2022 Utah Greater Sage-grouse Lek Count Report

Lek Counts
Aerial Search
Adaptive Management Triggers

Utah Division of Wildlife Resources.
24 August 2022

Abstract:

Greater Sage-grouse (Centrocercus urophasianus) lek counts are conducted annually within Utah with a goal of counting the peak number of males on all known leks in the state. Statewide lek counts within Sage-grouse Management Areas (SGMAs) were up 36.8% from 2021 counts, with 2913 male sage-grouse counted on 205 leks within SGMAs. The increase reverses a downward trend from the last population peak in 2015 through 2021. However, population changes are inconsistent across the state with two SGMAs still declining and the remaining nine showing increases in high male counts. An additional 188 male sage-grouse were counted outside of SGMAs for total of 3101 male sage-grouse counted state-wide. Statewide 413 leks were counted at least once with males observed on 225 leks.

Systematic greater sage-grouse aerial lek searches are scheduled annually to document new or previously unknown leks. Surveys are conducted by a contractor using infrared (IR) imaging from a fixed wing aircraft. Surveys were scheduled in the Panguitch SGMA. Due to needed repairs followed by long delays in FAA certification the contractor was unable to fly during the survey period this year. Flights are planned to resume next year.

The Utah Bureau of Land Management and US Forest Service resource management plans contain a set of adaptive management triggers developed and evaluated in conjunction with the Utah Division of Wildlife Resources. In 2022, continued declines in lek counts tripped Hard Triggers in the Hamlin Valley Federal Population Area following a soft trigger in the Hamlin Valley Federal Population Area in 2021.

Background:

Sage-grouse life history is tightly woven around leks and leks are a visible center of important sage-grouse habitats. Leks are associated with critical nesting and early brood-rearing habitats, and generally located within nesting habitat used by nesting sage-grouse hens, with the majority of nesting within 3.1 miles of a lek. Annual counts of male sage-grouse on leks has been shown to accurately reflect population changes (Dahlgren et al. 2016). The effectiveness of lek counts as population index and relative ease of data collection leads to lek counts forming the basis of most sage-grouse management and population monitoring.

Greater sage-grouse (*Centrocercus urophasianus*) leks have been counted in Utah for over half a century, and the Utah Division of Wildlife Resources (DWR) maintains lek records extending back to 1959. The DWR focused tremendous energy and resources into locating sage-grouse leks and defining populations during the 1960s and 1970s. Records of lek locations and counts form one of the most extensive and continuous monitoring systems for this species across its range. While ground searching for new leks continues, the majority of work is directed toward monitoring known leks.

Over the time period for which data is available, there is a consistent cyclic behavior with a peak and trough every eight to 10 years. Since 1959, we have seen an increase in the number of sage-grouse counted in Utah, however the raw counts are confounded by increasing levels of effort counting known leks and searching for unknown leks. To compensate for additional effort increasing total male counts, average males per lek is also calculated and provides an index of population change less impacted by counting effort. However, males per lek also has potential bias as increased search effort is likely to document smaller leks and decrease the average numbers of males per lek. Despite some bias in metrics, overall trend in lek counts is highly correlated with trends in populations. Lek counts accurately represent changes in sage-grouse populations over time.

Range wide loss of sagebrush habitat and concomitant decreases in populations have led to a number of petitions for listing under the Endangered Species Act. Greater sage-grouse were found warranted but precluded from listing in March of 2010, and in in October of 2015 were found not warranted for listing. However, they are still vulnerable to habitat loss and other factors and remain a species of concern in Utah. As a species of concern, considerable management time, effort, and funding is dedicated to the conservation of sage-grouse.

Although tremendous effort has been invested in lek searches, many areas of the state are relatively poorly surveyed for the existence of sage-grouse leks. Leks also have the potential to shift locations over time in response to vegetation and population changes, making continued lek searches necessary for ongoing monitoring of sage-grouse populations. Ground searches are conducted by Division employees, researchers, agency partners, private landowners, and others. New leks found via ground-based searches are incorporated into the state lek database as an active lek once reported and verified in a second year.

In addition to ground-based searches, aerial lek searches have enabled a more systematic search for leks in remote and poorly accessible areas throughout the state. Aerial searches allow leks to be found in remote areas, in areas with impassable roads, or areas that are otherwise inaccessible. Aerial searches also allow a large area to be surveyed more thoroughly than is possible via ground-based searches. Aerial surveys also eliminate the time necessary to obtain permission to access private lands or other limited access areas.

Goals and Objectives:
The goal of this project is to maintain monitoring continuity of sage-grouse leks in Utah, and to inventory sage-grouse habitat in the state to expand the lek database and mapping record.

The Utah Greater Sage-grouse Management Plan 2009 states as an objective with related strategies, which is directly applicable to this work:

Objective A-1: Monitor, protect, and maintain current population numbers.
A-1.1 Population Monitoring

A. Lek Surveys.
   1. Annual lek surveys will form the base metric to determine and assess both annual and long term population status and trend.
   2. Strive to survey all known, occupied and active, leks annually utilizing standard UDWR protocol.
   3. Conduct planned and systematic surveys and searches for new and unidentified leks in all potential habitats. Document, map, and file all search areas with GPS tracks.

Methods:

Greater Sage-grouse Lek Counts:

Greater sage-grouse lek counts are conducted in accordance with the protocol outlined in the 2009 Management Plan for Greater Sage-grouse in Utah. The methods specify that a minimum of three counts at approximate weekly intervals be conducted at each known lek between March 20 and May 7. First counts are conducted in March or early April, depending on conditions to capture maximum male attendance which generally occurs mid-April. Counts are conducted from ½ hour before sunrise up to 1 ½ hours after sunrise, at a site sage-grouse are counted from a vehicle or on foot at sufficient distance to not disturb lekking activity. At each visit the lek is counted a minimum of three times in succession using binoculars or a spotting scope. For each count, the time and number of male, female and unknown sex are recorded. Additional data on weather conditions and count location is recorded for each visit. Data is recorded digitally using an ArcGIS Survey123 app on a smart phone or tablet. See the 2009 Management Plan for Greater Sage-grouse in Utah for detailed protocol.

At the close of the lek counting season, data is compiled at the DWR state office where the counts are incorporated into the long-term sage-grouse database.

Undetermined leks have had displaying males observed, but they were either discovered this year, seen in previous years without males being documented in subsequent years, or had only one male observed. Undetermined leks are included in summary statistics.

The 2019 Utah Conservation Plan for Greater Sage-grouse in Utah specifies that population areas are evaluated using the slope of a linear regression line fitted to the most recent 20 years of data. The slope of the regression line represents the number of male sage-grouse added or lost from counts per year over the 20 year period. Results in this report are also presented as an annual percent population change over the 20 year evaluation period. Percent change is calculated as the slope of the regression line divided by the average number of male sage-grouse counted over the same period, multiplied by 100.

Fixed Wing Infrared Lek Search:

Flight areas are prioritized based on known populations, past flight paths, state and regional priorities, data needs for state sage-grouse conservation efforts and flight cost.

Transects were flown by Owyhee Air Research using a cryogenically cooled thermal imager mounted in stabilized gimbal mounts on fixed wing aircraft. Flights are conducted during morning periods from ½ hours before sunrise to 1 ½ hours past sunrise with weather conditions as specified in the Utah Lek Count Protocol. Polygons of the search area was provided to Owyhee Air Research who developes the flight plan and aircraft path within the specified polygon. Transects are flown at approximately 450 meters above ground level with and camera angle set to a predetermined tilt and zoom allowing for an approximately 500 meters swath of video coverage per pass. The pilot is responsible for flying pre-determined transects with a separate thermography specialist responsible for analyzing the video feed and operating the camera. Once detected along the transect, the aircraft orbits the detected grouse to view the potential lek from all angles, identify grouse to species, count number of birds, identify sex, and record the lek location. Flight data is entered into an excel spreadsheet and probable leks added to the internal DWR sage-grouse databases.

Results: Greater Sage-grouse Lek Counts

In Utah's Sage-grouse Management Areas, 379 greater sage-grouse leks were visited and 205 of those leks had at least one male counted. Across all leks counted within SGMAs there was a high count of 2913 males, for an average of 14.2 males per lek.

Statewide a total of 413 greater sage-grouse leks were visited. Of the leks visited, 225 had at least one male counted. Across all counted leks where sage-grouse were detected there was a high count of 3101 males, for an average of 13.8 males per lek.

