

2023 Sage-grouse Population Triggers Analysis

Michelle Kemner

Wildlife Staff Biologist

Idaho Department of Fish and Game

Amended November 13, 2023 v.3





Findings in this report are preliminary in nature and not for publication without permission of the Director of the Idaho Department of Fish and Game.

The Idaho Department of Fish and Game adheres to all applicable state and federal laws and regulations related to discrimination on the basis of race, color, national origin, age, gender, or handicap. If you feel you have been discriminated against in any program, activity, or facility of the Idaho Department of Fish and Game, or if you desire further information, please write to: Idaho Department of Fish and Game, PO Box 25, Boise, ID 83707; or the Office of Human Resources, U.S. Fish and Wildlife Service, Department of the Interior, Washington, DC 20240.

This publication will be made available in alternative formats upon request. Please contact the Idaho Department of Fish and Game for assistance.

Introduction

This report provides analysis results of the 2023 adaptive management population triggers for greater sage-grouse (*Centrocercus urophasianus*; hereafter, sage-grouse) in Idaho. Adaptive management triggers are identified and described in Attachment 1 ([Attachment1_2021IdahoPlan-FINAL.pdf](#)) of Executive Order 2022-03 <https://gov.idaho.gov/executive-orders/>, and approved in the Bureau of Land Management (BLM) <https://www.blm.gov/programs/fish-and-wildlife/sagegrouse/blm-sagegrouse-plans> and U.S. Forest Service (USFS) plan amendments for sage-grouse <https://www.fs.fed.us/sites/default/files/sage-grouse-great-basin-rod.pdf> (BLM 2015, 2019, USFS 2015). Along with habitat triggers (BLM -MD SSS 17 and 18 and USFS-GRSG-AM-ST-010 and 011 Standard), the objective of population triggers is to protect priority areas, evaluate causal factors, and recommend implementation level activities on federal land (BLM MD SSS 21 and 22 and USFS-GRSG-AM-ST-010 and 011 Standard).

Annually, Idaho Department of Fish and Game (IDFG) calculates two metrics to monitor sage-grouse population triggers within the 2015 Priority Habitat Management Areas (PHMA) and Important Habitat Management Areas (IHMA) within 4 Conservation Areas (CA) (Figure 1). The metrics are maximum number of males on lek routes and lambda (λ), or the finite rate of population change, as calculated from all leks.

Hard population triggers are defined as:

- A 20% decline in the current 3-year average of total maximum number of males counted on lek routes compared to the 2011 maximum male baseline *and* average finite rate of change (λ) significantly below 1.0 within IHMA or PHMA within a CA over the current 3-year period (MD SSS 19, BLM 2015).

Soft population triggers are defined as:

- A 10% decline in the current 3-year average of total maximum number of males counted on lek routes compared to the 2011 maximum male baseline *and* average finite rate of change (λ) below 1.0 within IHMA or PHMA within a CA over the current 3-year period (MD SSS 20, BLM 2015)

Triggers are to remain operational until the maximum male counts on lek routes returns to or is greater than the 2011 baseline (MD SSS 24, BLM 2015). Operational management allocations include temporary application of all PHMA management actions to IHMA within a Conservation Area where the criteria for hard triggers have been met.

Methods

The annual lek monitoring assignments rely on the previous year's sage-grouse lek database outputs. Therefore all Idaho leks from the 2022 lek database were intersected with the 2015 sage-grouse habitat management areas (BLM 2015). Ninety leks fall outside HMAs. Some of these leks are in agricultural areas on private lands adjacent to sagebrush habitats. We used the 10-km nesting buffer identified in

Appendix B of the 2012 Governor’s Plan (Governor’s Sage-grouse Task Force 2012), to assign each lek to the appropriate HMA. These leks are attributed as “PHMA by buffer,” etc., to maintain their unique identity, but are included in the analyses for their assigned HMA. Three leks are >10 km from any mapped Priority, Important, or General habitat.

Lek Routes

IDFG utilizes lek routes to monitor population trend. A lek route is a logistical group of leks that are counted on the same morning, often by the same observer(s) (Cook et al. 2022). These leks must be close enough to allow all leks on the route to be counted from 0.5 hours before official sunrise to 1.5-2 hours after sunrise. Lek routes are counted 3-4 times each spring, typically from late March to early May, depending on elevation. Counts are not conducted during inclement weather (e.g., rain or snow, or winds >15 kph). Observers record the number of males at each lek on each survey day. The maximum number of males on a lek route is the highest number of males counted on one survey day.

Some lek routes are split between different HMAs. Because the data for a route cannot be split, we assigned a lek route to the HMA which had the higher proportion of its leks within it (Appendix A). *It is important to note that there are no lek routes in West Owyhee IHMA under the 2015 BLM plan. A new map was developed in the 2019 BLM plan that changed a portion of PHMA to IHMA in West Owyhee CA. However, to provide continuity in data presentation across years, the map developed under the 2015 BLM plan was used in both the lek route and Lambda (λ) analyses.*

The lek route analysis compares the current 3-year average of males in each CA and HMA to the maximum number of males in 2011 (i.e., 2011 baseline). In 2011, we had 76 lek routes that qualified for inclusion in this analysis (Figure 1), which included 412 leks. This represents about 25% of the leks in the Idaho lek database. Note that the actual number of leks counted on lek routes may vary among years as new leks are observed on the route.

$$\% \text{ change} = \left(\frac{\text{Current 3year average} - \text{2011 total males}}{\text{2011 total males}} \right) * 100$$

If the % change is $\geq 20\%$, a hard population trigger has been tripped.

If the % change is between 10% and 20%, a soft population trigger has been tripped.

