2011-12 Greater Sage-grouse

Annual Report

Pinedale Anticline Project Area

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OVERVIEW

The 2008 Final Supplemental Environmental Impact Statement Record of Decision for the for the Pinedale Anticline Oil and Gas Exploration and Development Project (BLM 2008) includes a Wildlife Monitoring and Mitigation Matrix (WMMM) that identifies key wildlife species that will be monitored and specific changes that require mitigation. For greater sage-grouse, the WMMM is designed to quantitatively identify changes in greater sage-grouse populations within the Pinedale Anticline Project Area (PAPA).

The WMMM defines criteria for monitoring greater sage-grouse and outlines mitigation responses if specified thresholds are met. Six lek complexes are monitored annually for changes specified in the WMMM (Figure 1). Lek attendance by male greater sage-grouse, number of active leks, and winter concentration area use were monitored in 2011 and 2012 (Table1). Monitoring did not include nesting success and habitat selection as these criteria were removed from the WMMM through the adaptive management process.

The Wyoming Cooperative Fish and Wildlife Research Unit (WY CFWRU) conducted a Peer Review of the PAPA Wildlife Monitoring and Mitigation Plan to assess the scientific appropriateness of the monitoring design outlined in the WMMM. From the peer Review, Wyoming Game and Fish Department (WGFD) and Bureau of Land Management (BLM) biologists recommended modifying WMMM criteria by dropping nesting success and habitat selection monitoring components. The adaptive management process included a public comment period, and the final changes were approved by the BLM Authorizing Officer on January 6, 2011.

The WY CFWRU Review identified a need for additional winter sage grouse data to help understand seasonal impacts of energy development on greater sage-grouse in the Upper Green River Basin. Beginning in January 2011 agency biologists from WGFD and BLM conducted systematic winter concentration surveys to assess winter greater sage-grouse distribution. These surveys will be conducted over the next 4-5 years.

The Review also revealed a need to develop protocols for monitoring noise levels at leks. It was determined that a baseline for noise levels should be established before comparisons and analysis of impacts could occur. Areas that provide points for measurement needed to be defined and all methods standardized to allow for repeat measurements. Protocols for greater sage-grouse noise monitoring are in final preparation and should be available in 2013.

The WY CFWRU Review lead to a clarification for the WMMM criteria associated with “Peak numbers of males attending lek complexes”. The Pinedale Field Office Authorizing Officer determined these criteria would be analyzed comparing Development and Reference areas using a running average of the last 2 years of data. This comparison would average peak numbers of males by complex for each respective area (Development compared to Reference area) and assess if a 30% change has occurred over that 2 year period.

Monitoring of greater sage-grouse in 2011 and 2012 was conducted by agency personnel from the WGFD and BLM. Per the WMMM, occupied leks within the project area are counted following WGFD protocols (Appendix B). All occupied leks monitored are provided in Appendix A.

There are several measurements used to evaluate the matrix trigger for greater sage-grouse. A trigger can be met using any one of 6 comparisons. The matrix trigger for a 30% decline in total number of active leks within the development area for the current year is compared to 2007 baseline data. This matrix component has two triggers with a qualifier (PAPA ROD, Appendix B, pg.B3, footnote 1). 1). Measures the combined total of all development area complexes for the current year to 2007 baseline data. The combined total of active leks within the development area is measured against the total number of active leks within the combined development area total from 2007 baseline data. 2). Measures the number of active leks in a single development area complex compared to 2007 baseline data. In this case, one of the three development area complexes are compared to results from 2007 for each single development area complex.

The matrix trigger for a 30% decline in peak male numbers has two trigger components with a qualifier (PAPA ROD, Appendix B, pg.B3, footnote 1). 1). A 30% decline in peak male numbers within the entire development area is compared to the entire combined reference area total. The change is derived by comparing the current year total to the prior 2-year average in annual peak male numbers within the entire combined development area. The percent change from the development area is then compared to the percent change within the entire combined reference area. 2). A 30% decline in peak male numbers within an individual development area complex compared to the entire combined reference area. The change is derived by comparing the current year total to the prior 2-year average in annual peak male numbers within each single development area complex. The percent change from a single development area complex is then compared to the percent change within the entire combined reference area.

The trigger for a decline in habitat area use may be met when measurements detect an average 15% per year decline in the amount of winter concentration habitat area used over 2-years as compared to the entire combined reference areas and when combined with a concurrent average of 30% decline in peak number of males over 2-years compared to the entire combined reference areas.

Noise is measured by evaluating decibel levels at development area leks. A trigger will be met when noise exceeding 10 dBA above background (39dBA) (when measured from the edge of the lek) is combined with a concurrent average of 30% decline in peak number of male birds over 2 years compared to the entire combined reference area numbers.

Monitoring results for 2011 indicate no thresholds were exceeded. Monitoring results indicate a threshold was met in 2012. In 2012 The Duke's Triangle complex saw a 50% decline in active

leks as only one of the two leks active in 2007 was active in 2012, exceeding the threshold for a 30% decline in number of active leks in a single development area complex compared to 2007 baseline data.