Within SGMAs, 16 leks counted were classified as undetermined. These undetermined leks contributed 96 males to the total count. There was one male sage-grouse counted on one undetermined lek outside of SGMAs.

Overall counts on SGMAs were up 36.8% from 2021. This changes the overall trend of declining population totals since the last peak in 2015. Increases were seen in 9 of the 11 SGMAs in Utah. The Hamlin Valley and Sheeprock Mountains SGMAs had lower high male counts than 2021 counts.

The peaks and lows continue to decrease with each cycle of the populations – the low years are lower and the high years do not reach the previous peaks. Previous low years in 2002, 2011 and 2019 had 3,034, 2,710 and 2,094 males counted respectively. At the same time, Utah increased counting effort visiting 192 leks in 2002, 266 leks in 2011, 305 in 2019, and 379 in 2022. Effort is increasing each year; with accompanying decrease in males per lek and total males; with equal effort across years we would likely see a steeper decline in long-term sage-grouse counts (Figure 2).

Individual SGMA populations are more variable than the statewide aggregation of counts (Table 1). Population trajectories for individual SGMAs are described below.

Figure 1. Total high count for all Sage-grouse Management Areas within Utah over the past 20 years and males counted per lek for leks with males present. The trend line is fitted to total males counted and represents an overall annual change across two population cycles.

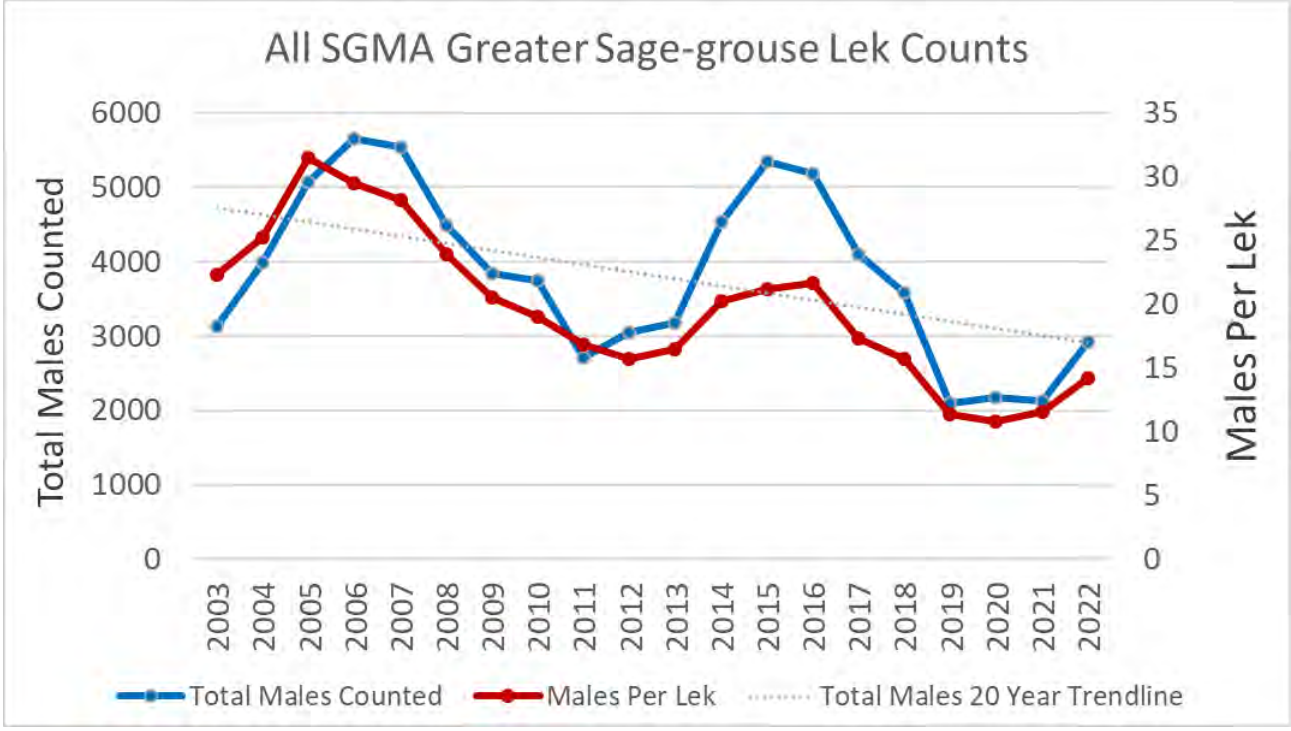


Figure 2. Number of leks visited each lekking season in Utah relative to the total number of males counted. More leks are being counted to maintain the same overall total male counts.

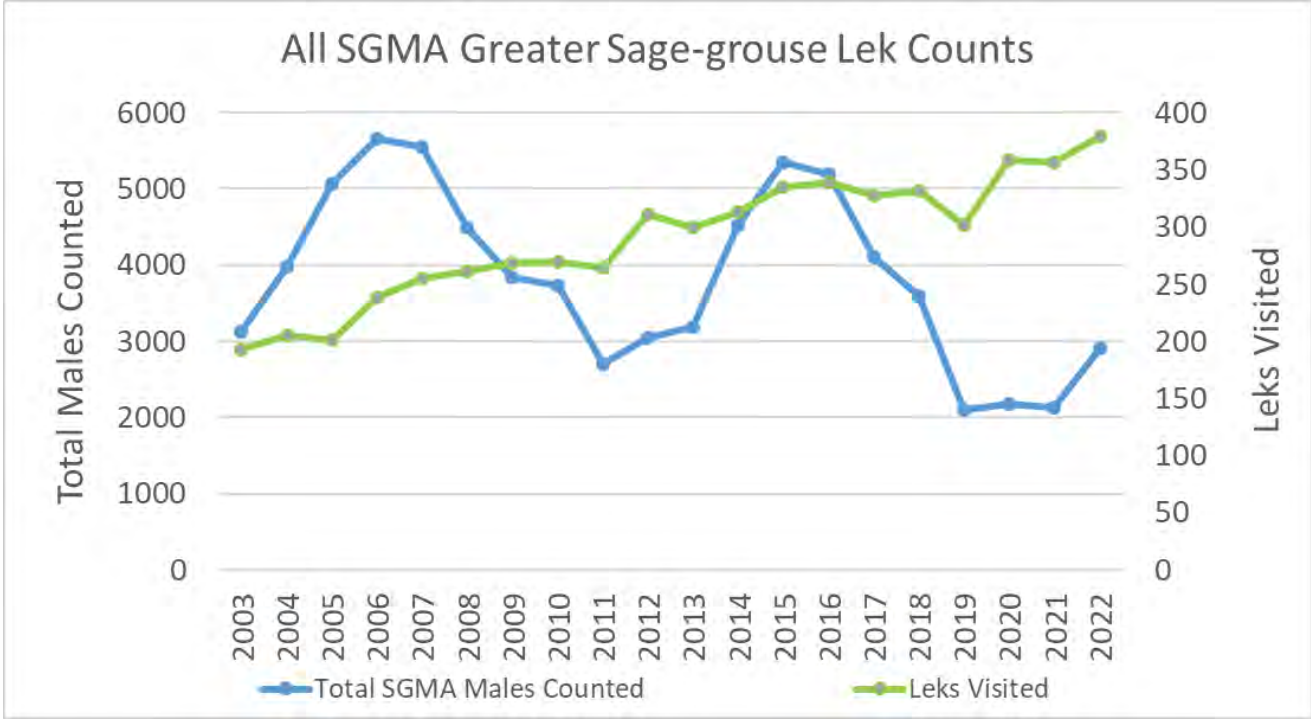


Table 1. Summary data for male greater sage-grouse high counts within each of Utah's Sage-grouse Management Areas and statewide for the 2022 lek counting season. See methods for definitions of fields.