Lambda (λ)

Lambda (λ) is simply the population size in time t+1 divided by the population size in time t. A stable population is represented by a λ (lambda) value of 1.0. If λ is less than 1.0 the population is decreasing and if λ is greater than 1.0 the population is increasing. Garton et al. (2011) used a population reconstruction model to calculate lambda and estimate the minimum population of sage-grouse back through time. The main requirement of the model estimate is that counts on a lek must occur in at least 2 successive years. The model developed by Garton et al. (2011) accumulates changes from time t+1 to time t for each lek, for all leks in a population.

However, in our case, we are concerned about the current 3-year change, because a population decline from year 1 to year 3 would be more important biologically than a 3-year average. We defined

significance for lambda by the 90% confidence interval (Scheaffer et al. 1996) around the lambda (λ) calculated from the 1st year to the 3rd year (e.g., lambda (λ) from 2021 to 2023). If the 90% confidence interval (CI) is less than, and does not include 1.0, then the finite rate of change is significantly declining. The finite rate of change and variance was calculated following Garton et al. (2011).

Ratio estimation under classic probability sampling designs—simple random, stratified, cluster, and probability proportional to size—assumes the sample units (leks counted in alternate successive years in this case) are drawn according to some random process but the strict requirement to obtain unbiased estimates is that the ratios measured represent an unbiased sample of the ratios (i.e., finite rates of change) from the population or other area sampled.

Any lek count data can go into this analysis if it meets the time of day and weather requirements for counting leks. Because the model uses ratios of counts cumulated within a larger area, lek counts may be included for leks that were visited 1 or more times within the season (2 visits are currently recommended). Aerial survey data that has been carefully reviewed (e.g., meets time and weather requirements and conducted by experienced pilots and observers) are also included.

Database and other lek monitoring priorities:

In addition to lek trend monitoring, there are other reasons for surveying particular leks within a given year. Lek database maintenance priorities typically focus on maintaining the occupancy status of a lek, following the Management Status categories for Idaho (See Appendix B):

1. Visiting undetermined leks that need 1 more visit to be reclassified as unoccupied (5 consecutive years with zero birds results in an unoccupied status).
2. Visiting unoccupied leks that haven't been visited in >5 years (unoccupied leks need to be visited every 5-10 years to maintain that status).
3. Maintaining updated occupancy status by visiting occupied leks at least once every 5 years.
4. Re-visiting newly discovered leks (i.e., pending leks) to validate whether the observation is a true lek and not a random occurrence.

Other priorities for surveying leks might be to evaluate response to infrastructure projects, wildfire, or habitat improvements. Although lek surveys for database or other priorities are biased (i.e., they are not a statistical sample of the population), they are important, nonetheless.

Sample size estimation for lambda (λ)

We calculated lambda (λ) and the variance based on the 2020-2022 lek data for PHMA and IHMA in each CA to calculate sample sizes needed for 2023 lek surveys. We used the sample size estimation formula for ratios from Scheaffer et al. (1986, page 139) to estimate the number of leks that need to have counts in both 2021 and 2023 to produce an estimate of lambda (λ) \pm 0.20.

Since lek route leks will automatically be included in leks counted both years, we wanted to assure that an unbiased proportion of other leks (i.e., leks not on lek routes) were included in the lambda (λ)

calculations. We multiplied the sample size estimate by the proportion of other leks to get the number of these leks that should be sampled in 2023. After assigning database priorities 1-4 above, we randomly selected the remaining leks to reach the target number. We then counted the total number of selected leks that would be counted both years (2021 and 2023) in each CA/HMA.

We excluded 292 unoccupied leks from the 2023 random selection, resulting in 1,655 leks in our working sample. IDFG has been utilizing this sample selection procedure since 2015, such that we have been able to update the occupancy status of many leks from undetermined to occupied or unoccupied (following the Annual Status definitions in Appendix B). Unoccupied leks do not contribute to the lambda (λ) analysis since there is no change between years. IDFG will continue to visit unoccupied leks every 5-10 years to confirm status (i.e. database priority 2).

In 2023, our goal was to count a minimum of 1,007 leks statewide; of these, 428 were on lek routes, 432 were randomly assigned leks, and 147 were database or other priorities (Table 1). Other priorities included counting leks within recent fire polygons and other areas of concern (e.g., West Owyhee IHMA leks and Table Butte in Mountain Valleys PHMA).

Results and Discussion

We counted 1,074 leks and/or locations of breeding males in 2023 (Table 1, Figure 1). Of all leks and locations counted, 587 were active and 487 were inactive (Appendix B). One pending new location of breeding birds was reported, and an additional 60 locations remain in “new” status because there are not enough observations to change their status. Of the 8 pending new observations of breeding birds in the 2022 database, 6 were confirmed as occupied (active) leks in 2023. The remaining 60 “new” locations will continue to be monitored to determine status in the future. These locations do not meet the definition of a lek, which is at least 2 males in at least 2 years during a 10-year period.

Statewide, male attendance at all lek routes (including routes in GHMA) in 2023 was up 8% from 2022 and up 30% 13% from 2021 (i.e., current 3-year change). This is reflected in the 2021–2023 lambda (λ) values (which includes all leks counted) where all HMAs had stable to increasing lambda (λ) (i.e., lambda (λ) ≥ 1.0) (Table 2). Figure 2 demonstrates how the current 3-year lambda (λ) can be stable to increasing, while still below the 2011 baseline. Figure 3 shows the lek route trend in 2023 compared to the 2011 baseline.

