



# MONTANA FISH, WILDLIFE & PARKS

## Montana Greater Sage-grouse Population Report

September 3, 2019

Montana Greater Sage-grouse population estimates and associated uncertainty, and the number of known breeding sites (called leks) are presented here in compliance with MCA 87-1-201(1)(11), as amended in 2017.

Montana Fish, Wildlife and Parks (FWP) biologists work with our federal agency and non-governmental organization partners and volunteers to count the number of displaying males at lek sites across the state in spring of each year. Counts are conducted at leks 1 – 3 times within a season; however, all leks are not monitored in every year. Each lek is also categorized based on activity status, such as confirmed active or confirmed inactive, according to established definitions (see below). FWP manages the sage-grouse lek count and activity status database for the State of Montana.

### Population Estimates - Methods

Montana FWP worked with Dr. Paul Lukacs, University of Montana, to estimate sage-grouse population numbers based on counts of displaying males at leks using  $N$ -mixture models. This modeling approach is a robust analytical method for estimating population size and trend over time for species like sage-grouse that congregate at discrete breeding sites (McCaffrey et al. 2016). Although FWP maintains a database of male counts at leks that date back to 1952, only data from 2002 onward could be used with this modeling approach.

### *Some Caveats...*

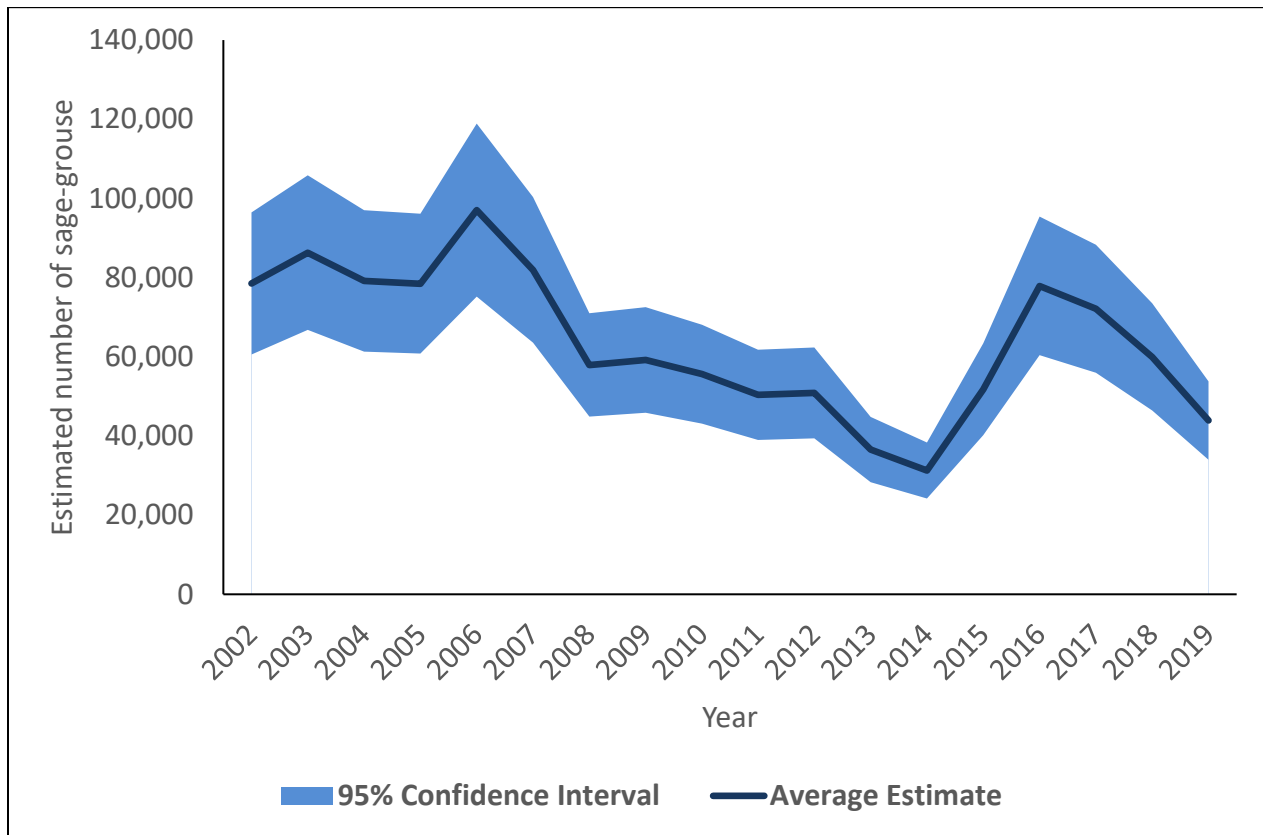
All models are approximations and rely on certain assumptions. The assumptions that were made in the development of these population estimates include:

