MONTANA FISH, WILDLIFE & PARKS

Montana Greater Sage-grouse Population Report

August 18, 2022

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. 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. 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 lek status definitions 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 develop a model that estimates sage-grouse population numbers based on counts of displaying males at leks using *N*-mixture models. For this 2022 report, it was run by Dr. David Messmer, FWP Wildlife Survey and Inventory Specialist. 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 in 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 limit bounds.

Population Estimates – Results and Discussion

Montana FWP and partners surveyed 757 leks at least once in spring 2022. The models estimate that there were approximately 52,606 (95% credible interval (CI): 40,346–64,866) sage-grouse in Montana in spring 2022 (Figure 1, Table 1). This estimate is down ~24% from last year's estimate of 68,980 (95% CI: 52,992–84,968).

Montana experienced extreme and exceptional drought conditions in 2021 (https://droughtmonitor.unl.edu/Maps/MapArchive.aspx) with higher than average temperatures and well below average precipitation. This meant that wet areas with critical food resources, forbs and insects, were likely limited during the brood-rearing season.

A similar decrease (26%) 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 in summer and fall 2018 (Berkeley et al. 2019).

Range-wide drought conditions in 2021 may have impacted the population in a similar manner, providing a potential explanation for this year's decline.

Sage-grouse population numbers generally oscillate over a period of 8 – 10 years across large scales (Fedy and Doherty 2011). A large portion of long-term variation in estimates among years in Montana's dataset may be due to natural fluctuations which are likely caused by weather patterns, predation, and other factors. It is important to consider long-term patterns over time and not make management decisions based on one or a few years of lek counts, especially at broad scales.

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.

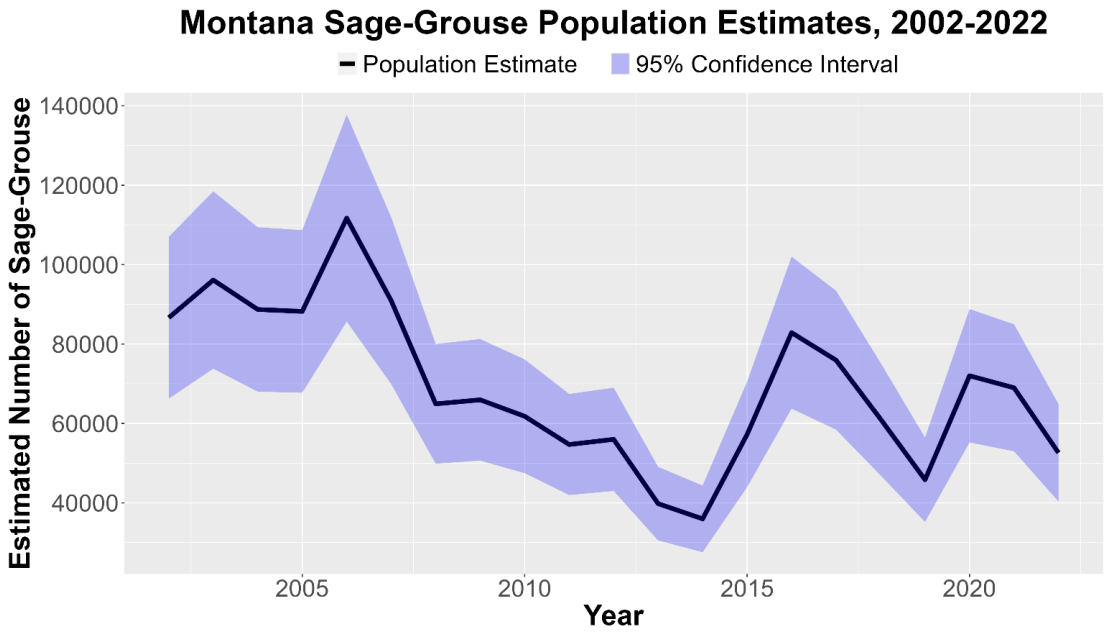

Figure 1. Greater Sage-grouse population estimates and associated uncertainty (95% credible intervals) from *N*-mixture models in Montana, 2002-2022. In general terms, credible intervals describe the uncertainty around the population estimate due to imperfect detectability of grouse on leks and variable lek count effort each year.

Table 1. Numerical estimates of Greater Sage-grouse population numbers and associated uncertainty from *N*-mixture models in Montana, 2002-2022.

Year	Population Estimate	Standard Error	Confidence Interval	
			Lower Bound	*Upper Bound*
2002	86621	10396	66244	106998
2003	96118	11390	73794	118442
2004	88706	10561	68007	109405
2005	88220	10443	67753	108688
2006	111701	13286	85660	137743
2007	90909	10713	69912	111906
2008	64927	7683	49867	79986
2009	65947	7806	50648	81247
2010	61807	7306	47488	76126
2011	54697	6491	41974	67420
2012	55994	6629	43001	68988
2013	39801	4718	30553	49049
2014	35976	4279	27590	44362
2015	57233	6768	43968	70498
2016	82865	9759	63738	101992
2017	75935	8925	58441	93428
2018	61103	7225	46942	75264
2019	45824	5418	35204	56443
2020	72011	8563	55226	88795
2021	68980	8157	52992	84968
2022	52606	6255	40346	64866

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, 2002-2022.*

Year	Confirmed Active	Confirmed Inactive	Confirmed Extirpated	Provisionally Active^	Never Confirmed Active	Unconfirmed	Total
2002	548	79	17	.	29	511	1184
2003	613	84	17	.	47	516	1277
2004	650	88	19	.	56	527	1340
2005	676	94	19	.	64	540	1393
2006	719	96	19	.	67	599	1500
2007	754	98	20	.	72	625	1569
2008	810	100	22	.	75	584	1591
2009	853	104	25	.	92	542	1616
2010	946	110	40	.	118	440	1654
2011	970	125	49	.	148	377	1669
2012	979	132	49	.	178	347	1685
2013	976	144	59	.	197	326	1702
2014	982	154	65	.	225	288	1714
2015	985	172	65	.	240	268	1730
2016	991	184	66	.	255	270	1766
2017	1007	199	66	.	254	284	1810
2018	1010	221	66	.	263	265	1825
2019	1018	234	66	.	273	256	1847
2020	993	271	66	.	276	259	1865
2021	994	292	66	.	284	252	1888
2022	988	309	66	(1)	291	237	1892

*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

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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.

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