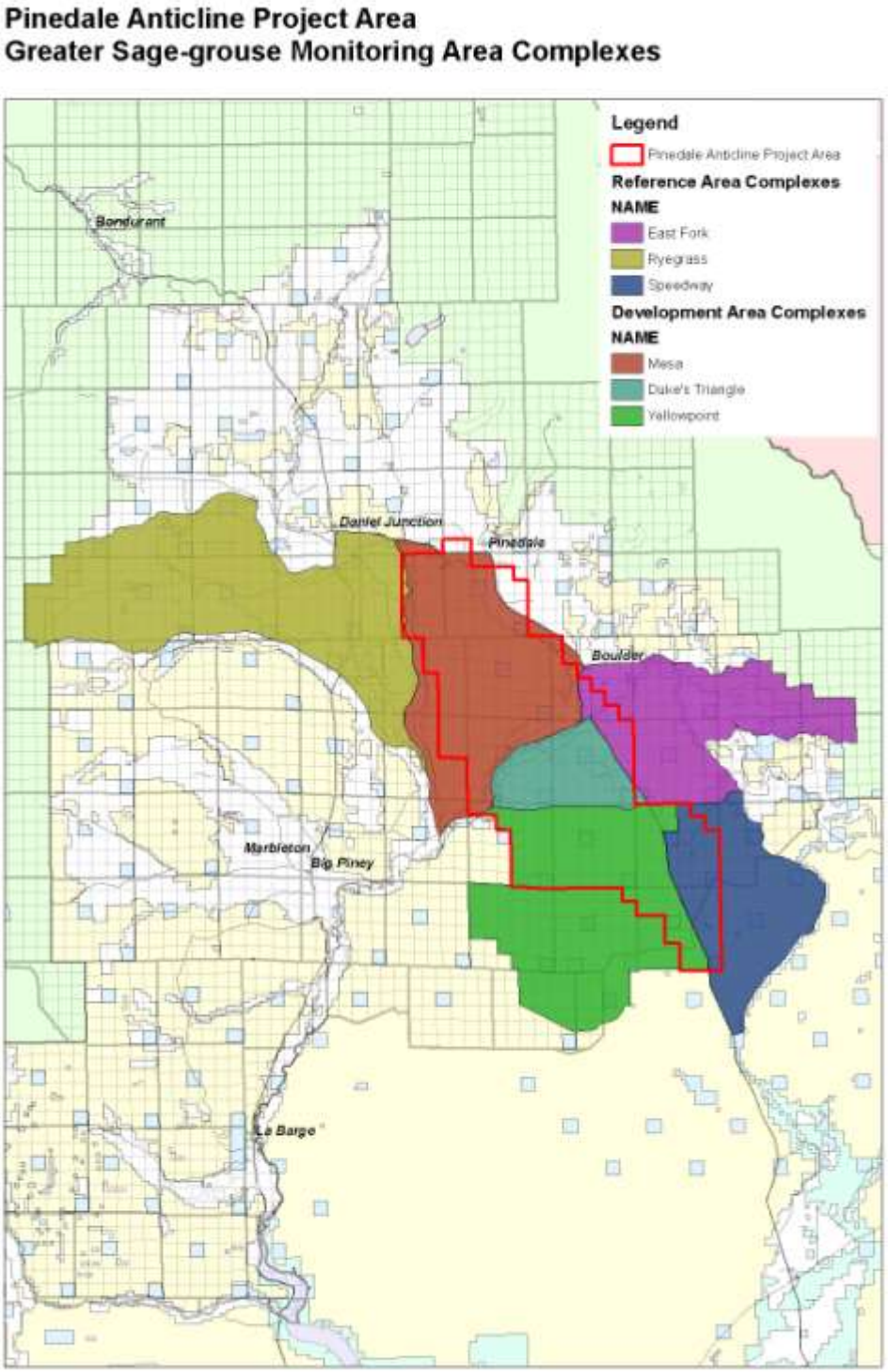

Figure 1. Greater Sage-grouse Monitoring Project Area

Table 1. Wildlife Monitoring and Mitigation Matrix from Appendix B 2008 PAPA ROD, as modified in 2011.

Species	Criteria	Method	Changes that will be monitored	Specific Changes Requiring Mitigation	Mitigation Responses
Sage Grouse	Number of active leks in identified lek complexes	Lek counts according to protocol	Active use on 70% of total current leks; Active use on 70% of leks in each complex (the development area complexes include the Mesa, Duke's Triangle, and Yellow Point complexes) compared to 2007 data	30% decline in total number of active leks, or 30% decline in the number of leks in a single complex[1]	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
	Peak numbers of males attending lek complexes	Lek counts according to protocol	Total average 2-year change in numbers of males attending development area lek complexes (the Mesa, Duke's Triangle, or Yellow Point lek complex), compared to the East Fork, Speedway, or Ryegrass reference lek complexes	Average of 30% decline in numbers over 2 years compared to reference area[1]	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
	Winter concentration area use	Monitoring according to protocol	Change in winter concentration area use compared to reference area (once initial data is available), and a concurrent change in the total average 2 year numbers of males attending development area lek complexes (the Mesa, Duke's Triangle or Yellow Point lek complex), compared to the East Fork, Speedway, or Ryegrass reference lek complexes	Average of 15% per year decline in amount of winter habitat used over 2 years compared to reference areas, and a concurrent average of 30% decline in numbers over 2 years compared to reference area	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
	Noise levels	Decibel monitoring from March 1-May 15 at lek sites	Noise levels demonstrated to impact peak lek use by male sage grouse and a concurrent change in the total average 2-year numbers of males attending development area lek complexes (the Mesa, Duke's Triangle, or Yellow Point lek complex), compared to the East Fork, Speedway, or Ryegrass reference lek complexes	Decibel levels at the lek more than 10 dBA above background measured from the edge of the lek (2000 ROD, p.27), and a concurrent average of 30% decline in peak numbers of male birds over 2 years vs. reference area.	Select mitigation response sequentially as listed below, implement most useful and feasible and monitor results over sufficiently adequate time for the level of impact described by current monitoring.
Footnote 1. If the number of leks decline but the bird numbers on lek complexes do not, the mitigation threshold would not be surpassed. If the number of leks does not decline but the bird numbers on lek complexes does decline, the mitigation threshold would be surpassed. If both numbers of leks and birds decline, the mitigation threshold would obviously be surpassed					

SURVEY METHODS

In 2011 and 2012, monitoring included identifying the number of active leks and peak numbers of males attending leks. A total of 25 leks within the development area were monitored or surveyed in 2011 and 2012. Of those 23 were classified as occupied in 2011 and 21 were occupied in 2012 (Appendix A). Thirty leks were monitored or surveyed in the reference area in 2011 and 31 were monitored or surveyed in 2012. There were 35 leks classified as occupied in 2011 and 2012(Appendix A). Monitoring follows WGFD protocols from the Handbook of

Biological Techniques (Emmerich et al 2007). Due to the high elevation of the Upper Green River Valley some variations to protocols are accepted. Leks may be classified as active or inactive based on the current year activity and, occupied or unoccupied based on a 10 year activity status (Appendix B). Lek *counts* are attempted on all occupied Leks. Unoccupied, destroyed or abandoned leks are not monitored annually but are surveyed following WGFD protocols for monitoring inactive leks. Lek *surveys* are conducted as necessary to determine whether an unoccupied lek status has changed. Newly discovered leks are added to the PAPA WMMM analysis the year they are discovered. Leks that meet the WGFD management status for unoccupied, destroyed or abandoned were not included in the analysis. Only lek counts were used in the 2011 and 2012 analysis.

Lek counts were conducted at 7 day (or greater) intervals over a 4-6 week period during the breeding season. Leks were monitored via ground counts during morning hours, beginning generally ½ hour before sunrise. Counts were made at least 3 times during the breeding season. Counts were made from locations that afford good visibility of the entire lek but at a distance that does not disturb the birds. Birds are counted from left to right (or vice versa) then recounted in the opposite direction. Male and female grouse are counted and recorded separately. The highest male count is included in the final analysis.