No new population triggers were tripped in 2023. Population triggers remain operational in Desert PHMA, Desert IHMA, Mountain Valleys PHMA, Southern IHMA, West Owyhee PHMA, and West Owyhee IHMA (Table 2). West Owyhee IHMA tripped trigger was based only on Lambda (λ) analysis because there are no lek routes in that Management Area. Lambda (λ) analysis in West Owyhee IHMA has been well below “1” since the trigger was tripped. Mountain Valleys IHMA tripped a soft trigger in 2019, but not in 2020, 2021, 2022, or 2023. Although lek routes in Mountain Valleys IHMA tripped a hard trigger every year since 2020, Lambda (λ) remained close to or greater than 1, which meant the overall population trigger in Mountain Valley IHMA was not tripped. Southern PHMA has never tripped a population trigger, likely because the 2011 baseline was 4 years after the Murphy Complex Fire; this fire

significantly impacted a large portion of Southern PHMA. The history of tripped population triggers, 2015–2023, is shown in Table 3.

As per the Executive Order 2022-03, the 2015 BLM and USFS ARMPA, an interagency Idaho Adaptive Management Team is directed to evaluate causal factors of soft and hard population triggers and to recommend management actions. A causal factor analysis and management recommendations report were completed for triggers that had tripped in 2019 or earlier (Desert PHMA and IHMA, Mountain Valleys PHMA, Southern IHMA, and West Owyhee IHMA) (Idaho Adaptive Management Team 2020). West Owyhee PHMA first tripped a hard trigger in 2020. As such, the causal factor analysis was initiated by the Adaptive Management Team.

After the breeding season in 2023, the lek database was updated following status designations and definitions described in Cook et al. (2022). Although this did not change how the overall analyses were done, it does change the 2023 lek data output file and will change how leks are monitored in the future. It also specifically defines what a “lek” is. Previous versions of this report assumed all locations prioritized for monitoring met the definition of a lek. However, not all locations qualified as a lek. Moving forward, cleaning out these locations from the export file will streamline the lek monitoring priorities list. The new definitions, designations, and terms are included as Appendix C.

Literature Cited

- Bureau of Land Management (BLM). 2014. Sage-grouse Habitat Management Areas of the Great Basin Region, Idaho-SW Montana sub-region, greater sage-grouse Environmental Impact Statement (EIS) – Proposed Plan. U.S. Department of the Interior, Bureau of Land Management, Idaho State Office.
- Bureau of Land Management (BLM). 2015. Record of decision and approved resource management plan amendments for the Great Basin region, including the greater sage-grouse sub-regions of Idaho and Southwestern Montana. U.S. Department of the Interior, Bureau of Land Management, Washington, DC. <https://www.blm.gov/programs/fish-and-wildlife/sagegrouse/blm-sagegrouse-plans>
- Bureau of Land Management (BLM). 2019. Idaho Greater Sage-Grouse Record of Decision and Approved Resource Management Plan Amendment. U.S. Department of the Interior, Bureau of Land Management, Idaho State Office, Boise, Idaho. <https://www.blm.gov/programs/fish-and-wildlife/sagegrouse/blm-sagegrouse-plans>
- Cook, A. A., P.A. Deibert, S.P. Espinosa, A. Moser, L. Schreiber, and M.A. Schroeder. 2022. Greater Sage-grouse range-wide population monitoring guidelines Part A: Standards for collecting and reporting of Greater Sage-grouse lek count data. WAFWA Sage and Columbian Sharp-tailed Grouse Technical Team, Boise Idaho.

- Connelly, J. W., K. P. Reese, and M. A. Schroeder. 2003. Monitoring of greater sage-grouse habitats and population. Station Bulletin 80. College of Natural Resources Experiment Station, College of Natural Resources, University of Idaho, Moscow, Idaho.
- Garton, E. O., J. W. Connelly, J. S. Horne, C. A. Hagen, A. Moser, and M. A. Schroeder. 2011. Greater sage-grouse population dynamics and probability of persistence. *Studies in Avian Biology* 38: 293-382.
- Governor's Sage-grouse Task Force. 2012. Federal Alternative of Governor C.L. "Butch" Otter for Greater Sage-grouse Management in Idaho. September 5, 2012 Version. Available at: <https://species.idaho.gov/wp-content/uploads/2016/05/Idaho-Sage-Grouse-Alternative.pdf>
- Idaho Adaptive Management Team. 2020. Targeted management recommendations to address Idaho sage-grouse habitat loss and population declines. Unpublished report.
- Scheaffer, R. L., W. Mendenhall, III, and R. L. Ott. 1986. Elementary survey sampling. Wadsworth Publishing, Belmont, California.
- State of Idaho, Governor Brad Little. Exec. Order No. 2022-03. 2022. Adopting Idaho's 2021 Sage-Grouse Management Plan & Idaho Sage-Steppe Mitigation Process. 18 March 2022. <https://gov.idaho.gov/wp-content/uploads/2022/03/eo-2022-03.pdf>
- USDA Forest Service. 2015. Greater Sage-grouse Record of Decision for Idaho and Southwest Montana, Nevada, and Utah. U. S. Department of Agriculture, U.S Forest Service, Intermountain Region and Northern Region, US. <https://www.fs.fed.us/sites/default/files/sage-grouse-great-basin-rod.pdf>