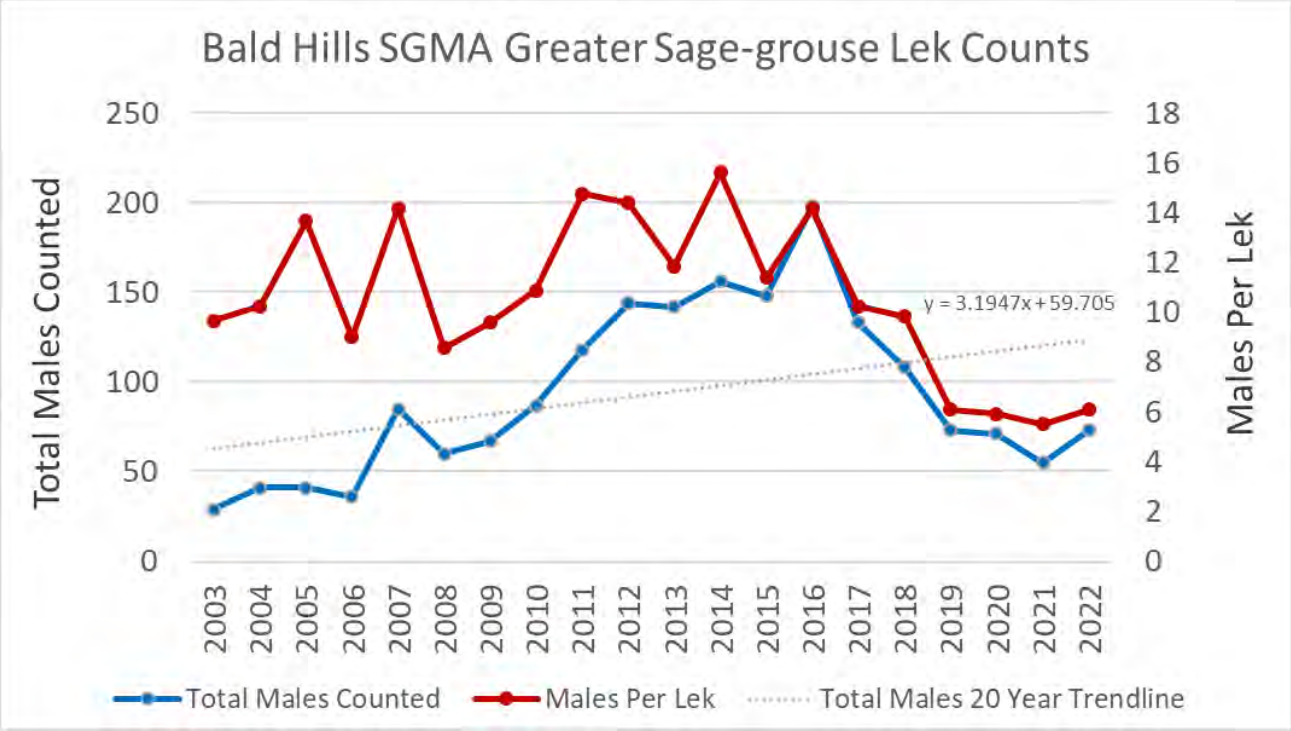
	Leks with Males	Total Leks Visited	Total Males Counted	Average Males per Lek (leks > 0)	Percent Change 2021 to 2022	20 Year Regression Slope (male/year)	20 Year Average Count	% Change Per Year over 20 Years	Undetermined Leks Found	Percent of UT Population
Bald Hills	12	17	73	6.1	32.7	3.2	93.3	3.4	0	2.4
Box Elder	37	91	499	13.5	40.2	-31.6	678.6	-4.7	2	16.1
Carbon	8	15	122	15.3	19.6	2.1	132.7	1.6	0	3.9
Hamlin Valley	6	10	43	7.2	-20.4	-2.3	79.3	-2.9	0	1.4
Ibapah	2	4	41	20.5	13.9	-0.1	39.7	-0.2	0	1.3
Panguitch	14	27	196	14.0	100.0	-3.5	300.7	-1.2	1	6.3
Parker Mountain-Emery	41	76	476	11.6	44.2	-19.0	802.2	-2.4	3	15.3
Rich-Morgan-Summit	36	51	758	21.1	22.3	-44.5	977.2	-4.6	0	24.4
Sheeprock Mountains	5	10	40	8.0	-13.0	-4.6	64.3	-7.2	0	1.3
Strawberry Valley	7	10	146	20.9	73.8	2.1	98.5	2.1	0	4.7
Uintah	37	68	519	14.0	48.7	2.4	556.8	0.4	0	16.7
Non-SGMA	20	34	188	9.4	82.5	-1.1	264.1	-0.4	0	6.1
All SGMA	205	379	2913	13.7	**36.8**	-95.7	3823.1	-2.5	6	93.9
All Leks	225	413	3101	14.2	**38.9**	-96.8	4087.2	-2.4	6	100.0

Bald Hills

In the Bald Hills SGMA 17 leks were visited, of those male sage-grouse were detected on 12. A total of 73 male sage-grouse were counted, for an average of 6.1 males per lek. From 2021 to 2022 the Bald Hills SGMA counts increased by 33%. This annual increase was a welcome reversal of the consistent downward trend from 2016 to 2021.

Overall, counts in the Bald Hills SMGA have trended up over the past 20 years when fitted to a 20 year trend line, at an average rate of 3.4% per year. However, the growth rate indicated over 20 years is not representative of current declines and population levels. No new leks were found.

Figure 3. Average males per lek for all leks with at least one male counted and total number of males counted within the Bald Hills Sage-grouse Management Area. Trend line represents a linear regression for total males counted from 2003 to 2022.

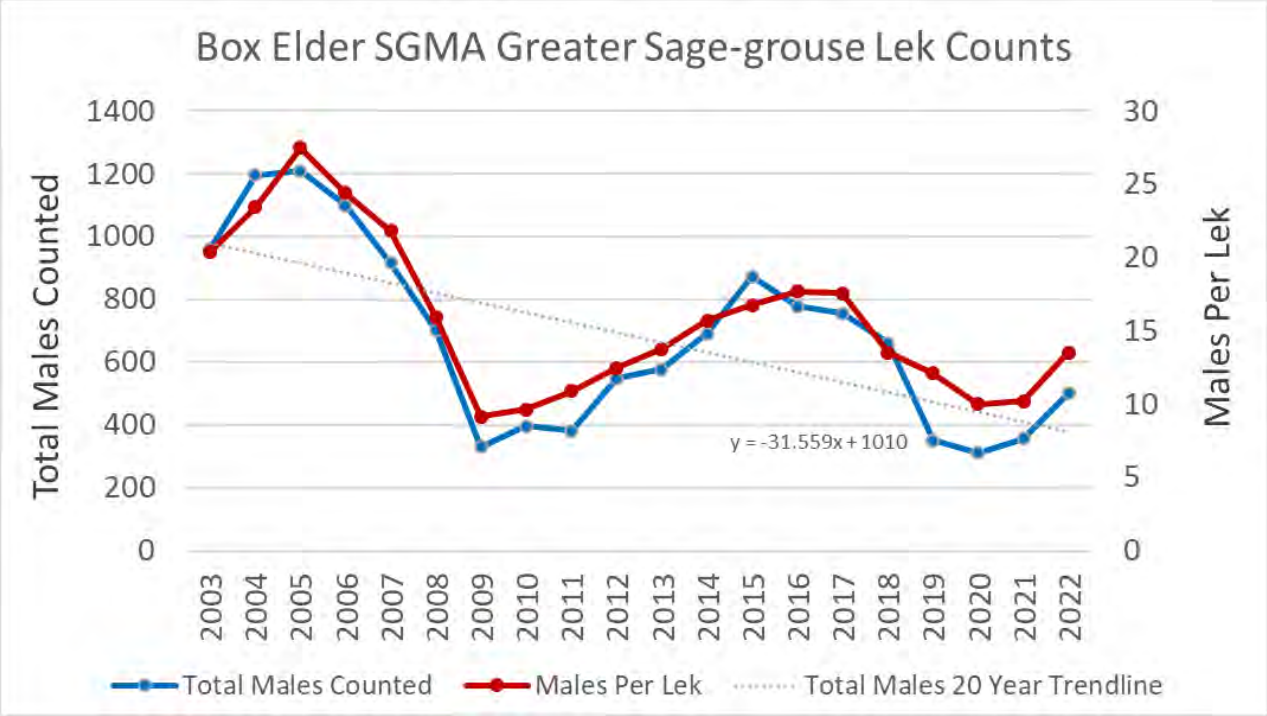


Box Elder

In the Box Elder SGMA 91 leks were visited, of those male sage-grouse were detected on 37. A total of 499 male sage-grouse were counted, for an average of 13.5 males per lek. From 2021 to 2022 the Box Elder SGMA counts increased by 40.2%. This annual increase fits within expected population cycles and if past patterns hold, counts are likely to continue increasing next year. Counts have trended down over the past 20 years, decreasing at an average annual rate of 4.7% per year based on a 20 year regression.

