34th Biennial Meeting

October 3-6, 2022

Lewistown, Montana

Intentionally blank

Welcome to the 34th Biennial (mostly) Meeting of the Prairie Grouse Technical Council

"*My favorite state has not yet been invented. It will be called Montana, and it will be perfect*." – Abraham Lincoln

"*Montana seems to me to be what a small boy would think Texas is like from hearing Texans*" – John Steinbeck

Dear Prairie Grousers:

After 31 years, welcome back to Montana! Montana is truly a grouser's dream – it's home to healthy populations of sharp-tailed grouse and greater sage-grouse, as well as four species of mountain grouse. For non-purists, Montana also provides habitat for four other species of non-grouse upland game birds.

The MSU Wildlife Habitat Ecology Lab, Department of Animal & Range Sciences, Montana Agricultural Experiment Station, and Montana Extension are honored to host the 34th PGTC. Yep, we've got great mountains, but we hope you will take some time to explore Montana's more underrated natural wonders while you are here – its vast intact prairies and rural communities.

On behalf of the PGTC Board and Conference Planning Committee, thanks for coming.

Lance McNew

34th Prairie Grouse Technical Council Sponsors

Northern Great Plains Joint Venture
Prairie Pothole Joint Venture
Big Sky Upland Bird Association
American Prairie
Montana State University
North American Grouse Partnership

Acknowledgements

Many fine folks have assisted with planning this meeting. Special thanks to the following:

PGTC Conference Planning Committee (alphabetically)

John Carlson – U.S. Fish and Wildlife Service
Ben Deeble – Big Sky Upland Bird Association
Sean Fields – Prairie Pothole Joint Venture
Jon Haufler – Ecosystem Management Research Institute
Denise Hoepfner – Montana State University
Lance McNew – Montana State University
Lucinda Morris – Prairie Pothole Joint Venture
Steve Riley – Northern Great Plains Joint Venture
Paul Santavy – CMR NWR, U.S. Fish and Wildlife Service
Morgan Solomon – Montana State University

PGTC Executive Board

Lance McNew (MT) – Chair (2019-present)
Don Wolfe (OK) – Past-chair (2017-2019)
RJ Gross (ND) – Past-chair (2015-2017)
Morgan Solomon (MT) – Secretary (Chairperson-assigned)

Field Trip Planning and Coordination

Paul Santavy, Ben Deeble, Morgan Solomon, Denise Hoepfner, Lance McNew

Hamerstrom Award Committee (in addition to Executive Board)
Mike Schroeder – Washington Department of Fish and Wildlife
Christian Hagen – Oregon State University

John Toepfer Prairie Grouse Research Scholarship Selection Committee
Aaron Pratt (Chair) – G.M. Sutton Avian Research Center
RJ Gross – North Dakota Game and Fish
Gary Huschle – U.S. Fish and Wildlife Service
Mike Schroeder – Washington Department of Fish and Wildlife
Greg Septon – Peregrine Management and Research, LLC
Dan Svedarsky – University of Minnesota, Crookston
Don Wolfe – G.M. Sutton Avian Research Center

PROGRAM

Monday, October 3

6:00 – 8:00 pm	Opening reception (finger foods, drinks)

Tuesday, October 4

8:00 – 8:40 am	Welcome
	Hank Worsech, Director, Montana Department of Fish, Wildlife and Parks
	Lance McNew, PGTC Chair

AM Moderator: Morgan Solomon (MSU)

SAGE GROUSE

8:40 – 9:00 am	Hayman et al. GROUSE-HABITAT RELATIONSHIPS ARE DRIVEN BY MULTILEVEL MOVEMENT PROCESSES
9:00 – 9:20 am	Messmer et al. IMPACT OF GRAZING MANAGEMENT ON VITAL RATES OF GREATER SAGE-GROUSE
9:20 – 9:40 am	Morford et al. ACCELERATING TREE ENCROACHMENT THREATENS GROUSE HABITAT
9:40 – 10:00 am	Parsons et al. RELATING SAGE-GROUSE NEST SUCCESS AND AMERICAN BADGER OCCURRENCE IN SD
10:00 – 10:20 am	Break
10:20 – 10:40 am	Maxwell et al. AN INTRODUCTION TO THE BIBLIOGRAPHY ON GREATER SAGE-GROUSE
10:40 – 11:00 am	Dahlgren et al. GROUSE TRANSLOCATIONS: MOVING BROODS, POPULATION IMPACTS, AND HABITAT
11:00 – 11:20 am	Gregory et al. SAGE-GROUSE ARE AN UMBRELLA SPECIES
11:20 – 11:40 am	Smith et al. INVASIVE ANNUAL GRASSES AND FIRE

11:40 am – 1:00 pm Lunch (on your own)

PM Moderator: Aubrey Sullivan (MSU)