Lek searches were conducted in the development and reference areas in 2011 and 2012 in an effort to identify new leks or leks that may have moved. These searches were not lek counts but a method to locate new leks or leks that had moved. Searches were conducted both aerially and on the ground using WGFD protocols and can be conducted at any time of the day from the initiation of strutting in early March until early-mid May, depending on the site and spring weather. Aerial searches were conducted using fixed-wing aircraft, flown following north south transects at 1 km to 1.5 km (0.6 - 0.9 mi) intervals. Flights were conducted during early morning hours on calm clear days between ½ hour before sunrise and up to 1 ½ hours after sunrise at about 100-150 meters (300-450 ft.) above the ground. While it is not feasible to monitor all leks in the same day, every effort is made to conduct searches on the same day at all leks within close proximity of each other to avoid double counts or missing birds.

Ground searches were conducted by driving along roads throughout the entire complex area. Stops were conducted at approximately ½ mile to 1 mile intervals to listen for the sounds of displaying grouse and scan the area with binoculars. Per WGFD protocols, during calm mornings displaying sage-grouse may be heard from a distance of 1.5 km (1 mile Searches were conducted beginning 1 hour before sunrise up to 2 hours after sunrise.

Winter concentration data collection included aerial surveys following WGFD protocols. Surveys were conducted using helicopter flying transects spaced at 1 mile or less intervals looking for grouse and tracks on the ground in snow cover from 300 feet or lower elevation above ground . This transect interval was not intended to provide complete coverage for "census"

purposes. Rather, it was designed to systematically survey a large area in order to efficiently determine relative distribution and habitat use patterns.

Noise monitoring surveys were not conducted in either 2011 or 2012. Protocols are being prepared for the PAPO as recommended by the WY CFWRU and it is anticipated that monitoring will resume in 2013. When monitoring resumes it will follow the protocols set out in the WMMM.

MONITORING RESULTS

Number of Active Leks in Identified Lek Complexes

Changes in active leks within the development area were compared to 2007 baseline data as outlined in the WMMM (Table 1, Figure 2). Specific changes that require mitigation include a "*30% decline in total number of active leks or 30% decline in the number of leks in a single complex*" (BLM 2008).

In 2007, development area leks in 3 lek complexes (Mesa, Duke's Triangle and Yellowpoint) totaled 16 active leks (Table 3). In 2011 a 6% decline in total active leks was documented (15 active leks). The total number of active leks within the development area declined to 13 in 2012 which equates to 19% decline compared to 2007.

For the number of active leks within a single development area complex, in 2007 the Mesa complex began with 6 active leks. In 2011, 7 active leks were reported for the Mesa complex, with 6 reported as active in 2012 (Table 4). The Yellowpoint complex has declined by 25% from 8 active leks in 2007 to 6 in 2012. Active leks fluctuated from a high of 3 in 2008 to the current low of 1 within the Dukes Triangle complex. There were 2 active leks in the baseline year (2007) with 1 active lek in 2012, representing a 50% decline for the year, which exceeds the 30% threshold for the number of active leks in a single complex.

Table 2. Duke's Triangle Complex peak male counts at occupied Leks and number of active Leks.

	DUKE'S TRANGLE COMPLEX PEAK MALE COUNTS AT OCCUPIED LEKS				
Year	Big Fred Lek	Little Fred Lek	Lower Sand Springs Draw Lek (new in 2007)	**Number of active leks within Duke's Triangle Complex**	**Percent change in active leks compared to 2007 baseline**
2006	***8***	***24***		***2***	
2007	***0***	***24***	***10***	***2***	*0%*
2008	**2**	22	14	**3**	50%
2009	**0**	0	13	**1**	**-50%**
2010	**0**	30	18	**2**	0%
2011	**0**	9	18	**2**	0%
2012	**0**	0	20	**1**	**-50%**

The Matrix includes a provision as stated in Footnote ***1: "****If the number of leks decline but the bird numbers on lek complexes do not, the mitigation threshold would not be surpassed. If the number of leks does not decline but the bird numbers on lek complexes does decline, the mitigation threshold would be surpassed. If both numbers of leks and birds decline, the mitigation threshold would obviously be surpassed*" (, Appendix B in the PAPA ROD, pg.B3, footnote 1).

The intent of the footnote is to insure a trigger would not be met if 1.) A lek or leks within one of the Development Area Complexes became inactive resulting in a 30% decline in active leks for that Complex and 2.) It could be demonstrated that the birds moved to another lek during the same time period, within that same Development Area Complex.

Based on the results of the Active Lek monitoring, and in consideration of the Appendix B footnote within the WMMM, lek searches were conducted. It was determined that none of the Duke's Triangle leks had moved and no new leks were discovered within the entire complex.

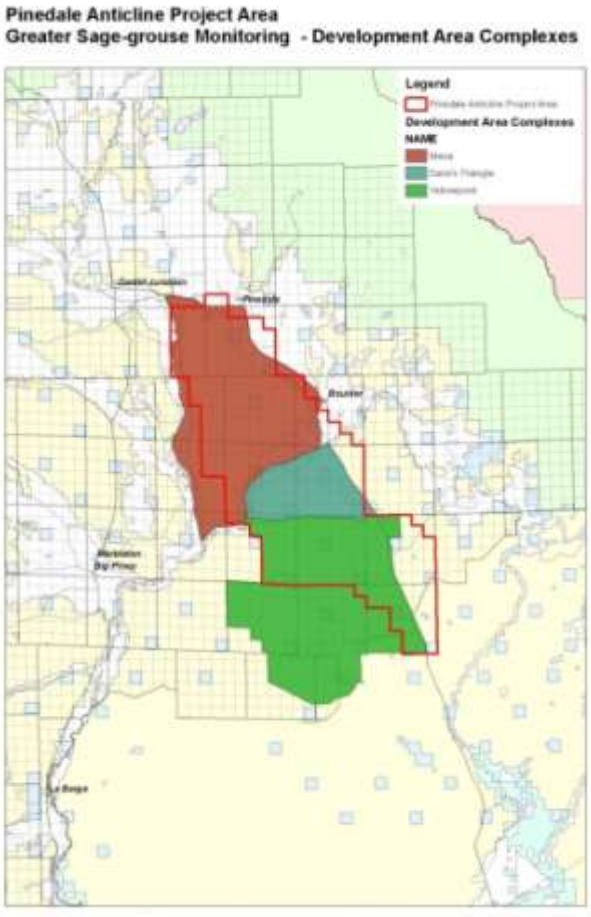

Figure 2. Development area lek complexes

Table 3. Combined development area complexes, number of active leks

Year	Combined Development Area Complexes Number of active Leks	Matrix Threshold: Percent change in active Leks compared to 2007
2007	*16*	
2008	16	-0%
2009	13	-19%
2010	15	-6%
2011	15	-6%
2012	13	-19%