There has been significant expansion of conifer cover into sagebrush habitat within the SGMA, however large areas of habitat have been restored in the SGMA in recent years. As restoration projects are completed in the area we hope to see an increase in population and a shift to a positive long term trend. Two potential new leks were found.

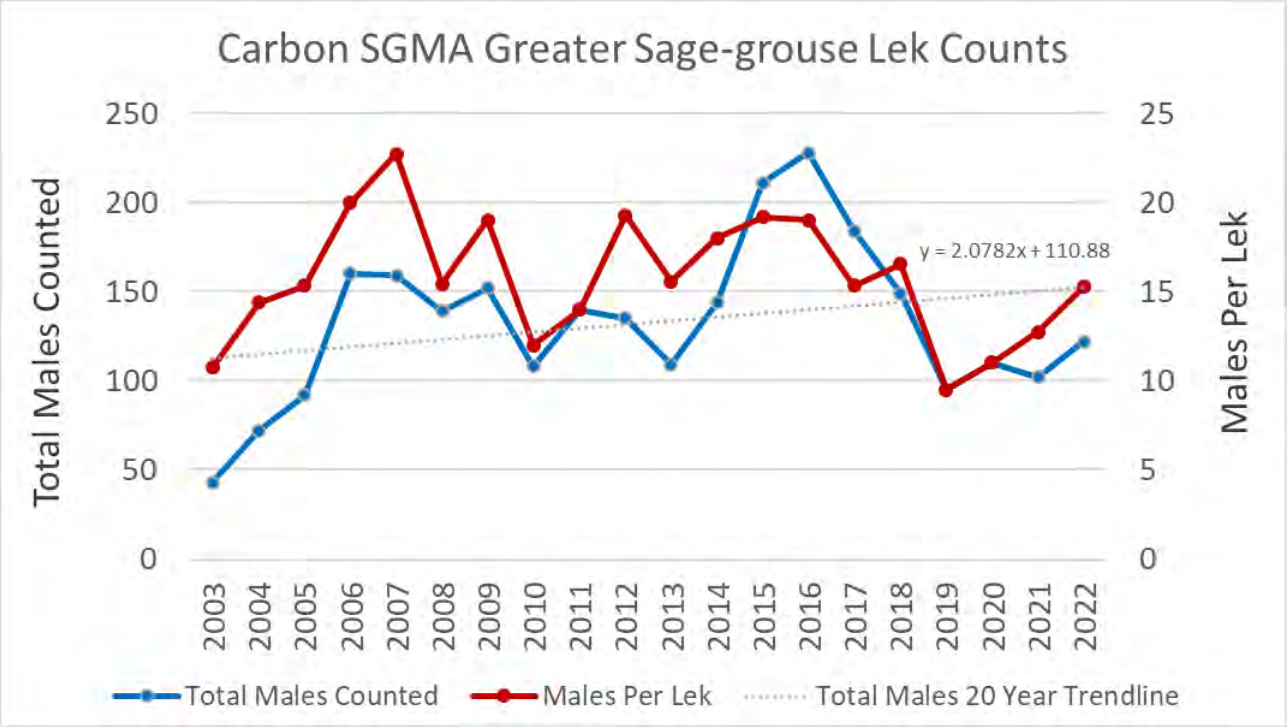
Figure 4. Average males per lek for all leks with at least one male counted and total number of males counted within the Box Elder Sage-grouse Management Area. Trend line represents a linear regression for total males counted from 2003 to 2022.



Carbon

In the Carbon SGMA 15 leks were visited, of those male sage-grouse were detected on 8. A total of 122 male sage-grouse were counted, for an average of 15.3 males per lek. From 2021 to 2022 the Carbon SGMA counts increased by 19.6%. This annual change fits within expected variation within normal population cycles. Counts in the SMGA have trended up over the past 20 years, increasing at an average annual rate of 1.6% per year. No new leks were found.

Figure 5. Average males per lek for all leks with at least one male counted and total number of males counted within the Carbon Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2003 to 2022.

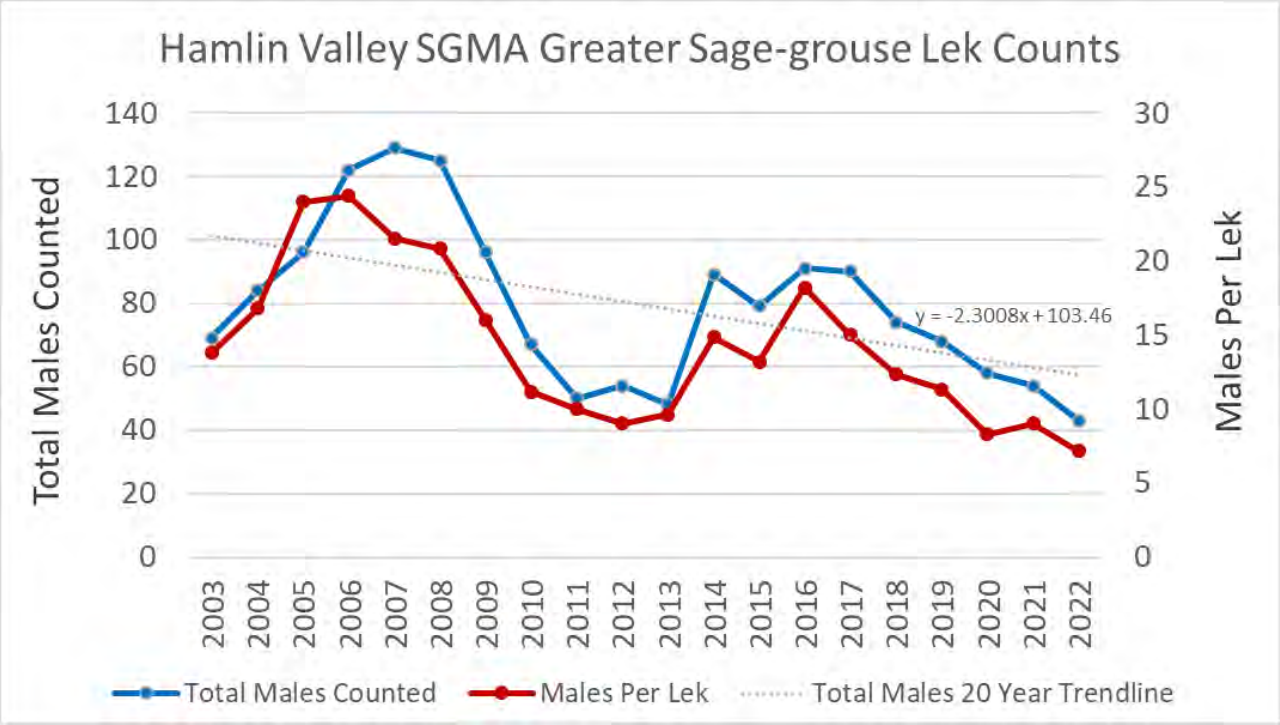


Hamlin Valley

In the Hamlin Valley SGMA 10 leks were visited, of those male sage-grouse were detected on six. A total of 43 male sage-grouse were counted, for an average of 7.2 males per lek. From 2021 to 2022 the Hamlin Valley SGMA counts decreased by 20.4%. This annual decrease does not follow expected population cycles and may be linked to extreme drought reducing survival and reproductive success. Counts in the SGMA have trended down over the past 20 years, decreasing at an average annual rate of 2.9% per year, or an average loss of 2.3 males per year. No new leks were found.

The Hamlin Valley population area met criteria for soft and hard federal adaptive management triggers (Table 2). Soft triggers due to average males per lek decreasing for six consecutive years on federal trend leks and a negative population growth rate (lambda) in four consecutive years for all PHMA leks. Hard triggers were due a lambda of less than one in 6 consecutive years for all PHMA leks and a lambda of less than one in 8 of 10 years for all PHMA leks. Contact the BLM or consult the BLM's causal factor analysis for more information on federal management plan triggers.

