

2021 Utah Greater Sage-grouse Lek Count Report

Lek Counts

Aerial Search

Adaptive Management Triggers



Utah Division of Wildlife Resources.
7 October 2021



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 down 2.2% from 2020 counts, with 2127 male sage-grouse counted on 184 leks within SGMAs. The decrease continues a downward trend from the last population peak in 2015. However, population changes are inconsistent across the state with four SGMAs showing increases in counts and seven showing decreases in counts. An additional 103 male sage-grouse were counted outside of SGMAs for total of 2230 male sage-grouse counted statewide. Statewide 387 leks were counted at least once with males being detected on 197 leks.

Systematic greater sage-grouse aerial lek searches are conducted annually to document new or previously unknown leks. Surveys are conducted by a contractor using infrared (IR) imaging from a fixed wing aircraft. Five mornings in 2021 were spent searching Rich-Morgan-Summit Sage-grouse Management Area (SGMA) and adjacent areas for sage-grouse leks using IR fixed wing surveys. Surveys were conducted in low density areas. Only previously known leks were detected, with no new leks found.

The Utah Bureau of Land Management and US Forest Service change management actions based on a set of adaptive management triggers developed and evaluated in conjunction with the Utah Division of Wildlife Resources. In 2021, lek counts tripped Hard Triggers in the Bald Hills, Box Elder, Panguitch, and Parker Federal Population Areas and a soft trigger in the Hamlin Valley Federal Population Area.

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 put into counting known leks and searching for unknown leks. To compensate for additional effort increasing raw counts, average males per lek is also calculated and provides an index of population change less impacted by counting effort.

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, then 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 Wildlife 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, there are many areas of the state that remain 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 2021 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 were 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 and they developed the flight plan and

aircraft paths 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, 357 greater sage-grouse leks were visited and 184 of those leks had at least one male counted. Across all leks counted within SGMAs there was a high count of 2127 males, for an average of 11.6 males per lek.

Statewide a total of 387 greater sage-grouse leks were visited. Of the leks visited, 197 had at least one male counted. Across all counted leks where sage-grouse were detected there was a high count of 2230 males, for an average of 11.3 males per lek.

Within SGMAs, 16 leks counted were classified as undetermined. These undetermined leks contributed 83 males to the total count. There were not any male sage-grouse counted on undetermined leks outside of SGMAs.

Overall counts on SGMAs were down 2.2% from 2020. This continues the overall trend of declining population totals since the last peak in 2015. Although populations increased slightly in 2020 over 2019, and 2021 counts are still slightly above 2019 if current patterns matched past cyclic behavior, Utah populations would have increased substantially this year.

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 357 in 2021. 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.

Individual SGMA populations are more variable than the statewide aggregation of counts (Table 1). Populations declined in seven SGMAs and increased in four SGMAs. 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.

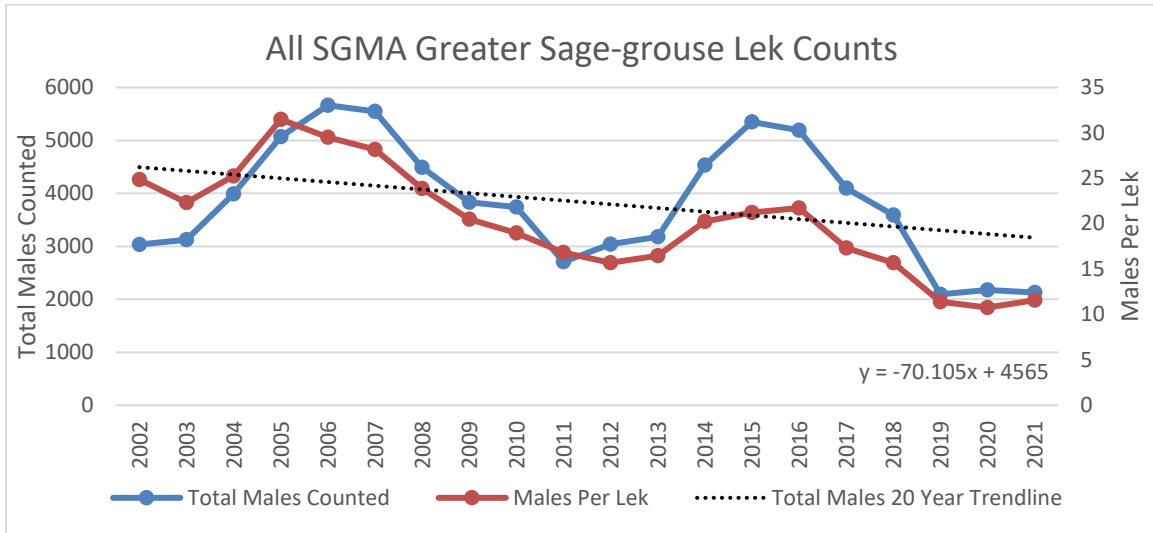
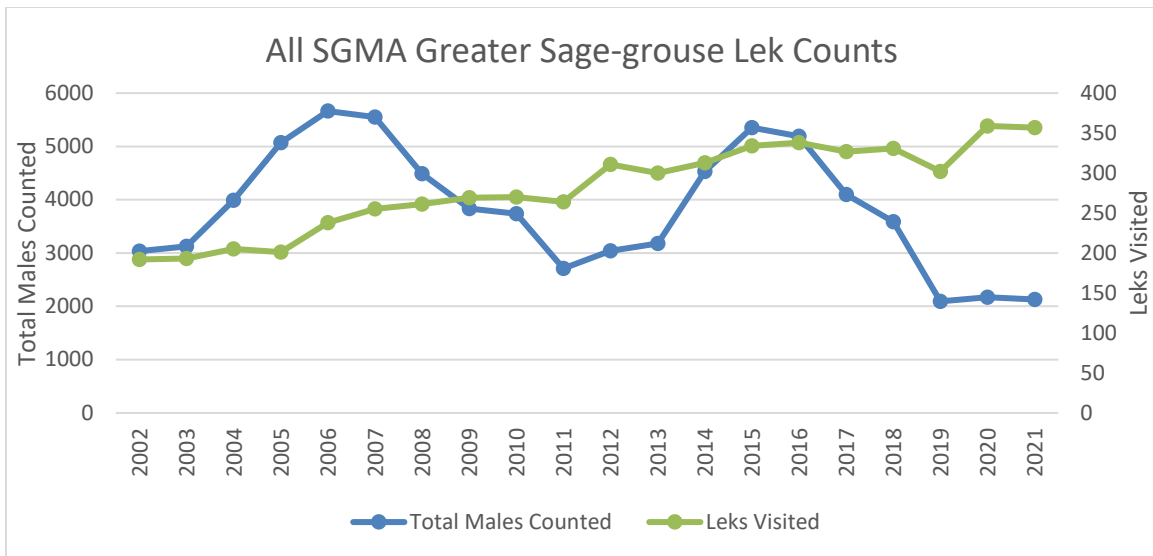


Figure 2. Number of leks visited each lekking season in Utah relative to the total number of males per lek. More leks are being counted to maintain the same overall total male counts.



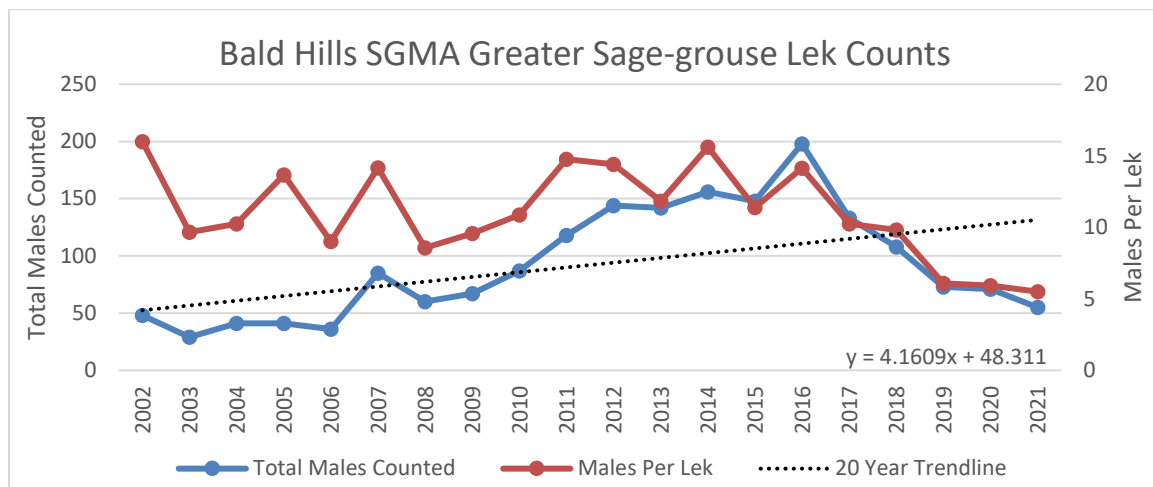
Bald Hills

In the Bald Hills SGMA 17 leks were visited, of those male sage-grouse were detected on 10. A total of 55 male sage-grouse were counted, for an average of 5.5 males per lek. From 2020 to 2021 the Bald Hills SGMA counts decreased by 22.5%. This annual decrease was not expected following historic population cycles and may be linked to extreme drought reducing survival and reproductive success. Repeated wildfires over the last 15 years and increasing predator (raven) populations are also likely contributing to current population lows.