Table 4. Development area, number of active leks per single complex

Year	Mesa Complex Number of active Leks	Matrix Threshold: Percent change in active Leks compared to 2007
2007	*6*	
2008	6	0%
2009	6	0%
2010	6	0%
2011	7	17%
2012	6	0%
Year	**Duke's Triangle Complex Number of active Leks**	**Matrix Threshold: Percent change in active Leks compared to 2007 (red indicates threshold has been met)**
2007	*2*	
2008	3	50%
2009	1	-50%
2010	2	0%
2011	2	0%
2012	1	-50%
Year	**Yellowpoint Complex Number of active Leks**	**Matrix Threshold: Percent change in active Leks compared to 2007**
2007	*8*	
2008	7	-13%
2009	6	-25%
2010	7	-13%
2011	6	-25%
2012	6	-25%

* All numbers were rounded to whole numbers

Peak Number of Males Attending Lek Complexes

The WMMM outlines monitoring total 2-year change in number of males attending development and 3 adjacent reference area lek complexes (Figure 3). A decline of 30% in 1 of the development area complexes, when compared to numbers in the entire combined reference area numbers, triggers mitigation.

Heavy snow conditions in 2011 made access to the East Fork complex difficult and agency personnel were not able to obtain counts for this area. Without data for 2011 it is not possible to calculate a 2-year average for this complex. For the purposes of analysis, this complex was not included (Table 5).

Comparison of Entire Development Area with Combined Reference Area

Peak number of males attending leks within the development area totaled 485 in 2011 (Table 6). The 2011 total is measured against the average of the two previous years (Table 7). The average of the 2009 and 2010 development area data was 584 males (624 + 544)/2). A 17% decline (485-584)/584*100) (Table 8) was documented for the entire development area when compared with the prior 2-year average of 515 males (544+485)/2) (Table 7). The Ryegrass and Speedway reference areas saw a combined peak male count totaling 905 male birds in 2011 (Table 9). This total is compared with the 2-year average from 2009 and 2010 reference area counts of 1174.5 male birds (1337+1012)/2 (Table 10). The result was a 23% decline for the reference areas (905-1174)/1174*100 (Table 11). The results indicated the reference areas declined by 6% more than the development areas in 2011.

In 2012, 466 males were counted attending all development area leks (Table 6). The 2-year average for 2010 and 2011 data totaled 515, (544+485)/2 (Table 7). When comparing the 2012 counts with the prior 2-year average (464-515)/515*100 (Table 8), we documented a 9% decline (466-515)/515*100 in peak males attending leks within the development area. The 2012 counts for peak number of males in the combined Ryegrass and Speedway reference area was 755 (Table 9). The 2010 and 2011, 2-year average (1012+905)/2 was 959 (Table 10), which is a 21% decline in the reference areas (755-959)/959*100 (Table 11). The results indicate the reference area experienced a 12% greater decline than the development area in 2012.

Table 5. Reference area, annual peak number of males attending development area Lek complexes beginning with baseline year (2007) including East Fork Complex data, but NOT used in analysis.

Year	Ryegrass Complex: Annual peak male Lek attendance	East Fork Complex: Annual peak male Lek attendance	Speedway Complex: Annual peak male Lek attendance	Combined Reference Area Complexes Annual peak male Lek attendance
2007	*687*	*274*	*934*	*1895*
2008	598	251	819	1668
2009	726	213	611	1550
2010	545	142	467	1154
2011	555	NA	350	NA
2012	406	142	349	897

Table 6. Development area, annual peak number of males attending development area Lek complexes beginning with baseline year (2007)

Year	Mesa Complex: Annual peak male Lek attendance	Dukes Triangle Complex: Annual peak male Lek attendance	Yellowpoint Complex: Annual peak male Lek attendance	Combined Development Area Complexes: Annual Peak Male Lek Attendance
2007	*539*	*34*	*286*	**859**
2008	**490**	**38**	**220**	**748**
2009	**438**	**13**	**173**	**624**
2010	**329**	**48**	**167**	**544**
2011	**339**	**27**	**119**	**485**
2012	**296**	**20**	**150**	**466**

Table 7. Development Area, running 2-year average peak number of males attending development area Lek complexes

Years Averaged	Mesa Complex: Running 2 - year Average peak male Lek attendance	Duke's Triangle: Running 2 - year Average peak male Lek attendance	Yellowpoint Complex: Running 2 - year Average peak male Lek attendance	Combined: Development Area Complexes Running 2 - year Average peak male Lek attendance
2006-2007	*558*	*31*	*261*	*850*
2007-2008	**515**	**36**	**253**	**804**
2008-2009	**464**	**26**	**197**	**686**
2009-2010	**384**	**31**	**170**	**584**
2010-2011	**334**	**38**	**143**	**515**
2011-2012	**318**	**24**	**135**	**476**

* All numbers were rounded to whole numbers

Table 8. Development Area, running 2-year average percent change in peak number of males attending development area Lek complexes

Year	Mesa Complex: Matrix Threshold: Running 2-year average percent change in numbers of males attending development area lek complexes	Duke's Triangle Complex: Matrix Threshold: Running 2-year average percent change in numbers of males attending development area lek complexes	Yellowpoint Complex: Matrix Threshold: Running 2-year average percent change in numbers of males attending development area lek complexes	Combined Development Area Complexes Matrix Threshold: Running 2-year average percent change in numbers of males attending development area lek complexes
2007	*11%*	*1%*	*50%*	*21%*
2008	**-12%**	**23%**	**-16%**	**-12%**
2009	**-15%**	**-64%**	**-32%**	**-22%**
2010	**-29%**	**88%**	**-15%**	**-21%**
2011	**-12%**	**-11%**	**-30%**	**-17%**
2012	**-11%**	**-47%**	**5%**	**-9%**

* All numbers were rounded to whole numbers

Table 9. Ryegrass and Speedway reference areas used for 2011-2012 analysis, annual peak number of males attending development area Lecomplexes beginning with baseline year (2007)

Year	Ryegrass Complex: Annual peak male Lek attendance	Speedway Complex: Annual peak male Lek attendance	Ryegrass and Speedway Reference Area Complexes (for 2011 – 2012 analysis): Annual Peak Male Lek Attendance
2007	*687*	*934*	*1621*
2008	598	819	1417
2009	726	611	1337
2010	545	467	1012
2011	555	350	905
2012	406	349	755