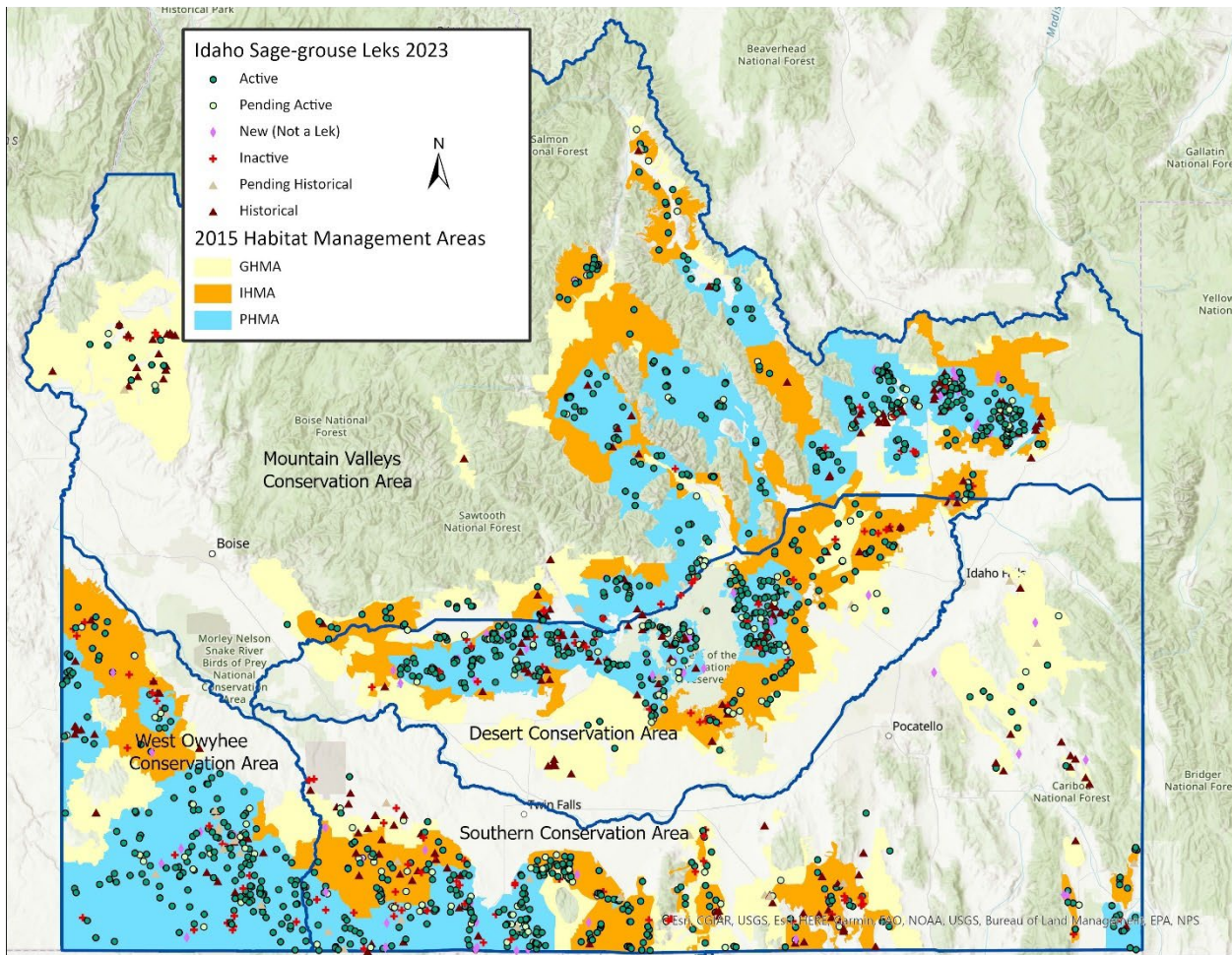


Figure 1. Location and status of all sage-grouse leks in each Conservation Area and the 2015 BLM Habitat Management Areas.

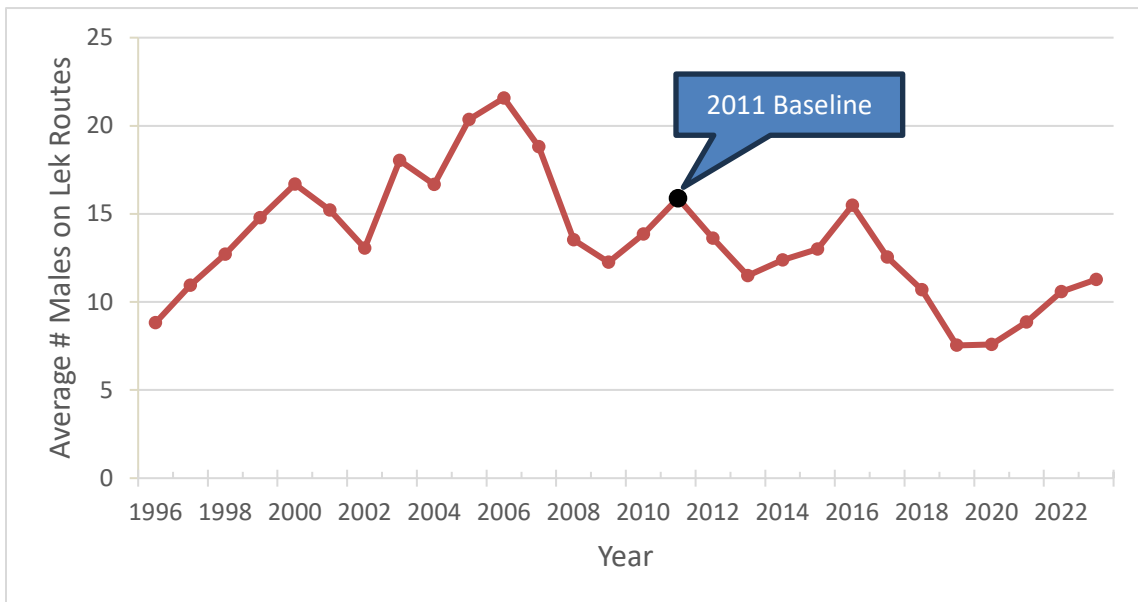


Figure 2. Average number of males per lek for all lek routes in Idaho, 1996-2023.

Table 1. Estimate of number of leks to count by Conservation Area and 2015 BLM Habitat Management Area (HMA) in Idaho in 2023, statistical sample needed of leks counted in 2021 and 2023 for lambda estimation, and actual 2023 results.