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 4.6% per year. However, the growth rate indicated over 20 years is not representative of current declines and population levels. One potential new lek was found.

The Bald Hills population area met criteria for both soft and two hard federal adaptive management triggers (Table 2). Hard triggers resulted from the population going below 25% of the 10 year rolling average and a negative population growth rate (λ) in eight of 10 years. See BLM causal factor analysis for more information.

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 2002 to 2021.

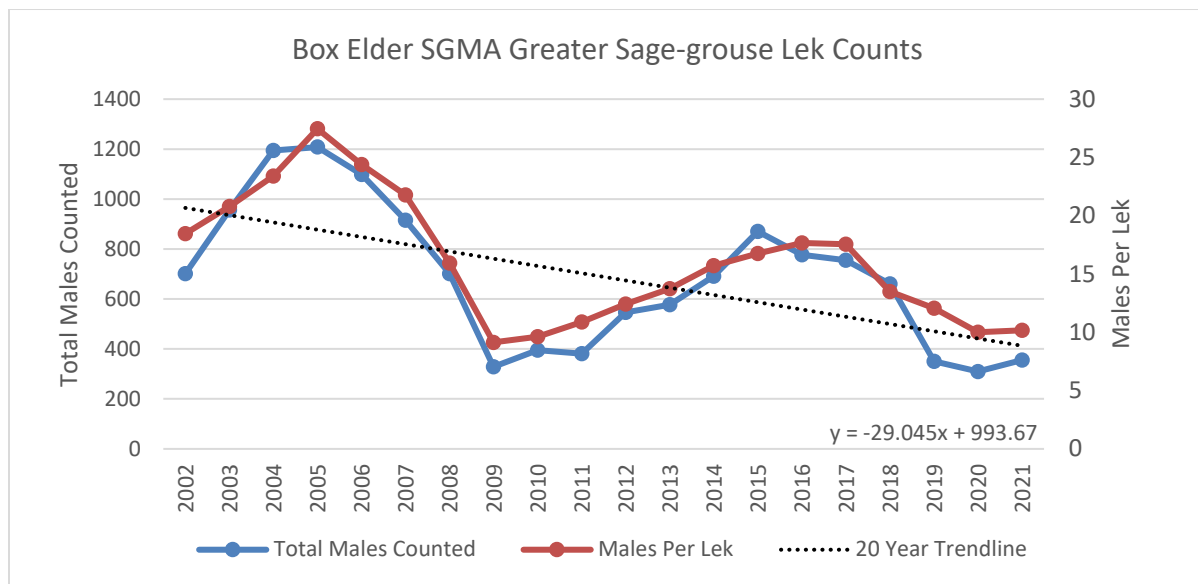


Box Elder

In the Box Elder SGMA 79 leks were visited, of those male sage-grouse were detected on 35. A total of 356 male sage-grouse were counted, for an average of 10.2 males per lek. From 2020 to 2021 the Box Elder SGMA counts increased by 14.8%. This annual increase fits within expected population cycles and if past patterns hold, counts are likely to continue increasing next year. However this population cycle low (2020) is below the last low in 2009 (329 males), and the recent high in 2015 (871 males) was below the previous high in 2005 (1208 males). Counts have trended down over the past 20 years, decreasing at an average annual rate of 4.5% 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 expect to see an increase in population and a shift to a positive long term trend. Two potential new leks were found.

Figure 4a. 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 2002 to 2021.



Despite overall population counts within the SGMA going up, a federal hard trigger is indicated this year for the Box Elder population area (the federal population area boundary is distinct from the state SGMA and federal PHMA) due to six consecutive years of negative population growth (lambda) calculated on leks within Priority Habitat Management Area. Specifically, Appendix I of the 2015 Amended Resource Management Plan for Utah states, “To generate a consistent and comparable number, lambda can only be calculated on leks that are counted in consecutive years”. This clause stipulates that the rate of population change (lambda) can only be calculated each year for leks that have been counted both in the current year and in the previous year. Due to the

combination of leks counted, calculations for federal triggers generated a lambda value reflecting population decline, while other statistics indicate population growth.

Figure 4b. Total number of male sage-grouse counted in the Box Elder Sage-grouse Management Area and the total number of male sage-grouse counted on leks in Priority Habitat Management Area within the Box Elder Federal Population Area. Total counts are generally very similar, and indicate growth from 2020 to 2021.

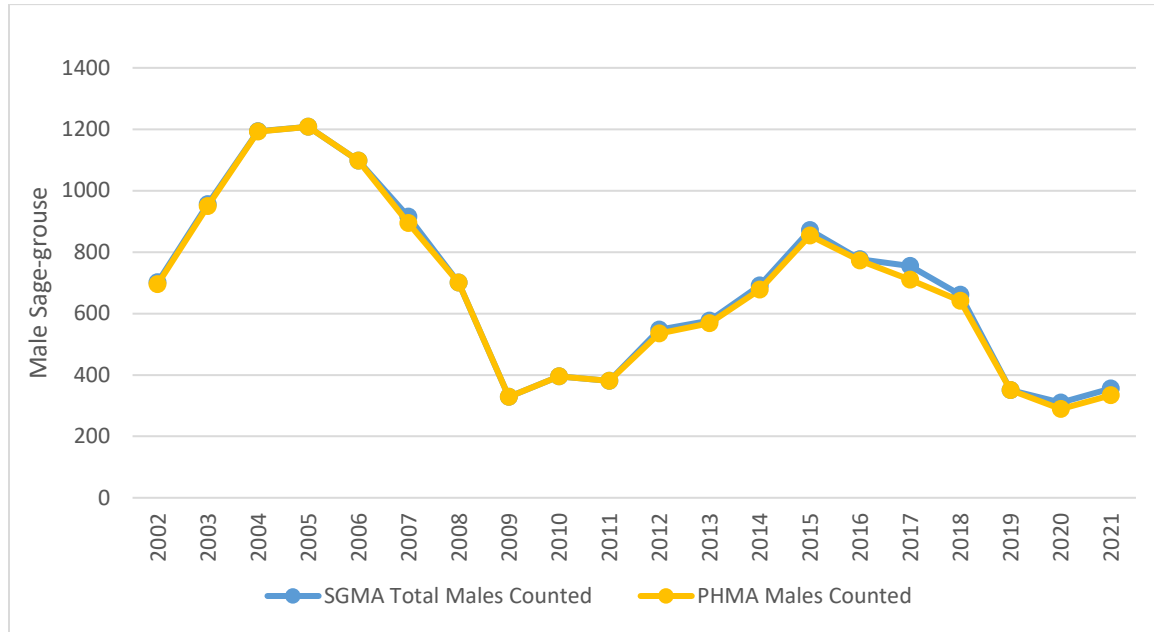
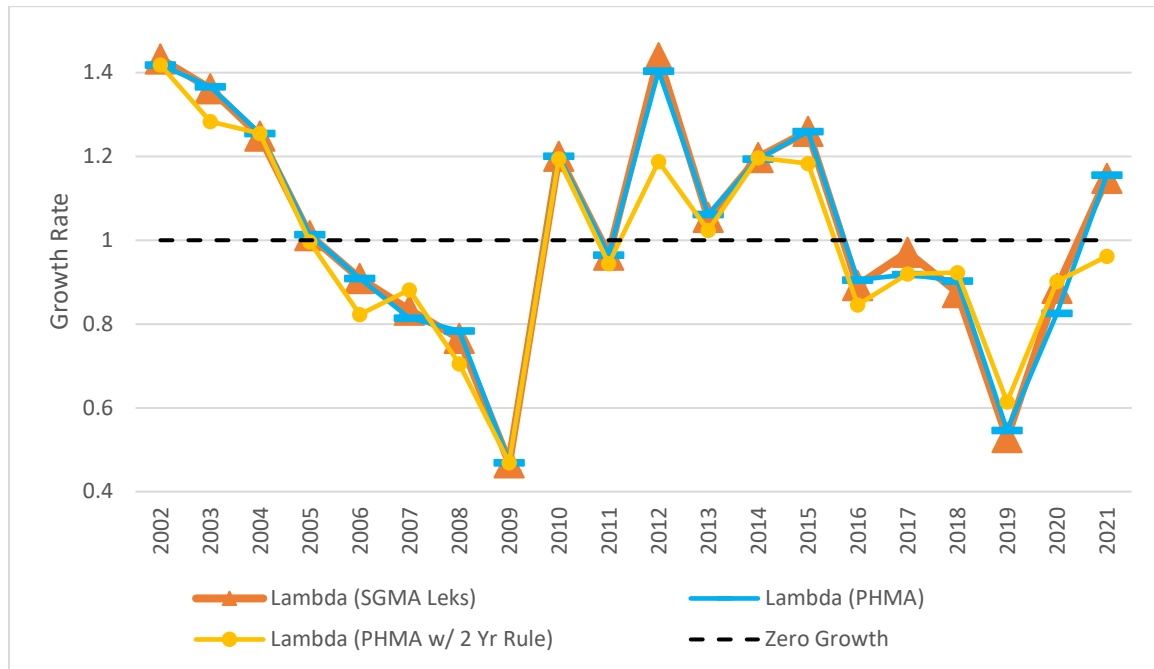