Table 10. Ryegrass and Speedway reference areas, running 2-year average peak number of males attending reference area Lek complexes

Years Averaged	Ryegrass Complex: Running 2 - year Average peak male Lek attendance	Speedway Complex: Running 2 - year Average peak male Lek attendance	Ryegrass and Speedway: Reference Area Complexes Running 2 - year Average peak male Lek attendance
2006-2007	*572*	*908*	*1480*
2007-2008	643	877	1519
2008-2009	662	715	1377
2009-2010	636	539	1175
2010-2011	550	409	959
2011-2012	481	350	830

*All numbers were rounded to whole numbers

Table 11. Ryegrass and Speedway reference areas, running 2-year average percent change in peak number of males attending reference area Lek complexes

Year	Ryegrass Complex: Matrix Threshold: Running 2-year average percent change in numbers of males attending development area lek complexes	Speedway Complex: Matrix Threshold: Running 2-year average percent change in numbers of males attending development area lek complexes	Ryegrass and Speedway Reference Area Complexes Matrix Threshold: Running 2-year average percent change in numbers of males attending development area lek complexes
2007	*66%*	*19%*	*35%*
2008	5%	-10%	-4%
2009	13%	-30%	-12%
2010	-18%	-35%	-27%
2011	-13%	-35%	-23%
2012	-26%	-15%	-21%

*All numbers were rounded to whole numbers

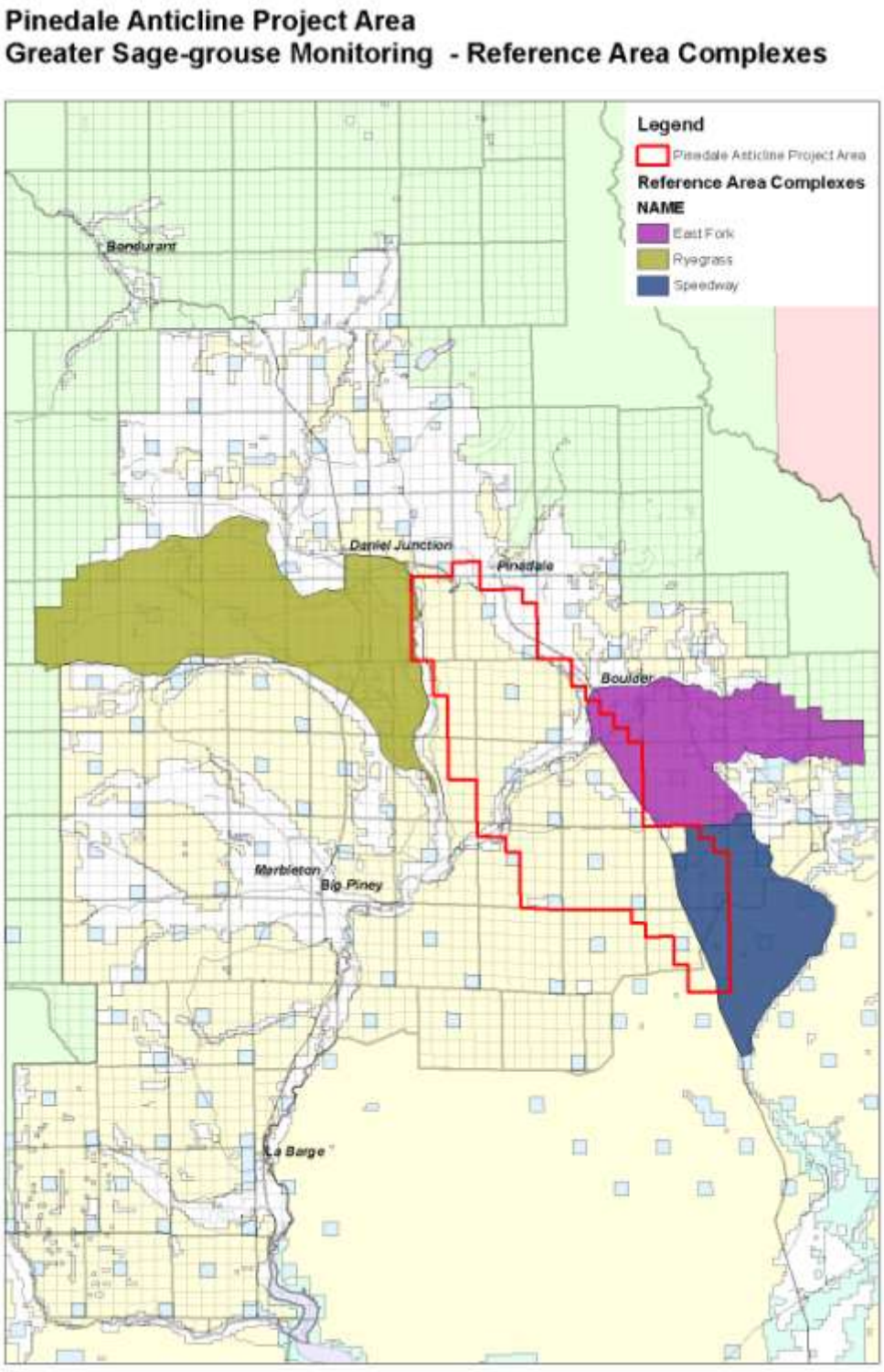

Figure 3. Reference Area Lek complexes

Comparison of Individual Development Area Complexes with Combined Reference Area

Individual complexes within the development area were compared to the combined reference area totals using a 2-year average. A decline of 30% in the development area, when compared to numbers in the reference area numbers triggers mitigation.

Mesa Complex

The Mesa complex declined 12% (339-384)/384*100 (Table 8) in 2011 when compared to the 2-year average of 334 male birds (329+339)/2) (Table 7). The reference areas combined total 23% (905-1175)/1175*100) decline (Table 11) was compared to the Mesa 12% decline. The results indicate the Reference areas declined by 11% more than the Mesa complex. In 2012, the Mesa complex declined 11% (296-334)/334*100 (Table 8) when compared to the 2-year average of 318 male birds (339+296)/2) (Table 7). The reference area decline of 21% (755-959)/959*100 (Table 11) indicates the reference areas had a 10% greater decline than the Mesa Complex.