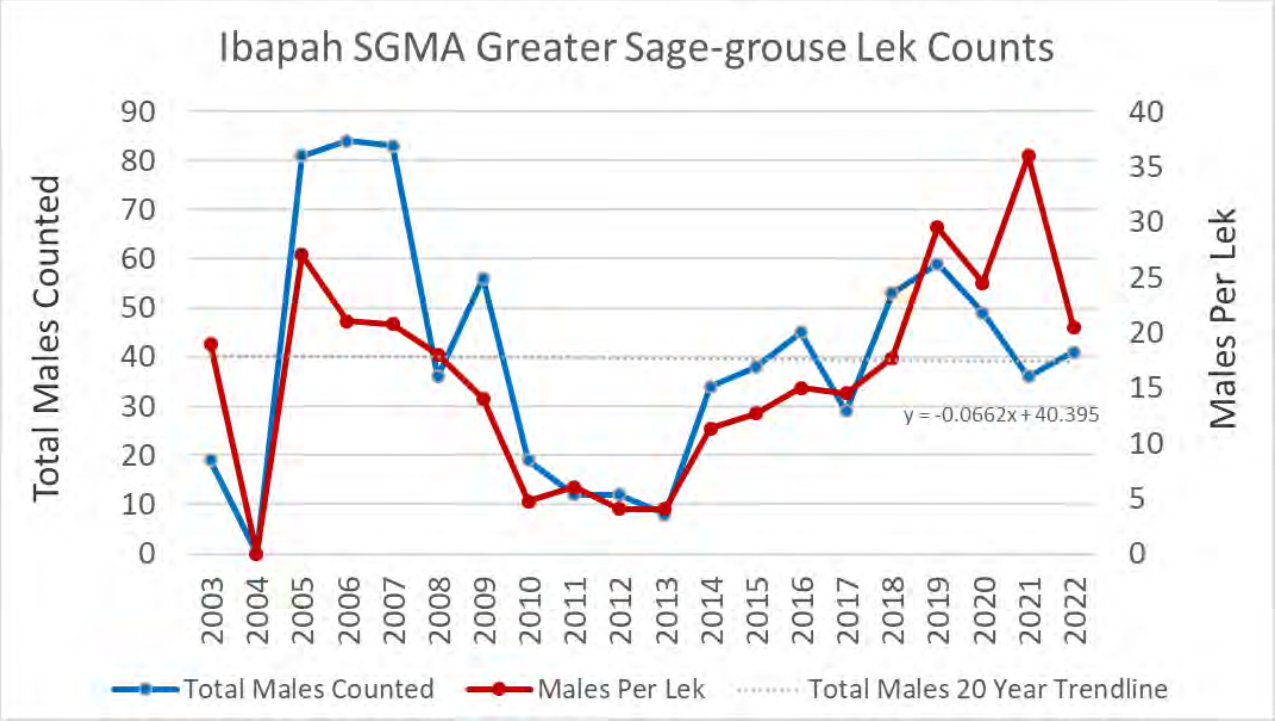
Figure 6. Average males per lek for all leks with at least one male counted and total number of males counted within the Hamlin Valley Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2003 to 2022.



Ibapah

In the Ibapah SGMA four leks were visited, of those male sage-grouse were detected on two. A total of 41 male sage-grouse were counted, for an average of 20.5 males per lek. From 2021 to 2022 the Ibapah SGMA counts increased by 13.9%. Annual counts in this area are variable due to limited number of leks in the area, and due to restrictions on entering Goshute tribal land related to the SARS-CoV-2/Covid19 pandemic, one occupied lek was not visited in 2021 making annual changes more dramatic than they may otherwise appear. Counts were essentially flat over 20 years with an average annual decrease of 0.2% per year. No new leks were found.

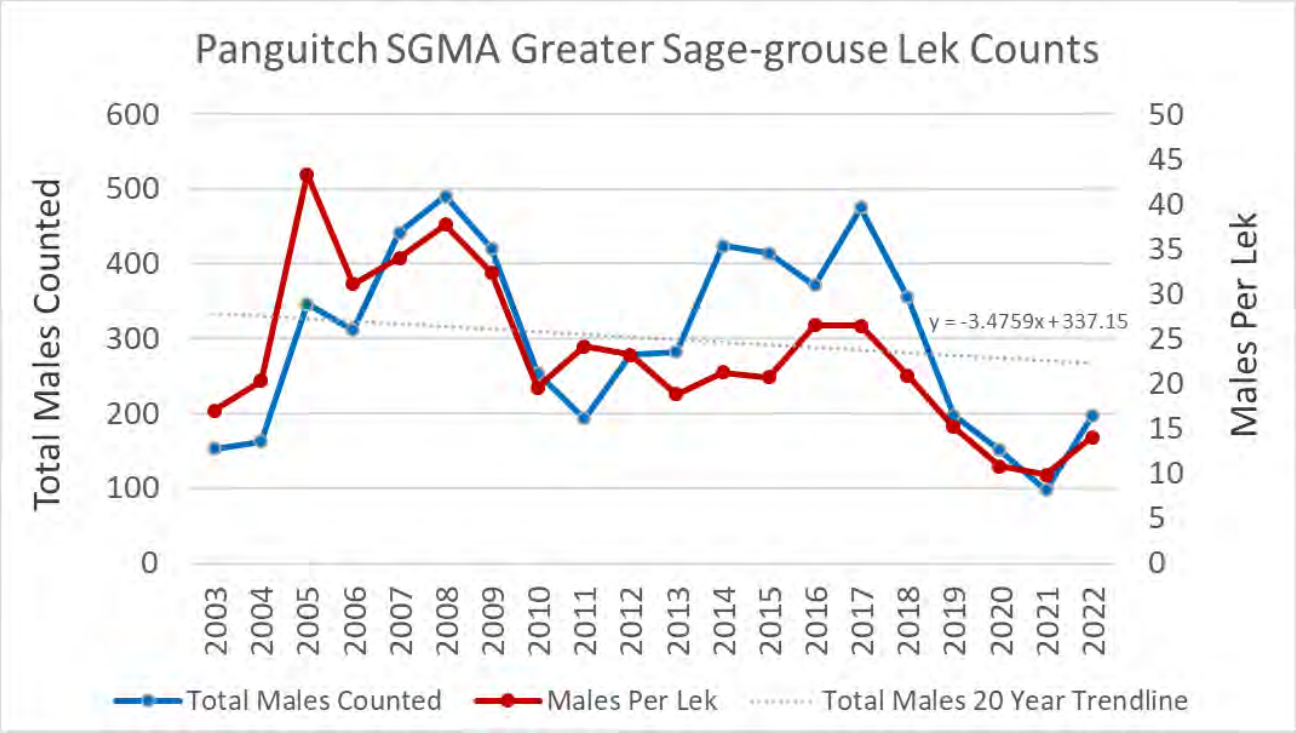
Figure 7. Average males per lek for all leks with at least one male counted and total number of males counted within the Ibapah Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2003 to 2022.



Panguitch

In the Panguitch SGMA 27 leks were visited, of those male sage-grouse were detected on 14. A total of 196 male sage-grouse were counted, for an average of 14.0 males per lek. From 2021 to 2022 the Panguitch SGMA counts increased by 100.0%. This annual increase roughly fits with what may be expected following historic population cycle lows. However, despite the significant year over year increase, the population is only back to levels similar to the previous population low in 2011. Counts declined on average over the past 20 years, decreasing at an average annual rate of 1.2% per year. One potential new lek was found.

