek, but is above the 19.4 males per lek observed in 2013 and 2019. For the 181 leks that were surveyed in 2020, the average lek had 20.4 males in attendance, which is below the recent average of 27.8, and down substantially from 2016's and 2017's observed values of 40.3 and 38.7 males per survey lek.

It is important to note that data collection efforts have increased considerably since the early 2000's. In 2000, only 63% of known occupied leks were checked, but in recent years, the number annually checked is usually above 90% of the known occupied leks. In addition, efforts by WGFD personnel, volunteers, and other government and private industry biologists have led to increased numbers of known leks.

Currently, no method exists to estimate total sage-grouse population size in a statistically significant way. However, the recent male per lek averages along with the observed chick per hen ratios in hunter submitted wings indicate that the sage-grouse population in southwest Wyoming had been slightly decreasing during this reporting period.

## **Harvest**

The 2019 hunting season for sage-grouse in the SWSGCA ran from September 21 to September 30 and allowed for a daily take of 2 birds with a limit of 4 grouse in possession (Table 3a). The 2019 season was consistent with how the season has been run since 2002 when the season opening date was moved to the third Saturday in September and the daily bag limit was reduced to 2 birds and a possession limit of 4 birds. The sage-grouse season had historically started as early as September first and ran for 30 days; during this time the daily limit was 3 grouse with a possession limit of up to 9 birds. Over time, the season was gradually shortened and the daily bag and possession limits reduced because of concern over declining sage-grouse populations. The opening date was moved back from the first of September to the third weekend because research suggested that hens with broods were concentrated near water sources earlier in the fall and therefore more susceptible to harvest. The later opening date allowed more time for those broods to disperse and therefore reduced hunting pressure on those hens that were successful breeders and on young of the year birds.

The data for grouse harvested in the SWSGCA are reported under Sage-Grouse Management Area G for the 2010 through 2019 hunting seasons in this report (Table 3b). Based on harvest survey estimates, 1,514 hunters harvested 2,821 sage-grouse during the 2019 hunting season. This is down slightly from the 3,590 birds reported harvested in 2017, and the 3,410 grouse harvested in 2018; but is still higher than the estimated harvests of 2013 and 2014, when 2,500 to 2,600 grouse were harvested. The trends in harvest statistics over the last 10 years are not well correlated with average male lek attendance due to changes in hunting season structure, weather conditions, and hunter participation levels over that period.

Wings are collected each hunting season via voluntary hunter submission to allow for the determination of the sex and age of harvested birds. Successful hunters submitted 570 grouse wings from the 2019 hunting season (Table 4). This represents just over 20% of the estimated total harvest for 2019, which is near the average submission rate of around 18%-19% of reported harvest, but it is down from the 2011 submission rate, when over one-quarter of the estimated harvest was submitted for age analysis.

The most important ratio obtained from the wing analysis is the chick to hen ratio; this ratio provides a general indication of chick recruitment. Assuming that hen and chick harvest is proportional to the actual makeup of the population, chick production for that year can be estimated. Even if the rate of harvest between age/sex groups is not random, the information can



be used as a tool for looking at population trends as long as any biases are relatively consistent across years.

In general it appears that chick:hen ratios of about 1.3:1 to 1.7:1 result in relatively stable grouse populations, while chick:hen ratios of 1.8:1 or greater result in increasing grouse numbers and ratios below 1.2:1 result in subsequent declines. The chick:hen ratio as determined from hunter submitted wings for the 2019 hunting season was 1.1 chicks/hen (Table 4). This ratio suggests a slightly decreasing grouse population. This observed chick:hen ratio corresponds well with the decreased male lek attendance seen in the spring of 2020.

## **Weather**

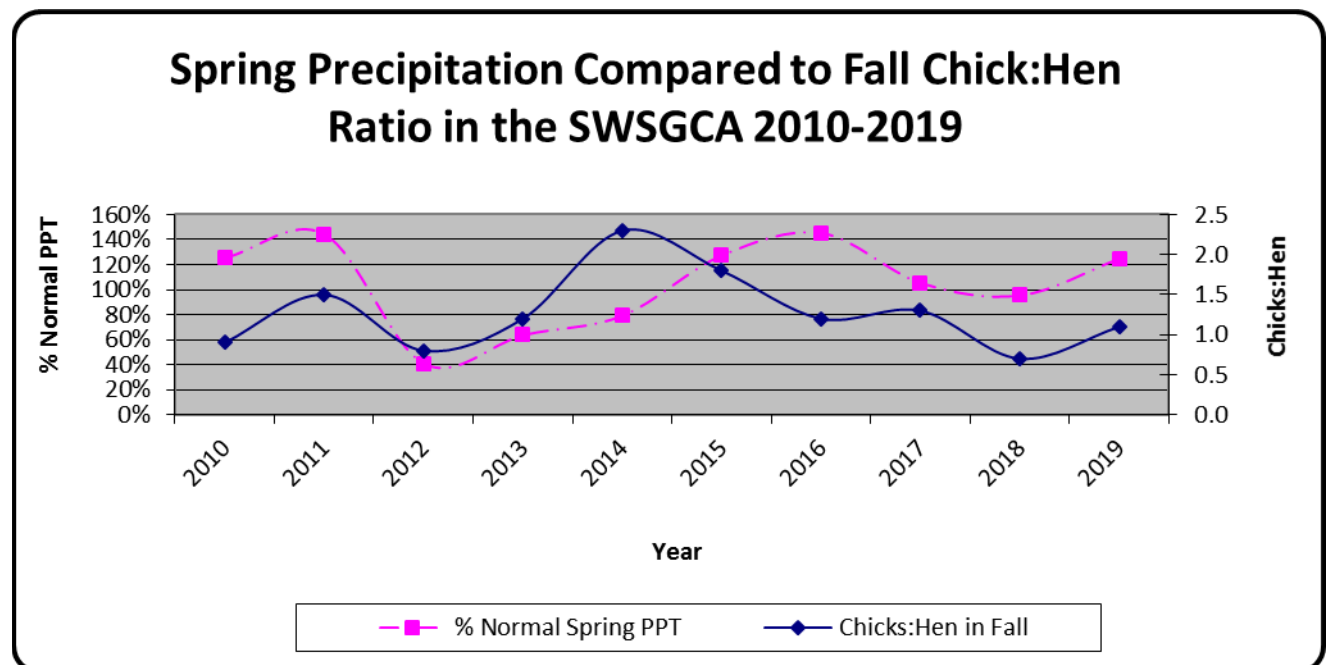
Spring habitat conditions are one of the most important factors in determining nesting success and chick survival for sage-grouse. Specifically, shrub height and cover, live and residual grass height and cover, and forb production, all have a large impact on sage-grouse nesting and brood rearing success. The shrubs and grasses provide screening cover from predators and weather, while the forbs provide forage and insects that reside in the forbs, which are an important food source for chicks. Spring precipitation is an important determinant of the quality and quantity of these vegetation characteristics. Residual grass height and cover depends on the previous year's growing conditions and grazing pressure while live grass and forb cover are largely dependent on the current year's precipitation.

Winter weather has not been shown to be a limiting factor to sage-grouse except in areas with persistent snow cover that is deep enough to limit sagebrush availability. This condition is rarely present in the SWSGCA even during severe winters.

The spring (March-June) precipitation and fall chick:hen ratios (as determined by hunter submitted wings) are given in Table 5 and Figure 4. Generally speaking, when spring precipitation is at or above 90% of average, chick to hen ratios are above average, but when spring precipitation is below average, chick:hen ratios also tend to be below average. However, periods of prolonged cold, wet weather may have adverse effects on hatching success, plant and insect phenology and production and chick survival.

**Table 5.** Spring precipitation compared to fall chick:hen ratios in the SWSGCA 2010-2019. Precipitation data from: <http://www.wrcc.dri.edu/index.html> (Click on Monitoring – under Monitoring click on Drought Monitoring then click on Monthly divisional precipitation or temperature – click on the map in the relevant portion of Wyoming, in this case division #3 Green and Bear Drainage Division – set up the plot as desired including “List the data for the points plotted?” Option – add the percentages listed under March through June of the year of interest and divide by four).

Year	% of Average March-June Precipitation	Chicks:Hen
2010	126%	0.9
2011	144%	1.5
2012	41%	0.7
2013	64%	1.2
2014	79%	2.3
2015	128%	1.8
2016	145%	1.2
2017	105%	1.3
2018	96%	0.7
2019	125%	1.1



## **HABITAT AND SEASONAL RANGE MAPPING**

While new leks are still being located in the SWSGCA, we believe that the majority of the currently occupied leks have been documented, however important other seasonal habitats such as winter concentration areas and especially nesting/early brood-rearing areas have not yet been adequately identified.

## PAST RESEARCH/STUDIES IN THE SWSGCA

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

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

Dinkins, J.B., M.R. Conover and S.T. Mabray. 2013. Do artificial nests simulate nest success of greater sage-grouse? *Human–Wildlife Interactions* 7(2):299–312.

Dinkins, J.B. 2013. Common raven density and greater sage-grouse nesting success in southern Wyoming: potential conservation and management implications. Dissertation. Utah State University, Logan.

Dinkins, J.B., M.R. Conover, C.P. Kirol, J.L. Beck, and S.N. Frey. 2014a. Greater sage-grouse (*Centrocercus urophasianus*) hen survival: effects of raptors, anthropogenic and landscape features, and hen behavior. *Canadian Journal of Zoology* 92:319-330.

*Dinkins, J.B., M.R. Conover, C.P. Kirol, J.L. Beck and S.N. Frey. 2014b. Greater Sage-Grouse (Centrocercus urophasianus) select habitat based on avian predators, landscape composition, and anthropogenic features. The Condor 116 (4), 629-642.*

Dinkins, J. B., K. T. Smith, J. L. Beck, C. P. Kirol, A. C. Pratt, and M. R. Conover. 2016. Microhabitat conditions in Wyoming sage-grouse core areas: effects on selection and nest success. *PLoS ONE* 11:e0150798.

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

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

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- Christiansen, T. 2010. Hunting and sage-grouse: a technical review of harvest management on a species of concern in Wyoming. Wyoming Game and Fish Department, Cheyenne.
- Conover, M. R., J. S. Borgo, R. E. Dritz, J. B. Dinkins and D. K. Dahlgren. 2010. Greater sage-grouse select nest sites to avoid visual predators but not olfactory predators. The Condor 112(2):331-336.
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- Dinkins, J. B., M. R. Conover, C. P. Kirol, J. L. Beck, and S. N. Frey. 2016b. Effects of common raven and coyote removal and temporal variation in climate on greater sage-grouse nesting success. Biological Conservation 202:50–58.
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- Peebles, L. W. 2015. Winter ecology of common ravens in southern Wyoming and the effects of raven removal on greater sage-grouse populations. Paper 4617. Thesis. Utah State University, Logan.

## Upper Green River Basin Working Group Area Job Completion Report

Species: **Greater Sage-grouse**

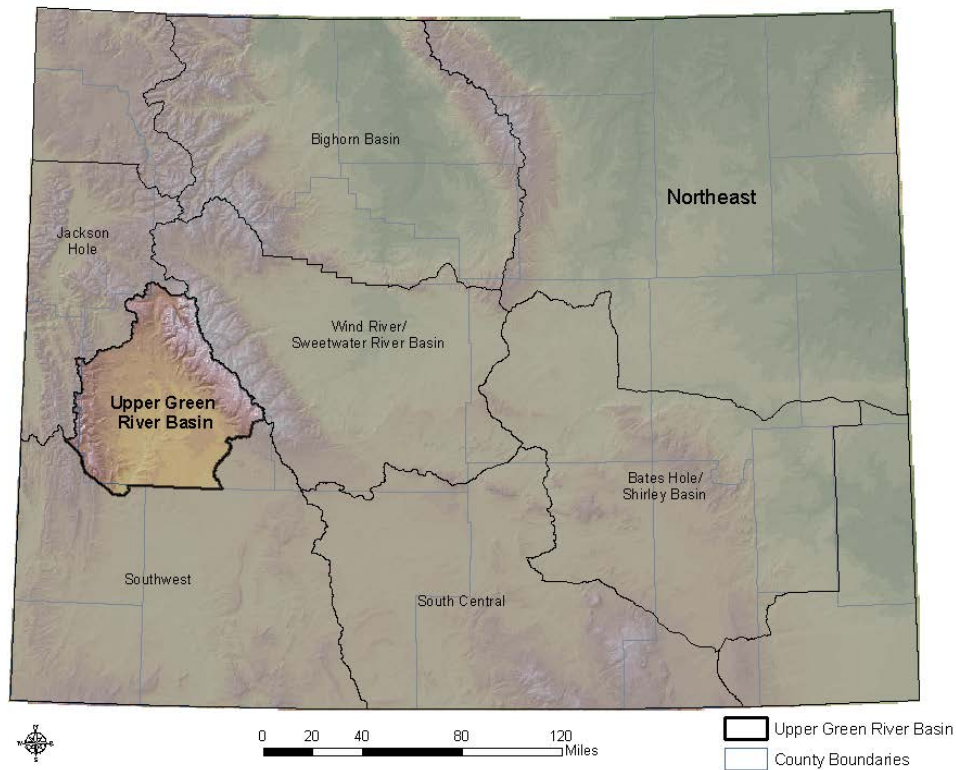
Conservation Plan Area: **Upper Green River Basin**

Period Covered: **6/1/2019 – 5/31/2020**

Prepared by: **Dean Clause, Pinedale Wildlife Biologist**



### Wyoming Sage-Grouse Local Working Groups - Upper Green River Basin



## Sage Grouse Lek Characteristics

### Working Group: Upper Green River

Region	Number	Percent
Pinedale	166	100.0

Classification	Number	Percent
Occupied	133	80.1
Unoccupied	33	19.9

Biologist	Number	Percent
Pinedale	94	56.6
Thayne	72	43.4

County	Number	Percent
Lincoln	2	1.2
Sublette	164	98.8

Management Area	Number	Percent
D	166	100.0

Working Group	Number	Percent
Upper Green River	166	100.0

BLM Office	Number	Percent
Pinedale	153	92.2
Rock Springs	13	7.8

Warden	Number	Percent
Big Piney	84	50.6
North Pinedale	24	14.5
South Pinedale	58	34.9

Land Status	Number	Percent
BLM	136	81.9
Private	20	12.0
State	10	6.0

Lek Status	Number	Percent
Active	101	60.8
Inactive	63	38.0
Unknown	2	1.2

## Sage Grouse Job Completion Report

Year: 2011 - 2020, Management Area: D, Working Group: Upper Green River

### 1. Lek Attendance Summary (Occupied Leks) (1)

#### a. Leks Counted

Year	Occupied	Counted	Percent Counted	Peak Males	Avg Males / Active Lek (2)
2011	131	100	76	2692	31.7
2012	132	117	89	3514	36.6
2013	130	116	89	3125	34.3
2014	130	111	85	3207	36.9
2015	134	109	81	4667	53.6
2016	138	117	85	5229	55.0
2017	137	97	71	4206	54.6
2018	140	116	83	4039	41.6
2019	138	69	50	2071	34.5
2020	135	100	74	2423	31.5

#### b. Leks Surveyed

Year	Occupied	Surveyed	Percent Surveyed	Peak Males	Avg Males / Active Lek (2)
2011	131	25	19	943	47.2
2012	132	6	5	149	37.3
2013	130	8	6	280	40.0
2014	130	14	11	290	29.0
2015	134	22	16	923	48.6
2016	138	19	14	886	63.3
2017	137	30	22	1091	52.0
2018	140	18	13	484	40.3
2019	138	62	45	1489	30.4
2020	135	29	21	498	23.7

1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

3) Inactive - Confirmed no birds/sign present (see official definitions)