LESSER PRAIRIE-CHICKEN

1:00 – 1:20 pm	Evans et al. ABOVE GROUND BIOMASS RESPONSE TO PRESCRIBED GRAZING FOR LESSER PRAIRIE-CHICKEN
1:20 – 1:40 pm	Haufler and Koch. NAGP'S CONSERVATION PLAN FOR LESSER PRAIRIE-CHICKENS
1:40 – 2:00 pm	Bain. LESSER PRAIRIE-CHICKEN STRONGHOLD DEVELOPMENT AT TNC'S SMOKY VALLEY RANCH
2:00 – 2:20 pm	Ricklefs et al. INVESTIGATING THE USE OF GRAZING DISTURBANCE FOR THE LESSER-PRAIRIE CHICKEN
2:20 – 2:40 pm	Rieber et al. LESSER PRAIRIE-CHICKEN MOVEMENTS UNDER PATCH-BURN AND ROTATIONAL GRAZING
2:40 – 3:00 pm	Break
3:00 – 3:20 pm	Parker et al. DEMOGRAPHIC EFFECTS OF A MEGAFIRE ON LESSER PRAIRIE-CHICKENS IN MIXED-GRASS PRAIRIE
3:20 – 3:40 pm	Solomon and McNew. EVALUATION OF HABITAT FOR PRIORITIZING LESSER PRAIRIE-CHICKEN CONSERVATION
3:40 – 4:00 pm	Messier et al. LINKING GREENESS (NDVI) TO LESSER PRAIRIE-CHICKEN REPRODUCTIVE HABITAT QUALITY
4:00 – 4:20 pm	Vhay et al. ASSESSMENT OF LESSER PRAIRIE-CHICKEN HABITAT IN THE SAND SAGEBRUSH PRAIRIE
4:20 – 4:40 pm	Teige et al. ASSESSMENT OF LESSER PRAIRIE-CHICKEN TRANSLOCATION
4:40 – 5:30 pm	Break
5:30 – 7:30 pm	Poster Session / Social @ American Prairie National Discovery Center

Wednesday, October 5

Field Tour (8am–4pm):	Departs in front of the Yogo Inn at 8:00 am sharp. Bagged lunches provided

Thursday, October 6

AM Moderator: Trapper Haynam (MSU)

GREATER PRAIRIE-CHICKEN AND SHARP-TAILED GROUSE

8:00 - 8:20 am	Augustine. PARTICIPANTS FLOCK TO KANSAS LEK TREKS PRAIRIE-CHICKEN FESTIVAL
8:20 – 8:40 am	Roy et al. SHARP-TAILED GROUSE RESPONSES TO FALL PRESCRIBED FIRE AND MOWING
8:40 – 9:00 am	Deeble et al. RESTORATION OF SHARP-TAILED GROUSE TO WESTERN MONTANA
9:00 – 9:20 am	Londe et al. WHY DIDN'T THE CHICKEN CROSS THE ROAD? IMPACTS OF ENERGY DEVELOPMENT
9:20 – 9:40 am	Haufler et al. CONSERVATION PLAN FOR GREATER PRAIRIE-CHICKENS AND SHARP-TAILED GROUSE
9:40 – 10:00 am	Woods. LONG-TERM POPULATION MONITORING OF SHARP-TAILED GROUSE IN BRITISH COLUMBIA
10:00 – 10:20 am	Break
10:20 – 10:40 am	Rutledge et al. PRIVATE LANDS STEWARDSHIP IN THE FLINT HILLS FOR GREATER PRAIRIE-CHICKENS
10:40 – 11:00 am	Roy and Chen. NEONICOTINOID PREVALENCE IN SHARP-TAILED GROUSE AND GREATER PRAIRIE-CHICKENS
11:00 – 11:20 am	Ellis-Felege et al. THE STORY OF THE RISE AND FALL OF PRAIRIE CHICKENS IN EASTERN NORTH DAKOTA
11:20 – 11:40 am	Kieleczowa. RANGEWIDE GENETIC DIVERSITY OF THE GREATER PRAIRIE-CHICKEN

11:40 – 12:00 pm	Lautenbach et al. SHARP-TAILED GROUSE SUBSPECIES STATUS IN SOUTH-CENTRAL WYOMING
12:00 – 1:30 pm	Lunch (on your own)

PM Moderator: Hunter Stier (MSU)

METHODS, ATTWATER'S AND OTHER TOPICS

1:40 – 2:00 pm	Morrow et al. FACTORS AFFECTING SURVIVAL OF ATTWATER'S PRAIRIE-CHICKEN BROODS
2:00 – 2:20 pm	Larsson et al. CAPTIVE PROPAGATION OF ATTWATER'S PRAIRIE-CHICKENS FOR RELEASE: UPDATES
2:20 – 2:40 pm	Hagen and Dugger. EVALUATION OF RUMP-MOUNTED TELEMETRY HARNESSES
2:40 – 3:00 pm	Walker and Schroeder. ATYPICAL PRIMARY MOLT PATTERNS IN GREATER SAGE-GROUSE
3:00 – 3:20 pm	Break
3:20 – 3:40 pm	Stein and Gregory. A DEEP DIVE INTO THE GENETIC DIVERSITY OF GREATER AND LESSER PRAIRIE-CHICKENS
3:40 – 4:00 pm	Hanlon et al. DRONES AND MACHINE LEARNING ADVANCEMENTS IN LEK-BASED POPULATION SURVEYS
4:00 – 4:20 pm	Rodgers. SUGGESTED PREVENTATIVE MEASURES TO LIMIT OLD-WORLD BLUESTEM INVASION
4:20 – 4:40 pm	Plourde and Harris. MONTANA FISH, WILDLIFE AND PARKS HABITAT PROGRAMS FOR UPLAND GAME BIRDS
4:40 – 5:00 pm	Richard et al. ORIGINS OF COLUMBIAN SHARP-TAILED GROUSE IN GRAND TETON NATIONAL PARK, WYOMING
5:00 – 5:15	Break
5:15 – 5:45 pm	Business Meeting
6:00 – 8:00 pm	Banquet and Keynotes by Andrew McKean

Keynote:

View From the Tailgate: Broadening Appeal for Upland Birds

Andrew McKean

We prairie grousers often base our conversations and our work around habitat, but for most of the humans who live in and around grasslands, it's the birds that matter. How we celebrate hunting and upland traditions matters as much to the future of prairie grouse as deep research into habitat dynamics.