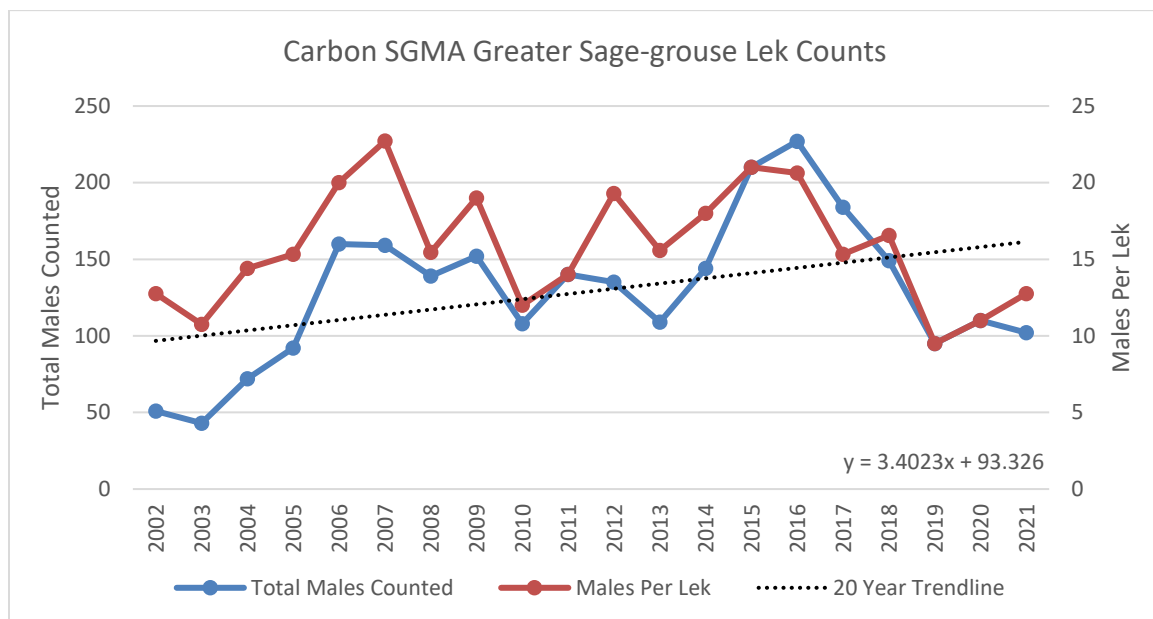
Figure 4c. Growth rate of sage-grouse counted in the Box Elder Sage-grouse Management Area in the Box Elder Federal Population Area Priority Habitat Management Area. Growth rates are similar as rates represent the same general population of birds. However when the “two year rule” for growth rate calculations is used, the growth rate in the population area shifts from positive growth to negative growth in 2021, which may not accurately represent the population, but reflect a coincidental combination of leks that were not visited this season and last season.



Carbon

In the Carbon SGMA 14 leks were visited, of those male sage-grouse were detected on 8. A total of 102 male sage-grouse were counted, for an average of 12.8 males per lek. From 2020 to 2021 the Carbon SGMA counts decreased by 7.2%. 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 2.5% per year. However, recent population declines are concerning. 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 2002 to 2021.

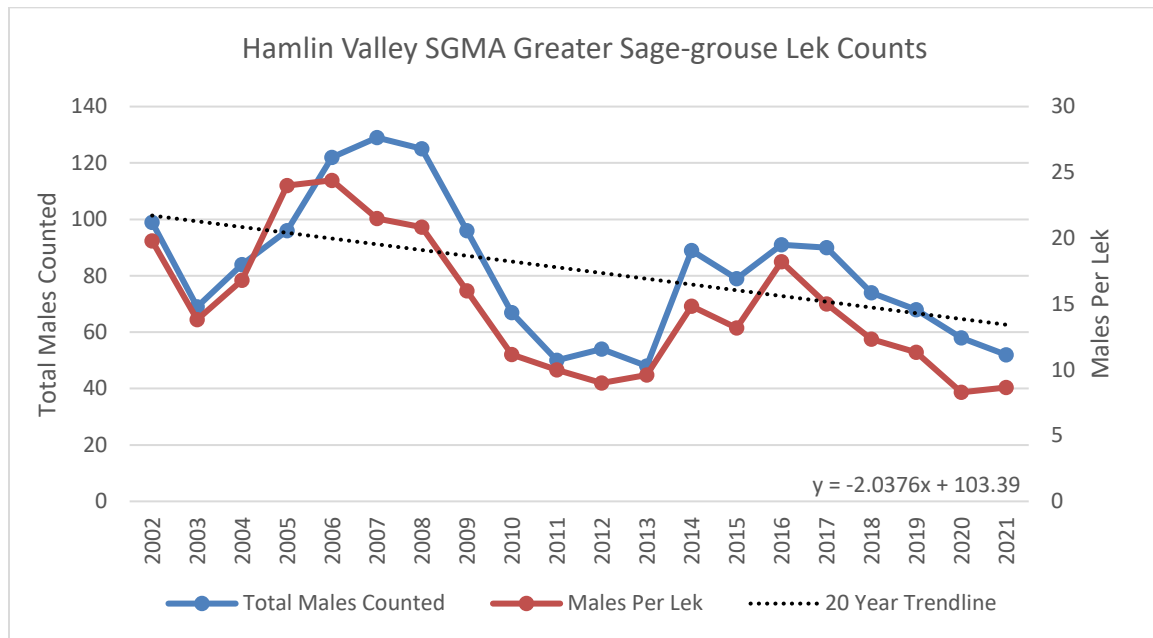


Hamlin Valley

In the Hamlin Valley SGMA 10 leks were visited, of those male sage-grouse were detected on six. A total of 52 male sage-grouse were counted, for an average of 8.6 males per lek. From 2020 to 2021 the Hamlin Valley SGMA counts decreased by 10.3%. This annual decrease was not expected following historic 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 2.3% per year.

The Hamlin Valley population area met criteria for soft federal adaptive management triggers (Table 2) due to average males per lek decreasing for six consecutive years and a negative population growth rate (λ) in four consecutive years. See BLM causal factor analysis for more information.