- FWP does not count females but can estimate the number of females based on an assumed sex ratio. We used an average ratio of 2.45:1 females to males based on published literature (Taylor et al. 2011). True population numbers may be larger or smaller than estimated depending upon the actual ratio in each year.
- Only data from known leks were used in the calculations. This could lead to under-estimating the true population if there were a sizeable number of unknown leks.
- Models assumed each male visited one lek. This could lead to over-estimating the true population if individual males visited and were counted at multiple leks.
- Models assumed each male was detected independently. This could lead to under-estimating the true population if detection of some individuals was dependent upon detection of other individuals.

It is also important to recognize these models use algorithms that will estimate similar, but not precisely the same, population numbers each time the models are run. This means that population estimates may vary slightly from the previous report but are well within reported confidence limit bounds.

## Population Estimates – Results and Discussion

The *N*-mixture models estimate that there were approximately 43,887 ( $\pm$  9,911) sage-grouse in Montana in spring 2019 (Figure 1, Table 1). The recent apparent declining trend in sage-grouse estimates is likely a result of the extreme drought in eastern Montana in summer 2017. By September 2017, every county in eastern Montana that supports sage-grouse except Carbon County was considered extremely or exceptionally dry ([https://mslservices.mt.gov/Geographic\\_Information/Maps/drought/](https://mslservices.mt.gov/Geographic_Information/Maps/drought/)). This extreme drought meant that wet areas with critical food resources during the late summer brood-rearing season were very limited. Of the three vital rates affecting sage-grouse populations - nest success, chick survival, and hen survival (Taylor et al. 2011) - chick survival and possibly hen survival were likely impacted by the limited late summer resources. This would have led to low recruitment in to the 2018 spring population, and hence lower count numbers in 2018. Data from FWP's sage-grouse research project in central Montana suggests nest success, chick survival, and hen survival remained comparatively low in summer and fall 2018 (Berkeley et al. 2019). Assuming these data are representative of statewide patterns, they may explain the lower population estimates in spring 2019. Sage-grouse population numbers oscillate over a period of 8 – 10 years across large scales (Fedy and Doherty 2011). Thus, the apparent decline in estimated population numbers in 2018 – 2019 is likely a result of natural fluctuations and does not warrant immediate concern.



**Figure 1.** Graphical representation of Greater Sage-grouse population estimates and associated uncertainty from *N*-mixture models in Montana, 2002 – 2019. In general terms, confidence intervals are the range of values that describe the uncertainty around the population estimate.

**Table 1.** Numerical estimates of Greater Sage-grouse population numbers and associated confidence intervals from *N*-mixture models in Montana, 2002-2019.

Year	Population Estimate	Confidence Range	
		<i>Lower Bound</i>	<i>Upper Bound</i>
2002	78,489	60,560	96,417
2003	86,310	66,772	105,848
2004	79,171	61,286	97,056
2005	78,467	60,827	96,107
2006	97,044	75,194	118,894
2007	81,935	63,551	100,319
2008	57,914	44,868	70,960
2009	59,194	45,881	72,508
2010	55,620	43,143	68,096
2011	50,421	39,027	61,815
2012	50,871	39,385	62,357
2013	36,587	28,347	44,827
2014	31,265	24,209	38,321
2015	51,797	40,166	63,427
2016	77,887	60,389	95,385
2017	72,106	55,950	88,262
2018	59,951	46,410	73,492
2019	43,887	33,976	53,798

There are other analytical models that have utility for estimating population size and trends, such as Integrated Population Models. However, these models require additional demographic information, such as recruitment data, that are currently unavailable statewide. FWP may explore additional modeling techniques in the future as new data become available.

### Number of Leaks - Summary

FWP maintains a spatial database of Greater Sage-grouse leks, summarized by activity status in Table 2. FWP staff are continually working to confirm and record new lek locations and update lek status. In 2018, FWP added a new status category, *Provisionally Active*, to alert the Montana Sage Grouse Habitat Conservation Program, the Bureau of Land Management, and industry proponents of newly discovered leks immediately. Two survey years are required to meet the definition of a Confirmed Active lek; thus, without a Provisionally Active status option, there was a delay of over one year before resource agencies and industry were notified of newly discovered leks. Provisionally Active status is meant to be temporary. If data are not sufficient to meet the definition of Confirmed Active after a second year of surveys, a Provisionally Active lek will revert to Unconfirmed and would not be evaluated under state or federal assessments for new development. If data is sufficient in the second year of surveys, the lek will immediately be classified as Confirmed Active.