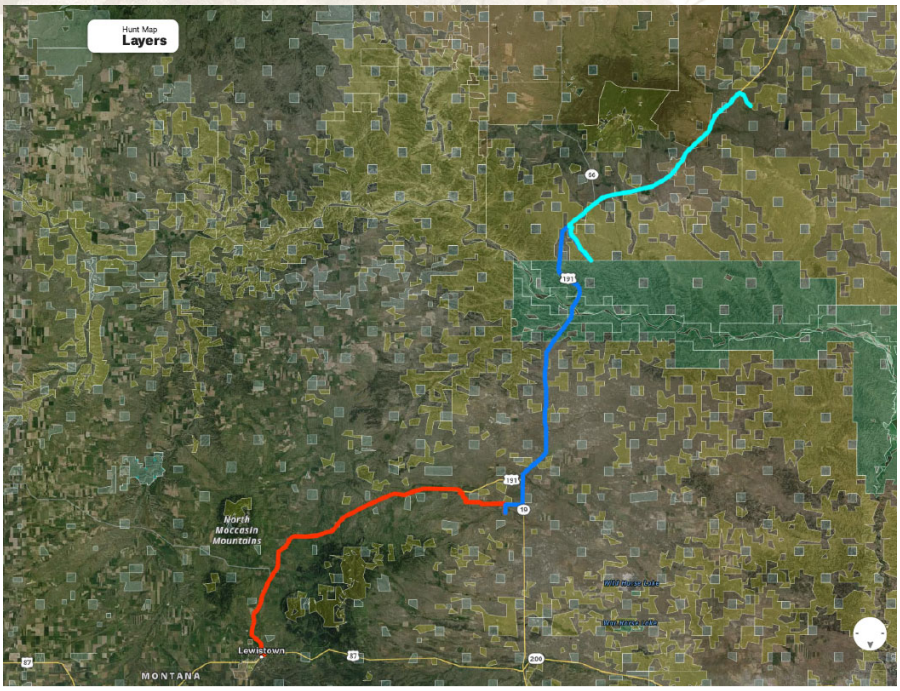
Andrew McKean is an independent journalist covering hunting, the outdoors, and natural resources policy. He lives outside Glasgow, Montana, where he contributes feature articles and reports to a number of national publications. He's the former editor of Rocky Mountain Fishing & Hunting News and served as information and education officer for Montana's Fish, Wildlife & Parks department before joining Outdoor Life as its Hunting Editor and later editor in chief.

McKean served briefly as a Montana Fish and Wildlife Commissioner. He's a longtime Hunter Education instructor, founder of Hi-Line Sportsmen, and serves on the boards of Wild Montana and the Mule Deer Foundation. He coaches the Glasgow Scotties' track and cross-country teams.

FIELD TRIP

We will visit several different sites that support robust sharp-tailed grouse and greater sage-grouse populations in north-central Montana. Speakers at each tour stop will discuss habitat attributes, management objectives and strategies, and on-going restoration efforts, along with an Unmanned Aerial System (drone) grouse survey demonstration at one of the stops. Highlighted spots will include Federal public lands managed by U.S. Fish & Wildlife (Charles M. Russell National Wildlife Refuge) and Bureau of Land Management, and privately owned lands managed by American Prairie, The Nature Conservancy, and a local conservation-oriented landowner/producer. The tour will last approximately 8 hours, departing Lewistown at 8:00AM and returning 4:00PM. Lunch and drinks will be supplied, and portable toilets will be available at each stop.

1. Leg 1, depart Lewistown (Yogo Inn) at 8:00AM, arrive at Bear Creek Land & Cattle Co LLC at 9:00AM; travel distance 43 miles; 1 hour stop for presentation/discussion
2. Leg 2, depart at 10:00AM, arrive at Bureau of Land Management and U.S. Fish & Wildlife Service's Charles M. Russell National Wildlife Refuge at 11:00AM; travel distance 42 miles; 1.5 hour stop for presentation/discussion/lunch
3. Leg 3, depart at 12:30PM, arrive at American Prairie and The Nature Conservancy at 1:30PM; travel distance 32 miles; 1 hour stop for presentation/demonstration/discussion
4. Return, depart at 2:30PM, arrive at Lewistown (Yogo Inn) at 4:00PM; travel distance 102 miles



THE HAMERSTROM AWARD

The Hamerstrom Award was established in honor of Fred and Fran Hamerstrom, pioneers of prairie grouse research and management. It will be awarded at the meeting of the Prairie Grouse Technical Council. The award will consist of a plaque with the engraved name of the recipient.

Award Criteria: 1. To recognize individual(s) and organization(s) who have made significant contributions in prairie grouse research, management or other support programs which have enhanced the welfare of one or more species of prairie grouse in a particular state or region. 2. The contribution should be evidenced by a sustained effort over at least 10 years. 3. The contribution may be related to research, management activity, promotion of an integrated program, or some combination thereof. The relative importance given to these three categories of contributions is the prerogative of the Awards Committee but it should be based on how it has helped the overall welfare and survival of prairie grouse.

Selection Procedure: 1. The selection of award recipients will be made by the three-member Executive Board and two additional members appointed by the Chairman. 2. Nominations will be accepted at large as well as from members of the Awards Committee. 3. Nominations will be submitted to the designated Awards Committee Chairman at least one month before the biennial meeting of the Prairie Grouse Technical Council. 4. Nominations should include the following information: A. Name, address, and phone number of nominee. B. Biographic sketch of individual of brief history of an organization. C. Overview of contributions indicating the nature of the contributions, duration, how it has contributed to the welfare of one or more species of prairie grouse, and the geographic area influenced by the contributions. 5. A maximum of two individual awards and two organization awards may be presented at a biennial meeting. No awards will be given if the Awards Committee feels that no deserving individuals or organization are available at the time.