## Sage Grouse Job Completion Report

Year: 2011 - 2020, Management Area: D, Working Group: Upper Green River

### 1. Lek Attendance Summary (Occupied Leks) (1)

**Continued**

#### c. Leks Checked

Year	Occupied	Checked	Percent Checked	Peak Males	Avg Males / Active Lek (2)
2011	131	125	95	3635	34.6
2012	132	123	93	3663	36.6
2013	130	124	95	3405	34.7
2014	130	125	96	3497	36.1
2015	134	131	98	5590	52.7
2016	138	136	99	6115	56.1
2017	137	127	93	5297	54.1
2018	140	134	96	4523	41.5
2019	138	131	95	3560	32.7
2020	135	129	96	2921	29.8

#### d. Lek Status

Year	Active	Inactive (3)	Unknown	Known Status	Percent Active	Percent Inactive
2011	104	21	0	125	83.2	16.8
2012	101	22	0	123	82.1	17.9
2013	98	26	0	124	79.0	21.0
2014	98	27	0	125	78.4	21.6
2015	106	25	0	131	80.9	19.1
2016	109	24	3	133	82.0	18.0
2017	98	29	0	127	77.2	22.8
2018	109	24	1	133	82.0	18.0
2019	109	22	0	131	83.2	16.8
2020	98	31	0	129	76.0	24.0

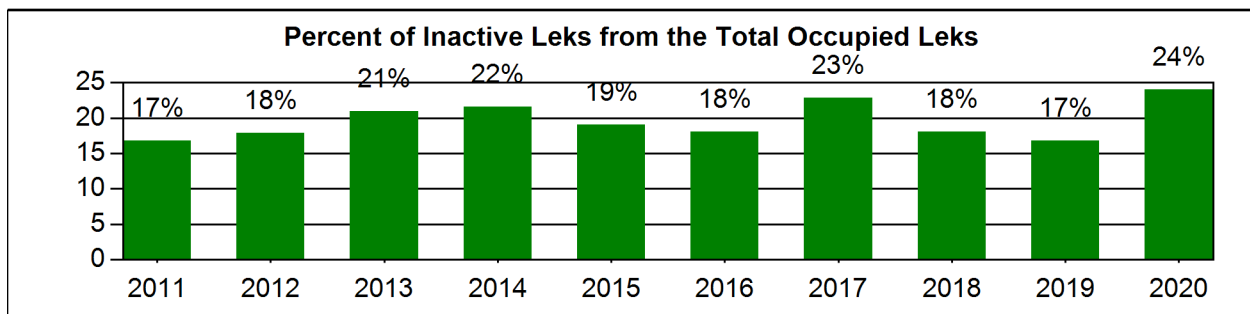
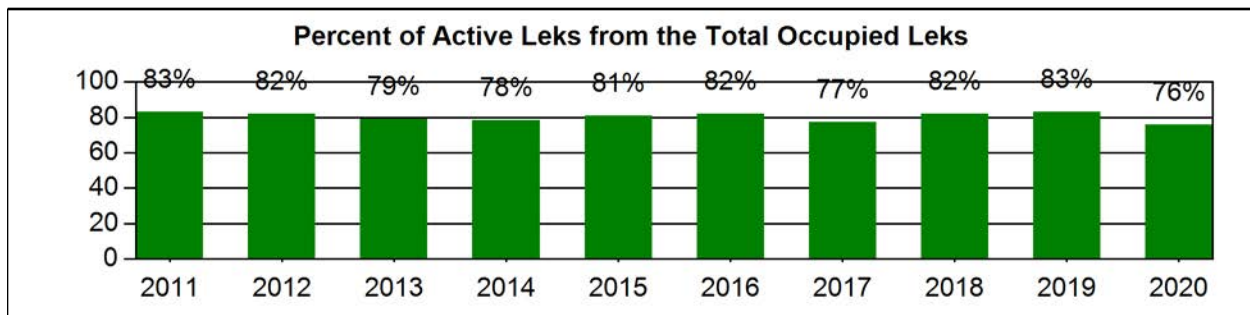
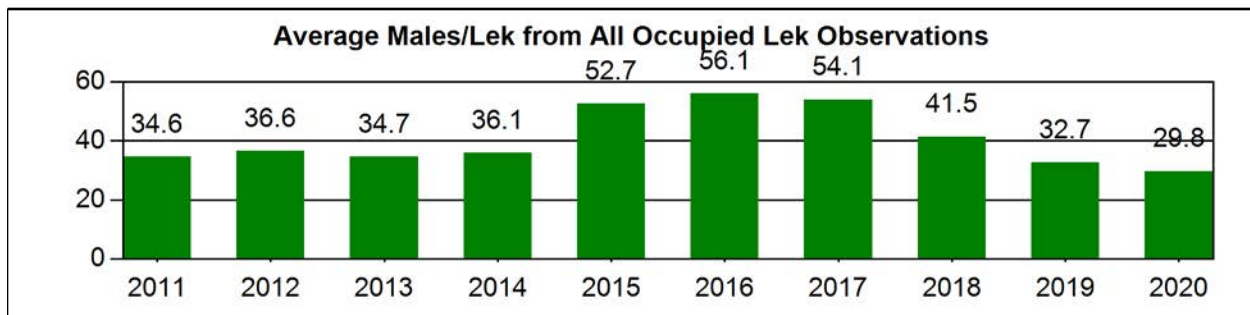
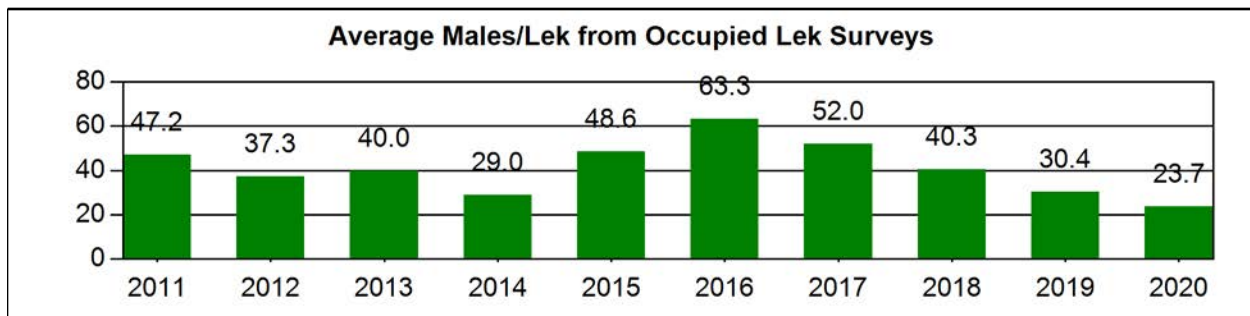
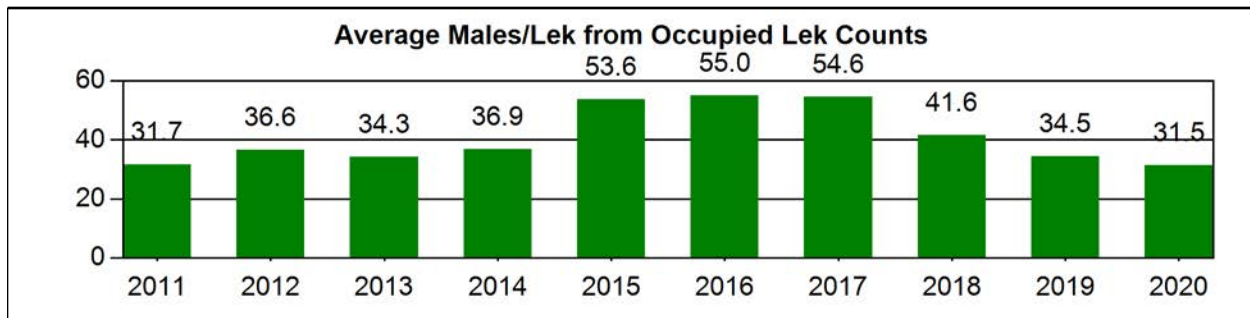
1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

3) Inactive - Confirmed no birds/sign present (see official definitions)

# Sage Grouse Occupied Lek Attendance Summary

Year: 2011 - 2020, Management Area: D, Working Group: Upper Green River



## Sage Grouse Job Completion Report

Year: 2010 - 2019, Management Area: D, Working Group: Upper Green River

### 3. Sage Grouse Hunting Seasons and Harvest Data

#### a. Season

Year	Season Start	Season End	Length	Bag/Possesion Limit
2010	Sep-18	Sep-30	13	2/4
2011	Sep-17	Sep-30	14	2/4
2012	Sep-15	Sep-30	16	2/4
2013	Sep-21	Sep-30	10	2/4
2014	Sep-20	Sep-30	11	2/4
2015	Sep-19	Sep-30	12	2/4
2016	Sep-17	Sep-30	14	2/4
2017	Sep-16	Sep-30	15	2/4
2018	Sep-15	Sep-30	16	2/4
2019	Sep-21	Sep-30	10	2/4

#### b. Harvest

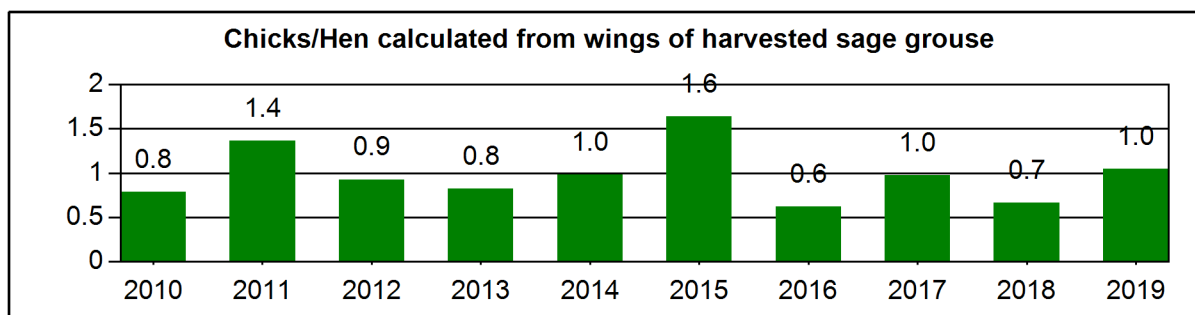
Year	Harvest	Hunters	Days	Birds/ Day	Birds/ Hunter	Days/ Hunter
2010	1510	526	1497	1.0	2.9	2.8
2011	1720	565	1605	1.1	3.0	2.8
2012	1320	476	1296	1.0	2.8	2.7
2013	628	387	848	0.7	1.6	2.2
2014	1056	406	1266	0.8	2.6	3.1
2015	1205	500	1129	1.1	2.4	2.3
2016	1990	706	2012	1.0	2.8	2.8
2017	988	402	921	1.1	2.5	2.3
2018	2161	853	2632	0.8	2.5	3.1
2019	1053	548	1248	0.8	1.9	2.3
Avg	1,363	537	1,445	0.9	2.5	2.6

## Sage Grouse Job Completion Report

Year: 2010 - 2019, Management Area: D, Working Group: Upper Green River

### 4. Composition of Harvest by Wing Analysis

Year	Sample Size	Percent Adult		Percent Yearling		Percent Young		Chicks/ Hens
		Male	Female	Male	Female	Male	Female	
2010	469	13.6	39.2	2.1	7.9	17.3	19.8	0.8
2011	547	8.6	32.5	4.0	4.4	24.1	26.3	1.4
2012	544	12.1	34.2	3.5	9.6	17.1	23.5	0.9
2013	372	12.1	40.9	3.2	5.6	17.2	21.0	0.8
2014	337	13.4	33.8	3.0	8.3	18.1	23.4	1.0
2015	482	12.4	27.0	2.1	5.4	24.7	28.4	1.6
2016	450	17.6	43.1	3.1	5.8	12.4	18.0	0.6
2017	573	15.0	35.1	3.3	6.3	18.8	21.5	1.0
2018	466	11.8	38.8	5.8	10.7	11.8	21.0	0.7
2019	342	7.3	32.5	1.8	12.0	14.3	32.2	1.0



## Lek Monitoring

A total of 166 leks are currently documented in the Upper Green River Basin Working Group Area (UGRBWGA). These leks are classified as follows; 133 occupied, 33 unoccupied, and 0 undetermined. During 2020, a total of 129 occupied leks (96%) were checked (survey or count). Lek monitoring efforts in 2020 resulted in the proportion of counts (78%) and surveys (22%), similar to most years. A significant reduction in count (increase in survey) leks occurred during 2019 due to limited access due to persistent snow during the month of April. Results from lek monitoring in 2020 showed 76% were active and 24% inactive of those leks classified as occupied. The average number of males/lek for all active leks decreased to 30 in 2020, compared to the past three years of 33 in 2019, 42 in 2018, and 54 in 2017. This results in a 9 % decrease compared to 2019 and a 47% decrease since the last peak in 2016 (Figure 1).

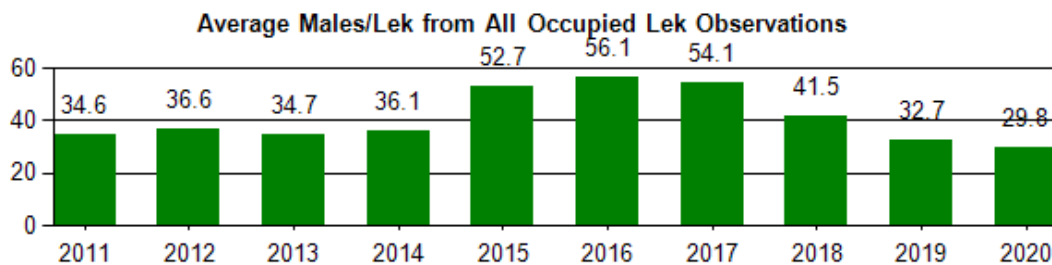


Figure 1. Average Peak Male Sage-grouse Lek Attendance 20011-2020, UGRBWG Area.

The highest documented average peak male attendance occurred in 2007 at 69 for this UGRBWGA. Since 2007, the observed average peak males has declined through 2010, stabilized from 2011-2014, and increased in 2015, stabilized in 2016-2017, and declined in 2018-2020 (Figure 3). The 2020 male lek attendance is 57% lower compared to the peak in 2007 using all occupied leks within the UGRBWGA. This trend is likely a combination of the cyclic nature of sage-grouse populations (Fedy and Doherty 2010), drought, and influences from habitat fragmentation in the Upper Green River Basin. Caution is warranted when analyzing long-range data sets (20+ years) within the UGRBWG area as the number of known (documented) leks have more than doubled during the past 18 years. Since many of these newly documented leks probably existed but were not monitored, there is some speculation in regards to what the average number of males/lek actually was prior to the mid 1990's.

The proportion of leks checked that are confirmed "active" has stayed relatively stable during the past 10 years, ranging from 76% to 83%. Although, there has been increased lek inactivity and abandonment in areas associated with gas development activity. Additional lek monitoring efforts and searches have resulted in locating new or undiscovered leks (65 new leks since 2004) mathematically negating the downward trend in the proportion of active leks in the UGRBWGA.

Peak male lek attendance from 1997-2020, using only leks known in 1997, reveals a trend similar to all known leks within the UGRBWGA (Figures 2 & 3). Since 1997, the discovery and monitoring of leks has more than doubled, explaining the variation in the

average number peak males between the two data trends (known leks from 1997 verses all known leks).

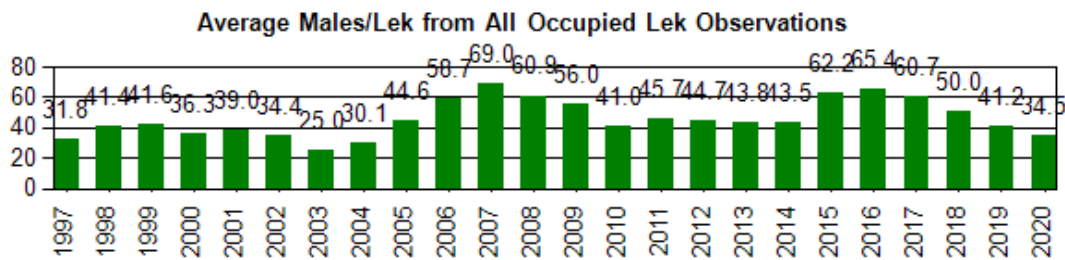


Figure 2. Average Peak Male Sage-grouse Lek Attendance 1997-2020 using only leks known in 1997, UGRBWG Area.