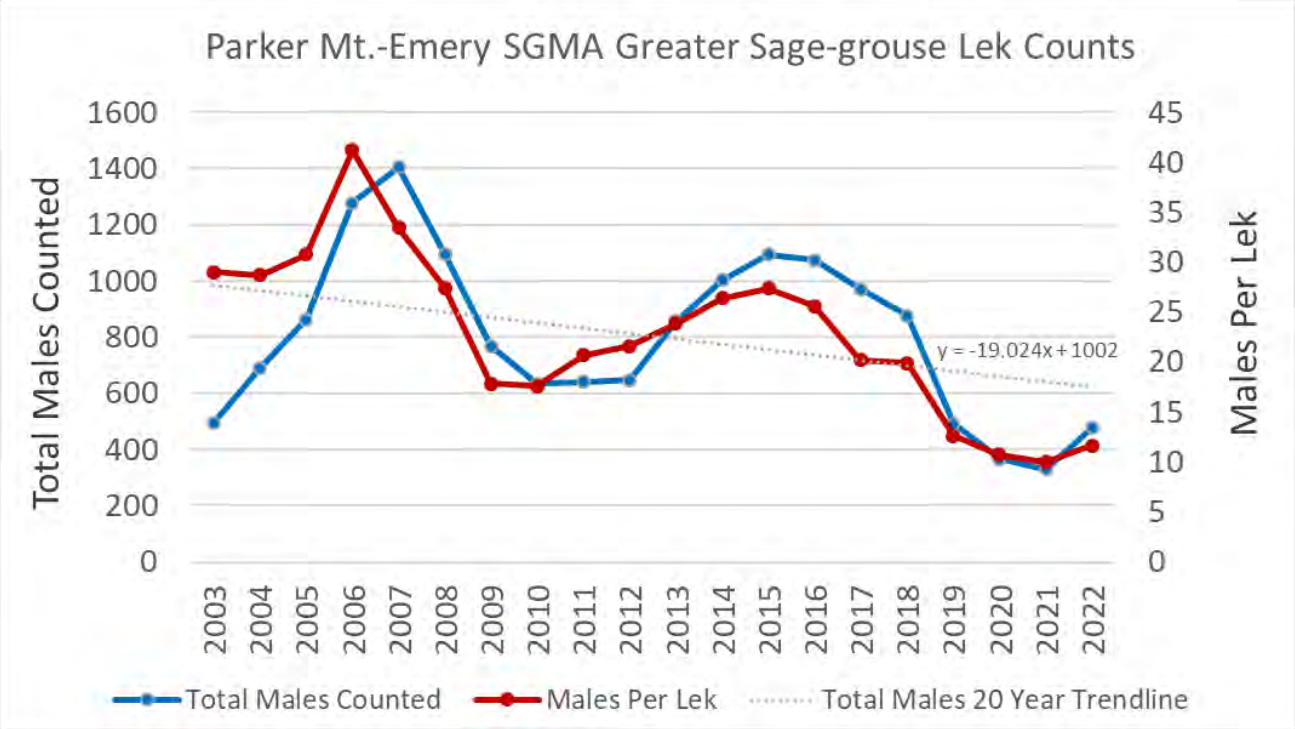
Figure 8. Average males per lek for all leks with at least one male counted and total number of males counted within the Panguitch Sage-grouse Management Area. Trend line represents a linear regression for total male counts from 2001 to 2020.



Parker Mountain-Emery

In the Parker Mountain-Emery SGMA 76 leks were visited, of those male sage-grouse were detected on 41. A total of 476 male sage-grouse were counted, for an average of 11.6 males per lek. From 2021 to 2022 the Parker Mountain-Emery SGMA counts increased by 44.2%. This annual increase following historic low counts that may be linked to extreme drought reducing survival and reproductive success. Males per lek is roughly one-third of the males per lek at a similar low count in 2003. In 2003 overall totals were similar, however only 27 leks were visited relative to 76 leks that were visited in 2021 to count a similar number of males. The SGMA trended down over the past 20 years, decreasing at an average rate of 2.4% per year, or an average loss of 19 males per year from the population. Three potential new leks were found.

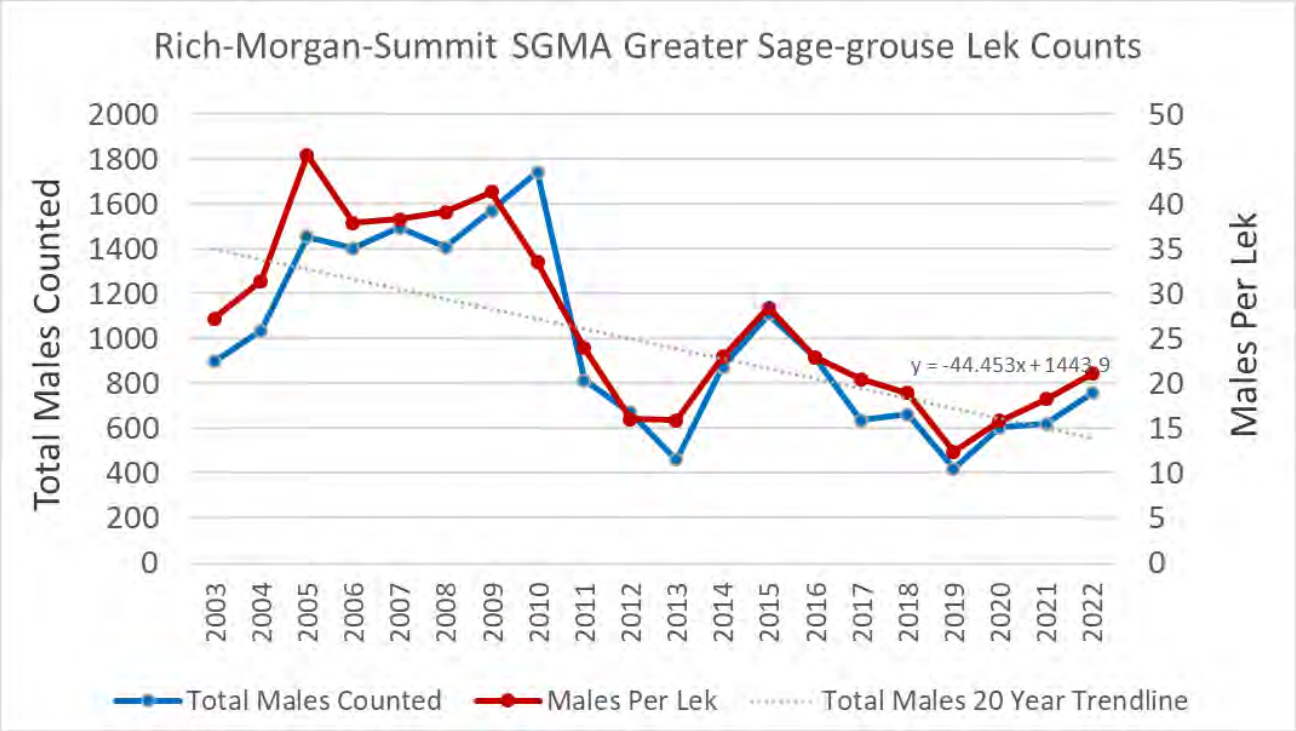
Figure 9. Average males per lek for all leks with at least one male counted and total number of males counted within the Parker Mountain-Emery Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2003 to 2022.



Rich-Morgan-Summit

In the Rich-Morgan-Summit SGMA 51 leks were visited, of those male sage-grouse were detected on 36. A total of 758 male sage-grouse were counted, for an average of 21.1 males per lek. From 2021 to 2022 the Rich-Morgan-Summit SGMA counts increased by 22.3%. This annual increase fits broadly within expected population cycles. However it is notable that population lows continue on a downward trend and population peaks are lower than in the past. Counts were down over the past 20 years, decreasing at an average annual rate of 4.6% or a loss of 44 males per year. No new leks were found.

Figure 10. Average males per lek for all leks with at least one male counted and total number of males counted within the Rich-Morgan-Summit Sage-grouse Management Area in 2020. Trend line represents a linear regression for total males counts from 2003 to 2022.