The first recipient was Fran Hamerstrom, in 1991, and it has been since awarded at the biennial meetings of the Prairie Grouse Technical Council. When the awards program was in the concept stage, Fran wanted to ensure that the Hamerstrom name not be associated with any interpretation of the word “conservation” that would include any relationship to the anti-hunting mentality. To make that clear, the awards presentation is to include the following recommendation from Fran’s Wild Foods Cookbook on yet another way to enjoy prairie grouse.

Prairie Grouse

Adapted from: Hamerstrom, Frances. 1989. Wild Foods Cookbook. Iowa State University Press, Ames, Iowa.

“Prairie grouse are outstanding table birds. Unlike most gallinaceous birds such as pheasant and ruffed grouse, they retain their juices well and do not tend to dry out while cooking. Very young birds, still in juvenal plumage, have light breast meat and delicate texture, but the flavor is still undeveloped. By October, almost all the birds are in prime condition, with breast meat dark, almost like the legs, and very delicious. Chickens and sharptails should be served rare or at most well-done.

Roast: Pluck dry, dress and clean. Do not stuff. Roast in a hot oven (450 degrees) 25 minutes for medium-rare sharptails or chickens.

Fried Prairie Grouse: Pluck, dress, and clean. Cut in pieces for frying. The breasts of these birds are so plump that it is often simpler to cut them away from the bone: then cut or divide each side of the breast into two pieces. If this is not done, the legs and back will be overdone while the breast still requires more cooking. Flour each piece lightly before placing it in the hot fat. Salt just before serving.

If you want to take the wild taste out of your grouse, pay no attention to anything I’ve written”.

Past Recipients of the Hamerstrom Award

1991	Fran Hamerstrom
1993	Ron Westemeier
1995	Dan Svedarsky and Jerry Kobriger
1998	Bob Robel
1999	Bill Berg
2001	Len McDaniel
2003	John Toepfer
2005	Nova Silvy and The Society of Tympanuchus Cupido Pinnatus, Ltd.
2007	Rick Baydack and Kerry Reese
2009	Randy Rodgers and Bill Vodehnal
2011	Mike Morrow, Jack Connelly, and The Minnesota Prairie Chicken Society
2013	Terry Wolfe, Mike Schroeder, and the Sutton Avian Research Center
2015	Patricia McDaniel and David Haukos
2017	K. C. Jensen, Don Wolfe, and The Minnesota Sharp-tailed Grouse Society
2019	Christian Hagen

The John Toepfer Prairie Grouse Research Scholarship

Dr. John Toepfer devoted 50 years to research and conservation of prairie grouse and mentored dozens of students. He unselfishly provided resources, encouragement, and advice to students and colleagues, and encouraged long-term field studies rather than purely academic research. To honor John's life and to continue his legacy of supporting prairie grouse students, the G. M. Sutton Avian Research Center, and a number of John's colleagues and friends, established the John Toepfer Prairie Grouse Research Scholarship fund. This fund will provide opportunities for continued work on the prairie grouse John committed his life to saving and will ensure the availability of perpetual support for graduate students studying prairie grouse.

John's career was varied and covered a lot of ground, starting with a BS and MS degree at University of Wisconsin – Stevens Point working with Ray Anderson and Fred and Fran Hamerstrom. He also would later receive his PhD at Montana State University studying prairie chickens. John worked over several states but primarily with prairie grouse in the Midwest. From 1996 – 2015, he served as Research Consultant with the Society of Tympanuchus Cupido Pinnatus, Ltd. conducting field research on prairie chickens in Wisconsin and across their range. This was a group that was stewarded by the Hamerstroms. John served on the Attwater's Prairie-Chicken Recovery Team and on the Board of the North American Grouse Partnership. He received The Hamerstrom Award from the Prairie Grouse Technical Council and the Minnesota Award from the Minnesota Chapter of the Wildlife Society.

John would use his photo of a prairie chicken sunrise and the question, "Is the sun rising for the prairie chicken...," as a springboard to challenge managers, conservationists, and students on whether their actions were creating a brighter future for the well-being of prairie chickens. This award will be given in recognition that with future professionals as those represented by the award's recipients then indeed "the sun is rising" on the future of prairie grouse. The only minimum criteria for consideration is that the applicant be a student actively researching prairie grouse and plan to attend and present their research findings at the upcoming Prairie Grouse Technical Council meeting. It will be viewed positively if the applicant exhibits a passion that is consistent with what John would have expected from a true student of prairie grouse.

If you would like to honor John's contribution to prairie grouse research and conservation, please donate to the scholarship fund. Tax-deductible contributions can be made to the John Toepfer Prairie Grouse Research Scholarship by donations to Sutton Avian Research Center. Define with the donation that it goes towards the scholarship. Credit card donations can be made on the website suttoncenter.org and checks can be mailed to G. M. Sutton Avian Research Center, P.O. Box 2007, Bartlesville, OK 74005.