2015 BLM Conservation Area/HMA	Total sample leks ^a	# of sample leks on lek routes ^b	Total leks to count 2023 ^c	Actual # leks counted 2023 ^d	Sample size needed of leks counted 2021 & 2023 ^e	Actual # leks counted 2021 & 2023	Statistical power reached
Desert PHMA	358	145	199	210	51	161	Yes
Desert IHMA	78	29	53	59	50	51	Yes
Mountain Valleys PHMA	330	131	169	207	64	177	Yes
Mountain Valleys IHMA	82	38	70	71	45	59	Yes
Southern PHMA	168	43	125	126	91	94	Yes
Southern IHMA	186	62	111	131	89	106	Yes
West Owyhee PHMA ^f	227	38	209	200	32	175	Yes
West Owyhee IHMA ^f	15	1	15	17	15	15	Yes
Desert General	36	4	14	7			NA
Mountain Valleys General	61	14	25	21			NA
Southern General	85	16	12	18			NA
West Owyhee General	3	0	1	0			NA
Not categorized or non-habitat	5	1	4	6			NA
Statewide	1,634	522	1,007	1,074			--

^a Leks and locations of breeding birds that do not meet the definition of a lek in 2022 database, excluding 313 unoccupied and not verified leks

^b When ran in lambda analysis, lek route leks are separated from their lek route and assigned to the HMA they plot in (See Appendix A)

^c Includes lek route leks, random leks, and database priorities

^d Includes pending new leks, which are locations of at least 2 breeding males but do not meet the definition of a lek

^e Number of leks that needed to be counted in both 2021 and 2023 to produce an estimate of $\lambda \pm 0.20$ (Scheaffer et al. 1986)

^f HMA assignments following BLM (2015)

Table 2. Lek triggers evaluation for lek routes and lambda (λ) by Conservation Area/2015 BLM Habitat Management Area in Idaho, 2023.

Conservation Area/HMA	Total males on lek routes														Lambda (λ)				
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Current 3-year avg ^a	% change from 2011 ^b	Route trigger tripped	λ 2021 to 2023	90% confidence interval ^c	λ trigger tripped ^d
Desert PHMA	1713	1434	1526	1394	1346	1710	1412	1097	746	619	796	1128	1321	1082	-37%	Hard	1.67	1.406-1.926	2019
Desert IHMA	233	186	194	194	190	241	164	138	124	110	98	170	118	129	-45%	Hard	1.02	0.822-1.227	2018
Mountain Valleys PHMA	1801	1719	1456	1608	1589	1663	1439	1173	874	952	1043	1452	1487	1342	-25%	Hard	1.09	0.954-1.244	2018
Mountain Valleys IHMA	336	290	317	334	390	432	370	306	203	253	247	289	258	265	-21%	Hard	1.06	0.814-1.301	No
Southern PHMA	276	263	265	345	403	490	450	363	342	403	392	531	633	519	+91%	No	1.53	1.293-1.783	No
Southern IHMA	628	555	495	509	581	666	557	448	323	317	356	445	452	403	-29%	Hard	1.26	0.930-1.598	2019
West Owyhee PHMA	693	600	527	566	837	1108	935	617	506	447	379	407	556	447	-35%	Hard	1.41	1.216-1.610	2020
West Owyhee IHMA ^e	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.24	0.867-1.610	2019

^a Current 3-year average.

^b % change in current 3-year average from 2011 total.

^c For a lambda (λ) trigger trip, the 90% confidence interval would be less than and not include 1.0.

^d For a population trigger to trip, both lek route and lambda (λ) must meet the trigger requirements. Once a hard trigger is tripped, untripping a trigger requires the current 3-year average of males on lek routes to return to or exceed the 2011 baseline.

^e No lek routes in West Owyhee IHMA under BLM (2015); thus, trigger is evaluated only on the lambda (λ) analysis. West Owyhee IHMA is operating under a hard habitat trigger due to the 2015 Soda Fire.

Table 3. History of tripped population triggers in Idaho, 2015–2023. Hard triggers remain operational^a until the maximum male counts on lek routes return to the 2011 baseline.

Conservation Area/HMA	2015	2016	2017	2018	2019	2020	2021	2022	2023
Desert PHMA	None	None	None	Soft	Hard	Operational	Operational	Operational	Operational
Desert IHMA	None	None	None	Hard	Operational	Operational	Operational	Operational	Operational
Mountain Valleys PHMA	None	None	None	Hard	Operational	Operational	Operational	Operational	Operational
Mountain Valleys IHMA	None	None	None	None	<i>Soft</i>	None	None	None	None
Southern PHMA	None	None	None	None	None	None	None	None	None
Southern IHMA	None	None	None	None	Hard	Operational	Operational	Operational	Operational
West Owyhee PHMA	None	None	None	None	None	Hard	Operational	Operational	Operational
West Owyhee IHMA	None	None	None	None	Hard	Operational	Operational	Operational	Operational

^a Operational management allocations include temporary application of all PHMA management actions to IHMA within a Conservation Area where the criteria for hard triggers have been met.

Appendix A. Lek Routes

Lek routes used in the population triggers analysis^a, Habitat Management Area and notes on assignments.