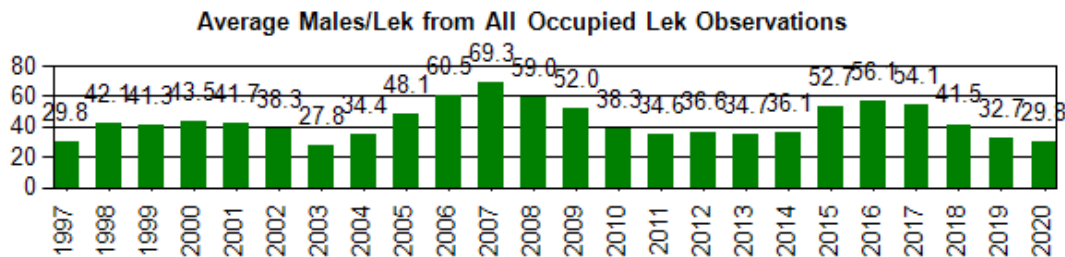


Figure 3. Average Peak Male Sage-grouse Lek Attendance 1997-2020 using all known leks, UGRBWG Area.

An analysis to assess natural gas development impacts to sage grouse leks in the Pinedale area shows lower male attendance, reduced occupancy and reduced activity on those leks within or near gas field development. Using the latest aerial imagery (2018 Sublette County Imagery), leks located within or less than one mile of gas field activity in the Pinedale Anticline Project Area (PAPA), Jonah Gas Fields, and Normally Pressured Lance (NPL) Gas Field were grouped for comparison. The group of leks referred to as “Disturbed Leks” (n=23) were those leks within or near (roughly within one mile) active gas field development within the PAPA, Jonah, and NPL. The other group of leks referred to as “Undisturbed Leks” (n=143) were the remaining leks in the UGRBWGA used as a control for comparison. The range of data used in this comparison was from 1997 – 2020 for the same reasons mention earlier (lack of lek monitoring and standardized monitoring protocol). In comparing Disturbed Leks vs. Undisturbed Leks, the average number of peak males/ active lek for occupied leks reveal somewhat similar trends. Although the long-term peak number of males in the Disturbed Leks has declined by 47% while the Undisturbed Leks have increased by 3% (Figures 4 & 5) when comparing the average peak males/active lek from 1997 to 2020.

Another main difference documented between the two data sets is associated with the lek occupancy, occupied verses unoccupied leks. A much higher proportion of leks are currently unoccupied (abandoned or destroyed) within or near the PAPA, Jonah, and NPL gas fields (Disturbed Leks) at 65% compared to only 14% of all leks outside these three gas fields (Undisturbed Leks) being unoccupied. Of the 8 remaining occupied leks within the Disturbed Lek set, 6 (75%) were active in 2020, while 127 (76%) of the occupied leks in the Undisturbed Lek set were active in 2020. Lek activity has been

variable within the in the Disturbed Leks ranging from 38% to 93% since 1997, due to changes in lek occupancy (occupied to unoccupied) along with a smaller sample size of leks. Lek activity has been relatively stable in the Undisturbed Leks ranging from 74% to 89% since 1997 (Figure 6).

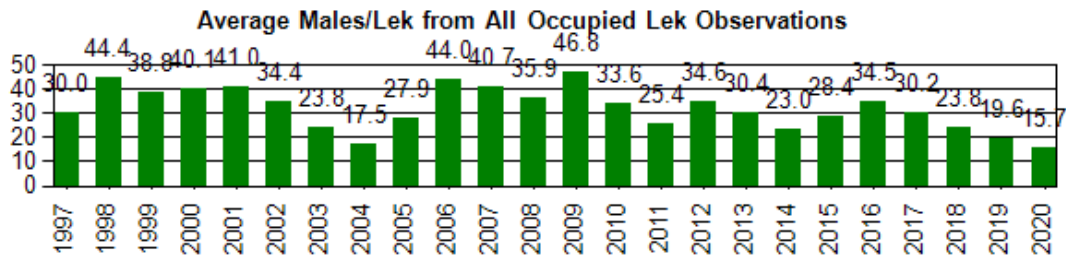


Figure 4. Average Peak Male Sage-grouse Lek Attendance 1997-2020, Disturbed Leks.

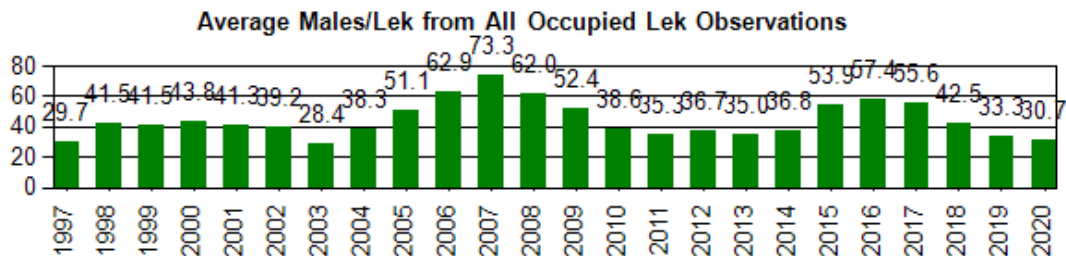


Figure 5. Average Peak Male Sage-grouse Lek Attendance 1997-2020, Undisturbed Leks.

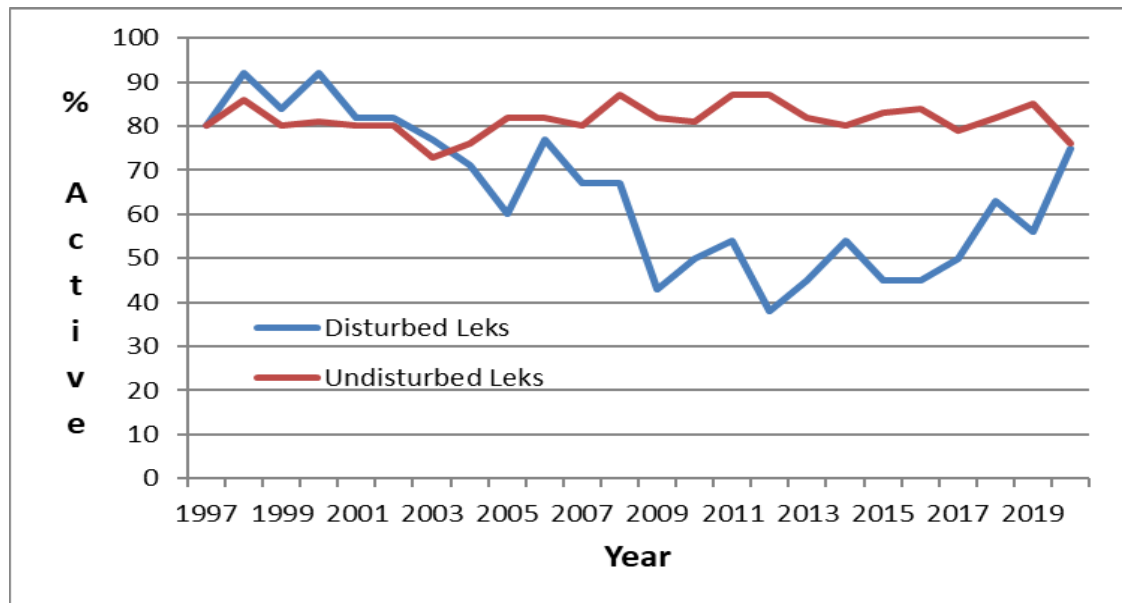


Figure 6. Proportion of active leks 1997-2020, Disturbed Leks verses Undisturbed Leks.

## Harvest

The 2019 sage-grouse season was September 21 through September 30, a 10-day hunting season, similar seasons since 2004. Hunting seasons since 2002 have allowed the season

to remain open through two consecutive weekends. From 1995 – 2001 hunting seasons were shortened to a 15-16 day season that typically opened during the third week of September and closed in early October. Prior to 1995, the sage-grouse seasons opened on September 1 with a 30 day season. Seasons have been shortened with later opening dates to increase survival of successful nesting hens (as they are usually more dispersed later in the fall) and to reduce overall harvest.

Bag limits from 2003 to 2019 have been 2 per day and 4 in possession. 2003 was the first year that bag/possession limits had been this conservative. Bag limits traditionally (prior to 2003) were 3 birds/day with a possession limit 9 (changed to 6 birds from 1994-2002). Prior to 2010, harvest estimates in the UGRBWGA were only reported from UGBMA 3 and not in that portion of UGBMA 7 that lies within the UGRBWGA. New Sage-grouse Management Areas (SGMA) were developed in 2010, where SGMA D covers all of the UGRBWGA and has been reported that way since 2010.

The 2019 harvest survey estimated that 548 hunters bagged 1053 sage grouse and spent 1248 days hunting, similar to most years, but a significant decrease from 2018 (the highest during the last 10-year period). The average number of birds per day was 0.8, the average number of birds per hunter was 1.9, and the number of days spent hunting per hunter was 2.3 during 2019. The increased hunter participation in 2018 can't be fully explained, except for the longer season length and favorable weather. Harvest rates (# birds/day, # birds/hunter, and # days/hunter) have remained somewhat similar since 2010, with the exception of lower harvest rates during 2013 and higher overall harvest and hunter participation in 2018 (Figure 4). From 1995 to 2002, overall harvest and harvest rates significantly declined following altered seasons (shortened and moved to a later date). Since 2010, hunter participation has varied from 387 to 853 hunters per year.

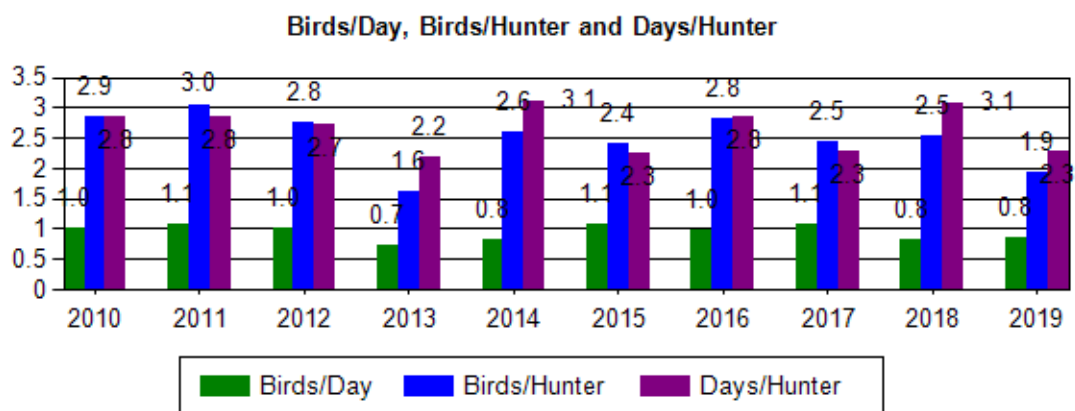


Figure 4. Sage grouse harvest rates 2010-2019 in SGMA D.

#### Wing Collections

Eighteen sage-grouse wing barrels were distributed throughout Sublette County in 2018 within SGMA D. Barrels were placed prior to the sage-grouse hunting season opener and were taken down following the closing date. Wing collections were typically made following each weekend of the hunting season. The wings are used to determine age and sex based on molting patterns and feather characteristics.



A total of 342 sage-grouse wings were collected from barrels in the UGRBWGA during 2019, lower than 466 in 2018, and 573 in 2017. The number of wings collected during the past 10-year period ranged from 337 to 573. Of the 342 wings collected in 2019, 46% were juvenile birds and 44% were adult and yearling hens. The overall composition of wings in 2019 indicated a ratio of 1.0 chicks/hen (adult and yearling females), which typically results in lower to stable lek counts the following spring. The 2016 wing collections showed a 0.6 chicks/hen ratio, representing the lowest production during the past 10-year period. Conversely, wing collections during 2015 showed 1.6 chicks/hen, resulting in the highest production during the past 10-year period (Figure 5). The combination of low chick production during the past several years explains the recent declines male lek attendance. This chick/hen ratio derived from wing collections has been a relatively good indicator to predict future population trends, as male lek attendance trends have broadly correlated with chick production in the UGRBWGA.

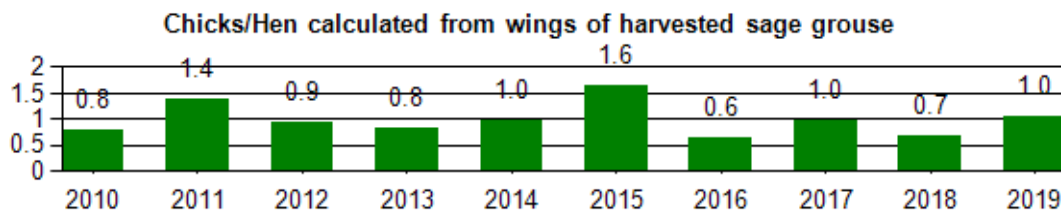


Figure 5. Sage grouse chick/hen ratios derived from wing collections 2010-2019, UGRBWGA.

### Winter Distribution Surveys

No specific winter sage grouse surveys were conducted during the 2018-2019 winter within the UGRBWG Area. Winter surveys were initially conducted in 2004 and continued through 2013 within portions of the Upper Green River Basin. This winter data has been used to develop winter concentrations area maps (first map developed in 2008). Additional analysis methods such as Resource Selection Function (RSF) models have recently been utilized with winter survey data to help refine previously identified winter concentration areas (WCA). Although, WCA have been identified throughout the UGRBWG Area, the Sage Grouse Implementation Team has only recognized one area located in the Alkali Draw & Alkali Creek Area as of 2019. Efforts to re-delineate WCA's throughout the UGRBWGA are planned for completion in 2021.

### Sage-grouse Research Projects

From 1998-2009 there were several research projects initiated and completed that have provided information on sage-grouse demographics and effects of natural gas development on sage-grouse populations. See UGRBWGA 2010 JCR for a summary of past sage-grouse research in the Pinedale area.

### Significance of Geophagy:

There is an on-going study (initiated in 2013) looking into the significance of geophagy by sage grouse within the UGRBWGA. Sage-grouse geophagy, or intentional ingestion of soil, was documented in Sublette County Wyoming during the winter of 2012 – 2013.

While it is well-known for a variety of other birds and mammals, it represents a behavior that has not been described for sage-grouse. The goal of this project is to assess the importance of "soil-eating" areas in describing winter habitat selection by sage-grouse. Currently, within the Upper Green River Basin researchers have identified 24 confirmed locations of geophagy behavior. An additional 20+ potential locations have also been identified. Past collaborators on the project have been the BLM, Teton Raptor Center, Wyoming Wildlife Consultants, and Sublette County Conservation District. Soil has been collected and tested at each confirmed location and compared to soil at random locations in order to identify the potential target mineral or compound responsible for the behavior. Soil tests indicate higher sodium, pH, and clay content at the documented geophagy sites.

A Utah State University graduate student is currently assessing habitat selection for wintering sage-grouse in the presence of geophagy sites. This resource selection analysis will not only help determine how geophagy sites influence winter habitat selection, but also help predict areas of importance to wintering sage-grouse in these areas. A second graduate student from Utah State University is continuing research and data collection efforts for this geophagy project specifically to evaluate how geophagy behavior may influence reproduction during the breeding season.