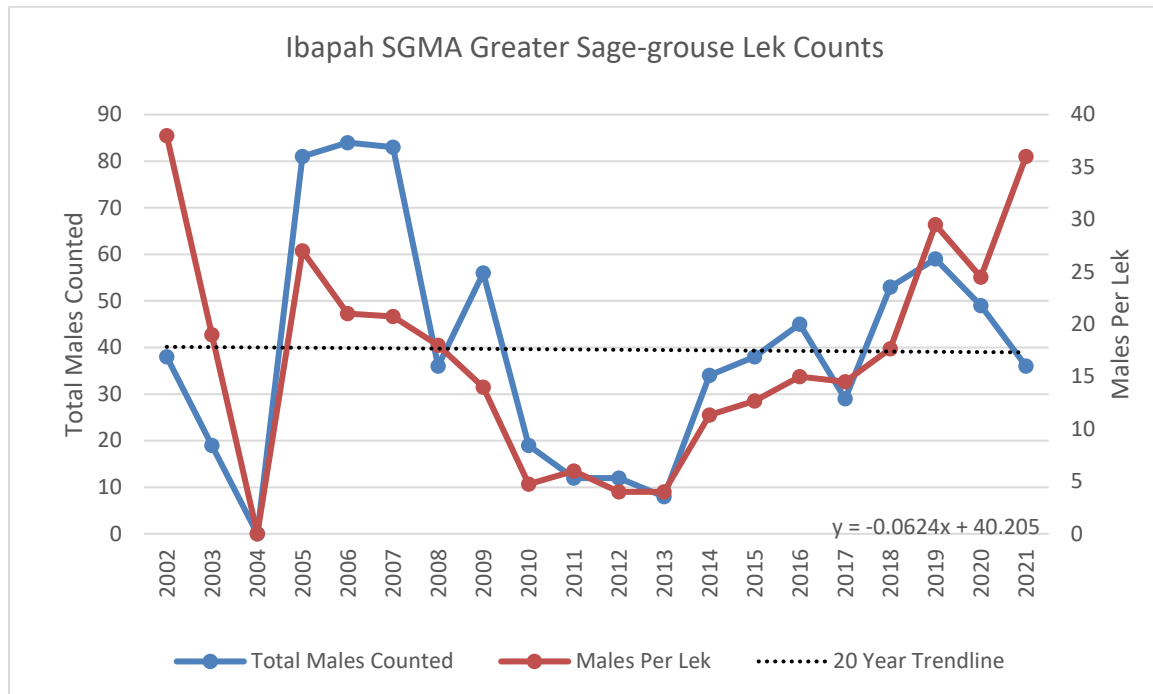
Figure 6. Average males per lek for all leks with at least one male counted and total number of males counted within the Hamlin Valley Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2002 to 2021.



Ibapah

In the Ibapah SGMA three leks were visited, of those male sage-grouse were detected on 1. A total of 36 male sage-grouse were counted, for an average of 36 males per lek. From 2020 to 2021 the Ibapah SGMA counts decreased by 26.5%. 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. As a result, this count is likely lower than the actual population in 2021. This population is connected to populations in Nevada and counts may be influenced by population variation in Nevada. Counts were essentially flat over 20 years with an average annual decrease of 0.1% 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 2002 to 2021.

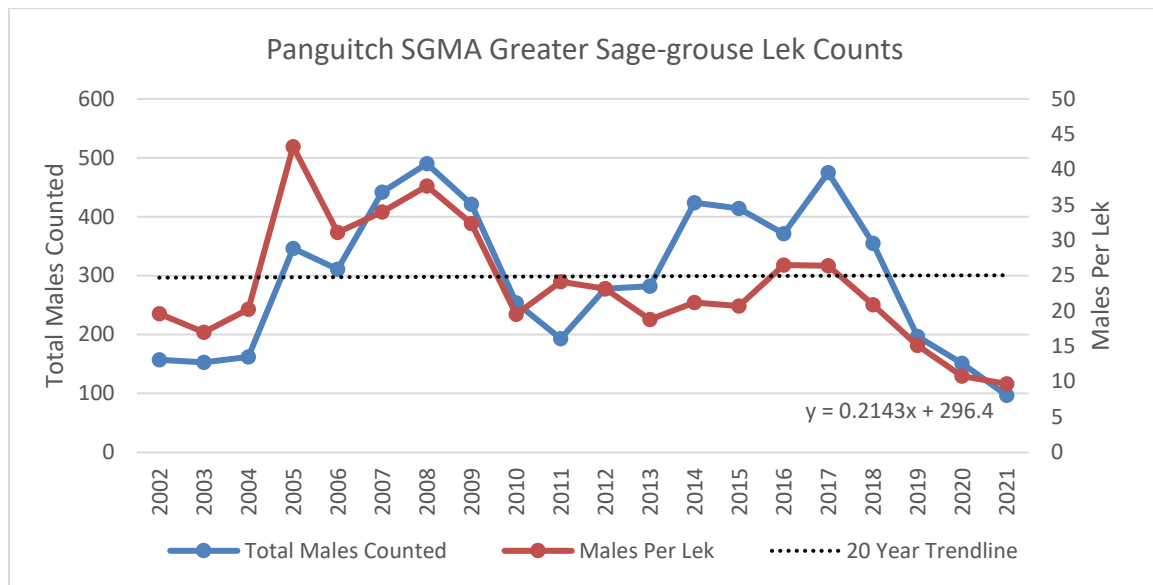


Panguitch

In the Panguitch SGMA 26 leks were visited, of those male sage-grouse were detected on 10. A total of 97 male sage-grouse were counted, for an average of 9.7 males per lek. From 2020 to 2021 the Panguitch SGMA counts decreased by 35.8%. This annual decrease was not expected following historic population cycles and may be linked to extreme drought reducing survival and reproductive success. Counts were flat over the past 20 years, increasing at an average annual rate of 0.06% per year. No new leks were found.

The Panguitch population area met criteria for three soft and two hard federal adaptive management triggers (Table 2). Hard triggers were due to four consecutive years of 20% or greater annual decline in average males per lek and the average males per lek dropping 75% below the 10-year rolling average. See BLM causal factor analysis for more information.

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.

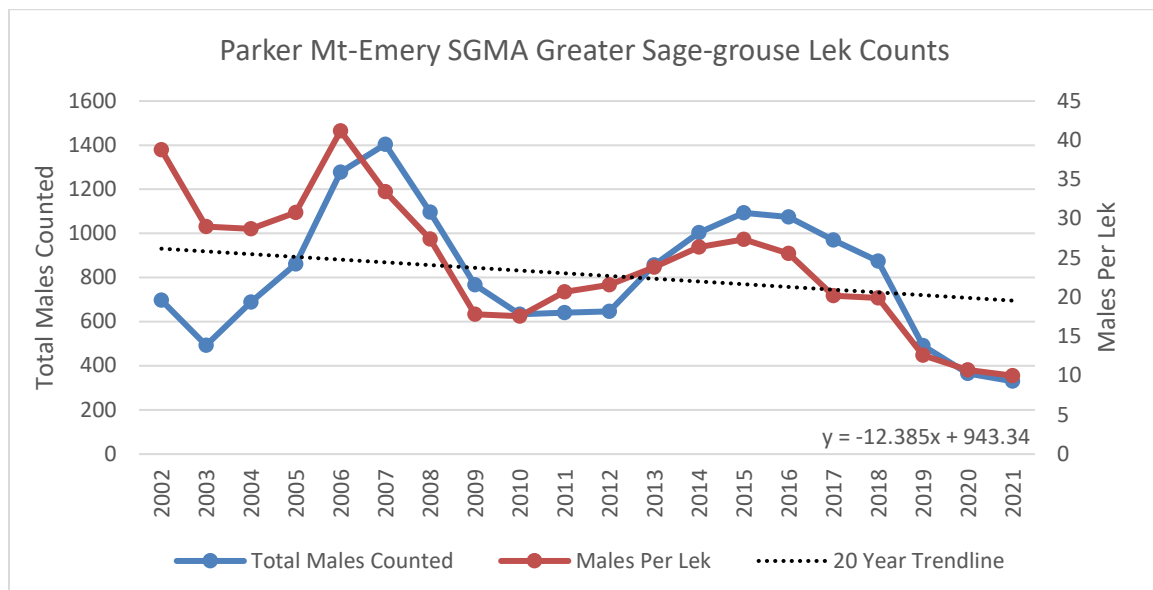


Parker Mountain-Emery

In the Parker Mountain-Emery SGMA 72 leks were visited, of those male sage-grouse were detected on 33. A total of 330 male sage-grouse were counted, for an average of 10.0 males per lek. From 2020 to 2021 the Parker Mountain-Emery SGMA counts decreased by 9.5%. This annual decrease was not expected following historic population cycles and may be linked to extreme drought reducing survival and reproductive success. With additional stressors of exceptionally dry conditions in 2018, followed by a severe winter and wet, late spring in 2019-20. 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 65 leks that were visited in 2020 to count the same number of males. The overall trend down over the past 20 years, decreasing at an average rate of 1.4% per year. Three potential new leks were found.

