



MONTANA FISH, WILDLIFE & PARKS

Montana Greater Sage-grouse Population Report

August 28, 2023

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 federal agency, 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. FWP also updates and manages the sage-grouse lek count and activity status database for the State of Montana. These data are used to assess population trends for use in sage-grouse management decisions. They are also provided to the Montana Sage-grouse Habitat Conservation Program and the Bureau of Land Management for use in land use decisions and permitting. Each lek is also categorized based on activity status, such as confirmed active or confirmed inactive, according to established definitions (see lek status definitions below).

Population Estimates - Methods

Montana FWP worked with Dr. Paul Lukacs, University of Montana, to develop a model that estimates sage-grouse population numbers based on counts of displaying males at leks using *N*-mixture models. For this 2023 report, it was run by Dr. Alixandra Godar, FWP Wildlife Population Ecologist/Biometrician. 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 the database of male counts at leks dates back to 1952, only data from 2002 onward could be used for this approach.

It is 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 previous reports but are well within reported confidence limits.

Population Estimates – Results and Discussion

Montana FWP and partners surveyed 766 leks at least once in spring 2023. The models estimate that there were approximately 51,087 (95% credible interval (CI):39,078–63,096) sage-grouse in Montana in spring 2023 (Figure 1, Table 1). This estimate is down ~5% from last year's estimate of 53,758 (95% CI:41,329–66,186), and a 27% decrease over the past two seasons from the estimate in 2021 of 70,287 (95% CI:54,086–86,488).

Montana experienced exceptional drought conditions in 2021 and 2022 (<https://droughtmonitor.unl.edu/Maps/MapArchive.aspx>) with higher-than-average temperatures and well below average precipitation. This meant that wet areas critical for cover and food resources, forbs and insects, were likely limited during the brood-rearing season. Extremely difficult survey conditions occurred in spring of 2023 with persistent spring snow and wet impassable roads later into the spring than typical, shortening the survey period. Because of the compressed survey timeframe many surveys did not achieve the preferred 3

visits/lek or the preferred time of season to document peak male attendance. While some of this variation is accounted for in the model, this may have affected overall accuracy for the 2023 estimate.

Weather factors drive short term changes in sage-grouse numbers. A similar decrease (25%) was experienced in the 2019 population estimate after drought conditions occurred in summer 2018. During this time, FWP was conducting a sage-grouse research project in central Montana, that suggested nest success, chick survival and hen survival were low during summer and fall 2018 (Berkeley et al. 2019). Range-wide drought conditions in 2021 and 2022 may have impacted the population in a similar manner, providing a possible explanation for the past two year's decline.

Sage-grouse population numbers generally oscillate over a period of 8 – 10 years across large scales (Fedy and Doherty 2011). In Montana, weather patterns, predation, and other factors are believed to cause these oscillations. Longer term trends, over multiple oscillations, are important to consider when making management decisions.

An assumption used in the development of these estimates is, a male to female ratio of 1:2.45 (Taylor et al. 2011). The 2018 and 2019 population reports list other main assumptions. There are also 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 and/or improved modeling techniques in the future as new data become available.