Ecology of Greater Sage-grouse in Alkali Creek and the Upper Green River Basin: There are additional questions that would aid managers about the ecology of sage-grouse in the new 140,000 acre Normally Pressured Lance (NPL) Gas Field with a potential for up to 3,500 wells. Although there are large winter flocks and documentation of sage-grouse movement to the NPL in winter, it is unknown what proportion of birds survive while using the area. It is possible to have a great deal of human use or development of an area, without any impacts to survival. Instead, animals can be displaced or avoid an area, which might not result in any population-level impacts, but would reduce the carrying capacity. However, if survival is compromised, it becomes necessary to understand the timing and causes of bird mortality. Therefore, it is necessary to assess survival rates of sage-grouse in the region to better understand the utility of the area in sage-grouse conservation. In addition to the importance of movements, resource selection, and survival, it has been documented that sage-grouse in the area are geophagic. If geophagy plays an important role in winter resource selection, resulting in high use of the NPL site during winter, we might be missing a key parameter in RSF models and WCA delineations on the site, because we have not considered geophagy. Last, we know very little about the mobility of these flocks, their fidelity to certain areas, and the stability of group membership within Alkali Creek and Alkali Draw. The intensive aerial flights that were conducted on the site capture sage-grouse distributions in late January and February but key areas during November, December and March (i.e., current timing restriction for the WCA are in effect from November 15 to March 15), could go unknown if we rely solely on flight data. Because delineation of a WCA requires 50 birds, it becomes important to understand how flock numbers change over time.

Collectively, these issues require a comprehensive research project which will provide information to help manage sage-grouse populations in the NPL region. Specifically, this study will provide movements, resource selection, survival, and sites selected by sage-grouse for geophagic behavior. Because these questions require fine-scale observations of sage-grouse, global positioning systems transmitters combined with solar-powered Argos platform transmitter terminals (GPS-PTTs) are being used which have been shown to effectively monitor activities of sage-grouse in other parts of Wyoming (J. Millspaugh, unpublished data). Our study is focused within the Alkali Creek and Alkali Draw regions of the NPL for 3 years (initiated in 2019).

### **Sage-Grouse Working Group**

The UGRBWG was formed in March of 2004. The group is comprised of representatives from agriculture, industry, sportsmen, public at large, conservation groups, and government agencies (federal and state). The purpose of the UGRBWG is to work towards maintaining or improving sage-grouse populations in the Upper Green River basin. The group is directed to formulate plans, recommend management actions, identify projects, and allocate available funding to support projects that will benefit sage-grouse. The Upper Green River Basin Sage-Grouse Conservation Plan was finalized in May of 2007 and can be found on the WGFD website (<https://wgfd.wyo.gov/Habitat/Sage-Grouse-Management>). This plan identified past, proposed, and ongoing projects; recommended management activities; funding sources; and other relevant sage-grouse information within the UGRBWGA intended to maintain and/or increase sage-grouse populations. The Working Group completed an addendum to this 2007 plan (Upper Green River Basin Sage-Grouse Conservation Plan Addendum – 2014) that provides updated information on activities, projects, and management strategies within the UGRBWGA. Appropriation of State monies approved for sage grouse projects during past years have been allocated to the UGRBWG for local conservation measures that benefit sage grouse. Raven control, water windmill to solar pump conversion, and cheatgrass inventory/control projects continue to account for the majority of allocated funds granted to the UGRBWG in recent years.

### **Management Summary**

Data collected and reported in this 2019 Sage-Grouse Job Completion Report (June 2018 thru May 2019) gives insight to population trends. Analysis of lek trend data indicates that the sage-grouse populations steadily increased from 2003 to 2007, dropped slightly in 2008, continued to decline through 2011, stabilized through 2014, increased significantly in 2015, followed by a relatively stable population in 2016 and 2017, and population decline in 2018-2020. Lek trend data suggest grouse populations were at the lowest level in 2003 and highest level in 2007.

Lek monitoring in the UGRBWGA showed a 146% increase in the peak number of males per lek from 2003 to 2007 as males increased from 28 males/lek to 69 males/lek. This trend reversed after 2007, as the number of males/lek declined by 48% dropping to 36 males/lek by spring of 2014. During 2015, lek counts showed a 47% (53 males/lek) increase followed by an 8% increase in 2016, 4% decrease in 2017, 23% decrease in 2018, 21% decrease in 2019, and a further decrease of 9% in 2020 (30 males/lek). Sage-

grouse leks within developing gas fields continue to show declines and lek abandonment regardless of lek trends outside of gas development, indicating negative impacts to sage grouse in and near natural gas fields. Existing leks within non-core habitats and within gas development fields will be subject to further impacts.

Sage-grouse hunting season dates, season length, and bag limits have remained similar since 2002, running from mid to late September for 9-15 days with a daily bag limit of 2 birds and a possession limit of 4 birds. Although season length and bag limits have remained similar since 2002, overall harvest and hunter participation has varied somewhat, while harvest rates (# birds taken/day, #birds taken/hunter, and # days/hunter) have remained similar on most years. With grouse numbers steadily increasing from 2003-2007, declining from 2007-2014, increasing in 2015-2016, and decreasing in 2017-2018, the progression of hunter participation was expected to show similar trends. Variation in hunter participation can be affected by hunting season structure, weather conditions (especially during the current short seasons), and hunter perceptions of sage-grouse populations.

Wing collection from barrels (drop locations) continues to provide good sample sizes to determine overall chick survival trends within the UGRBWGA. During 2008-2019 wing collections ranged from 22% to 58% of the reported harvest. The sample size of 342 wings in 2019 accounted for 32% of the reported harvest. These annual wing samples can vary significantly based on weather conditions affecting hunter participation, especially during the weekend days of hunting season. Overall, some correlation exists between trends in wing sample sizes and harvest, and provides managers the most reliable data for determining annual reproductive rates in the UGRBWGA.

Trends in chicks/hen derived from wing collections continue to show a correlation with following year lek trends. An increase (or decrease) in the number of chicks/hen in the harvest typically results in similar trends documented on leks the following year(s). In general, a chick/hen ratio below 1.1 has shown declines in overall male lek attendance the following spring, 1.1 to 1.3 chicks/hen has shown stable attendance, and a chick/hen ratio greater than 1.3 has shown increases in lek attendance in the UGRBWGA. During the past 5 years (2015-2019) the chicks/hen ratio has varied from 0.6 to 1.6 and averaging 1.0 chicks/hen.

Above normal precipitation during 2004 and 2005 during key periods (specifically in the spring and early summer) contributed to increased sage-grouse numbers due to enhanced production and juvenile survival in the Upper Green River Basin. Declining chick survival was documented in 2006 and 2007 caused by spring and summer drought conditions in the Upper Green River Basin. Male sage-grouse lek numbers declined from 2007-2011 and remained stable from 2012-2014. Good to above average spring precipitation during 2008-2011 led to good herbaceous production, which should have helped turn around the recent declining trends in the UGRBWGA. It appears the cold temperatures during the spring of 2009 and 2010 impacted reproduction resulting in further declines in lek numbers in 2010. Spring moisture in 2011 resulted in very good habitat production, and most likely contributing to the slight increase in bird numbers

documented during the spring of 2012. Drought conditions in 2012 and 2013 most likely attributed to poor chick survival as spring temperatures were near normal, resulting in little change on spring lek counts in 2014. In 2014, good forage production was the result of increased precipitation during the fall of 2013 and spring of 2014 which likely contributed to increased male lek counts in 2015. Although the winter of 2014-15 was mild with low precipitation, the spring of 2015 had above average precipitation, primarily attributed to a very wet May, apparently resulting in very good chick production. The 2015-2016 winter and 2016 spring conditions were very similar to the previous year with dry winter and wet spring conditions, but resulted in poor chick production and similar lek counts. The 2016-17 winter conditions were severe with heavy snow loads and cold temperatures followed by a dry spring, yet lek counts in 2017 were similar to those recorded in 2016. The 2017-18 winter was mild with low snow accumulations and above average temperatures followed by a relatively wet spring, and a decline in 2018 lek counts. The 2018-19 winter resulted in late persistent snow and cold temperatures through the spring of 2019, and a decline in 2019 lek counts. The 2019-20 winter was average snow and cold temperatures and a slight decline in 2020 lek counts. The predictability of factors that determine nest success and chick survival remains complex and is likely more dynamic than just climate conditions such as precipitation and temperature trends.

The current amount and rate of natural gas development in the Upper Green River Basin has and will continue to impact sage-grouse habitat and localized populations. Lek monitoring data has shown lower male attendance and a high rate of lek abandonment within and adjacent to developing gas fields. Sage-grouse studies and research in the UGRBWGA has also documented impacts to grouse from gas development. Direct, indirect, and cumulative impacts to sage-grouse from gas and residential development will continue to challenge managers to maintain current grouse numbers.

### **Recommendations**

1. Continue to monitor sage-grouse leks and look for new and previously undocumented ones.
2. Continue to monitor and provide input on natural gas development/sage-grouse projects being conducted.
3. Continue to place wing barrels in enough locations to obtain an adequate and representative sample to derive sex/age and harvest trend information.
4. Continue existing efforts and encourage new efforts to document and identify important sage-grouse areas (breeding, brood rearing, and winter).
5. Continue to work with GIS personnel and land managers to create and update seasonal range maps (breeding, summer/fall, and winter) to aid land managers in protecting and maintaining important sage-grouse habitats. Delineation of winter concentration areas will be a priority.
6. Continue to identify needed sage-grouse research, data collection efforts, project proposals, development mitigation, and funding.
7. Implement proposals and management recommendations identified in the Upper Green River Basin Sage-Grouse Working Group Conservation Plan and Plan Addendum where possible.

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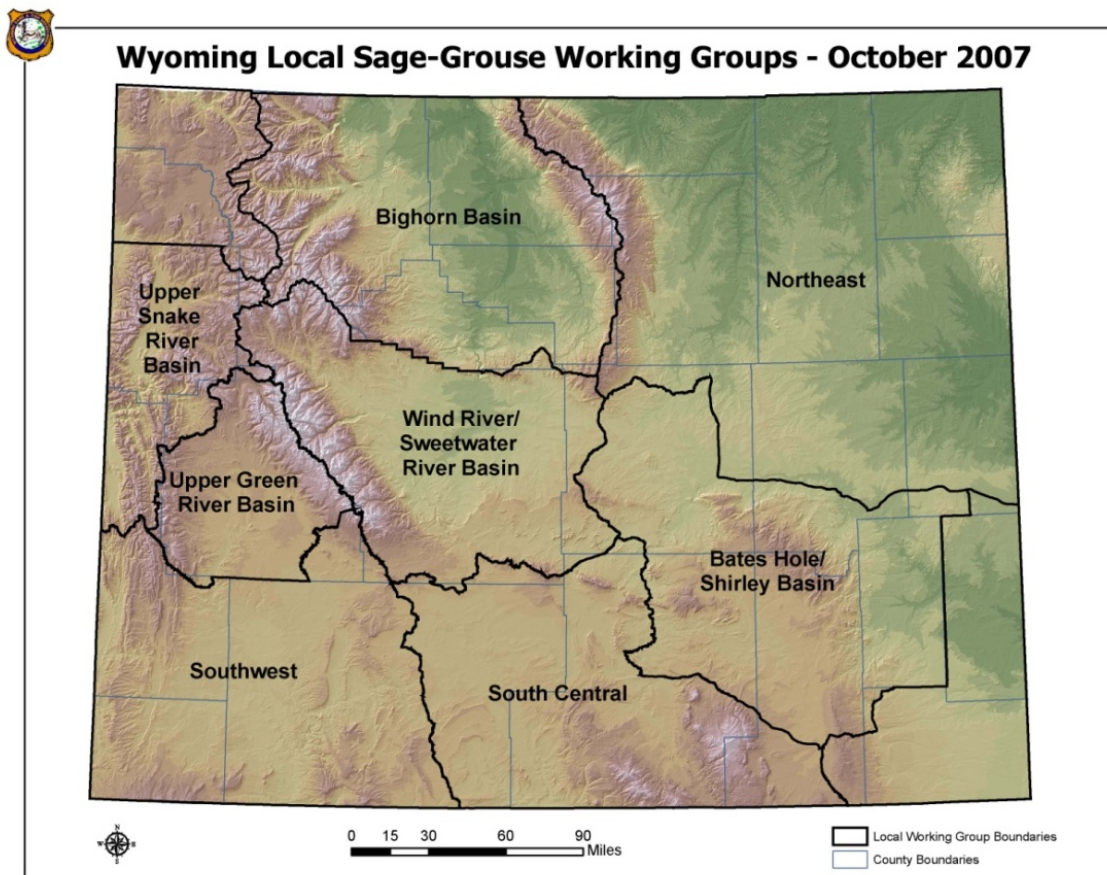
## Upper Snake River Basin Conservation Area Job Completion Report

**Species:** Greater Sage-Grouse

**Period Covered:** June 1, 2019 – May 31, 2020

**Management Areas:** A; Upper Snake River Basin

**Prepared by:** Alyson Courtemanch, North Jackson Wildlife Biologist



## Sage Grouse Lek Characteristics

### Working Group: Upper Snake River Basin

Region	Number	Percent
Jackson	17	89.5
Pinedale	2	10.5

Classification	Number	Percent
Occupied	15	78.9
Undetermined	1	5.3
Unoccupied	3	15.8

Biologist	Number	Percent
Jackson	17	89.5
Thayne	2	10.5

County	Number	Percent
Sublette	2	10.5
Teton	17	89.5

Management Area	Number	Percent
A	19	100.0

Working Group	Number	Percent
Upper Snake River Basin	19	100.0

BLM Office	Number	Percent
Pinedale	19	100.0

Warden	Number	Percent
Big Piney	2	10.5
North Jackson	15	78.9
South Jackson	2	10.5

Land Status	Number	Percent
National Park	12	63.2
USFS	4	21.1
USFWS	3	15.8

Lek Status	Number	Percent
Active	9	47.4
Inactive	9	47.4
Unknown	1	5.3



## Sage Grouse Job Completion Report

Year: 2011 - 2020, Working Group: Upper Snake River Basin

### 1. Lek Attendance Summary (Occupied Leks) (1)

#### a. Leks Counted

Year	Occupied	Counted	Percent Counted	Peak Males	Avg Males / Active Lek (2)
2011	14	14	100	112	14.0
2012	16	15	94	142	14.2
2013	16	13	81	149	16.6
2014	16	13	81	163	16.3
2015	16	14	88	227	25.2
2016	15	15	100	227	20.6
2017	15	15	100	176	16.0
2018	15	15	100	108	10.8
2019	15	15	100	62	5.6
2020	15	12	80	67	8.4

#### b. Leks Surveyed

Year	Occupied	Surveyed	Percent Surveyed	Peak Males	Avg Males / Active Lek (2)
2011	14	0	0		#Error
2012	16	0	0		#Error
2013	16	0	0		#Error
2014	16	0	0		#Error
2015	16	0	0		#Error
2016	15	0	0		#Error
2017	15	0	0		#Error
2018	15	0	0		#Error
2019	15	0	0		#Error
2020	15	0	0		#Error

**c. Leks Checked**

Year	Occupied	Checked	Percent Checked	Peak Males	Avg Males / Active Lek (2)
2011	14	14	100	112	14.0
2012	16	15	94	142	14.2
2013	16	13	81	149	16.6
2014	16	13	81	163	16.3
2015	16	14	88	227	25.2
2016	15	15	100	227	20.6
2017	15	15	100	176	16.0
2018	15	15	100	108	10.8
2019	15	15	100	62	5.6
2020	15	12	80	67	8.4

**d. Lek Status**

Year	Active	Inactive (3)	Unknown	Known Status	Percent Active	Percent Inactive
2011	8	3	3	11	72.7	27.3
2012	11	3	1	14	78.6	21.4
2013	9	4	0	13	69.2	30.8
2014	10	3	0	13	76.9	23.1
2015	9	5	0	14	64.3	35.7
2016	11	4	0	15	73.3	26.7
2017	11	4	0	15	73.3	26.7
2018	11	4	0	15	73.3	26.7
2019	11	4	0	15	73.3	26.7
2020	8	4	0	12	66.7	33.3