Lek Route	Conservation Area	2015 BLM Habitat Management Area	Notes
Antelope Creek	Mountain Valleys	Priority	
Antelope Pocket	Southern	Priority	Most of route in Priority
Big Desert #1	Desert	Priority	
Big Desert #3	Desert	Priority	Most of route in Priority
Big Desert #5	Desert	Priority	
Big Jack's Creek	West Owyhee	Priority	
Birch Creek	Southern	Important	
Blair Trail	Desert	Important	
Bliss-Hill City Road	Desert	Priority	
Bloomington	Southern	Important	
Brown's Bench	Southern	Priority	
Brown's Creek	West Owyhee	Priority	
Carlson Cabin	Mountain Valleys	Priority	
Cottonwood Ridge	Southern	Important	4 leks in Important, 3 in Priority; small pocket of Priority here
Cow Creek	West Owyhee	Priority	
Crane Creek	Mountain Valleys	General	
Crooked Creek	Mountain Valleys	Priority	
Crow's Nest-Clover	Southern	Important	Only occupied lek is in Important, others in Important, 1 in general, 3 not in mapped habitat
Curlew East	Southern	Important	1 lek in non-habitat
Curlew North	Southern	Important	1 lek in non-habitat
Curlew South	Southern	Important	2 leks in non-habitat
Curlew West	Southern	Important	
Dishpan	Southern	Priority	
Dry Creek	Southern	Important	
Dry Gulch	Mountain Valleys	Important	
EIU Sheep Creek (2B032 only)	Southern	Important	2B032 was only lek counted in 2011, it is in Important
Fingers Butte	Desert	Priority	Most of route in Priority
Fir Grove	Desert	Priority	
Grassy Hills	Southern	Priority	
INL/Tractor Flat	Desert	Important	1 lek in General

Lek Route	Conservation Area	2015 BLM Habitat Management Area	Notes
Jacoby	Mountain Valleys	Priority	
Kinyon	Southern	Important	
Leadore East	Mountain Valleys	Priority	
Leadore West	Mountain Valleys	Priority	1 lek in non-habitat
Lidy	Mountain Valleys	Priority	3 leks in non-habitat
Lincoln/Minidoka	Desert	Priority	1 lek in General
Little Hat Creek	Mountain Valleys	Important	
Little Lost	Mountain Valleys	Priority	
Little Sagehen Flat	Mountain Valleys	Important	
Lower Birch Creek	Mountain Valleys	Priority	
Lower Lemhi	Mountain Valleys	Important	
Lower Pahsimeroi East	Mountain Valleys	Important	
Lower Pahsimeroi West	Mountain Valleys	Important	
Macon Flat	Desert	Priority	
Medicine Lodge	Mountain Valleys	Priority	2 leks in non-habitat
Middle Mountain	Southern	Important	
Midvale Hill	Mountain Valleys	General	
Monday Gulch	Mountain Valleys	General	
Moores Flat	Mountain Valleys	Important	
North Shoshone	Desert	Priority	
Oreana	West Owyhee	Priority	
Paddelford Flat	Desert	Priority	1 lek in non-habitat
Picabo	Desert	Priority	1 lek in non-habitat
Plano	Mountain Valleys	Important	
Red Road	Mountain Valleys	Priority	4 leks in Important, 6 in Priority
Rock Creek	Mountain Valleys	Priority	Most of route in Priority
Rocky Knoll	West Owyhee	Priority	
Roland Road	West Owyhee	Priority	
Roseworth	Southern	Important	5 leks in Important, 2 in Priority
RWMC/INL	Desert	Priority	5 leks in Priority, 3 in Important
Sheep Creek	West Owyhee	Priority	
Sheep Station	Mountain Valleys	Priority	
Shoshone Basin	Southern	Priority	
Slug Creek	Southern	General	
Soulen Center	Mountain Valleys	General	
South Big Desert	Desert	Important	
Stible Road	Desert	Important	

Lek Route	Conservation Area	2015 BLM Habitat Management Area	Notes
Sunday Creek	Southern	General	
Table Butte	Mountain Valleys	Priority	
Timmerman	Desert	Priority	
Upper Big Lost	Mountain Valleys	Priority	
Upper Birch Creek	Mountain Valleys	Important	
Upper Lemhi	Mountain Valleys	Priority	
Upper Pahsimeroi	Mountain Valleys	Priority	
Wickahoney	West Owyhee	Priority	
Yellow Sign Road	Southern	Important	

^a Two lek routes, Spring Gulch and Winter Camp, are not included because they were not surveyed in 2011.

Appendix B. Status Designations and Definitions for Idaho Sage-grouse Leks 2022

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

- **Active** – A previously identified lek that has been attended by >1 displaying male sage-grouse during the current breeding season.
- **Inactive** – Any lek where sufficient data suggests that there was no male attendance throughout the current breeding season. Absence of male grouse during a single visit is insufficient documentation to establish that a lek is inactive. This designation requires documentation of 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 acceptable weather conditions (clear to partly cloudy and winds <10 kph) and in the absence of obvious disturbance. The second annual visit to a potentially inactive lek can be a ground check later in the strutting season; inactive status can be confirmed if no fresh droppings or feathers are found at the lek site.
- **Unknown** – Leks that were not surveyed this breeding season or for which status as active or inactive could not be determined. Leks surveyed 1 time by air with 0-1 birds observed will receive an unknown status.
- **Pending** – An observation of >1 displaying male in a new location. The new location should be thoroughly examined to assure that the observation is not one of a lek that has moved. Typically, new leks should be at least 0.5–1 km from other lek locations and/or separated topographically.