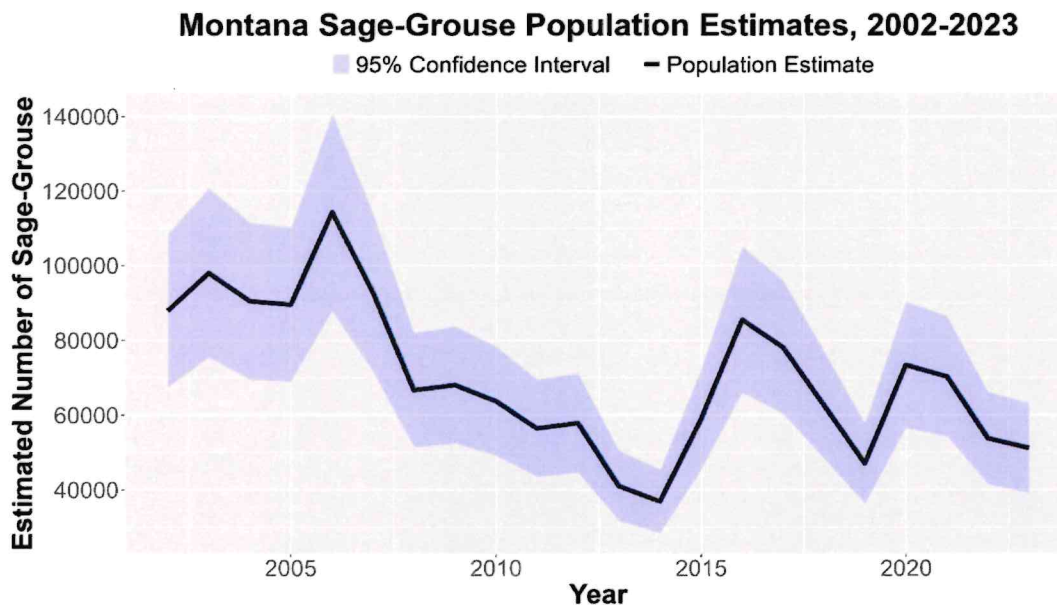


Figure 1. Greater Sage-grouse population estimates and associated uncertainty (95% credible intervals) from N-mixture models in Montana, 2002-2023. In general terms, credible intervals describe the uncertainty around the population estimate due to imperfect detectability of grouse on leks and variable lek count effort each year.

Table 1. Numerical estimates of Greater Sage-grouse population numbers and associated uncertainty from *N*-mixture models in Montana, 2002-2023.

Year	Population Estimate	Standard Error	Confidence Interval	
			Lower Bound	Upper Bound
2002	87893	10520	67275	108511
2003	98026	11599	75291	120760
2004	90509	10761	69417	111601
2005	89571	10570	68854	110287
2006	114356	13566	87767	140946
2007	92876	10902	71508	114244
2008	66682	7867	51262	82102
2009	68027	8012	52323	83732
2010	63727	7498	49031	78424
2011	56441	6668	43372	69510
2012	57848	6824	44473	71223
2013	41037	4840	31551	50523
2014	36933	4382	28345	45521
2015	58893	6932	45306	72480
2016	85491	10047	65799	105184
2017	78088	9140	60173	96003
2018	62592	7373	48141	77043
2019	47052	5539	36194	57909
2020	73360	8654	56399	90321
2021	70287	8266	54086	86488
2022	53758	6341	41329	66186
2023	51087	6127	39078	63096

Number of Leks

FWP maintains a spatial database of Greater Sage-grouse leks, summarized by activity status in Table 2. FWP staff annually work to confirm and record 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, 2002-2023. *

Year	Confirmed	Confirmed	Confirmed	Provisionally	Never	Unconfirmed	Total
	Active	Inactive	Extirpated	Active^	Confirmed		
2002	542	79	8	.	29	516	1174
2003	609	84	8	.	47	516	1264
2004	645	88	10	.	56	528	1327
2005	671	94	10	.	64	541	1380
2006	713	96	10	.	67	605	1491
2007	748	98	11	.	72	630	1559
2008	805	100	13	.	75	586	1579
2009	847	104	15	.	93	545	1604
2010	939	110	30	.	119	443	1641
2011	963	125	39	.	148	380	1655
2012	974	130	39	.	178	350	1671
2013	972	143	49	.	197	332	1693
2014	978	154	55	.	224	292	1703
2015	981	172	55	.	238	272	1718
2016	987	184	56	.	256	271	1754
2017	1002	199	56	.	255	286	1798
2018	1005	221	56	.	263	268	1813
2019	1013	234	56	.	273	259	1835
2020	987	272	56	.	276	260	1851
2021	987	293	56	.	284	255	1875
2022	985	310	56	(1)	291	245	1887
2023	982	322	62	(3)	300	228	1897

*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 previous reports. These are not errors; rather they are the most up-to-date numbers as of this report.

^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 meet the Provisionally Active criteria in the past two years is noted in parenthesis.

Lek Status Definitions

Confirmed Active - Data supports existence of a 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 2nd 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