Duke's Triangle

The Duke's Triangle complex declined 11% (27-31)/31*100 (Table 8) in 2011compared to the 2-year average of 38 male birds (48+27)/2 (Table 7). The 11% decline for Duke's Triangle was then compared to the 23% (905-1175)/1175*100 (Table 11) decline in the combined reference areas. The reference area declined 11% more than the Duke's Triangle complex in 2011. The Duke's Triangle complex experienced a 47% (20-38)/38*100 decline in 2012 (Table 8) when compared to the 2-year average of 24 male birds (27+20)/2) (Table 7). Compared with the reference area decline of 21% (755-959)/959*100 in 2012 (Table 11) the Duke's Triangle development area complex declined by 26% more than the reference areas.

Yellowpoint

In 2011, Yellowpoint complex surveys demonstrated a 30% (119-170)/170*100) (Table 8) decline from the 2-year average of 143 male birds (167+119)/2 (Table 7). When compared to the reference areas decline of 23% (905-1175)/1175*100 (Table 11) the Yellowpoint complex declined by 7% more than the reference areas. The 2012 analysis compared a 5% (150-143)143*100) (Table 8) increase from the 2-year average of 135 male birds (119+150)/2 (Table 7) in the complex to the 21% (755-959)/959*100) decline in the combined reference areas (Table 11).

LEK SEARCHES

The PAPO committed to conduct searches covering all 6 lek complexes over a 3-year period (2 complexes per year). Complexes not surveyed aerially were searched from the ground following WGFD protocols. Lek searches were conducted during breeding season, in the reference complex areas and the development areas beginning in 2011 with ground searches only. In 2012 aerial searches were conducted April 23rd-25th in the Speedway and East Fork reference complex areas along with the Dukes Triangle, and Yellowpoint development complex areas (Figure 4). Ground searches were conducted in the entire Dukes Triangle complex in both years. No new or relocated leks were discovered in the development area in either year from aerial or ground searches.

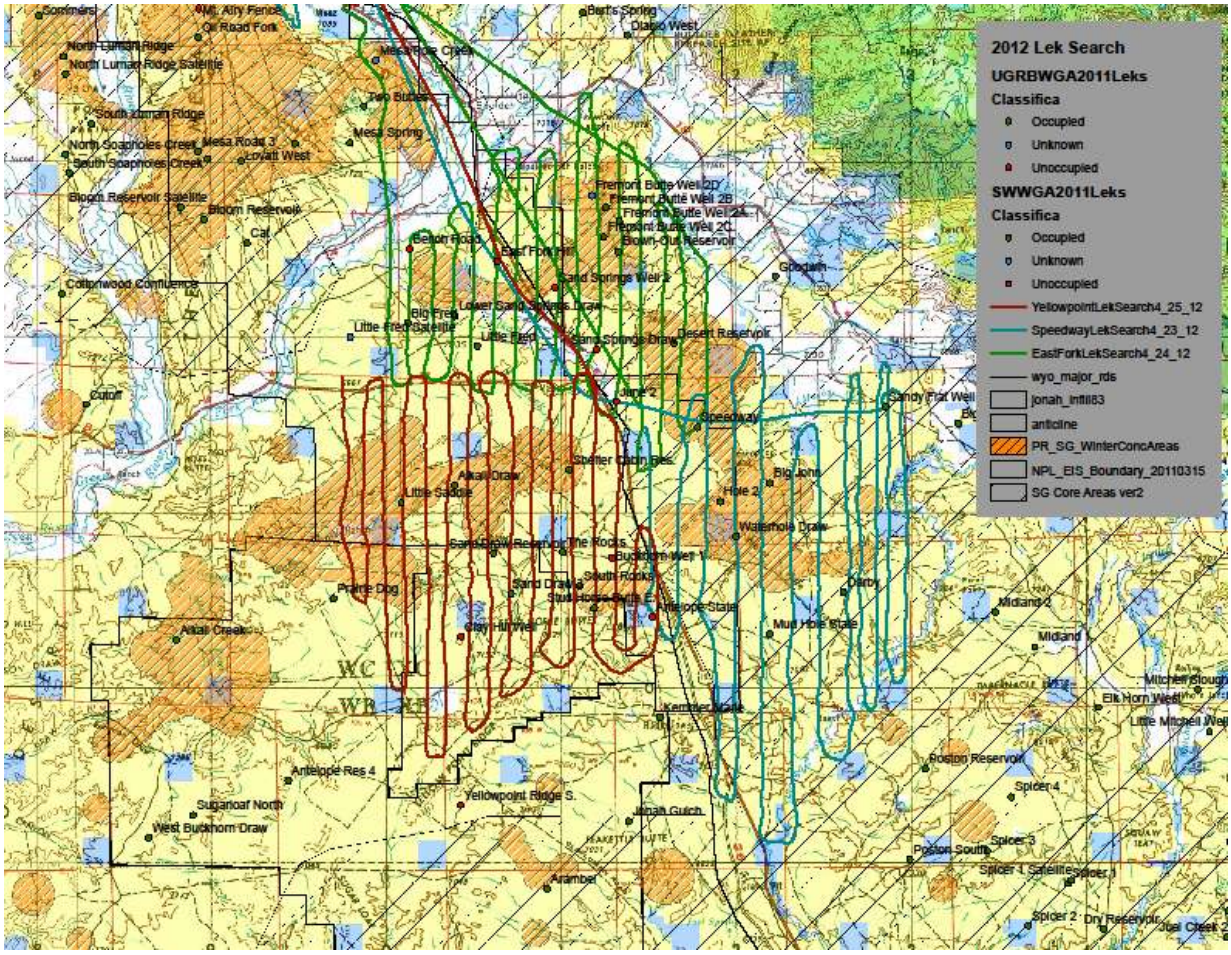

Figure 4. Lek search routes flown in April 2012

WINTER CONCENTRATION AREAS

The WMMM outlines monitoring winter concentration use will be compared to reference area once initial data is available. Methods used to determine how changes will be measured are yet to be determined. Aerial surveys were conducted of wintering greater sage-grouse over the past

2 winters. In 2011, flights occurred January 16th-January 21st and in 2012 flights occurred January 21st- January 24th. The flight data will be incorporated with ground data to develop a baseline of concentration areas. Continued aerial winter surveys are planned for another 2-3 years until refinements to existing greater sage-grouse winter use maps can be made (Figure 5). Once the concentration areas are better defined monitoring protocols will be developed to assess if a 30% decline in winter habitat use occurs as a result of energy development.

Winter concentration areas were defined and identified using a dataset created from data collected from multiple agencies and organizations. Live sage grouse observations from December through March 15th from 1980-2011 were sorted by year with the number of birds present at the observation location. All observations with less than 50 birds were dropped from the analysis. Group sizes 50-99 were buffered .5 mile, groups 100-199 were buffered .75 miles, groups 200-499 were buffered 1 mile and groups greater than 500 were buffered 1.5 miles. These buffers were then merged together and aggregated at 1 mile to encourage continuity of the polygons and to better represent habitat use by those bird groups.