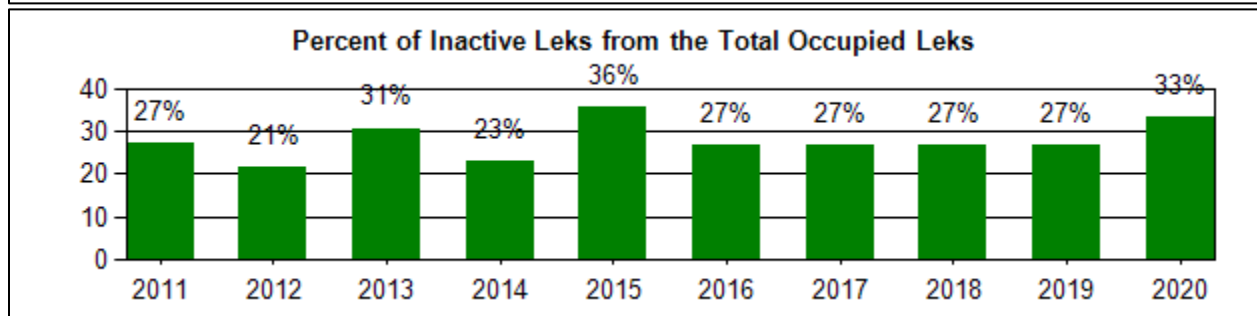
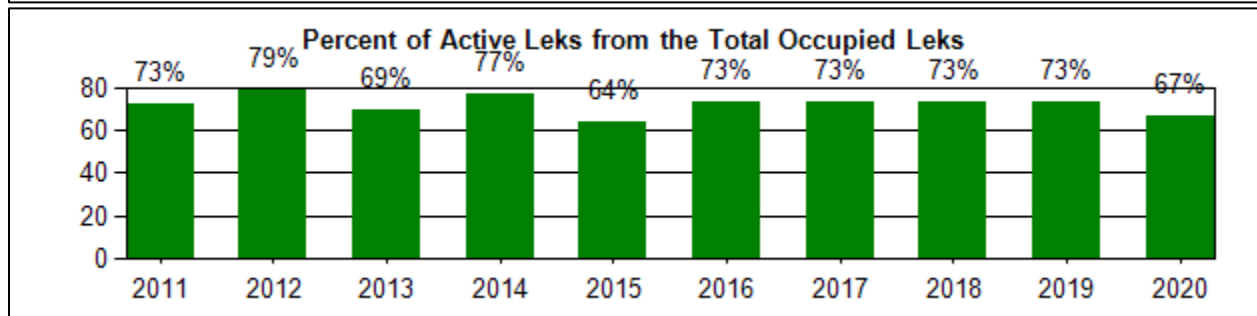
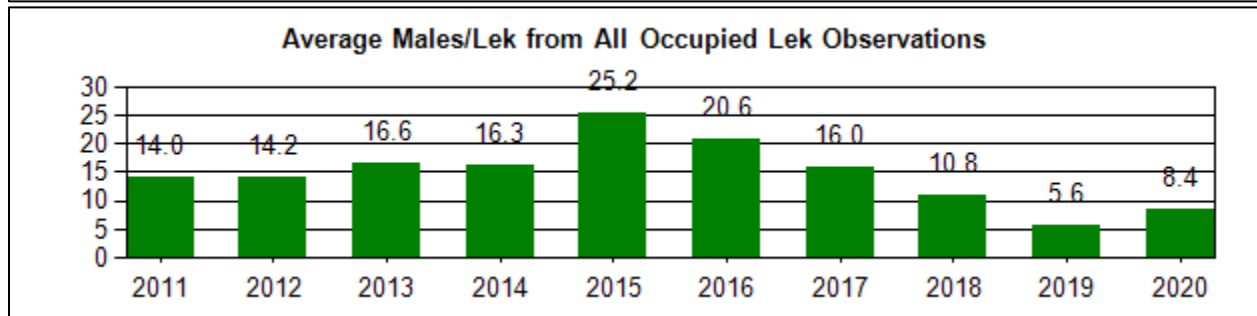
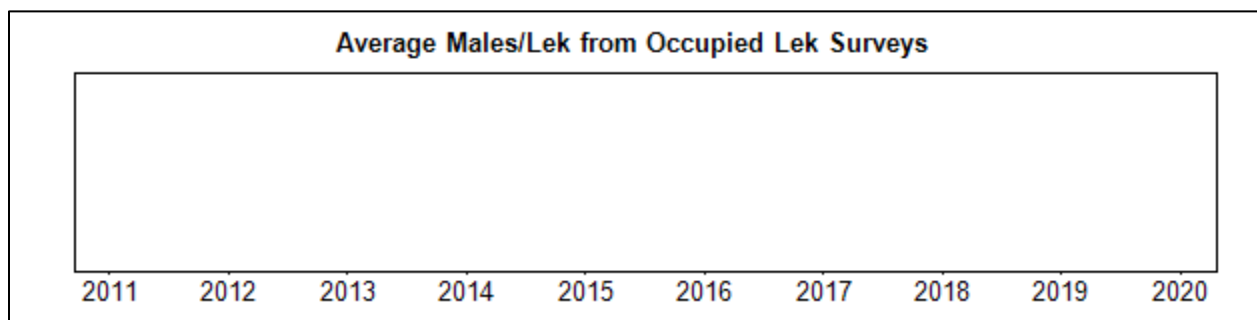
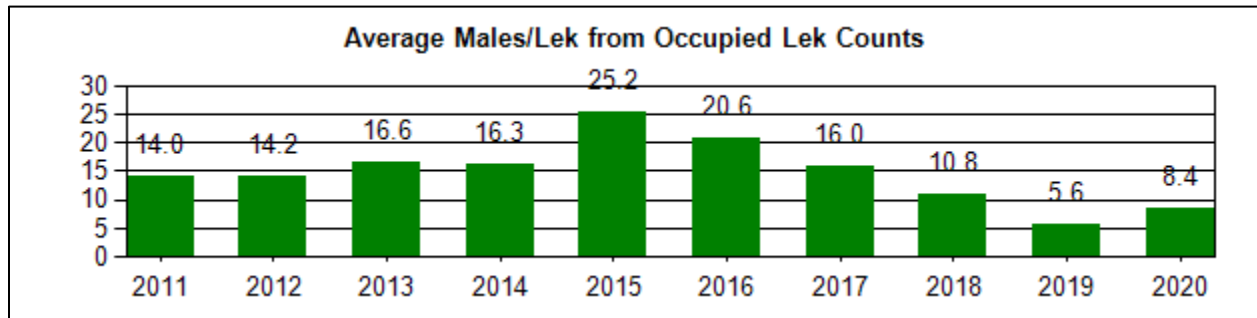
1) Occupied - Active during previous 10 years (see official definitions)

2) Avg Males/Active Lek - Includes only those leks where one or more strutting males were observed. Does not include "Active" leks where only sign was documented.

3) Inactive - Confirmed no birds/sign present (see official definitions)

# Sage Grouse Occupied Lek Attendance Summary

Year: 2011 - 2020, Working Group: Upper Snake River Basin



## Lek Monitoring

Sage-grouse data collection within the Upper Snake River Basin Conservation Area (USRBCA) focuses on lek surveys. Prior to 1994, relatively few leks were monitored and since 2000, efforts have been made to increase data collection on leks and standardize data collection methods. Starting in 2005, lek counts in GTNP, and to some extent on the NER, were coordinated to occur on the same days when it was logistically possible. This presumes that all leks in Jackson Hole constitute a sub-population and the leks in the Gros Ventre drainage constitute a second sub-population. No marked birds from the Gros Ventre leks have appeared on the Jackson Hole leks (Holloran and Anderson 2004, Bryan Bedrosian *pers. comm.*) and there is no evidence of genetic flow from the Gros Ventre to Jackson Hole (Schulwitz et al. 2014).

Lek counts and lek surveys have been conducted within the area since 1948; however, the most consistent data sets occur from 1989 to the present. Sage-grouse leks within the USRBCA are summarized in Table 1 from 2000 through 2020. There are a total of 19 leks in the USRBCA: 15 occupied (9 of these were active this year), 3 unoccupied, and 1 undetermined. The two leks in the Pinedale Region (Clark's Draw and Ollie's Draw) were not checked this year due to COVID-19 restrictions on field work for some agencies.

There is some movement of males between leks, particularly from the North Gap lek on the NER to leks in GTNP and between leks in the lower valley with leks in the upper valley as the spring progresses and snow melt occurs. As a result, the total of the high counts on all leks in each year may represent an inflated estimate of total males in the population.

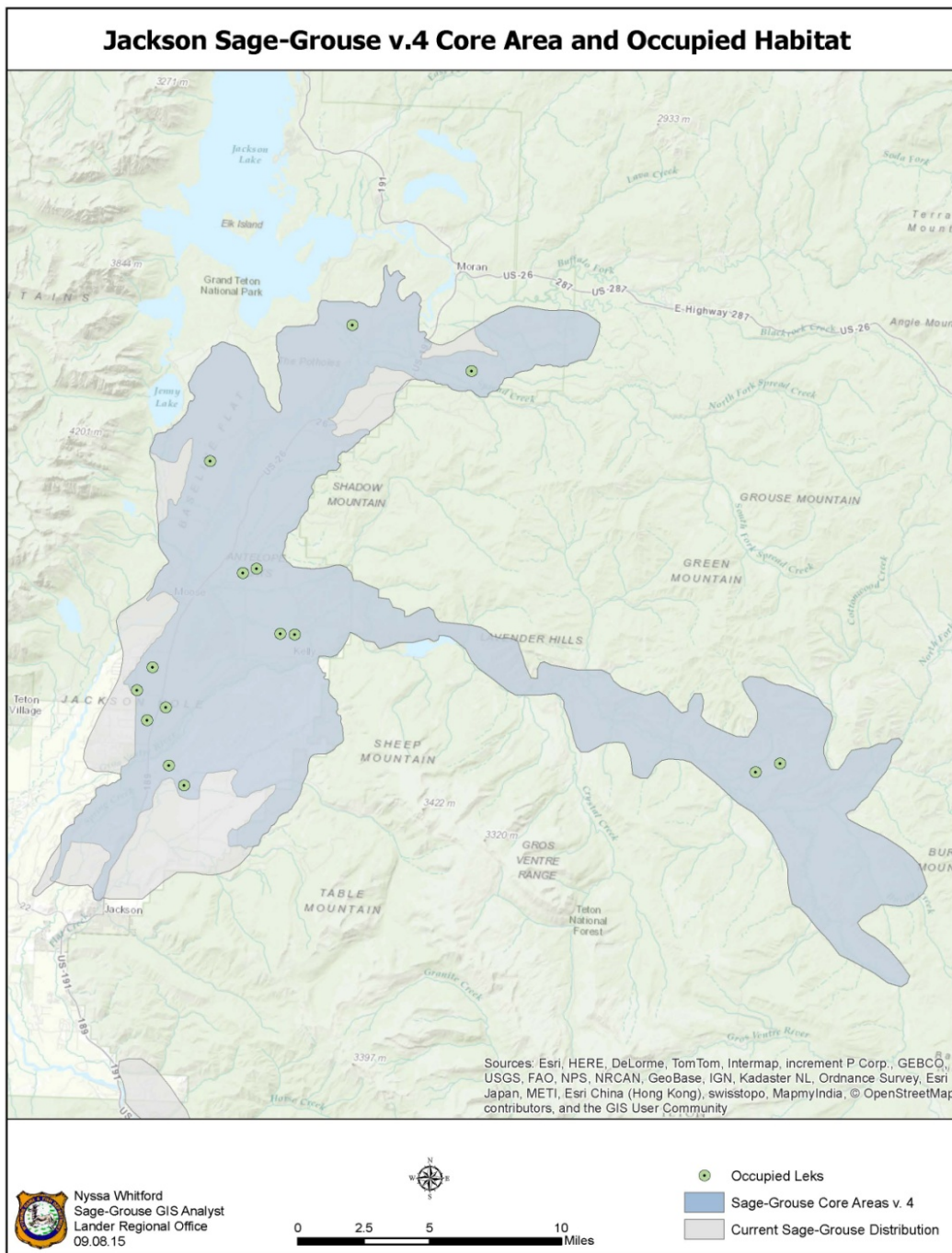


Figure 1. Sage-grouse core area, occupied habitat, and occupied leks in the Upper Snake River Basin Area (does not show Clark's Draw and Ollie's Draw leks).

Table 1. Maximum male counts at sage-grouse leks in the Upper Snake River Basin Conservation Area, 2000-2020. Blank cells denote years when the lek was inactive or it was not checked.

Year	3 Bar H Road	Airport	Airport Pit	Antelope Flats	Bark Corral East	Bark Corral West	Beacon	Breakneck Flats	Clark Draw	Dry Cottonwood	McBride	Moulton East	Moulton West	NER- North Gap	NER- Simpson	Ollie's Draw	RKO	Spread Creek	Timbered Island	Average # males/active lek
2000		18						21				28		5						18.0
2001		15						19				30		6						17.5
2002		19					24	9				28		4						16.8
2003		25						7				35		3					8	15.6
2004		17			2			14				54		4					15	17.7
2005		17						16		6		49		18					17	20.5
2006		23	6				4	21		9		44		30					20	19.6
2007		23			1			30		4	1	41		9				4	20	14.8
2008		16			2	8		22		13		38		23			12	5	26	16.5
2009		10	2		5			21		1		33		11			15	4	22	12.4
2010		10			24			24	13	4		40		13			13	5	18	16.4
2011		11				10		5	13			27		21			10	15		14.0
2012		17			3			14	14			44	14	18	3		8		7	14.2
2013		17						14	13	5		46		8			6	24	16	16.6
2014		11	3		10			18	7			61		21			8	8	16	16.3
2015		12				11		27	17			103		10			21	15	11	25.2
2016		7				13		34	12	8		21	53	7			48	6	18	20.6
2017		10				4		22	13			36	46	4		5	15	5	16	16.0
2018		13				7		8	5			28		6		8	16	5	12	10.8
2019		8				1		7	6			14	5	1		4	8	1	7	5.6
2020		7				6		3				24		12			4	4	7	8.4
Max		63	6	10	24	13	24	34	17	13	27	103	63	30	54	8	48	24	26	

## Population Trends and Estimates

The peak number of males and average number of males per lek are used as the main measures of population trend over time in the USRBCA. These provide a reasonable index of abundance of sage-grouse populations over time in response to environmental conditions. Average peak number of males per active lek declined in the early 1990's (Figure 2). Counts from 2009 - 2016 years showed a generally increasing trend, however there has been a sharp decrease from 2017 – present (Figure 2). The average peak males per lek in 2015 and 2016 were the highest recorded since 1994 at 25.2 and 20.6, respectively. However, the average peak males per lek dropped to 16.0 in 2017, 10.8 in 2018, 5.6 in 2019, and 8.4 in 2020.

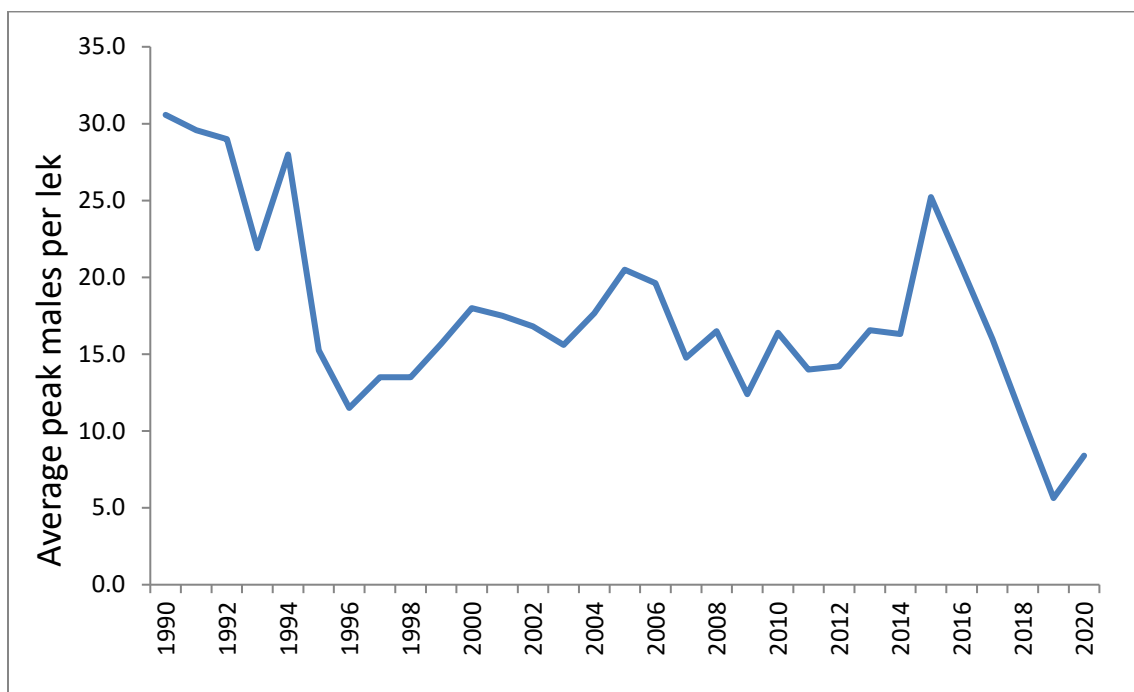


Figure 2. Average peak male counts for active leks in the Upper Snake River Basin Conservation Area, 1990-2020.