The Parker population area (distinct from the Parker Mountain-Emery SGMA) met criteria for one hard federal adaptive management trigger (Table 2). The hard trigger was due to six consecutive years of negative population growth (lambda) calculated on leks within Priority Habitat Management Area. See BLM causal factor analysis for more information.

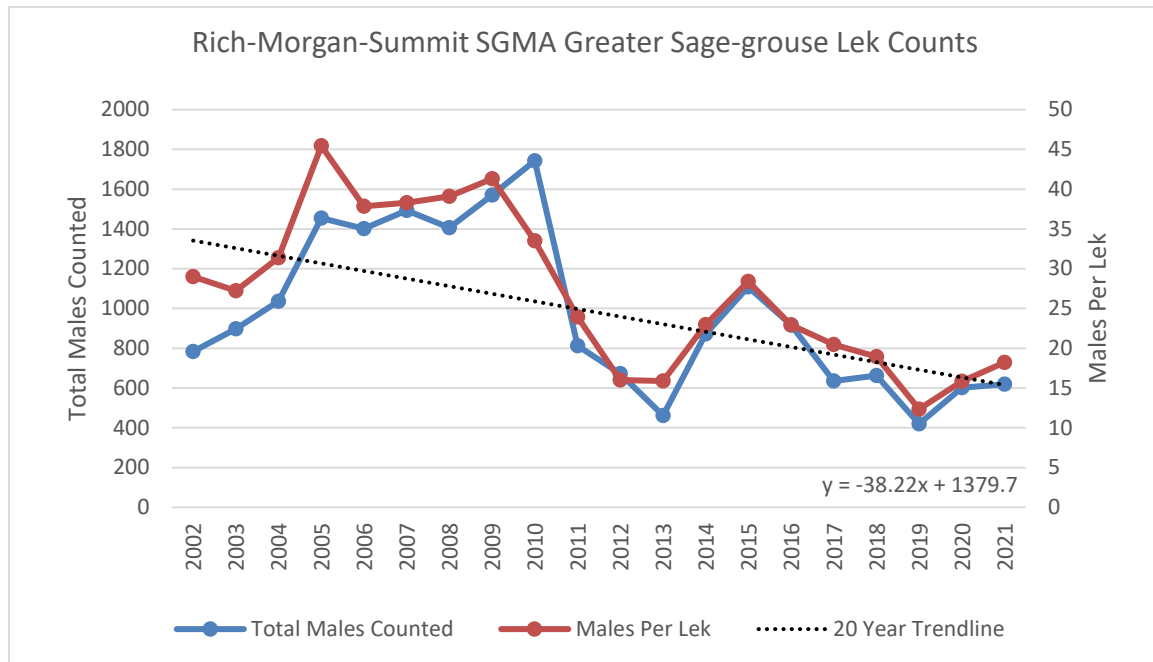
Figure 9. Average males per lek for all leks with at least one male counted and total number of males counted within the Parker Mountain-Emery Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2002 to 2021.



Rich-Morgan-Summit

In the Rich-Morgan-Summit SGMA 49 leks were visited, of those male sage-grouse were detected on 34. A total of 620 male sage-grouse were counted, for an average of 18.2 males per lek. From 2020 to 2021 the Rich-Morgan-Summit SGMA counts increased by 3.0%. 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 3.6% and may be related to losses of winter habitat. One potential new lek was 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 2002 to 2021.

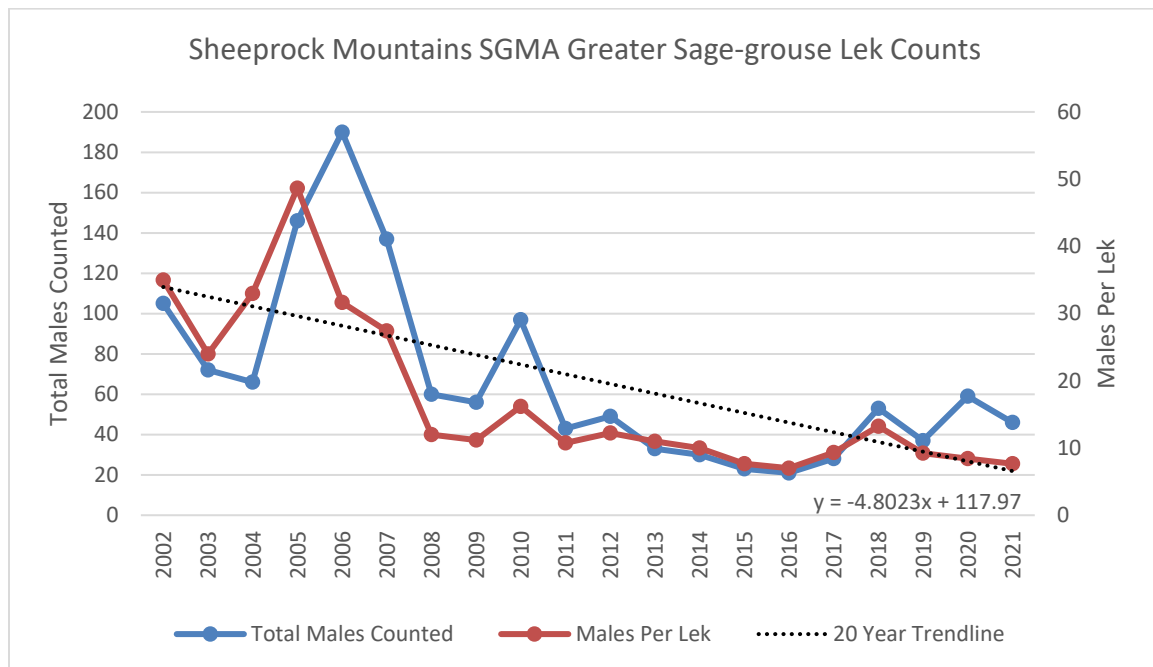


Sheeprock Mountains

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 4.9% 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 nine leks were visited, of those male sage-grouse were detected on 6. A total of 46 male sage-grouse were counted, for an average of 7.6 males per lek. From 2020 to 2021 the Sheeprock Mountains SGMA counts decreased by 22.0%. 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 an increase in production within the SGMA. Declines in population are concerning, but relative to drought conditions and other SGMAs the Sheeprock Mountains is doing acceptably well. One new lek was found contributing four males to the overall count, in addition to a new lek found in 2018 and 2020.

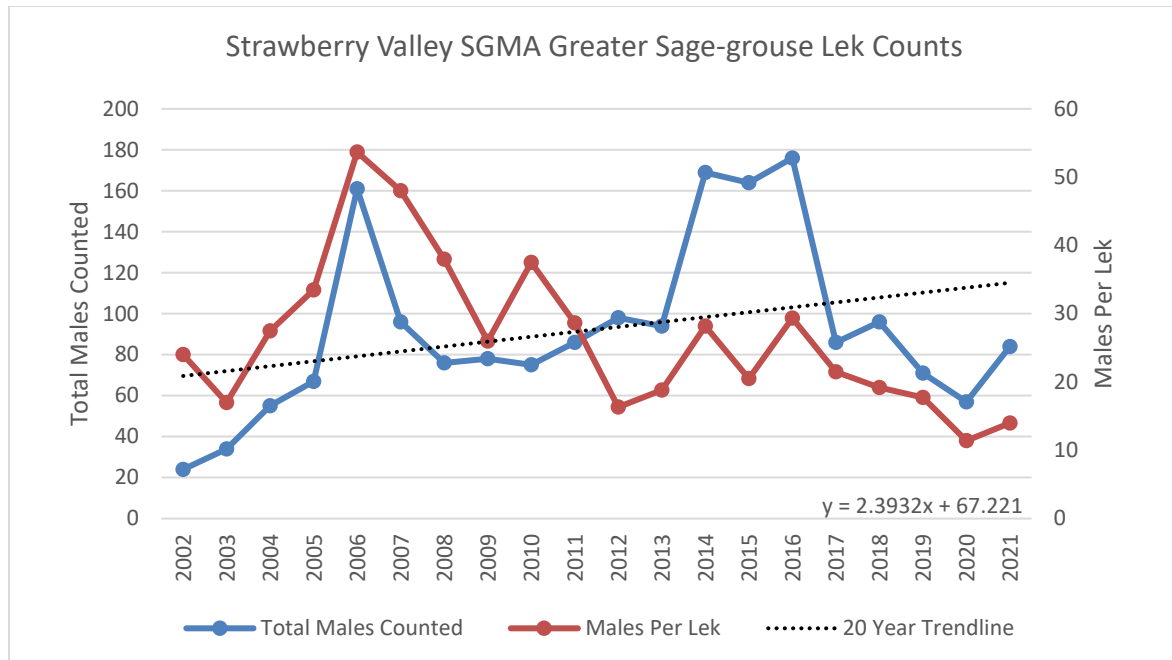
Figure 11. Average males per lek for all leks with at least one male counted and total number of males counted within the Sheeprock Mountains Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2002 to 2021.