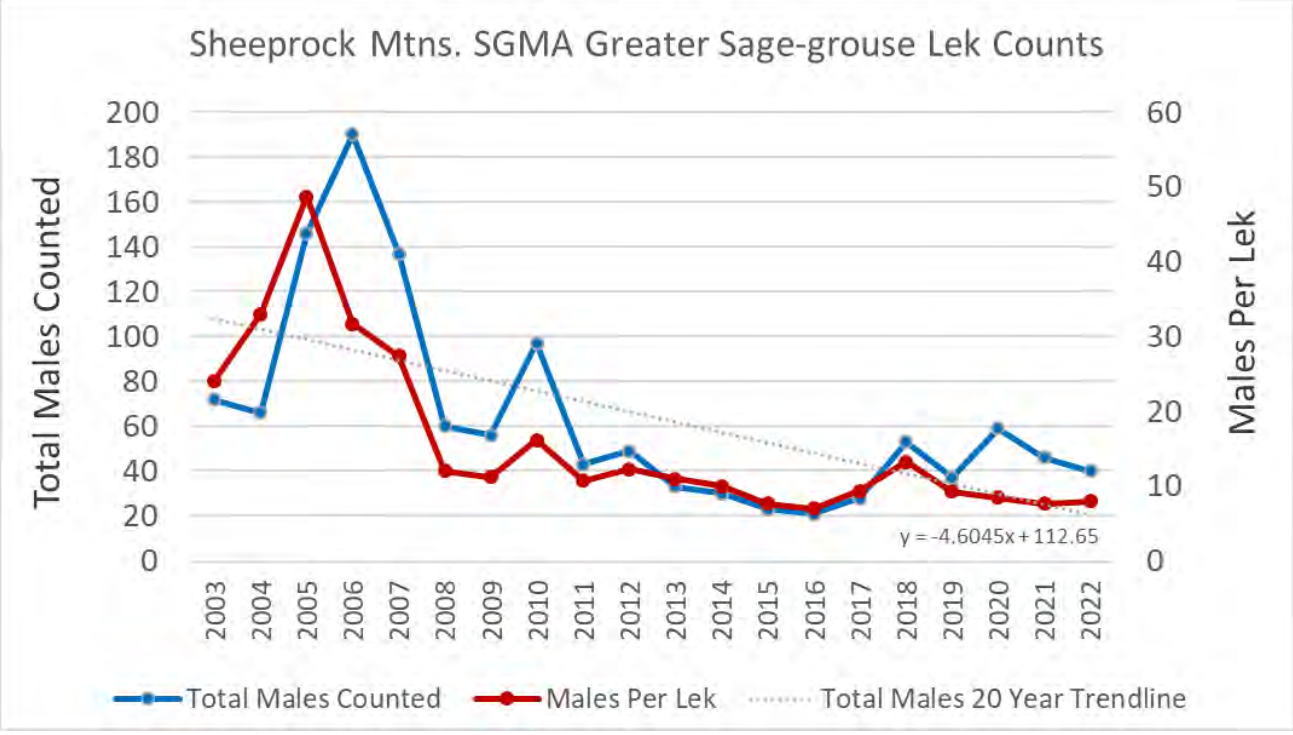


Sheeprock Mountains

The Sheeprock Mountains SGMA has had long term declines in population and counts are down over the past 20 years, decreasing at an average annual rate of 7.2% per year. The SGMA has been the focus of intense conservation effort, with habitat restoration, predator control and population augmentation. In 2016, 2017, 2018, and 2019 106 female and 40 male sage-grouse, for a total of 146, were released on active leks in the SGMA.

In the Sheeprock Mountains SGMA 10 leks were visited, of those male sage-grouse were detected on five. A total of 40 male sage-grouse were counted, for an average of 8.0 males per lek. From 2021 to 2022 the Sheeprock Mountains SGMA counts decreased by 13%. The overall increase in years after releases is partially attributed to direct additions of males to leks, however the increase is larger than the number of males released indicating there may be some related increase in production within the SGMA. Declines in population are concerning, with drought conditions and other stressors likely contributing. No new leks were found. However, a lek found in 2021 was confirmed.

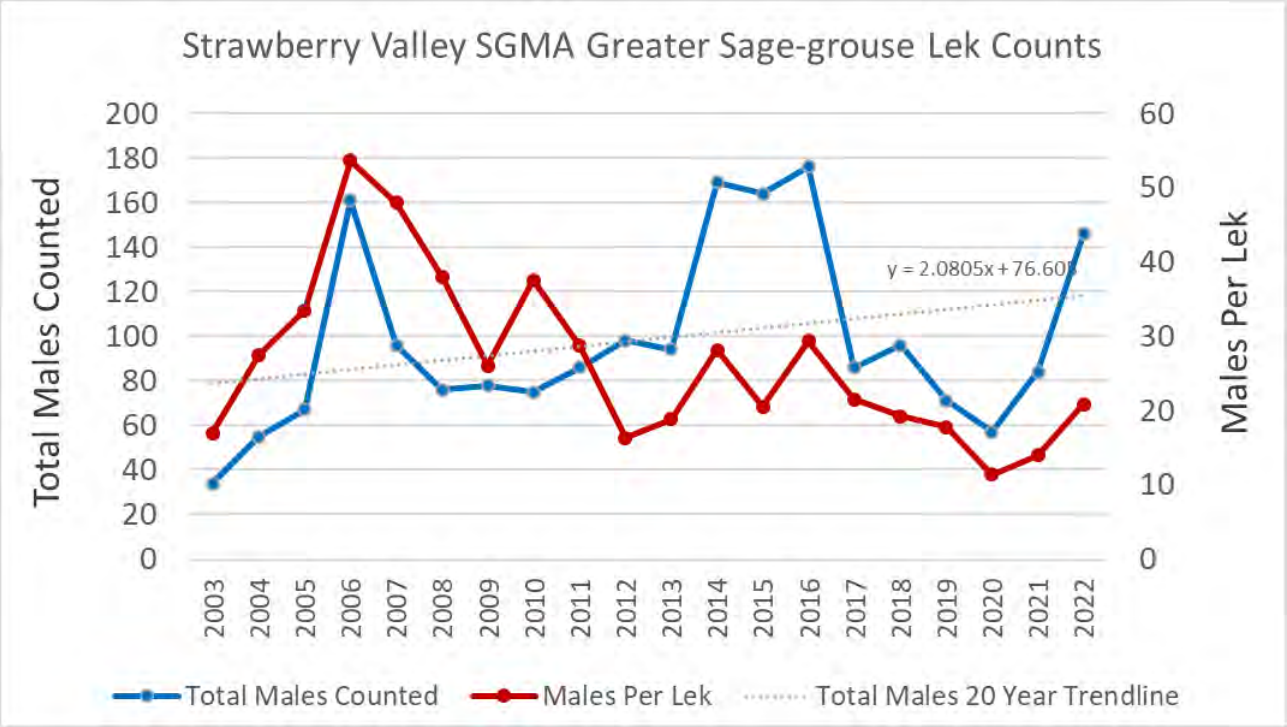
Figure 11. Average males per lek for all leks with at least one male counted and total number of males counted within the Sheeprock Mountains Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2003 to 2022.



Strawberry Valley

In the Strawberry Valley SGMA 10 leks were visited, of those male sage-grouse were detected on seven. A total of 146 male sage-grouse were counted, for an average of 20.9 males per lek. From 2021 to 2022 the Strawberry Valley SGMA counts increased by 73.8%. This annual increase is encouraging considering population trends in other areas of the state. Strawberry is a higher elevation area that receives more precipitation, so may be less impacted by ongoing drought. Generally, counts were up over the past 20 years, increasing at an average annual rate of 2.1% per year. No new leks were found.

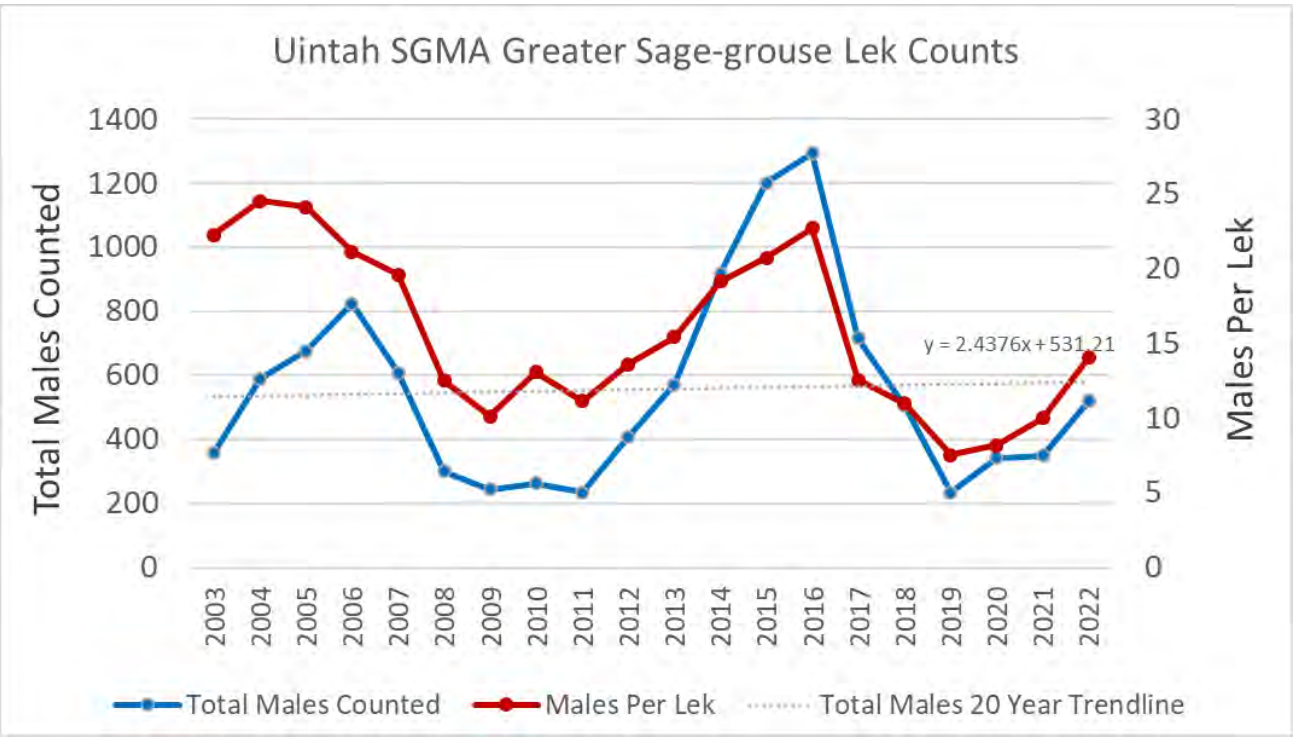
Figure 12. Average males per lek for all leks with at least one male counted and total number of males counted within the Strawberry Valley Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2003 to 2022.