Data from the most recent 10 year period suggests that the population experienced a peak in 2015 and then declined sharply from 2017 - 2020. The population decline over the past 4 years is very concerning. The drop is largely driven by a significant reduction in counts at the Moulton East and Moulton West leks, which had a peak of 103 males in 2015 and only peaked at 19 males in 2019 and 24 in 2020. Declines at other leks such as Breakneck Flats in the Gros Ventre drainage (from 34 males in 2016 to 7 in 2019 and 3 in 2020) and RKO lek (48 in 2016 to 8 in 2019 and 4 in 2020) reflect this trend. The long term persistence of this population continues to be of paramount concern to the local working group and resource managers.

## **Productivity**

No productivity data were collected on this population this year.

## **Harvest**

Most of the USRBCA has been closed to hunting since the establishment of GTNP in 1929. No sage-grouse hunting has been allowed on lands under the jurisdiction of GTNP or the NER. In 2000, the hunting season was closed in the entire USRBCA and remains so today.

## **Habitat**

Management of greater sage-grouse habitat in Wyoming is based on a “core area” strategy of limiting human disturbance in the most important sage-grouse habitats. This strategy is codified by a Governor’s executive order, which can be found on the WGFD website.

The majority of sage-grouse habitat in the USRBCA is located within GTNP. There is also habitat in the Gros Ventre drainage on Bridger-Teton National Forest and the NER. Little habitat occurs on private lands.

No wildfires or prescribed burns occurred in significant areas of sagebrush habitat in sage-grouse core areas within the USRBCA during the reporting period. The Kelly Hayfields restoration project continued this year in GTNP, which is a project to remove smooth brome hayfields and reestablish a sagebrush community. There were no other significant human developments or surface disturbances in the core area during this reporting period.

Winter 2019/2020 conditions were average in early winter but then shifted rapidly due to several large snowstorms later in the winter. Most sage-grouse winter habitat areas were covered in deep snow that persisted late into the winter and early spring. The first visits to the Breakneck and Dry Cottonwood leks in spring 2020 necessitated snowmobiling from Lower Slide Lake, which is unusual. These very deep snow conditions likely impacted over-winter sage-grouse survival and contributed to the low lek counts observed in spring 2020.

## **Conservation Planning**

The Upper Snake River Basin Sage-Grouse Conservation Plan was updated in March 2014 and can be found on the WGFD website at:

[https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/Sage%20Grouse/SG\\_USR\\_CONSERVPLAN.pdf](https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/Sage%20Grouse/SG_USR_CONSERVPLAN.pdf)

The Upper Snake River Basin Sage-Grouse Working Group met several times during the reporting period to plan lek monitoring schedules, review lek survey data, discuss and fund special projects, and review other issues affecting sage-grouse in the area. The local working group is particularly concerned about the low lek counts in 2018-2020 and met several times to discuss potential courses of action to reverse this decline. During summer 2019, the local working group became concerned that at least a soft trigger was surpassed, and following Appendix I of the Executive Order, prepared a



document notifying the Statewide Adaptive Management Working Group of this concern. In response, the Jackson Sage-Grouse Technical Team was assembled in 2019 to review the situation and make recommendations of ways to address the population decline. The Technical Team submitted a report outlining its findings and recommendations in April 2020.

## **Special Projects**

### Sage steppe plant community restoration in abandoned smooth brome dominated hayfields in Grand Teton National Park

Grand Teton National Park

#### **SUMMARY**

The sagebrush steppe vegetation within GTNP forms the core habitat for sage-grouse within the Upper Snake River Basin. While the Park contains 47,000 acres of big sagebrush, it has nearly 9,000 acres of abandoned hayfields that were once sagebrush. These hayfields are now dominated by a nearly shrubless monoculture of smooth brome (*Bromus inermis*). In the 30-50 years that these hayfields have been abandoned, sagebrush has re-established in only a limited area. However, where the sagebrush has returned, the native bunchgrass/forb understory hasn't always. Since 2006, Craighead Beringia South has been collecting GPS points from collared sage-grouse and has demonstrated that grouse do not utilize the hayfields nearly frequently as the intact sagebrush nearby. These abandoned hayfields are within 4 miles of the Moulton lek. Clearly, for these hayfields to ever be prime habitat for sage-grouse and other sagebrush obligates, they must be restored to their former sagebrush-steppe vegetation.

For the benefit of sage-grouse and many other species, the park has begun to restore these hayfields to native sagebrush-steppe vegetation. This work has been initiated with funds from the Wyoming Sage-Grouse Conservation Fund and the National Park Service. During 2015 and 2016, Grand Teton National Park staff have treated additional acres for smooth brome removal, continued to monitor and conduct noxious weed treatments as necessary, collected native seeds, and seeded treated areas with native seeds. Fencing was also constructed on some treatment units to reduce native ungulate grazing pressure. In total, there are 1,263 acres in various stages of restoration treatment. The goal is to restore 4,500 acres to ecological function, which will require many more years of work.

### Invasive species control in occupied sage-grouse habitat

Mark Daluge, Teton County Weed and Pest District

Jason Wilmot, Bridger-Teton National Forest

#### **SUMMARY**

This project is designed to address the issue of noxious weeds out-competing the natural habitat in such a way that sage-grouse suffer from lack of cover and inadequate forage. By employing Early Detection/Rapid Response tactics we will be more efficiently managing our resources. Over time this method can greatly conserve cost because it targets small problems while they are still manageable before they become too expensive and extensive to treat. Our project would benefit the grouse in preserving their natural habitat and keeping their habitat free of large noxious weed infestations. Well established noxious weed infestations will be controlled so they do not continue their spread.

Sage-grouse in the Upper Gros Ventre watershed have very limited winter range and are vulnerable to loss of habitat due to noxious weed infestations. The core winter ranges (Breakneck Flats and the Cottonwood-Fish Creek) on Bridger-Teton National Forest support a large percentage (> 60%) of the high quality foraging and thermal cover in the entire watershed. Thus, little other habitat is available to displaced birds. This is an ongoing project that has received financial support numerous times by the Upper Snake River Basin Sage-Grouse Working Group. In 2016, crews treated noxious weeds on approximately 81.5 acres and surveyed and mapped 765 acres in the Gros Ventre watershed. This project applied for and received funding from the Upper Snake River Basin Sage-Grouse Working Group for 2017-2018.

## **Management Summary**

It appears that following a population rebound in 2015 and 2016, the population has undergone a significant decline during the past 4 years. Lek counts in spring 2019 were the lowest on record for this population, although spring 2020 improved slightly. As a result of this population decline, the local working group met several times throughout this reporting period to discuss potential courses of action. During summer 2019, the local working group became concerned that at least a soft trigger was surpassed, and following Appendix I of the Executive Order, prepared a document notifying the Statewide Adaptive Management Working Group of this concern. In response, the Jackson Sage-Grouse Technical Team was assembled in 2019 to review the situation and make recommendations of ways to address the population decline. The Technical Team submitted a report outlining its findings and recommendations in April 2020. Data collection and discussions are continuing regarding which recommendations from this report may or may not be implemented by the respective land management agencies and WGFD.

Lek data suggest the population has declined over the long term (1989-present) (Table 1, Figure 2). The long-term viability of this population probably can be assured only if mortality factors currently affecting adult and juvenile hens do not increase. Reinstating the hunting season in Management Area A (formerly Areas 1 and 2) is not warranted at this time.

Limited winter habitat continues to be a primary issue for this population. Therefore, monitoring sagebrush habitats used by sage-grouse is a priority. Additional documentation of sage-grouse distribution would be helpful to confirm seasonal distribution, movements, and habitat use. Key areas on public lands used by sage-grouse should be protected from management actions which could have adverse impacts on that habitat, including recreation access. Wildfire suppression should be considered in occupied sage-grouse habitat in Jackson Hole and the Gros Ventre drainage. Restoration of native sagebrush habitats on lands formerly hayed in GTNP and the Gros Ventre drainage appears to have the greatest potential to expand and enhance habitat used by sage-grouse in the USBCA. Protecting sagebrush habitat on private lands from future residential development is also important. Sagebrush restoration on private lands may also be an option in the future.

Past and current sage-grouse research by local researchers provides essential information to manage this sage-grouse population and its habitat in Jackson Hole. Managers should continue to prioritize funding and in-kind support to these research efforts.

## Recommendations

1. Continue to help coordinate lek surveys across jurisdictional boundaries using the lek survey protocols adopted by the WGFD.
2. Continue coordinating with other agencies to ensure periodic monitoring of historic, unoccupied or inactive leks. Continue to coordinate with other agencies to search for new leks.
3. Continue to document sage-grouse observations to improve occupied habitat mapping.
4. Support GTNP's sagebrush habitat restoration projects in the Mormon Row and Hayfields areas which could be used as winter, nesting, and brood-rearing habitats for sage-grouse.
5. Continue to work with land management agencies during the implementation of habitat improvement projects to minimize impacts to sage-grouse occupied habitats.
6. Implement the USRBWG Sage-Grouse Conservation Plan (2014). Work to implement the strategies and projects identified in the plan.
7. Support implementation of the most current version of the Governor's Executive Order for Greater Sage-Grouse Core Area Protection.

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[http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SG\\_USR\\_CONSERVPLAN0005529 .pdf](http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SG_USR_CONSERVPLAN0005529.pdf)
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[https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/Sage%20Grouse/SG\\_USR\\_CONSERVPLAN.pdf](https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/Sage%20Grouse/SG_USR_CONSERVPLAN.pdf)

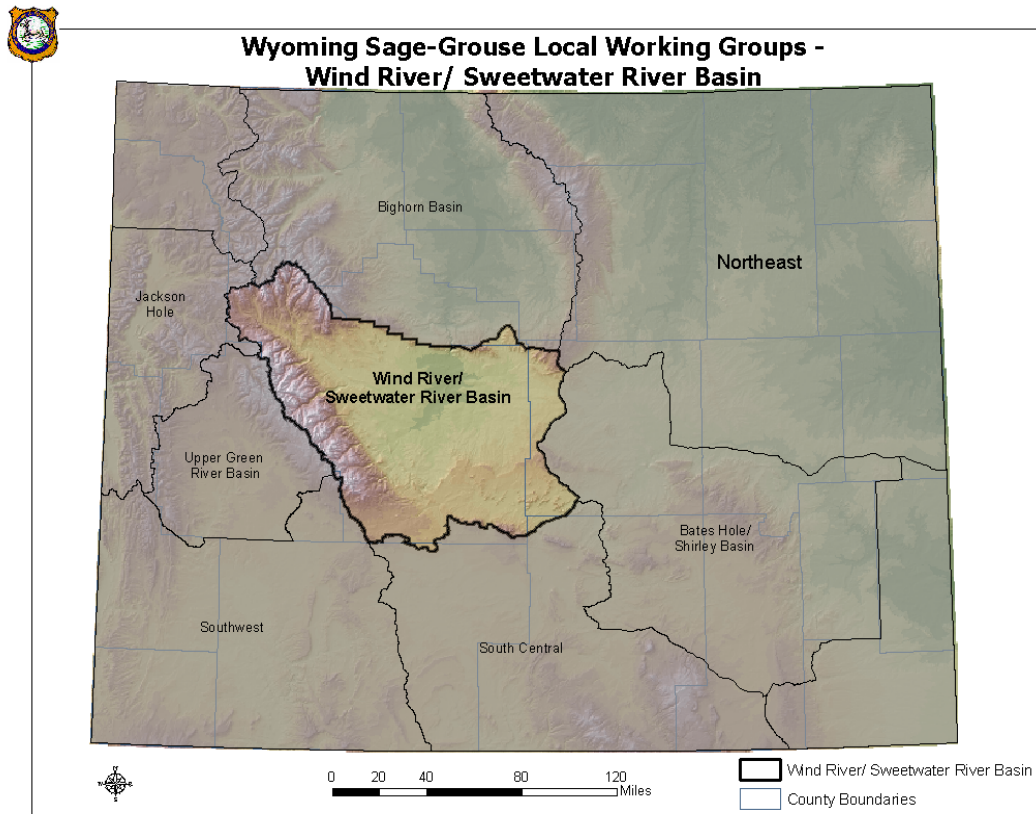
## Wind River/Sweetwater River Conservation Area Job Completion Report

Species: **Greater Sage Grouse**

Mgmt. Areas: **E & WR, Lander Region**

Period Covered: **June 1, 2019 – May 31, 2020**

Prepared by: **Stan Harter, South Lander Wildlife Biologist**



## Sage Grouse Lek Characteristics (2020)

### Working Group: Wind River/Sweetwater River

Region	Number	Percent
Casper	2	0.8
Lander	196	75.7
WRIR	61	23.6

Classification	Number	Percent
Occupied	198	76.4
Undetermined	18	6.9
Unoccupied	43	16.6

Biologist	Number	Percent
WRR-USFWS	61	23.6
Casper	2	0.8
North Lander	69	26.6
Sinclair	1	0.4
South Lander	125	48.3
Worland	1	0.4

County	Number	Percent
Carbon	1	0.4
Fremont	229	88.4
Hot Springs	4	1.5
Natrona	24	9.3
Sweetwater	1	0.4

Management Area	Number	Percent
E	198	76.4
WR	61	23.6

Working Group	Number	Percent
Wind River/Sweetwater River	259	100.0

BLM Office	Number	Percent
Lander (WRR)	61	23.6
Casper	12	4.6
Lander	177	68.3
Rock Springs	7	2.7
Worland	2	0.8

Warden	Number	Percent
Shoshone-Arapahoe Tribal	61	23.6
Dubois	1	0.4
Lander	73	28.2
North Riverton	27	10.4
South Riverton	62	23.9
West Casper	2	0.8
West Rawlins	33	12.7

Land Status	Number	Percent
BLM	149	57.5
BOR	4	1.5
Private	30	11.6
Reservation	60	23.2
State	16	6.2

Lek Status	Number	Percent
Active	148	57.1
Inactive	36	13.9
Unknown	75	29.0

## Sage Grouse Job Completion Report

Year: 2011 - 2020, Working Group: Wind River/Sweetwater River

### 1. Lek Attendance Summary (Occupied Leks) (1)

#### a. Leks Counted

Year	Occupied	Counted	Percent Counted	Peak Males	Avg Males / Active Lek (2)
2011	187	70	37	1668	26.9
2012	193	78	40	1899	28.8
2013	196	81	41	1543	22.4
2014	199	101	51	1860	21.6
2015	215	116	54	4589	44.1
2016	212	95	45	4694	55.2
2017	207	87	42	3499	44.3
2018	209	110	53	3678	38.7
2019	206	97	47	2416	31.4
2020	204	104	51	2206	26.6