PGTC Conferences

1st	Grand Island, Nebraska	September 1957
2nd	Emporia, Kansas	March 1959
3rd	Stevens Point, Wisconsin	September 1960
4th	Pierre, South Dakota	September 1961
5th	Nevada, Missouri	September 1963
6th	Warroad, Minnesota	September 1965
7th	Effingham, Illinois	September 1967
8th	Woodward, Oklahoma	September 1969
9th	Dickinson, North Dakota	September 1971
10th	Lamar, Colorado	September 1973
11th	Victoria, Texas	September 1975
12th	Pierre, South Dakota	September 1977
13th	Wisconsin Rapids, Wisconsin	September 1979
14th	Halsey, Nebraska	September 1981
15th	Emporia, Kansas	September 1983
16th	Sedalia, Missouri	September 1985
17th	Crookston, Minnesota	September 1987
18th	Escanaba, Michigan	September 1989
19th	Billings, Montana	September 1991
20th	Ft. Collins, Colorado	July 1993
21st	Medora, North Dakota	August 1995
22nd	College Station, Texas	February 1998
23rd	Gimli, Manitoba	September 1999
24th	Woodward, Oklahoma	November 2001
25th	Siren, Wisconsin	September 2003
26th	Valentine, Nebraska	September 2005
27th	Chamberlain, South Dakota	October 2007
28th	Portales, New Mexico	October 2009
29th	Hayes, Kansas	October 2011
30th	Crookston, Minnesota	September 2013
31st	Nevada, Missouri	September 2015
32nd	Dickinson, North Dakota	October 2017
33rd	Bartlesville, Oklahoma	October 2019
34th	Lewistown, Montana	October 2022

ORAL PRESENTATION ABSTRACTS

(LISTED ALPHABETICALLY BY AUTHOR)

PARTICIPANTS FLOCK TO KANSAS LEK TREKS PRAIRIE-CHICKEN FESTIVAL

J.K. AUGUSTINE, Audubon of Kansas, Manhattan, KS 66505

Audubon of Kansas (AOK) held its first annual Kansas Lek Treks Prairie-Chicken Festival from April 7-10, 2022 in Hays, KS. National advertising attracted 90 participants from 25 different states and one international attendee. About 25% of attendees were from Kansas. Participants saw both Lesser and Greater Prairie-Chickens during the festival on private lands in eastern Gove and western Trego Counties in Kansas, and Sharp-tailed Grouse during pre- and post-festival trips to AOK's Hutton Niobrara Ranch Wildlife Sanctuary in northern Nebraska. The banquet featured a welcome by Brad Loveless, Secretary of Kansas Department of Wildlife and Parks (KDWP), and a presentation by Nate Swick, host of American Birding podcast. Field trips to Cheyenne Bottoms Wildlife Area, Quivira National Wildlife Refuge, Smoky Valley Ranch, Castle Rock, and Monument Rocks were also offered. Funding was obtained through registration fees, a Kansas Department of Tourism grant, and sponsorships from KDWP and The Nature Conservancy in Kansas. Additional partners included the Sternberg Museum of Natural History, Kansas Wetlands Education Center, and 'Boomer' the prairie-chicken mascot from the Missouri Department of Conservation. Next year's festival will be held Apr 13-16, 2023. Volunteers are needed and conservation partners are welcome. More information can be found at https://www.kansaslektreks.org/

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LESSER PRAIRIE-CHICKEN STRONGHOLD DEVELOPMENT AT THE NATURE CONSERVANCY'S SMOKY VALLEY RANCH

M.R. BAIN, The Nature Conservancy, 1114 Co Rd 370, Oakley, KS 67748

Smoky Valley Ranch is located within the shortgrass/CRP ecoregion between the Arkansas River and I-70 in western Kansas, where range wide aerial surveys indicate that well over half of all Lesser Prairie-Chicken (LPC) now occur. Lek surveys on the Ranch suggest that the population has increased over tenfold since 2015, with 189 males surveyed this spring. We suspect the population has responded to changes in stocking rates and a rest-rotation grazing system that includes deferment. The Nature Conservancy and partners are utilizing the Ranch as an anchor property in a stronghold development pilot area of approximately 200,000-acres. One additional pilot area in the Red Hills of Kansas and Oklahoma is underway, as well as efforts in other potential strongholds. This strategy includes intense spatial focusing of additional staff capacity, test incentive payments to producers, and social science to identify and address barriers to habitat management and long-term conservation. Our goal is to create a collaborative model that can be transferred to other communities, eventually resulting in large, interconnected blocks of high-quality grasslands with long-term voluntary conservation.

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IMPACT OF GRAZING MANAGEMENT ON VITAL RATES OF GREATER SAGE-GROUSE IN CENTRAL MONTANA

L.I. BERKELEY Montana Fish Wildlife and Parks, Helena, MT 59601 USA,
J. HELM University of Montana, Missoula, MT 59812 USA,
D. J. MESSMER* Montana Fish Wildlife and Parks, Helena, MT 59601 USA,
M. SZCZYPINSKI Montana Fish Wildlife and Parks, Roundup, MT 59072 USA,
V. J. DREITZ University of Montana, Missoula, MT 59812 USA, and
J. GUDE Montana Fish Wildlife and Parks, Helena, MT 59601 USA

We evaluated the effects of livestock grazing on sage-grouse breeding season vital rates and whether rotational grazing systems implemented through the Natural Resources Conservation Service (NRCS) Sage Grouse Initiative (SGI) improved vital rates of greater sage-grouse in central Montana, 2011–2019.

We used radio telemetry to collect data on hen survival, nest success, and chick survival. We used field measurements and remote sensing to quantify vegetation characteristics. Our results indicated generally weak or negligible effects of SGI grazing management on vegetation metrics. Likewise, nest success and chick survival were not higher during or after pastures enrolled in SGI programs. Results on hen survival are forthcoming.

Although preliminary, our results suggest that annual and pasture (spatial) variation have more of an effect on sage-grouse demographics and habitat than grazing management. Our preliminary conclusions concur with other recent research indicating that preserving sagebrush habitat by keeping working ranches intact may be more important than recommending particular grazing management systems.