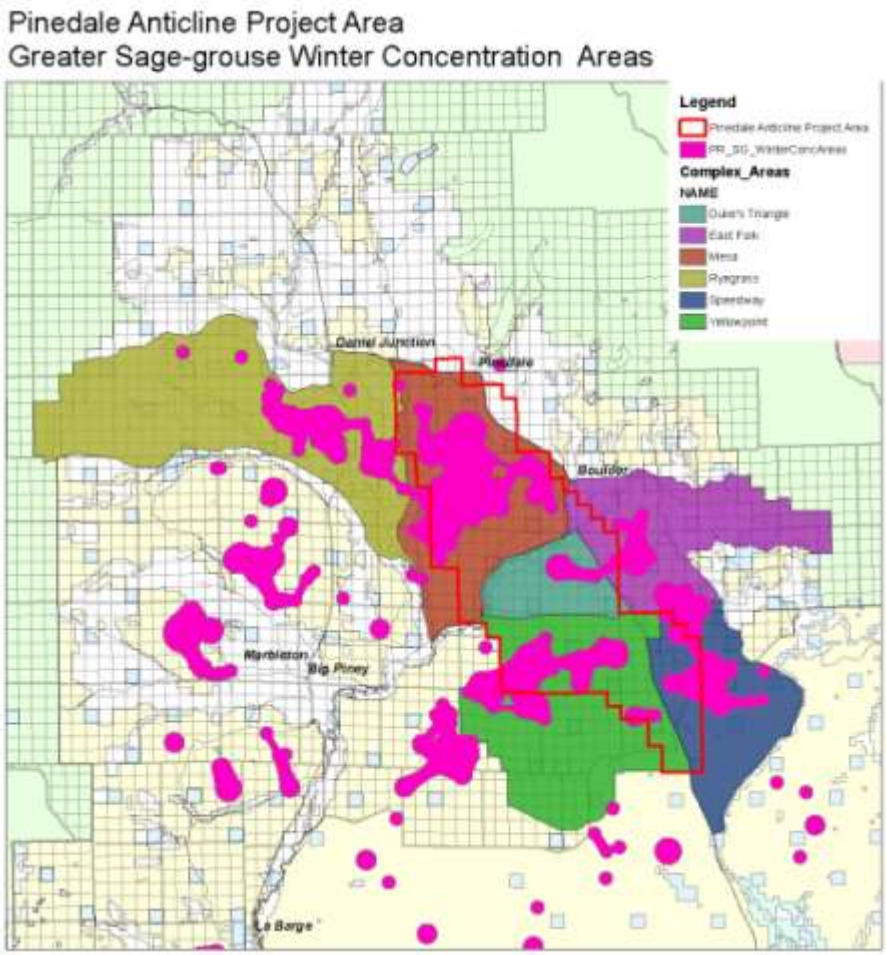

Figure 5. Map of 2011-12 winter concentration areas

NOISE MONITORING

In conjunction with the state-wide modeling effort the PAPO contracted with UC Davis to establish baseline ambient values and a noise measurement protocol for the PAPA based on an analysis of measurements of ambient sound levels in the region made by KC Harvey in 2009 and by the PAPO in 2010. The goal is to determine baseline noise levels for leks in the region based on ambient measurements from the PAPA and the reference areas. No noise data was collected in 2011 or 2012 as a result of the WY CFWRU recommendation to develop appropriate protocols. UC Davis has been contracted to develop a protocol for collection of additional measurements to refine baseline ambient values and determine compliance with noise stipulations. Monitoring will resume once protocols are established. The protocols will be posted on the PAPO web page when received.

University of California, Davis (UC Davis) has been working cooperatively with the State of Wyoming to develop a state wide noise monitoring model. They have adapted the NMSim noise model originally developed for the National Park Service. The model provides interactive tools that allow the user to input data to simulate impacts from noise generally associated with energy development. The model could be useful for planning and guiding management decisions.

LITERATURE CITED

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Appendix A. Development and Reference Area Occupied Leks Monitored in 2011 and 2012 including prior years data used in analysis

PAPA Leks –Annual Peak Number of Males at leks classified as OCCUPIED during 2011 and 2012							
Development Area Complexes	Lek Name	**2007 baseline year**	**2008**	**2009**	**2010**	**2011**	**2012**
MESA	Bloom Reservoir	**123**	107	97	68	81	75
	Cat	**24**	19	2	9	3	2
	Lovatt Draw Reservoir	**0**	0	0	0	0	0
	Lovatt West	**9**	25	0	0	2	0
	Mesa Road 3	**100**	97	76	40	38	32
	Mesa Springs	**0**	0	0	0	0	0
	Oil Road Fork	**184**	154	156	105	93	72
	Pole Creek (became unoccupied in 2012)	**0**	0	0	NC	0	0
	Two Buttes	**99**	88	86	82	87	79
	Tyler Draw North (new in 2009)			21	25	35	36
DUKE'S TRIANGLE	Big Fred	**0**	2	0	0	0	0
	Little Fred	**24**	22	0	30	9	0
	Little Fred Satellite (became unoccupied in 2012)	**NC**	0	NC	NC	0	0
	Lower Sand Springs Draw	**10**	14	13	18	18	20
YELLOW POINT	Alkali Draw	**67**	37	23	29	29	19
	Prairie Dog	**39**	41	38	23	13	29
	Sand Draw 3	**5**	0	0	0	0	0
	Sand Draw Reservoir	**38**	24	19	19	12	13
	Shelter Cabin Reservoir	**74**	51	44	27	22	40
	South Rocks	**33**	41	40	25	22	28
	Stud Horse Butte E.	**4**	2	0	0	0	0
	The Rocks	**26**	24	9	11	0	0
	Little Saddle (new in 2010)				33	21	21
Reference Area Complexes	Lek Name	**2007 baseline year**	**2008**	**2009**	**2010**	**2011**	**2012**
RYEGRASS	Brodie Burn	**2**	0	0	6	0	1
	Brodie Draw 1	**30**	18	19	8	14	10
	Brodie Draw 2	**18**	32	18	12	7	20
	Brodie Draw 3	**0**	2	1	4	0	0
	Cut Across	**0**	19	7	0	12	0
	Fear Ditch	**41**	42	21	18	37	23
	Fear Ditch Reservoir	**30**	4	20	19	24	11
	Grindstone Butte North (new in 2011)					9	6
	Grindstone Draw	**33**	32	38	33	35	26
	Jewett Red Flat Reservoir	**82**	33	50	31	28	NC
	North Luman Ridge	**28**	27	7	2	4	0