#### b. Leks Surveyed

Year	Occupied	Surveyed	Percent Surveyed	Peak Males	Avg Males / Active Lek (2)
2011	187	86	46	1311	22.6
2012	193	89	46	1358	21.2
2013	196	90	46	1056	15.3
2014	199	87	44	976	17.7
2015	215	85	40	1595	25.3
2016	212	104	49	2744	34.3
2017	207	103	50	2542	33.4
2018	209	87	42	1402	22.3
2019	206	100	49	1195	17.1
2020	204	68	33	605	15.1

## Sage Grouse Job Completion Report

Year: 2011 - 2020, Working Group: Wind River/Sweetwater River

### 1. Lek Attendance Summary (Occupied Leks) (1)

Continued

#### c. Leks Checked

Year	Occupied	Checked	Percent Checked	Peak Males	Avg Males / Active Lek (2)
2011	187	156	83	2979	24.8
2012	193	167	87	3257	25.1
2013	196	171	87	2599	18.8
2014	199	188	94	2836	20.1
2015	215	201	93	6184	37.0
2016	212	199	94	7438	45.1
2017	207	190	92	6041	39.0
2018	209	197	94	5080	32.2
2019	206	197	96	3611	24.6
2020	204	172	84	2811	22.9

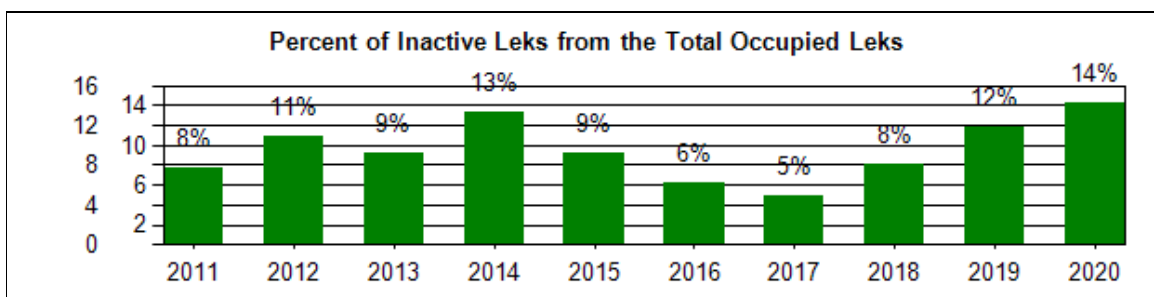
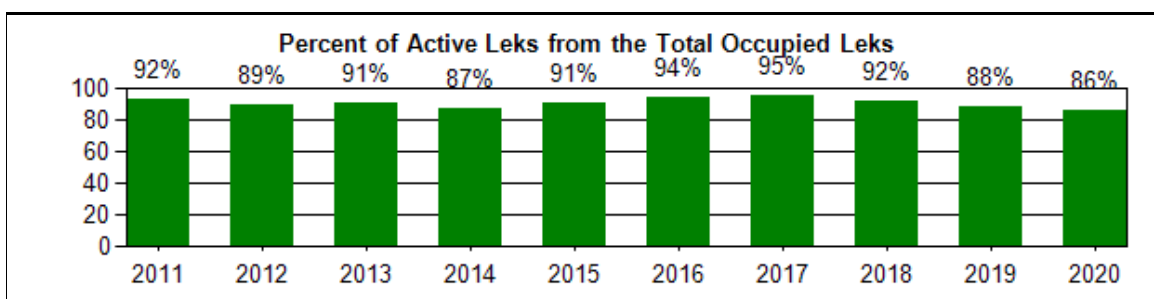
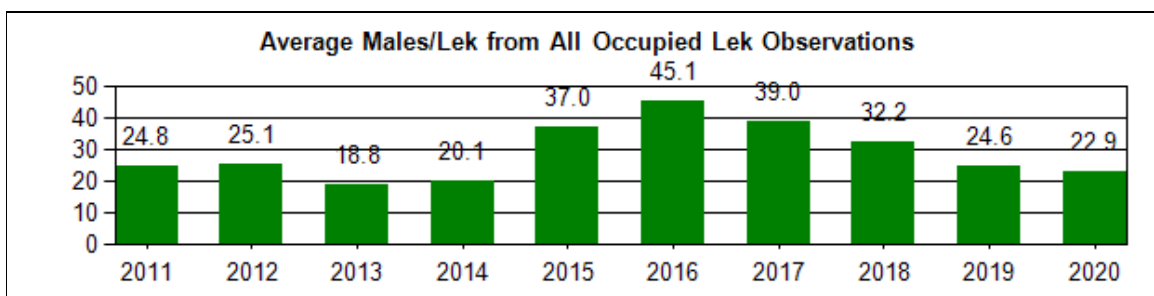
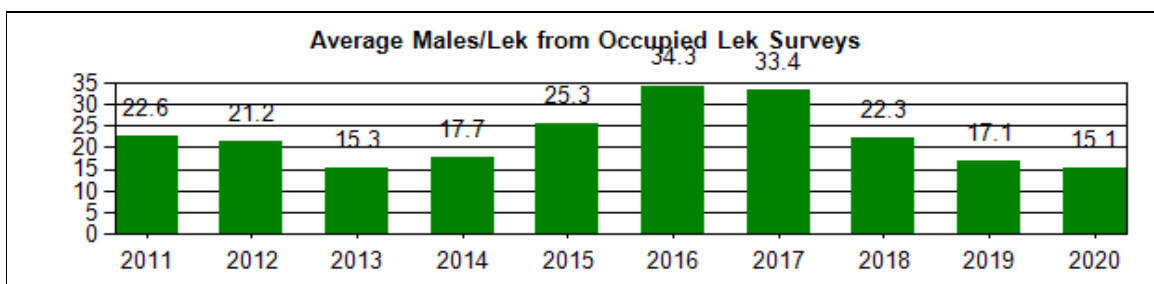
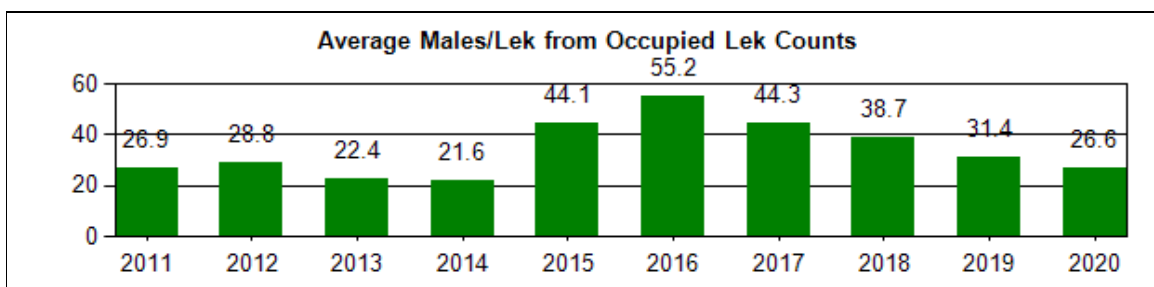
#### d. Lek Status

Year	Active	Inactive (3)	Unknown	Known Status	Percent Active	Percent Inactive
2011	121	10	25	131	92.4	7.6
2012	131	16	20	147	89.1	10.9
2013	139	14	18	153	90.8	9.2
2014	142	22	24	164	86.6	13.4
2015	167	17	17	184	90.8	9.2
2016	167	11	21	178	93.8	6.2
2017	156	8	26	164	95.1	4.9
2018	158	14	25	172	91.9	8.1
2019	148	20	29	168	88.1	11.9
2020	126	21	25	147	85.7	14.3



## Sage Grouse Occupied Lek Attendance Summary

Year: 2011 - 2020, Working Group: Wind River/Sweetwater River



## Sage Grouse Job Completion Report

Year: 2010 - 2019, Working Group: Wind River/Sweetwater River

### 3. Sage Grouse Hunting Seasons and Harvest Data

**a. Season**

Year	Season Start	Season End	Length	Bag/Possesion Limit
2010	Sep-18	Sep-30	13	2/4
2011	Sep-17	Sep-30	14	2/4
2012	Sep-15	Sep-30	16	2/4
2013	Sep-21	Sep-30	10	2/4
2014	Sep-20	Sep-30	11	2/4
2015	Sep-19	Sep-30	12	2/4
2016	Sep-17	Sep-30	14	2/4
2017	Sep-16	Sep-30	15	2/4
2018	Sep-15	Sep-30	16	2/4
2019	Sep-21	Sep-30	10	2/4

**b. Harvest**

Year	Harvest	Hunters	Days	Birds/ Day	Birds/ Hunter	Days/ Hunter
2010	2495	1056	2866	0.9	2.4	2.7
2011	1779	771	1801	1.0	2.3	2.3
2012	2068	890	2296	0.9	2.3	2.6
2013	1240	565	1325	0.9	2.2	2.3
2014	1546	772	1853	0.8	2.0	2.4
2015	2158	737	1846	1.2	2.9	2.5
2016	1910	922	2264	0.8	2.1	2.5
2017	1364	630	1427	1.0	2.2	2.3
2018	2250	970	2519	0.9	2.3	2.6
2019	1525	814	1891	0.8	1.9	2.3
Avg	1,834	813	2,009	0.9	2.3	2.5

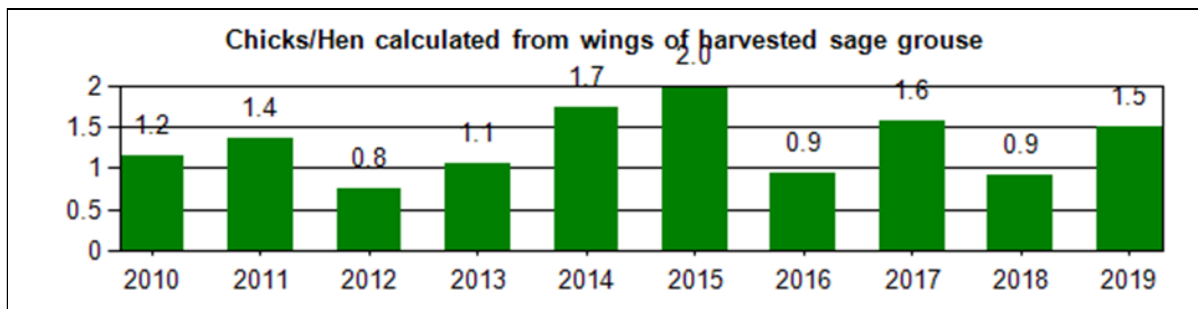
## Sage Grouse Job Completion Report

Year: 2010 - 2019, Working Group: Wind River/Sweetwater River

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### 4. Composition of Harvest by Wing Analysis

Year	Sample Size	Percent Adult		Percent Yearling		Percent Young		Chicks/ Hens
		Male	Female	Male	Female	Male	Female	
2010	476	16.0	30.3	4.4	6.7	15.1	27.5	1.2
2011	376	9.0	27.1	6.9	8.5	14.4	34.0	1.4
2012	443	18.5	36.1	6.3	6.8	11.1	21.2	0.8
2013	202	18.8	29.7	0.5	9.4	14.9	26.7	1.1
2014	343	10.5	23.3	2.3	8.5	30.3	25.1	1.7
2015	513	11.3	21.2	5.3	6.6	21.4	34.1	2.0
2016	307	16.9	29.6	3.9	11.1	16.9	21.5	0.9
2017	393	18.8	28.5	2.8	2.0	20.9	27.0	1.6
2018	520	17.9	29.0	6.5	10.4	13.7	22.5	0.9
2019	311	14.5	22.5	4.2	10.0	19.0	29.9	1.5



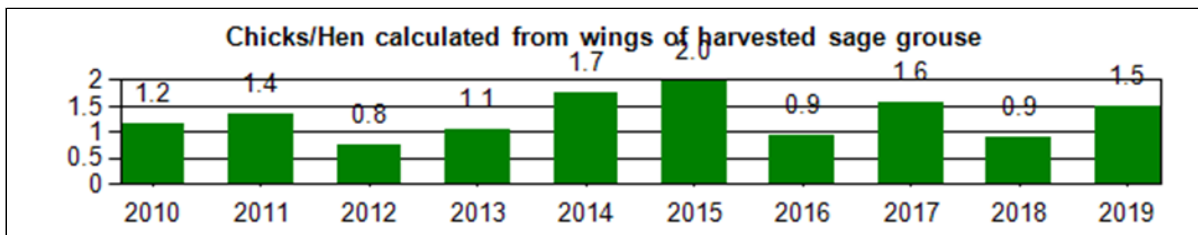
## Sage Grouse Wing Analysis Summary

**Year: 2019, Working Group: Wind River/Sweetwater River**

Adult Males:	45	% of All Wings:	14.5
Adult Females:	70	% of All Wings:	22.5
Adult Unknown:	0	% of All Wings:	0.0
Total Adults:	115		
Yearling Males:	13	% of All Wings:	4.2
Yearling Females:	31	% of All Wings:	10.0
Yearling Unknown:	0	% of All Wings:	0.0
Total Yearlings:	44		
Chick Males:	59	% of All Wings:	19.0
Chick Females:	93	% of All Wings:	29.9
Chick Unknown:	0	% of All Wings:	0.0
Total Chicks:	152		
Unknown Sex/Age:	0		
<b>Total for all Sex/Age Groups:</b>	<b>311</b>		

Chick Males:	59	% of All Chicks	38.8
Yearling Males:	13	% of Adult and Yearling Males	22.4
Adult Males:	45	% of Adult and Yearling Males	77.6
Adult and Yearling Males:	58	% of Adults and Yearlings	36.5
Total Males:	117	% of All Sex/Age Groups	37.6
Chick Females:	93	% of All Chicks	61.2
Yearling Females:	31	% of Adult and Yearling Females	30.7
Adult Females:	70	% of Adult and Yearling Females	69.3
Adult and Yearling Females:	101	% of Adults and Yearlings	63.5
Total Females:	194	% of All Sex/Age Groups	62.4

Chicks:	152	% of All Wings:	48.9
Yearlings:	44	% of All Wings:	14.1
Adults:	115	% of All Wings:	37.0
Chicks/Hen	1.5		



### **Lek Monitoring**

WGFD, federal agencies, and volunteers have conducted lek counts and surveys each spring within the WRSRCA for over 40 years, providing some of the best long-term abundance data currently available for sage-grouse. Known leks indicate sage-grouse distribution within the WRSRCA, as represented below in Figure 1.