Strawberry Valley

In the Strawberry Valley SGMA eight leks were visited, of those male sage-grouse were detected on six. A total of 84 male sage-grouse were counted, for an average of 14.0 males per lek. From 2020 to 2021 the Strawberry Valley SGMA counts increased by 47.6%. 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 2.5% per year.

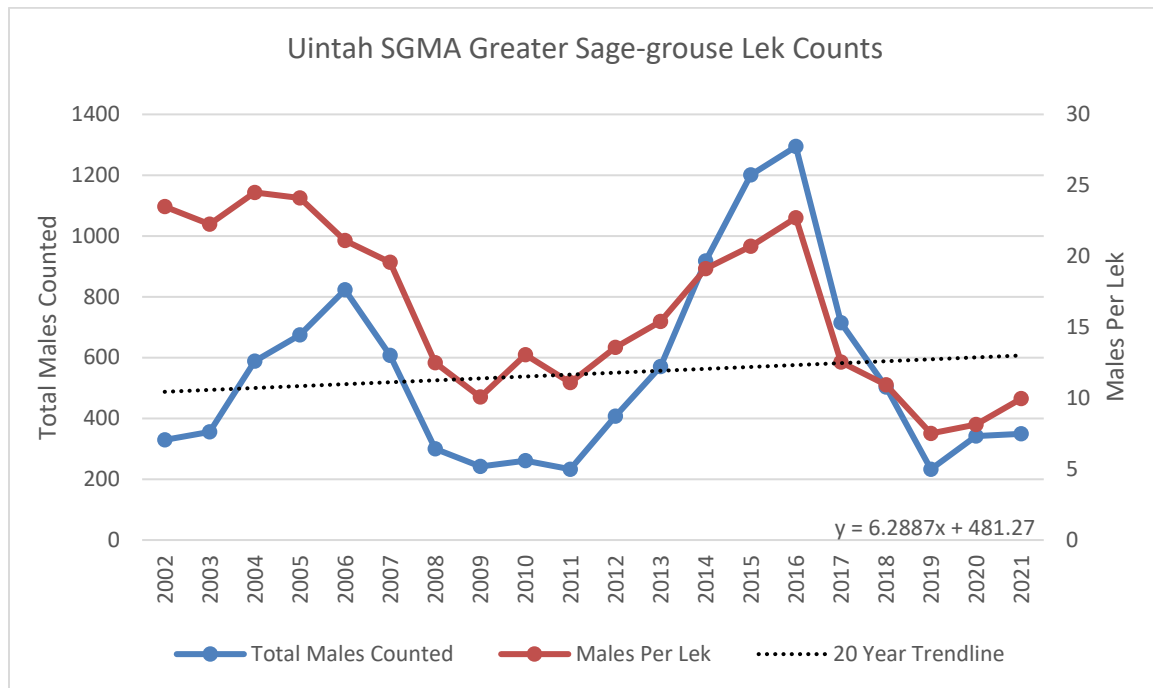
Figure 12. Average males per lek for all leks with at least one male counted and total number of males counted within the Strawberry Valley Sage-grouse Management Area. Trend line represents a linear regression for total males counts from 2002 to 2021.



Uintah

In the Uintah SGMA 70 leks were visited, of those male sage-grouse were detected on 35. A total of 349 male sage-grouse were counted, for an average of 9.9 males per lek. From 2020 to 2021 the Uintah SGMA counts increased by 2.0%. Counts were up over the past 20 years, increasing at an annual rate of 1.1% per year.

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 2002 to 2021.



Non-SGMA

Outside of designated SGMAs 30 leks were visited, of those male sage-grouse were detected on 13. A total of 103 male sage-grouse were counted, for an average of 7.9 males per lek. From 2020 to 2021 the Non-SGMA counts decreased by 35.2%. Counts were up over the past 20 years, increasing at an average annual rate of 2.6% 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 2001 to 2020.

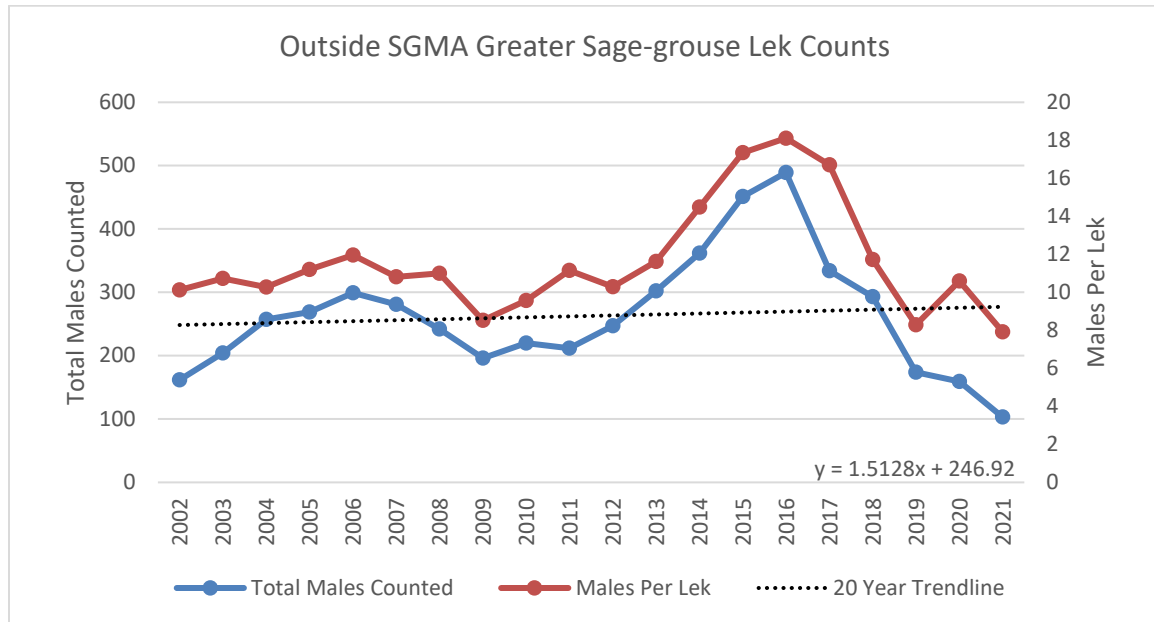


Table 1. Summary data for male greater sage-grouse high counts within each of Utah’s Sage-grouse Management Areas and statewide for the 2021 lek counting season. See methods for definitions of fields.