**Table 2.** Number of known Greater Sage-grouse leks in Montana by classification status, 2002 – 2019.\*

Year	Confirmed Active	Confirmed Inactive	Confirmed Extirpated	Provisionally Active <sup>^</sup>	Never Confirmed Active	Unconfirmed	Total
2002	548	79	17	.	29	514	1187
2003	613	84	17	.	47	521	1282
2004	650	88	19	.	56	532	1345
2005	675	94	19	.	64	545	1397
2006	718	96	19	.	67	605	1505
2007	753	98	20	.	72	631	1574
2008	809	100	22	.	75	592	1598
2009	851	104	25	.	91	553	1624
2010	948	110	40	.	118	446	1662
2011	971	125	50	.	150	383	1679
2012	979	133	50	.	180	353	1695
2013	978	144	59	.	200	332	1713
2014	985	154	65	.	227	293	1724
2015	988	172	65	.	242	269	1736
2016	990	186	66	.	256	268	1766
2017	1007	200	66	.	252	276	1801
2018	1014	219	66	(3)	260	249	1808
2019	1017	231	66	3	263	238	1818

\*FWP’s database is dynamic and the status of a lek can change retroactively based on new information entered at any time. Reviewers may notice small changes in classification numbers from what was reported in previous reports. These are not errors; rather they are the most up-to-date numbers as of this report.

<sup>^</sup>New status created in 2018. See definition below. Provisionally Active status is only relevant for the current year; leks categorized as Provisionally Active in previous years have been moved to Confirmed Active or Unconfirmed status, as appropriate. The number of leks that met the Provisionally Active criteria in 2018 is noted in parenthesis.

## **Lek Status Definitions**

*Confirmed Active* - Data supports existence of lek. Supporting data defined as 1 year with 2 or more males lekking on site followed by evidence of lekking (Birds - male, female or unclassified; -OR- Sign - vegetation trampling, feathers, or droppings) within 10 years of that observation.

*Confirmed Inactive* - A Confirmed Active lek with no evidence of lekking (Birds - male, female or unclassified; -OR- Sign - vegetation trampling, feathers, or droppings) for the last 10 years. Requires a minimum of 3 survey years with no evidence of lekking during a 10 year period. Reinstating Confirmed Active status requires meeting the supporting data requirements.

*Confirmed Extirpated* - Habitat changes have caused birds to permanently abandon a lek (e.g., plowing, urban development, overhead power line) as determined by the biologists monitoring the lek.

*Never confirmed active* – An Unconfirmed lek that was never confirmed active. Requires 3 or more survey years with no evidence of lekking (Birds - male, female or unclassified; -OR- Sign - vegetation trampling, feathers, or droppings) over any period of time.

*Provisionally Active* – Preliminary data supports existence of an active lek. This status can only apply during the first year of detection. Supporting data defined as 1 observation with 2 or more males lekking on site AND sign of lekking (vegetation trampling, feather, or droppings) or followed by a 2<sup>nd</sup> observation of 2 or more males lekking within the same survey year.

*Unconfirmed* - Possible lek. Grouse activity documented. Data insufficient to classify as Confirmed Active status.

## **References**

- Berkeley, L., M. Szczypinski, J. Helm, and V. Dreitz. 2019. The impacts of grazing on greater sage-grouse habitat and population dynamics in central Montana, FY2019 Annual Progress Report. Montana Fish, Wildlife and Parks, Helena.
- Fedy, B.C. and K.E. Doherty. 2010. Population cycles are highly correlated over long time series and large spatial scales in two unrelated species: greater sage-grouse and cottontail rabbits. *Oecologia*; DOI 10.1007/s00442-010-1768-0
- McCaffrey, R., J.J. Nowak, and P.M. Lukacs. 2016. Improved analysis of lek count data using N-Mixture models. *Journal of Wildlife Management*; DOI: 10.1002/jwmg.21094.
- Taylor, R.L., B.L. Walker, D.E. Naugle, and L.S. Mills. 2011. Managing multiple vital rates to maximize Greater Sage-grouse population growth. *Journal of Wildlife Management*; DOI: 10.1002/jwmg.267