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

- **Occupied** – A lek that has been active during at least 1 breeding season within the current 5-year period.
- **Unoccupied** – An unoccupied lek is one that has not been active during a period of 5 consecutive years. To be designated unoccupied, a lek must be “inactive” (see above criteria) in 5 consecutive breeding seasons. A lek may also be unoccupied if it has been surveyed in 7 of the last 10 years and no birds have been observed in any year. The site of an unoccupied lek should be re-visited at least once every 7-10 years to determine whether it has been reoccupied by grouse.
- **Undetermined** – Any lek that has not been surveyed or documented as active in the last 5 years, or has had insufficient survey information to designate the lek as unoccupied.
- **Pending** – A newly discovered lek. A “pending” status is assigned to a location of >1 displaying male as defined above. Because grouse may temporarily display in a random location, the status of the lek observation must be determined within the following 4 years. If >1 displaying males are observed at the location in at least 1 of the following 4 years, the leks status converts to “occupied.” If the location is surveyed in at least 2 of the next 4 years, and 0 birds are observed, it is determined that the observation was not a true lek and the observation is converted to a “not verified” status. If the “new” lek is not surveyed in the next 4 years, the status reverts to “not verified.”
- **Not Verified** – Not Verified leks are those that have a single observation of birds in one year, but are not confirmed as active following the initial observation. Some leks that are not verified may have been from an historical document where the location is suspect; in some cases a lek may

have been found in the general vicinity, then the lek remains in the database with an updated location. Documentation of Not Verified leks remains on file with IDFG, but are not exported to the annual lek database update. Criteria for Not Verified status includes:

- An historical lek observation prior to 1980 that was recorded in one year, but no lekking birds have been observed at or near the location in at least 7 different years following the initial recorded observation.
- Any lek observation that was recorded in one year, but no lekking birds have been observed at the location in the most-recent 5 years or in at least 7 different years following the initial recorded observation.
- Any Pending lek that is not confirmed as above converts to Not Verified.

Appendix C. Status Designations and Definitions for Idaho Sage-grouse Leks 2023, Idaho Department of Fish and Game

Introduction

The Idaho Department of Fish and Game (IDFG) curates the Idaho Sage-grouse Lek Database, which stores monitoring data comprised of annual counts of breeding greater sage-grouse (GRSG; *Centrocercus urophasianus*) collected during spring lek surveys. These monitoring data are important for tracking GRSG population status and informing GRSG conservation and management across Idaho. IDFG updates the lek database at least annually. IDFG then shares the lek database as biannual data exports with conservation partners, including the Bureau of Land Management, US Forest Service, and US Fish and Wildlife Service.

In late 2022, the Western Association of Fish and Wildlife Agencies (WAFWA) published new guidelines to monitor GRSG (Cook et al. 2022). The WAFWA guidelines also updated the definition of a lek, which was previously reported by Connelly et al. (2003) and Connelly and Schroeder (2007) and applied to the Idaho Sage-grouse Lek Database. Moreover, Cook et al. (2022) provides standardized definitions for observations of breeding greater sage-grouse that qualify for lek designation versus observations that do not qualify. Providing clear definitions is important because many past observations of breeding greater sage-grouse were designated as leks in the database, but these observations were never subsequently verified.

Applying Cook et al. (2022), lek definitions and status designations provided herein were incorporated into the Idaho Sage-grouse Lek Database beginning in 2023. These standardized definitions and designations will improve GRSG monitoring efficiency and aid GRSG habitat conservation and management by informing land-use planning. The following paragraph introduces users of the Idaho Sage-grouse Lek Database to changes that have occurred since the 2022 database was exported to partners.

Attention Lek Database Users:

The 2023 Greater Sage-grouse Lek Database including important status designations has changed compared to previous versions. Status designations and definitions (ManagementStatus column) mostly follow Cook et al (2022). Please disregard previous designations and definitions. Column LekID is now UniqueID, Column LekName is now Name. The only locations in the data export that do not meet the definition of a lek are labeled “new” under the ManagementStatus column. “Undetermined” status (locations that never met the definition of a lek) will not be included in the data export but are retained by IDFG for record keeping. Leks are considered “Active” when there are at least 2 males displaying in at least 2 of the past 10 years. The previous definition was at least 2 males displaying in 1 of the past 5 years. The Column “MonitoringCrosswalk” is for administrative purposes only. The column “LastActive” was added for your convenience. If you have any questions, please contact Michelle Kemner. Michelle.kemner@idfg.idaho.gov, 208-854-8950.

Lek – A lek is a traditional location where at least 2 male Greater sage-grouse congregate during at least 2 springs within a 10-year period to perform their strutting display and opportunistically breed with females. Although males are territorial on leks and occupy an area, not a point, the representative location for the lek is the estimated or calculated center of the display activity. The ‘lek’ is the standard reporting and analysis unit for evaluating population status and long-term trends. Because males may

alter their display locations within and between years (for numerous possible reasons), these multiple locations ‘within’ the lek have been referred to as “sub-leks”, “satellite leks”, “alternative leks”, or “temporary leks”. The location provided for the overall ‘lek’ should represent the dominant, largest, and/or most recent annual activity center. The lek identifier is the critical piece of data to remain consistent over time, the location can shift over time (Cook et al. 2022).

Lek Route – A logistical group of leks that are counted on the same morning, often by the same observer(s) (Cook et al. 2022). The Idaho Department of Fish and Game (IDFG) monitors up to 85 lek routes across southern Idaho. Lek routes must be counted annually to monitor population trends.

Lek Database – A spatial database containing Greater sage-grouse lek survey data managed by IDFG. There are 2 columns in Idaho’s sage-grouse lek database that refer to the annual status and overall management status of a lek or a location of displaying males:

- **Annual Status** – The current year’s lek status based on standardized survey observations.
- **Management Status** – Definitions adhere to Cook et al. (2022). IDFG expanded designations resulting in more precision and clarity in the lek or location status.

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

- **Active** – Any lek or location with an IDFG lek identification number that was attended by at least 2 displaying male sage-grouse during the current breeding season.
- **Inactive** – Any lek or location with an IDFG lek identification number where sufficient data suggests that there were less than 2 male sage-grouse attending throughout the current breeding season.
- **Unknown** – Any lek or location with an IDFG lek identification number that was not surveyed during the current breeding season.

Annual status designations are not used to determine whether that location meets the definition of a lek. Rather, that depends on the observation history of male sage-grouse attendance (i.e., displaying male counts and survey frequency).