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GROUSE TRANSLOCATIONS: MOVING BROODS, POPULATION IMPACTS, AND HABITAT SELECTION IN EXPLORATORY VS. SETTLEMENT STATES

DAHLGREN[1], D. K., P. COATES[2], S. MATHEWS[2], M. B. MEYERPETER [2], K. LAZENBY[1], J. KOLAR[3], S. PICARDI[1], S. O'NEIL[2], and D. J. DELAHANTY[4]

1 Utah State University, Logan, UT

2 U. S. Geological Survey, Western Ecological Research Center, Dixon, CA

3 North Dakota Game and Fish, Dickinson, ND

4 Idaho State University, Pocatello, ID

Past grouse translocations had little monitoring of translocated individuals. Marked translocated grouse have been plagued with low survival and productivity. We translocated female greater sage-grouse, both pre-nesting and brooding. We developed a novel method to transport and release brood females and chicks. We used a brood transport box with two compartments separated by a removable perforated divider. The female and chicks were able to stay in contact, but the brood female was unable to physically impact the chicks during transport. At the release site, the brood was transferred to a 4 x 8-foot release pen and released once normal behavior was observed. We had high survival during the translocation and release. Post-release movements were lower than pre-nesting females. Brood translocations may be useful for other grouse and gallinaceous species. We used radio-telemetry to monitor both the translocated females in the augmented population and resident females in the source population. We found no impact to the source population due to females removed for translocation. Brood translocations had the most positive impact on the augmented populations with only slight benefit coming from translocated pre-nesting females. We used GPS-PTT radios to monitor both translocated brood and pre-nesting female movements and habitat selection. We found that translocated grouse exhibited exploratory and settlement behaviors and that habitat selection differed based on behavioral-state. Therefore, when predicting optimal release areas, all post-release locations of translocated grouse should not necessarily be used for predictive models. Rather, habitat selected during settlement state should guide release area evaluations and habitat selected during the exploratory state should likely be censored.

RESTORATION OF SHARP-TAILED GROUSE TO WESTERN MONTANA

B. DEEBLE*, BD Upland Services, 2475 Humble Rd. Missoula MT 59804, B. LARKIN, MPG Ranch, 19400 Lower Woodchuck Rd. Florence, MT 59833 , T. CROSS, Crosswinds Ecological Consulting, LLC. PO Box 18, Hartland, Vermont 05048 , B. BALIS, Montana Department of Fish, Wildlife and Parks, 3201 Spurgin Rd., Missoula, MT, 59804, C. HAMMOND, Montana Department of Fish, Wildlife and Parks, 490 North Meridian, Road Kalispell, MT 59901, A. SULLIVAN and L.B. McNEW, Dept. of Animal and Range Sciences, Montana State University, Bozeman, MT 59717

Sharp-tailed grouse once ranged across Montana. Circa 2003, the last known sharp-tails disappeared from west of the Continental Divide in Montana despite a multi-year effort to supplement a declining population on the Tobacco Plains of northwest Montana and smaller attempts to reintroduce birds to the National Bison Range near Missoula. In 2019, following intensive collaborative planning by agencies, academics, stakeholders, and funders, the Montana Fish and Wildlife Commission launched a western Montana reintroduction effort. In fall 2021 the first seventy-five males were trapped in eastern Montana and released on three private ranches in western valleys. In April 2022, trapping was paused following the detection of avian influenza in the state, though not before a small number of additional males and females were translocated. Over five years, we aim to transplant up to 180 grouse annually, monitoring survival, movement, lek establishment, and reproductive success using MOTUS, VHF, and satellite tags. We are also cataloging DNA, and using both nuclear (12 microsatellite and one sexing locus) and mitochondrial (2 regions) markers to identify individuals, determine sex, parentage, reproductive success, and to track trends in genetic diversity and effective population size. In June 2022, the first successful nesting by sharp-tailed grouse in western Montana since 1991 was confirmed and was soon followed by a second in July.

bddeeble@gmail.com

B. Deeble

c. 406-327-9939

PRAIRIE TALES: THE STORY OF THE RISE AND FALL OF PRAIRIE CHICKENS IN EASTERN NORTH DAKOTA

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J. KOLAR, North Dakota Game and Fish Department.

The greater prairie-chicken (Tympanuchus cupido) population in Grand Forks County, North Dakota has declined since 2005, after initial success following restoration efforts from 1992-1998. During this period, sharp-tailed grouse (Tympanuchus phasianellus), which co-occupy the area, have increased. We conducted annual spring lek counts (15 March to 15 May 2019 - 2022) to monitor the population trends for both prairie grouse species. Within two study blocks, we attempted to identify all leks of both species through listening surveys and then return to count the number of birds on each lek by species and sex. We counted between 24 and 38 active leks annually. We observed steady decreases in prairie chickens (only 6 male prairie chickens were observed in 2022); increases in sharp-tails; and increases in hybrid Greater prairie-chicken x sharp-tailed grouse (8/31 leks in 2022). Previously, managers assumed that hybrids were relatively rare, but we documented as many as 16 hybrids in a single year. Current trends suggest prairie chickens will not persist without active management to increase their populations.