Uintah

In the Uintah SGMA 68 leks were visited, of those male sage-grouse were detected on 37. A total of 519 male sage-grouse were counted, for an average of 14.0 males per lek. From 2021 to 2022 the Uintah SGMA counts increased by 48.7%. Counts were up over the past 20 years, increasing at an annual rate of 0.4% per year. No new leks were found.

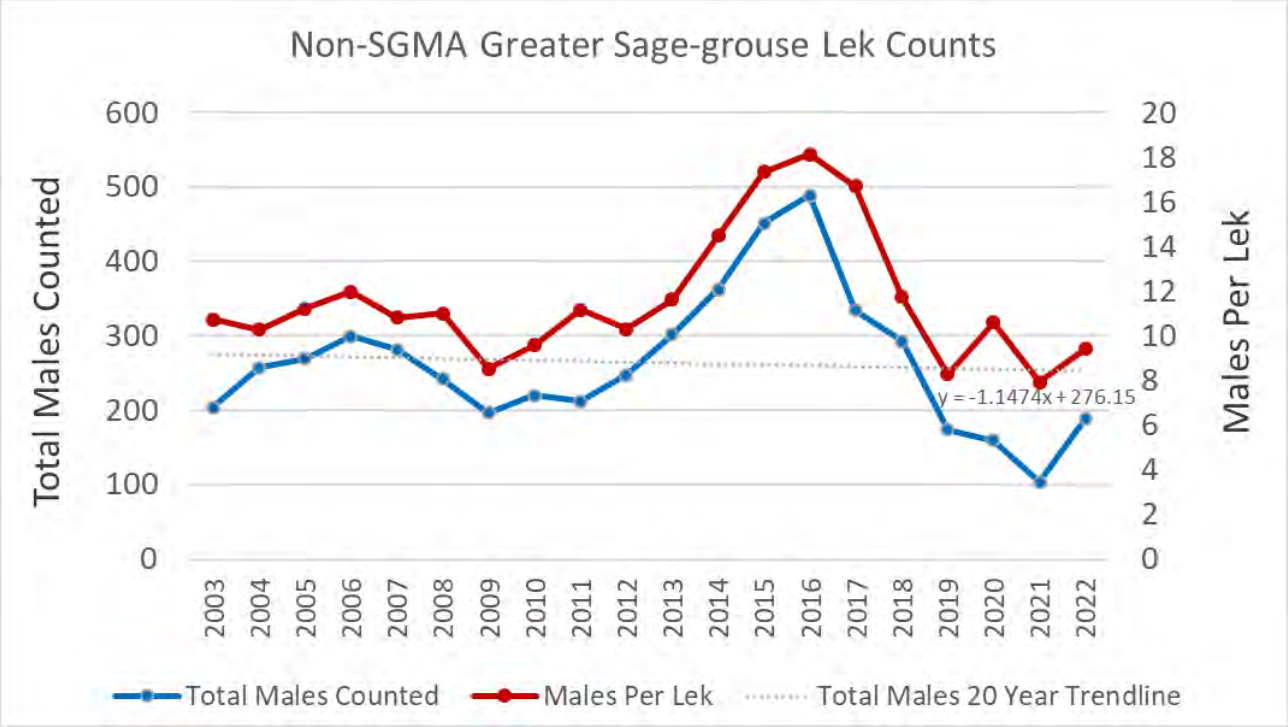
Figure 13. Average males per lek for all leks with at least one male counted and total number of males counted within the Uintah Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2003 to 2022.



Non-SGMA

Outside of designated SGMAs 34 leks were visited, of those male sage-grouse were detected on 20. A total of 188 male sage-grouse were counted, for an average of 9.4 males per lek. From 2021 to 2022 the Non-SGMA counts increased by 82.5%. Counts were down over the past 20 years, decreasing at an average annual rate of 0.4% per year.

Figure 14. Average males per lek for all leks with at least one male counted and total number of males counted outside of Sage-grouse Management Areas. Trend line represents a linear regression for total males counts from 2003 to 2022.



Fixed Wing Infrared Lek Search

Fixed wing infrared lek searches were planned for the Dog Valley, Coyote Bench, East Bench and Skutumpah areas of the Panguitch SGMA. However, no flights were conducted due to a mechanical issue followed by a long delay in FAA certification.

BLM and USFS Adaptive Management Triggers

The Utah Bureau of Land Management and US Forest Service changes management actions based on a set of adaptive management triggers developed in conjunction with the Utah Division of Wildlife Resources. These adaptive management triggers are based on metrics of males per lek on *trend leks* (MPL) in each federal population area and overall population change (lambda) for all leks within federal Priority Habitat Management Area in each federal population area. It is important to note that the BLM population areas are similar to DWR Sage-grouse Management Areas; however there are differences in area and leks included. The federal plans containing the following adaptive management triggers are included here for information purposes. The State of Utah continues to manage greater sage-grouse based on the Utah 2019 Conservation Plan for Greater Sage-grouse and 2009 Greater Sage-grouse Management Plan.

Triggers are defined as:

<u>Soft Triggers</u>

1a) 4 consecutive years of 10% or greater annual decline in average males per lek in each year, based on "trend leks"

OR

1b) 6 consecutive years of declining average males per lek in each year, based on "trend leks"

OR

1c) 40% or greater decline in average males per lek in any single year, based on "trend leks" for the 4 years covered by lambda values in soft trigger question 2

OR

1d) 50% or greater decline in average males per lek in a 4 consecutive year period, based on "trend leks"

AND

2) Lambda of less than 1 in 4 consecutive years, based on all leks in the PHMA.

<u>Hard Triggers</u>

a) 4 consecutive years of 20% or greater annual decline in average males per lek in each year, based on "trend leks"

OR

b) Average males per lek, based on trend leks, drops 75% below the 10-year rolling average males per lek in any single year (not a 75% decrease, but a decline under 25% of the 10-year rolling average)

OR

c) Lambda of less than 1 in 6 consecutive years, based on all leks within the PHMA

OR

d) Lambda of less than 1 in 8 years of a 10 year window, based on all leks within the PHMA

Table 2. BLM population areas and trigger status for 2022 lek counts. Red indicates trigger. Blue indicates no trigger. MPL is average males per lek for trend leks within a population area. Lambda is calculated on all leks in PHMA within each population area.

Federal Population Area	Soft Trigger	Hard Trigger	Note
Bald Hills	No	No	Trigger criteria not met.
Box Elder	No	No	Trigger criteria not met.
Carbon	No	No	Trigger criteria not met.
Emery	No	No	Trigger criteria not met.
Hamlin Valley	Yes	Yes	Soft Trigger: Six years of declining MPL (S.1.b) combined with four years of lambda less than 1 for all leks (S2). Hard Trigger: Lambda of less than on in 6 consecutive years (H.c); Lambda of less than one in 8 of 10 years (H.d).
Ibapah	No	No	Trigger criteria not met.
Panguitch	No	No	Trigger criteria not met.
Parker	No	No	Trigger criteria not met.
Rich	No	No	Trigger criteria not met.
Sheeprock Mountains	No	No	Trigger criteria not met.
Strawberry Valley	No	No	Trigger criteria not met.
Uintah	No	No	Trigger criteria not met.

Figure 18: State of Utah Sage-grouse Management Areas relative to Federal Priority Habitat Management Areas and Federal Greater Sage-grouse Population Areas with federal trend leks and other leks.