Management Status – For management purposes, potential and verified leks are assigned one of the following designations based on Cook et al. (2022). Although a location designated as “new” falls within the definition of “undetermined” in Cook et al. (2022), IDFG adopted the word “new” for monitoring purposes, and the scenarios for “new” are described below.

The same information is presented in tabular form at the end of this document (Appendix). See Table 1 for the lek monitoring framework, which specifies the frequency and timeline of surveys needed to analyze population trends.

- **Active** – A lek that has at least 2 males counted during two or more years within the past 10 years.
- **Inactive** – A previously identified lek at which all observations within the past 10 years have been less than 2 males and that had at least 2 males recorded during a lek count between 11 and 20 years ago (Cook et al. 2022). IDFG identifies when leks are placed in this status:
 - A lek must have been surveyed and found to be “Inactive” (Annual Status) in at least 5 breeding seasons since the last observation of at least 2 displaying males.

- The site of an inactive lek should be re-visited at least once every 5 years to determine if it becomes re-occupied (active).
- **Pending Active** – A lek with one observation of at least 2 males in the last 10 years and at least one observation of at least 2 males more than 10 years ago. This status captures leks insufficiently monitored to classify as Active, Inactive, or Historical but contains a more recent observation than Pending Historical (Cook et al. 2022).
- **Undetermined** – A location where male sage-grouse are displaying that has not been documented in multiple years and does not meet the definition of a lek. Sage-grouse may spontaneously display in an alternate location that is not maintained through time; undetermined leks should be verified in subsequent breeding seasons (Cook et al. 2022). There are 2 situations in the IDFG lek database where this term applies:
 - Observations of at least 2 displaying males at a previously documented location that were greater than 10 years apart and happened over 10 years ago.
 - An observation of at least 2 displaying males that was recorded once over 10 years ago, but no lekking birds have been observed at the location since initial observation (These are typically observations of displaying males noted on historic documents and/or maps and were included in the original IDFG lek database).
 - Documentation of “Undetermined” leks remains on file with IDFG and are not typically included in lek database export.
- **Pending Historical** – A lek with insufficient observations in the last 10 years to classify as Active, Inactive, Historical, or Pending Active. This requires one observation of at least 2 males recorded 11 to 20 years ago and may include at least one observation of at least 2 males more than 20 years ago (Cook et al 2022). IDFG defines “insufficient” as any lek with less than 5 observations since the last observation of at least 2 displaying males.
- **Historical** – A lek at which all observations within the last 20 years have been less than 2 males, but previously met the definition of a lek (Cook et al. 2022).
- **New** – A newly discovered location of at least 2 displaying males observed in the same location at least twice during the current breeding season or when there is one observation of at least 2 displaying males within the past 10 years and an observation (or observations) of at least 2 displaying males at a previously documented location of breeding birds (not a lek) that was greater than 10 years ago. Counts must be conducted 7-10 days apart within the current breeding season to be included as a “new” location to monitor. A “New” location must be surveyed for at least 5 and up to 9 consecutive years following the initial observation because grouse may temporarily display in a random location. If at least 2 displaying males are observed at the location in at least 1 of the following 5 years, the status converts to “Active.” If the location is surveyed during the next 5 years and 0 birds are observed, the location is converted to “Undetermined” status.

Status designation for locations that DO NOT meet the definition of a lek:

- Undetermined
- New

Status designations for locations that meet the definition of a lek:

- Active
- Inactive
- Pending Active
- Pending Historical
- Historical

Table 1. Lek monitoring framework.		
Management Status	Survey Frequency	Timeline
Lek Route	Annually	In perpetuity
New	Annually	Until status is changed to Active or Undetermined; typically, 5 years but can be up to 9 years following initial observation.
Pending	Annually	Until status is changed to Active, Inactive, or Historical.
Active (off lek routes)	Random	These leks are randomly assigned by IDFG sage-grouse Staff Biologist annually to ensure robust sample size for Population Triggers. Leks are surveyed at a minimum of every 5 years.
Inactive	Sporadic	Every 5 years
Historical	Sporadic	Every 7-10 years if applicable

Lek Database Records Management:

- Lek counts conducted prior to March 20th in low elevations and March 25th in higher elevations will not be included in Idaho’s sage-grouse lek database because this is outside the standardized survey window.
- Lek counts must be conducted between ½ hour before and 1½ to 2 hours after sunrise. Leks counts conducted after 0930 will not be included in Idaho’s sage-grouse lek database because this is outside the standardized survey window.
- Lek counts should be completed by 30 April in low elevation sites and 5 May in higher elevation sites in Idaho, unless instructed otherwise. Lek counts falling outside the 20 March–30 April, or 25 March–5 May calendar dates will not be included in Idaho’s lek database except in unusual circumstances such as deep snow events (spring 2023).

Literature Cited

Connelly, J. W. and M. A. Schoeder. 2007. Historical and current approaches to monitoring Greater Sage-grouse. Pages 3-10 *in* K. P. Reese and R.T Bowyer (editors). Monitoring populations of sage-grouse. College of Natural Resources Experiment Station Bulletin 88, University of Idaho, Moscow.

Connelly, J. W., K. P. Reese, and M. A. Schroeder. 2003. Monitoring of greater sage-grouse habitats and population. Station Bulletin 80. College of Natural Resources Experiment Station, College of Natural Resources, University of Idaho, Moscow, Idaho.

Cook, A. A., P.A. Deibert, S.P. Espinosa, A. Moser, L. Schreiber, and M.A. Schroeder. 2022. Greater Sage-grouse range-wide population monitoring guidelines Part A: Standards for collecting and reporting of Greater Sage-grouse lek count data. WAFWA Sage and Columbian Sharp-tailed Grouse Technical Team, Boise Idaho.