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ABOVE GROUND BIOMASS RESPONSE TO PRESCRIBED GRAZING FOR LESSER PRAIRIE-CHICKEN HABITAT MANAGEMENT

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An Area of Critical Environmental Concern (ACEC), located in New Mexico in the Sand Shinnery Oak Prairie Ecoregion (SSOP), is managed by the Bureau of Land Management under a multi-use mandate, with emphasis on habitat management for lesser prairie-chickens (Tympanuchus pallidicinctus; LEPC). This includes, but is not limited to, prescribed grazing within context of best available data for LEPCs. The goal of this project is to quantify vegetation response and beef-herd health associated with prescribed grazing designed specifically to meet conservation goals for the species. We GPS-tagged cattle among different herds to quantify and compare vegetation response and cattle-specific health metrics, 2020-2022. The objective of this presentation is to quantify available above ground herbaceous biomass before, after, and one-year post-grazing within two pastures, Crowley (4014 ha) and Old Savory (3092 ha). Preliminary results suggest grazing reduce biomass from 987 kg/ha to 285 kg/ha (71% decrease) in Crowley and 759 kg/ha to 327 kg/ha (57% decrease) in before and after grazing measurements. Herbaceous biomass did not decrease one-year post-grazing from post-grazing measurements in both pastures (Crowly: 238 kg/ha; Old Savory: 288 kg/ha).

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USE OF A NEW WEB-BASED TOOL REVEALS THAT GREATER SAGE-GROUSE ARE AN UMBRELLA SPECIES FOR SHRUB STEPPE BIRD COMMUNITIES AT RANGE-WIDE SCALES

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Prairie-grouse and Greater Sage-grouse are often cited as umbrella species for rangeland conservation. However, direct evidence of this is often equivocal. We created a Python-based tool to mine public databases for bird occurrence data. Our script allows users to specify the time period and geographic extent of interest. The tool will return counts of each species present, species richness, biodiversity, rarity and apply State Space Model MCMC analysis to estimate abundance, λ, and r for selected species or guilds present. We used this tool to evaluate hypotheses related to sage-grouse being an umbrella species for sage-brush areas throughout the intermountain west. We found that sage-brush areas with protections for sage-grouse had significantly higher rarity and similar levels of diversity and richness compared to sage-brush areas lacking sage-grouse protections. During this presentation we will demonstrate the utility of this tool on a selected species of prairie-grouse.

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THIS ONE IS TOO TIGHT, THIS ONE IS TOO LOOSE, WHICH ONE IS JUST RIGHT? AN EVALUATION OF RUMP-MOUNTED TELEMETRY HARNESSES USED TO MONITOR PRAIRIE GROUSE

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Monitoring of wildlife population performance as it relates to management or disturbance often relies upon handling and marking of animals. Such studies must assume that marking animals does not affect their behavior or demography. Recent advances in the miniaturization of satellite and Global Positioning Systems (GPS) has led to widespread use of this technology in prairie grouse research. Previous research has indicated potential negative effects of GPS unit mass and the rump-mounted harness attachment type. Concerning the latter, some studies have reported abrasions and irritations of the skin in and around the thighs of greater sage-grouse (Centrocercus urophasianus). We examined survival and retention rates of two types of harnesses fitted to sage-grouse (n = 161) across southeastern Oregon, and northwestern Nevada (2019-2021). The standard harness was one with Teflon tape that had an elastic band inserted in it. The altered harness was the standard but had plastic tubing shrink- fitted to part of the harness to reduce potential for abrasions under the thigh region. We discuss implications of harness type on grouse survival and retention of telemetry devices to achieve research objectives.

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DRONES AND MACHINE LEARNING PROMISE ADVANCEMENTS IN LEK-BASED POPULATION SURVEYS OF PRAIRIE GROUSE

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Unbiased counting of prairie and sage-grouse at leks is an annual challenge that requires substantial time and effort. Unmanned arial vehicles (a.k.a. drones) and artificial intelligence are emerging tools that may 1) increase efficiency of lek counts, 2) reduce sources of observer error, and 3) automate the creation of digital data that can be stored and used for further analysis. We compared standard lek count methods and counts collected by a drone at 23 greater sage-grouse leks in 2021 and 2022. At each lek, sage grouse were counted following standard state-wide monitoring protocols as well as a drone programmed with an autonomous flight plan and equipped with an infrared video camera. Integrating an autonomous flight plan allowed a single observer to simultaneously observe sage-grouse to ensure that the drone did not interfere with breeding behavior. We then employed two independent methods to identify and count sage grouse from each video. Birds were first counted manually by a trained observer, and then by a machine learning-based automated tool. Comparisons of counts show promise for surveys using drones and automated processes. The average difference across all observations for 2021 was less than one bird, while the average standard deviation across observations is less than four birds; counts via drone were consistently greater. Both drone (15 ± 3 min) and traditional lek counts (15 ± 5 min) took similar time to complete. However, the drone survey consists of four separate counts completed in one flight. Using just one count per flight could increase the number of leks surveyed daily. Future analyses will estimate detection probabilities for traditional and drone-based lek surveys.

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CONSERVATION PLAN FOR GREATER PRAIRIE-CHICKENS AND SHARP-TAILED GROUSE

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The Western and Midwestern Associations of Fish and Wildlife Agencies, North American Grouse Partnership, and Ecosystem Management Research Institute helped coordinate 14 state wildlife agencies in the development of a conservation plan for greater prairie-chickens (GPC) and plains and prairie subspecies of sharp-tailed grouse (STG). The plan calls for expanded and coordinated grassland and shrubland conservation efforts using GPC and STG as flagship species. The objective is to maintain, improve, and restore large blocks of native grasslands and shrublands of sufficient size, arrangement, and quality to support populations of GPC and STG along with associated grassland and shrubland wildlife species. Occurrence data of both species were compiled and new estimated occupied ranges were developed. Spatial layers were compiled to help identify priority areas for targeted conservation efforts. State wildlife agencies and conservation partners including USDA, USFWS, non-profit organizations, Joint Ventures and others should cooperate to identify and refine areas where 50,000-acre blocks of high-quality habitat for GPC and STG can be managed. The current version of the plan is seeking input and engagement from partners and coordination with other on-going grassland conservation efforts to increase effective implementation of grassland conservation actions.