	North Soapholes Creek	**16**	15	26	15	31	1
	Old Reservoir	**8**	19	60	2	6	0
	Onion Creek	**NC**	0	NC	NC	NC	NC
	Onion Spring	**11**	2	0	0	2	7
	Onion Spring 2 (new in 2009)			38	38	21	54
	Ryegrass Draw	**81**	88	147	106	125	59
	Ryegrass Draw South	**NC**	69	49	35	38	41
	Ryegrass Reservoir	**7**	14	10	2	15	NC
	Ryegrass Road Fork	**42**	30	33	25	14	40
	Sommers	**37**	27	15	0	19	16
	South Luman Ridge	**44**	42	40	25	15	20
	South Soapholes Creek	**13**	21	6	0	1	0
	Upper Onion Creek	**164**	62	121	164	98	71
SPEEDWAY	Big John	**117**	96	80	73	63	56
	Darby	**104**	94	75	56	32	41
	Desert Reservoir	**226**	234	150	153	61	72
	Hole 2	**0**	0	0	18	17	25
	Mud Hole State	**235**	200	142	82	64	62
	Speedway	**132**	103	94	54	84	52
	Waterhole Draw	**120**	92	70	31	29	41
EAST FORK	Blown Out Reservoir	**216**	208	171	109	NC	87
	Fremont Butte Well 2A	**31**	14	16	12	NC	34
	Fremont Butte Well 2B	**27**	29	26	21	NC	21
	Freemont Butte Well 2C	**NC**	NC	NC	NC	NC	NC
NC = Not Checked.	Unoccupied leks are not listed						

Appendix B. WGFD Sage-grouse definitions. Some variations to agency definition protocols do occur in the Upper Green River Valley due to higher elevation.

Wyoming Sage-Grouse Definitions:
(Revised 02/09/2010)

The following definitions have been adopted for the purposes of collecting and reporting sage-grouse 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 observations of two or more male sage-grouse engaged in courtship displays. Before adding the suspected lek to the database, it must be confirmed by an additional observation made 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 population peaks. Such areas usually fail to become established leks. Therefore, a site where small numbers of males (<5) are observed strutting should be confirmed active for two years before adding the site to the lek database.

Satellite Lek – A relatively small lek (usually less than 15 males) that develops within about 500 meters of a large lek 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 any associated satellites. Perimeters should be mapped by experienced observers using established protocols for all leks with larger leks receiving higher priority. Perimeters may vary over time as population levels or habitat and weather conditions change. However, changes to mapped perimeters should occur infrequently and only if grouse use consistently (2+ years) demonstrates the existing perimeter to be inaccurate. A point **within** the lek perimeter must be recorded or calculated as the identifying location for the lek. The point may be the geographic center of the perimeter polygon as calculated though a GIS exercise or a GPS point reflecting the center of breeding activity as typically witnessed on the lek.

Lek Complex - A lek or group of leks within 2.5 km (1.5 mi) of each other between which male sage-grouse may interchange from one day to the next.

Lek Count - A census technique that documents the actual number of male sage-grouse observed attending a lek complex. The following criteria are designed to assure counts are done consistently and accurately, enabling valid comparisons to be made among data sets. Additional technical criteria are available from the WGFD.

- 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 census of a group of leks that are relatively close and represent part or all of a single breeding population/sub-population. Leks should be counted on routes to facilitate repetition by other observers, increase the likelihood of recording satellite leks, and account for shifts in breeding birds if they occur. Lek routes should be established so that all leks along the route can be counted within 1.5 hours following the criteria listed under "Lek Count".

Lek Survey - 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.

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 suggests that there was no strutting activity throughout a strutting season. Absence of strutting grouse during a single visit is insufficient documentation to establish that a lek is inactive. This designation requires documentation of either: 1) an absence of birds on the lek during at least 2 ground surveys separated by at least 7 days. These surveys must be conducted under ideal conditions (4/1-5/7, no precipitation, light or no wind, ½ hour before to 1 hour after sunrise) or, 2) a ground check of the exact known lek site late in the strutting season (after 4/15) that fails to find any sign (droppings/feathers) of strutting activity. Data collected by aerial surveys may not be used to designate inactive status.

• **unknown** – Leks for which status as active or inactive has not been documented during the course of a strutting season. Except for those leks not scheduled for checks in a particular year, use of this status should be rare. Leks should be checked with enough visits to determine whether it is active or not. It is better to have two good checks every other year and confirm it "inactive" than to check it once every year, not see birds, but 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** – (Formerly "historical lek".) There are two types of unoccupied leks, "destroyed" and "abandoned." 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 active in the last ten years, but survey information is insufficient to designate the lek as unoccupied. Undetermined leks will be protected through prescribed management actions during surface disturbing activities until sufficient documentation is obtained to confirm the lek is unoccupied. Use of this status should be rare (see "unknown" above).

Winter Concentration Area - During winter, sage-grouse feed almost exclusively on sagebrush leaves and buds. Suitable winter habitat requires sagebrush above snow. Sage-grouse tend to select wintering sites where sagebrush is 10-14 inches above the snow. Sagebrush canopy cover utilized by sage-grouse above the snow may range from 10 to 30 percent. Foraging areas tend to be on flat to generally southwest facing slopes or on ridges where sagebrush height may be less than 10 inches but the snow is routinely blown clear by wind. When these conditions are met, sage-grouse typically gain weight over winter. In most cases winter is not considered limiting to sage-grouse. Under severe winter conditions grouse will often be restricted to tall stands of sagebrush often located on deeper soils in or near drainage basins. Under these conditions winter habitat may be limiting. On a landscape scale, winter habitats should allow sage-grouse access to sagebrush under all snow conditions.
Large numbers of sage-grouse have been documented to persistently use some specific areas which are characterized by the habitat features outlined above. These areas should be delineated as "winter concentration areas". Winter concentration areas do not include all winter habitats used by sage-grouse, nor are they limited to narrowly defined "severe winter relief" habitats. Delineation of these concentration areas is based on determination of the presence of winter habitat characteristics confirmed by repeated observations and sign of large numbers of sage-grouse. The definition of "large" is dependent on whether the overall population is large or small. In core population areas frequent observations of groups of 50+ sage-grouse meet the definition while in marginal populations group size may be 25+. Consultation and coordination with the WGFD is required when delineating winter concentration areas.