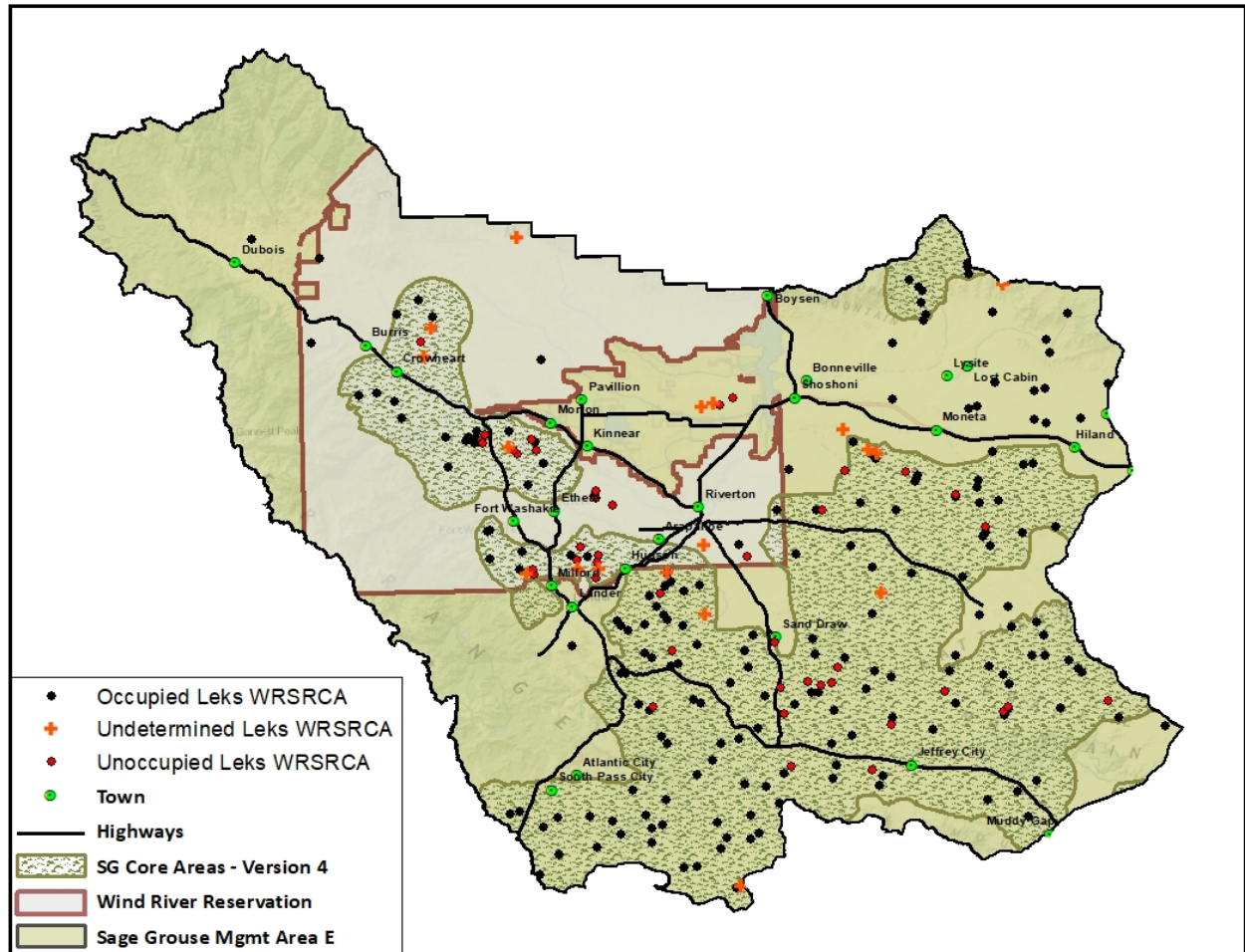


Figure 1. Known sage-grouse lek (2020) and core area distribution in the Wind River/Sweetwater River Conservation area.

### **Lek Attendance - 2020**

Sage-grouse are generally found throughout the WRSRCA, except in heavily forested, agriculturally developed, or urbanized areas. Sage-grouse leks in the WRSRCA are located within the Lander WGFD Region, 4 BLM Resource Areas, 5 Wyoming counties, and the WRR. There were 198 known occupied leks within the conservation area in 2020, along with 43 unoccupied and 18 undetermined leks. As seen above in Figure 1, a majority of leks of all 3 classification levels occur within the 3 core areas that are partially or entirely within the WRSRCA (Crowheart, Greater South Pass, and Washakie). It is highly probable there are leks within the WRSRCA that have not yet been documented, as evidenced by at least 132 (average 6 per year) new or newly discovered leks being documented in the WRSRCA through intensive monitoring and search efforts since 1995. Similarly, there are leks that have been abandoned or destroyed that are undocumented. Lek attendance generally increased between 1995 and 2006, declined until 2013,

increased again for 3 years, only to decline in 2017 through 2020, mimicking Wyoming's statewide trends, but with generally higher numbers than the Wyoming average (Figures 2 and 3).

Personnel from WGFD, BLM, USFWS, and Shoshone-Arapahoe Tribal Fish and Game (SATFG), assisted by several researchers, consultants, and volunteers checked 172 of the 204 known occupied leks in the WRSRCA in 2020. This was a reduction from 197 leks checked in each of the last 2 years, because of work restrictions related to the COVID-19 pandemic. Of those leks checked, 104 were counted and 68 were surveyed. Of the 147 leks where status was confirmed, 126 (85.7%) were active and 21 (14.3%) were inactive, with a lower proportion in active status than the average since 2011.

Average male lek attendance for all leks checked dropped from 24.6 in 2019 to 22.9 in 2020. Average maximum male attendance at count leks also dropped from 31.4 in 2019 to 26.6 in 2020, remaining below the count lek average since 2010 (34.0), and 65% below the long-term peak in 2006 (76.0).

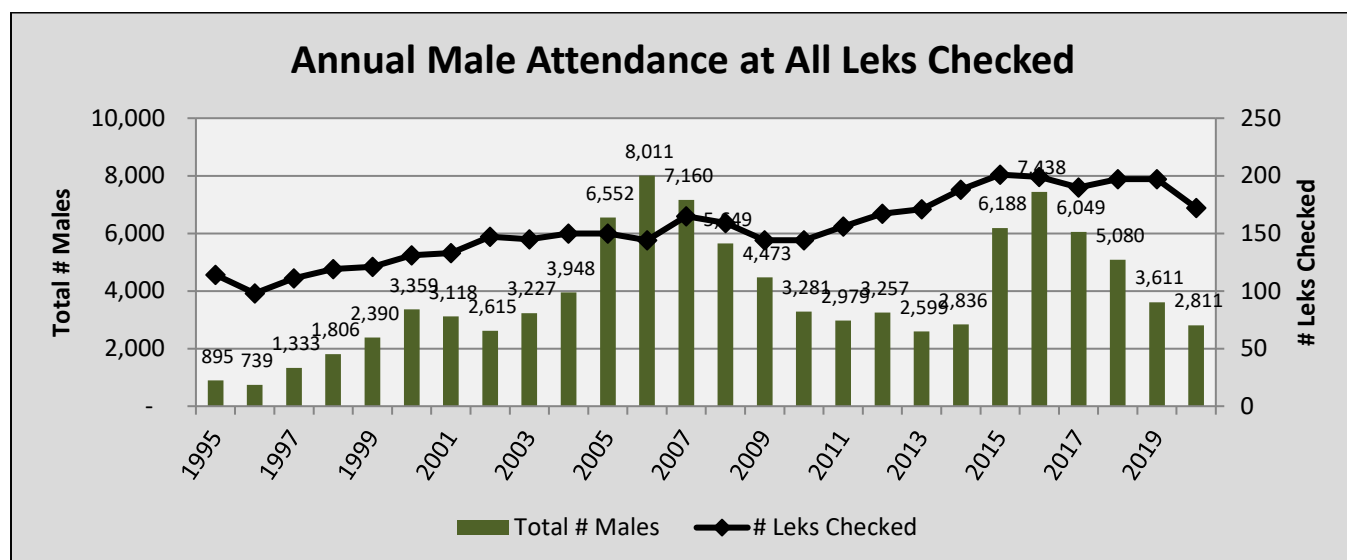


Figure 2. Total male attendance at all leks within the Wind River/Sweetwater River Conservation Area, 1995–2020.

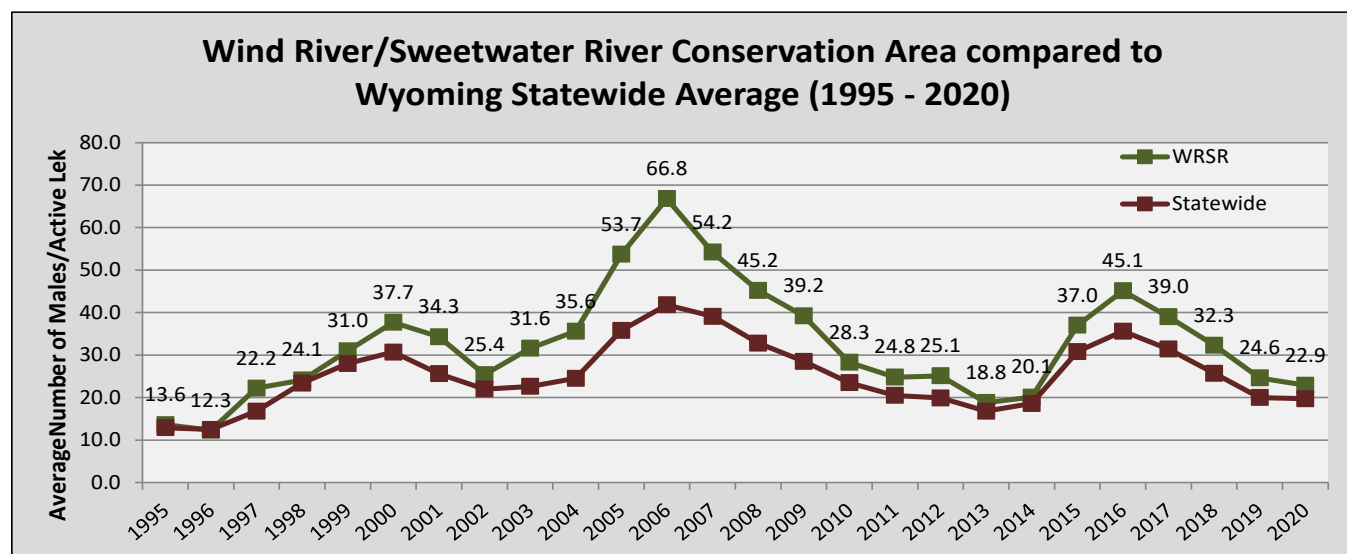


Figure 3. Average male lek attendance (all leks checked) in WRSRCA relative to Wyoming statewide trends, 1995–2020.

### **Lek Perimeter Mapping**

As of 2020, nearly all leks in the WRSRCA have perimeters mapped.

### **Productivity**

Since summer brood data are very limited in the WRSRCA, wing data collected from harvested birds provide a more reliable indicator of recruitment than do brood survey data. Harvested wings are collected from hunters at 7 wing barrels placed annually along major hunting area exit roads in Sage Grouse Management Area E and at the Lander Game Check Station, and typically provide significant wing data, due to a relatively high number of sage-grouse hunters in the area. Wing data are summarized for the WRSRCA for hunting seasons 2010 – 2019, and reported in detail for 2019 (pages 7 and 8). Wings collected from harvested birds during the 2019 hunting season yielded an average brood size of 1.5 chicks per hen, 15% above the average of 1.3 chicks per hen over the last 10 years. This was the fourth best average brood size since 2010, and was 67% higher than in 2018. Population growth typically requires 1.7 chicks/hen or more based on historic statewide averages. With chick survival in 2019 being just below that threshold, male lek attendance in 2020 was 7% below that of 2019.

### **Hunting Season and Harvest**

Regulated hunting is the cornerstone of the North American Model of Wildlife Conservation, a system that keeps wildlife a public and sustainable resource, and scientifically managed by professionals. Many greater sage-grouse populations can, and do, support hunting under this model (WGFD - Hunting and Sage Grouse, 2010). The Wind River/Sweetwater River Conservation Area has some of the most robust habitats in the entire sage grouse range. As outlined in the hunting season tables on page 6, bag limits, season lengths, and harvest levels are within acceptable levels for the “population” of sage grouse within the WRSRCA. Wings are collected annually from harvested birds in barrels placed at major exits from hunting spots within the WRSRCA. Data gathered from these wings are used to calculate age and sex ratios, and chick survival. Sage-grouse hunting on tribal lands within the Wind River Reservation is minimal and data are not included in this report.

Sage-grouse hunting season in Management Area E lies entirely within Wyoming Hunt Area 1, which has been “standardized” since 2009, keeping opening day on the 3<sup>rd</sup> Saturday in September and ending on September 30. The 2019 sage-grouse hunting season was 10 days long (Sept. 21 – 30). In 2019, hunter numbers were 16% lower and sage grouse harvest was 32% lower, compared with the 2018 hunting season. Hunter effort (days/bird) and success (birds/hunter) statistics were the lowest in the last 10-year period (Page 6).

### **Habitat (Current and Historic)**

Long-term sage-grouse habitat conditions have been affected by long-term drought throughout the WRSRCA. Disturbance (i.e., localized energy development, season-long grazing by livestock and wildlife, etc.) combined with lengthy drought periods and sagebrush eradication programs in many areas have negatively impacted sage-grouse and their habitats. In an effort to improve conditions for sage-grouse, habitat improvement projects are being planned and/or implemented throughout the WRSRCA to address declining sage-grouse habitat condition. In addition, research projects in the WRSRCA are continuing to provide more insight to sage-grouse movements and habitat use. Habitat conditions vary greatly within the WRSRCA, due to climatic differences, soil types, land use, and elevation.

### **Habitat Monitoring/Inventory**

Habitat monitoring is discussed in past WRSRCA JCRs, and in the 2007 WRSRCA Local Sage Grouse Conservation Plan and 2014 Addendum. No habitat monitoring transects were measured in 2019, except

for vegetation monitoring in association with research in the Jeffrey City area by the University of Wyoming (Smith, et al., ongoing). However, implementation of Rapid Habitat Assessments (RHAs) continued as part of the South Wind River/Sweetwater Mule Deer Initiative, to develop a baseline from which to gauge overall habitat condition. Several RHAs covering shrub/rangeland habitats were completed within the WRSRCA in 2019, and offer insight as to the condition of sage-grouse habitats within the South Wind River and Sweetwater Mule Deer herd units that overlap a portion of the WRSRCA.

### ***Winter Habitat Use Survey***

Limited winter observations were collected in 2019-20, mostly as opportunistic observations during deer, elk, and moose classifications flights or random ground surveys.

### ***Habitat Treatments***

Since adoption of the WRSR LWG plan in 2007, a number of vegetation treatments have been implemented with the intention of improving habitats for sage grouse, mule deer, and other wildlife. Summaries of these treatments are reported in past JCRs and in the 2007 WRSRCA Local Sage Grouse Conservation Plan and 2014 Addendum. No new treatments in sage grouse habitats occurred during 2019.

### ***Conservation Easements***

Within the WRSRCA, several privately owned properties have been placed under conservation easements with deed restrictions ranging from minimal to no new construction of houses, barns, or other buildings. Conservation easements are mostly located in the Lander Foothills, Sweetwater River, Twin Creek, Dubois, and Ervay Basin areas. Presently, over 32,000 acres of private lands are permanently protected by conservation easements within the WRSRCA, and provide protection of crucial wildlife habitat, water quality, maintain migration routes, and continue traditional agricultural land uses.

### **Research**

A number of research projects have been conducted in the WRSRCA since 2000. Studies conducted prior to 2020 were reported in past JCRs and in the 2007 WRSRCA Local Sage Grouse Conservation Plan and 2014 Addendum, which contains the most complete bibliography of sage grouse research for the WRSRCA through March 2014. A collection of current sage-grouse research being conducted in Wyoming is compiled annually by Dr. Jeff Beck at the University of Wyoming and is included in the annual statewide sage-grouse JCR. Citations for ongoing research and published works from the WRSRCA are included at the end of this report.

### **Diseases**

No new cases of West Nile Virus (WNV) or other avian diseases are known to have occurred in sage grouse in the WRSRCA in 2019.

### **Management Recommendations**

1. Incorporate recommendations outlined in Wyoming Governor's Executive Orders and associated "Stipulations for Development in Core Sage-Grouse Population Areas".
2. Implement the Wind River/Sweetwater River Local Sage-Grouse Conservation Plan and 2014 Addendum and work to incorporate recommended management practices.
3. Continue to collect age and sex composition of the harvest via wing collection and analyses.
4. Continue intensive lek counts in the Government Draw area south of Hudson.
5. Continue ground checks of all non-intensively monitored leks.
6. Continue to search for new or undiscovered leks in remote areas of WRSRCA.
7. Continue to cooperate with private landowners and Federal/State land managers to reduce negative impacts to crucial sage-grouse habitats.
8. Continue to coordinate research projects within or applicable to the WRSRCA.



## **Literature Cited**

### **Ongoing Research within the Wind River/Sweetwater River Sage-grouse Conservation Area**

#### ***Response of Greater Sage-grouse to Treatments in Wyoming Big Sagebrush –***

*Smith, Beck, et al - University of Wyoming*

#### ***Comparison of Avian and Mammalian Predators in Sage-Grouse Core and Non-Core Areas: Assessing Predator Abundance and Responses to Anthropogenic Features –***

*Claire L. Revekant<sup>1</sup> and Jonathan B. Dinkins<sup>1</sup> <sup>1</sup>Department of Animal and Rangeland Sciences, Oregon State University, Corvallis, OR 97331*

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