	Leks with Males	Total Leks Visited	Total Males Counted	Average Males per Lek (leks > 0)	Percent Change 2019 to 2020	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	10	17	55	5.5	-22.5	4.1	92.0	4.5	1	2.5
Box Elder	35	79	356	10.2	14.8	-29.0	688.7	-4.2	2	16.0
Carbon	8	14	102	12.8	-7.3	3.4	129.1	2.6	0	4.6
Hamlin Valley	6	10	52	8.6	-10.3	-2.0	82.0	-2.5	0	2.3
Ibapah	1	3	36	36.0	-26.5	-0.1	39.6	-0.2	0	1.6
Panguitch	10	26	97	9.7	-35.8	0.2	298.7	0.1	0	4.3
Parker Mountain-Emery	33	72	330	10.0	-9.6	-12.4	813.3	-1.5	3	14.8
Rich-Morgan-Summit	34	49	620	18.2	2.9	-38.2	978.4	-3.9	1	27.8
Sheeprock Mountains	6	9	46	7.7	-22.0	-4.8	67.6	-7.1	4	2.1
Strawberry Valley	6	8	84	14.0	47.4	2.4	92.4	2.6	0	3.8
Uintah	35	70	349	10.0	2.0	6.3	547.3	1.1	0	15.7
Non-SGMA	13	30	103	7.9	-35.2	1.5	262.8	0.6	0	4.6
All SGMA	184	357	2127	11.6	-2.2	-70.1	3828.0	-1.8	11	95.4
All Leks	197	387	2230	11.3	-4.4	-68.6	4091.7	-1.7	11	100.0

Results: Fixed Wing Infrared Lek Search

Fixed wing infrared lek searches were conducted on the mornings of April 12, 15, and 17-19 by Owyhee Air Research in the Northern Region. The survey covered approximately 107,000 acres made up of approximately 42,567 acres in Ant Valley, 17,645 around Hardware Ranch, 19,716 in East Canyon, 7,530 in the Henefer-Echo WMA, and 20,020 acres around Mountain Green. The area consisted of low density sage-grouse habitat. Low population levels further decreased the probability of detecting a new lek, and detection rates were low. Previously known leks were detected; however no unknown leks were detected.

This was the fifth year the UDWR has utilized aerial infrared surveys to search for greater sage-grouse. Previous searches have been successful in detecting a new leks that DWR staff, university researches and previous helicopter lek searches were not able to locate.

The cost of the aerial lek search was \$24,897.55, which is comparable to the amount budgeted for helicopter lek searches in previous years. Detection rates vary significantly based on the area survey, with areas of low density sage-grouse populations having few detections.

Management Implications:

Results from previous year's aerial IR lek searches in comparison to previous years helicopter lek searches indicates that aerial IR methods are more effective in thoroughly covering an area and detecting more new leks per area. Helicopter lek searches have the additional expense of three biologist observers, and the significant safety risk of low level helicopter flight. We recommend using aerial lek search funding for fixed wing IR aerial lek searches in the future as a more cost effective and safer alternative to helicopter lek search flights. Locations of all leks, including undetermined leks are available to DWR employees and other partners involved in lek counts via the ArcCollector Utah Sage-grouse Lek Count app and through the lek database distributed prior to the beginning of annual lek counts.

Greater sage-grouse lek counts remain a critical tool for tracking sage-grouse populations within the state and must continue into the future for successful management of the species.

Figure 15: Flight path of 2021 aerial infrared fixed wing lek searches in Ant Valley and Hardware Ranch in Northern Region and Rich-Morgan-Summit SGMA. No new leks were detected. Sage-grouse were only seen at the Ant Flat lek.

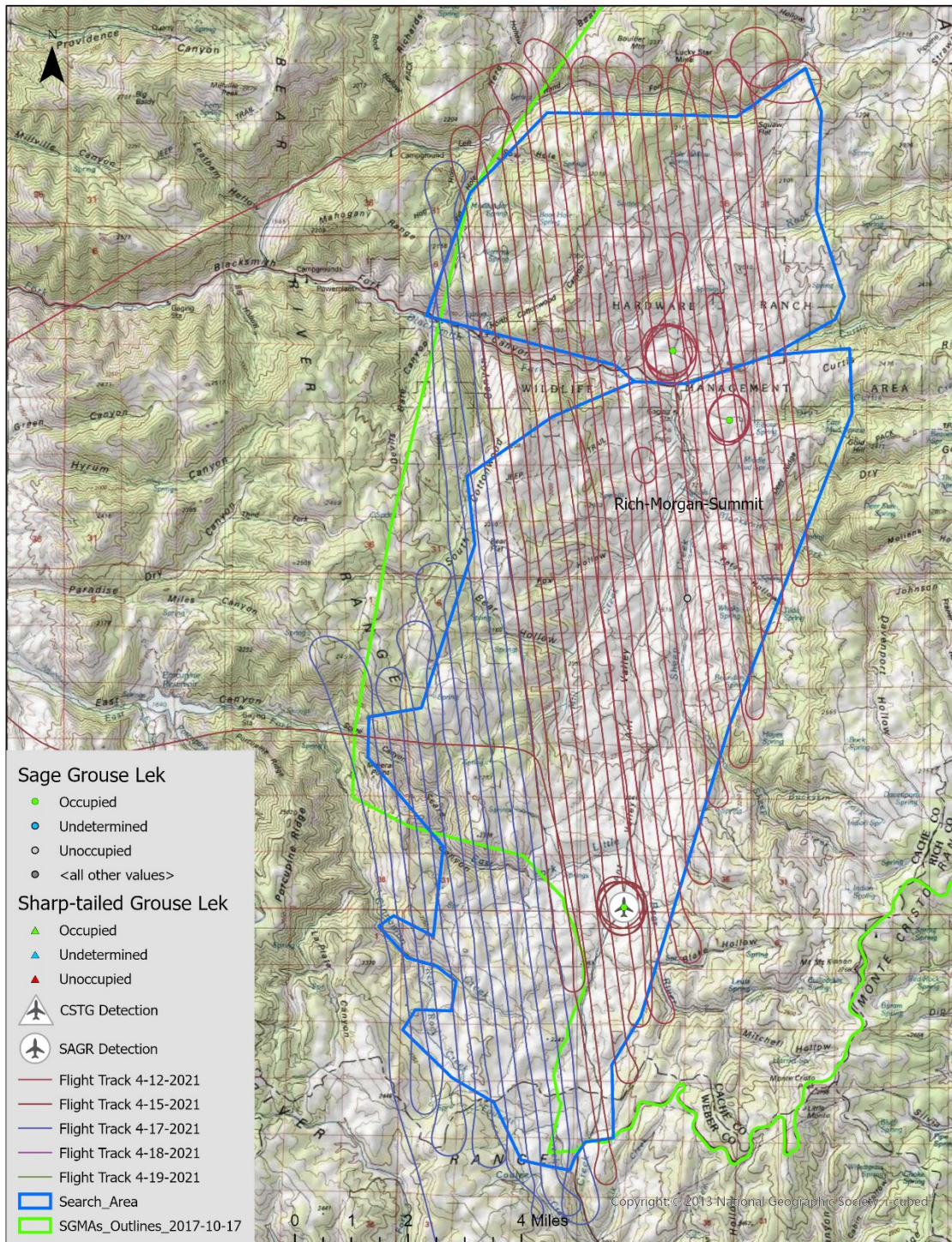


Figure 16: Flight path of 2021 aerial infrared fixed wing lek searches in the Mountain Green area in the Northern Region. No new leks were detected. Sharp-tailed grouse were only seen at the Mahogany Mountain lek.

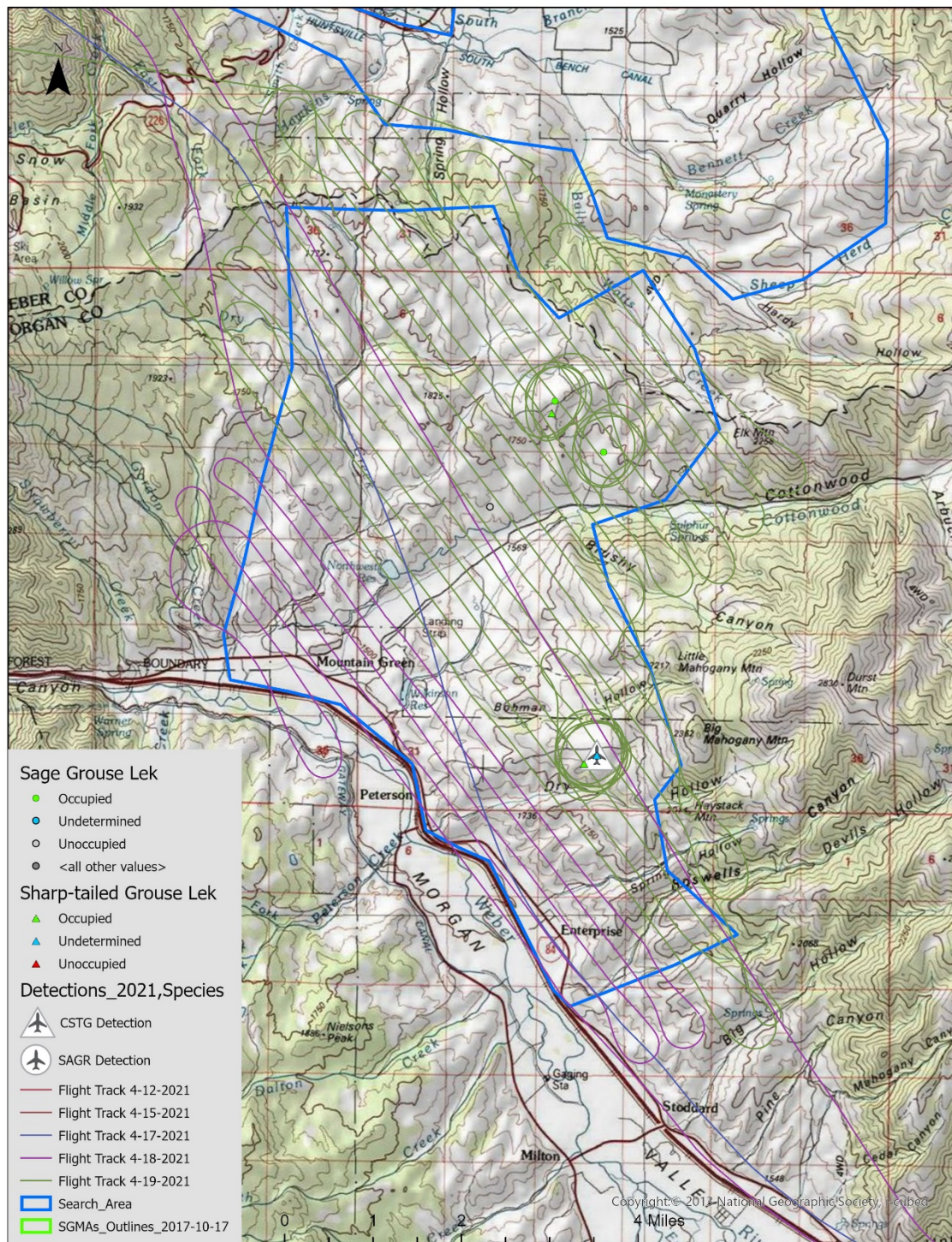
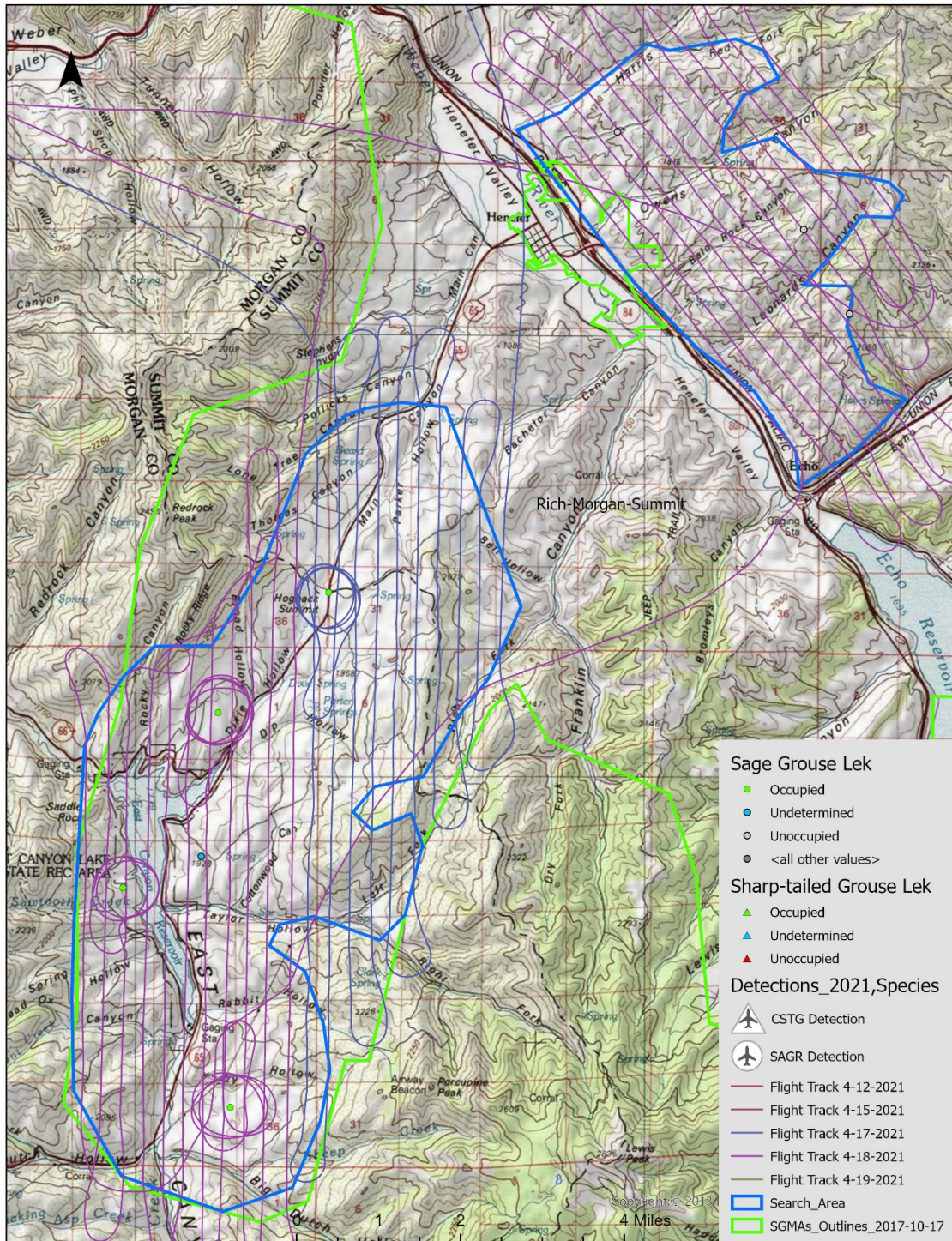


Figure 17: Flight path of 2021 aerial infrared fixed wing lek searches of East Canyon and Henefer-Echo WMA with in the Rich-Morgan-Summit SGMA. No grouse were detected.



BLM Adaptive Management Triggers

The Utah Bureau of Land Management 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 (λ) 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.

Triggers are defined as:

Soft Triggers

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

Hard Triggers

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

OR

d) λ 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 2021 lek counts. Red indicates *trigger*, pink indicates a *warning* that one or more criteria that could lead to a trigger was met, but overall criteria was not sufficient for a 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	Yes	Yes	Soft Trigger: Six years of declining MPL (S.1.b), 40% or greater decline in one year (S.1.c), 50% decline over a four year period (S.1.d), combined with four years of lambda less than 1 for all leks (S.2). Hard Trigger: Population is below 25% of the 10 year rolling average (H.b), λ less than 1 in 8 of 10 years (H.d).
Box Elder	No	Yes	Warning: Four years of lambda less than 1 for all leks (S.2). Hard Trigger: λ less than 1 in 6 of 6 years (H.d).
Carbon	No	No	Warning: Greater than 40% decline in trend leks MPL in 2019 (S.1.c).
Emery	No	No	Warning: Greater than 40% decline in MPL in 2019 (S.1.c). Greater than 50% decline in MPL over a four-year period (S.1.d).
Hamlin Valley	Yes	No	Soft Trigger: Six years of declining MPL (S.1.b) combined with four years of lambda less than 1 for all leks (S.2).
Ibapah	No	No	No notable declines.
Panguitch	Yes	Yes	Soft Trigger: Four years of >10% declining MPL (S.1.a), greater than 40% decline in MPL in 2019 and 2020 (S1c). Greater than 50% decline in MPL over a four-year period (S.1.d), combined with four years of lambda less than 1 for all leks (S.2). Hard Trigger: Four years of >20% declining MPL (S.1.a), Population is below 25% of the 10 year rolling average (H.b).
Parker	No	Yes	Warning: Four years of lambda less than 1 for all leks (S.2). Hard Trigger: λ less than 1 in 6 of 6 years (H.d).
Rich	No	No	No notable declines.
Sheeprock Mountains	No	No	No notable declines.
Strawberry Valley	No	No	Warning: Greater than 40% decline in MPL in 2019 (S.1.c).
Uintah	No	No	Warning: Six years of declining MPL (S.1.b), greater than 40% decline in MPL in 2019 and 2020 (S.1.c).

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.