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NAGP'S CONSERVATION PLAN FOR LESSER PRAIRIE-CHICKENS

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Conservation actions for lesser prairie-chickens (LEPC) have failed to prevent its listing as threatened and endangered. While the Range-wide Plan for Lesser Prairie-chickens provides a solid long-term foundation for conservation, a more focused and executable conservation strategy is needed to reverse continuing declines. The North American Grouse Partnership (NAGP) reviewed the status of LEPC conservation in 2017 and developed specific recommendations for what was needed. NAGP has since developed a more specific conservation plan for this purpose. This plan identifies a strategic system of core areas with each consisting of a 50,000 ac block of high-quality habitat. NAGP has identified potential locations for core areas with an initial effort to establish 500,000 ac of high-quality habitat. To voluntarily engage landowners to provide LEPC conservation, enhanced incentives are needed to make LEPC conservation economically advantageous. NAGP has worked with landowners to identify incentives they endorse. They include enhancements to existing conservation programs, stacking of different programs within core areas, and new sources of funding. Also needed is a new mitigation framework that will restrict impacts within core areas and then actually replace acres lost. While the price tag for this work is substantial, it is past time that restoration of Southern Great Plains prairie ecosystems receives the priority that they deserve. LEPC are the flagship species for launching a more effective conservation effort.

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GROUSE-HABITAT RELATIONSHIPS ARE DRIVEN BY MULTILEVEL MOVEMENT PROCESSES

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Sage-grouse use of landscapes are modulated by their multilevel movement processes. Understanding the relative contributions of hard-wired and environmental influences on movement processes is necessary for a comprehensive understanding of sage-grouse ecology. We equipped 86 female sage-grouse with transmitters which were programmed to record >4 locations per day. We calculated 15 movement properties across all sage-grouse phenological stages for up to 4 years per individual. We related the 15 movement properties to 24 landscape-condition variables and 7 behavior modes using a direct gradient analysis. Numerous terrain and vegetation variables were weakly associated with female sage-grouse movement properties, but no single landscape condition or class of conditions appeared to explain a dominant portion of movement-property variation. Hard-wired or learned seasonal behavior modes appeared to be more influential than managed vegetation conditions. Sage-grouse can exhibit reactive responses to landscape conditions but also use the landscape as a function of high-level endogenous constraints likely due to memory mechanisms, high temporal predictability of some resources, and moderate spatial heterogeneity of resources. Management prescriptions may ignore important ecological levels such as those responsible for learned-heuristic movement and space use modes.

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RANGEWIDE GENETIC DIVERSITY OF THE GREATER PRAIRIE-CHICKEN (TYMPANUCHUS CUPIDO)

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Genetic diversity is important to the health of wildlife populations but is being lost for many species due to declines in the number of individuals and loss of connectivity. The Greater Prairie-Chicken (Tympanuchus cupido) is a lek-mating grouse whose population and range have contracted greatly since the beginning of the 20th century due to agriculture and other anthropogenic land uses. In collaboration with several state and federal agencies we collected lek feathers and tissue from across four states for use in an analysis of range-wide genetic diversity and population structure using microsatellite loci. We found that genetic diversity across the range remains high (H E =0.908 versus H O =0.827). In addition, we found moderate evidence of genetic structure linked to each state, and two distinct sub-populations in OK. Future landscape genetic analysis will link observed structure to landscape attributes to support management.

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CAPTIVE PROPAGATION OF ATTWATER'S PRAIRIE-CHICKENS FOR RELEASE INTO THE WILD: UPDATES ON PRODUCTION AND FOSTERING METHODOLOGIES

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The Sutton Avian Research Center has completed three full years of captive breeding of the Attwater's prairie-chicken. There are numerous challenges and complexities of raising these birds in captivity. Typically, the eggs are incubated artificially and chicks have been raised by humans. Hand-raised chicks commonly exhibit increased mortality at 4 to 10 days old due to inanition – a lack of nourishment and vitality. Experiments were started in 2022 to foster chicks with adult prairie-chicken hens in an attempt to increase survival rates. Methods included 1) moving artificially incubated eggs and placing them under the hens to hatch; and, 2) placing chicks ranging from newly hatched to 16 days old under hens with broods for fostering. No inanition-based mortalities were observed for foster raised chicks, and the reduction in hand raising was a labor-saving benefit. Fostering contributed to a 65% chick production increase compared to 2021.

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UNDERSTANDING SHARP-TAILED GROUSE SUBSPECIES STATUS IN SOUTH-CENTRAL WYOMING

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Sharp-tailed grouse (Tympanuchus phasianellus; hereafter STGR) are found in suitable grassland and shrubland habitat across northern North America. There are currently 6 extant subspecies, including Columbian (T. p. columbianus) and plains (T. p. jamesii), both of which are found in Wyoming. Within Wyoming, Columbian STGR can be found in Teton County; a second population in south-central Wyoming was historically thought to be Columbian STGR, however, recent evidence suggests otherwise. The objective of our study was to determine if south-central Wyoming STGR are Columbian, plains, or possibly a different subspecies of STGR. We collected morphological measurements and genetic samples from south-central Wyoming (unknown STGR; n = 430), eastern Wyoming (known plains STGR; n = 75), and eastern Idaho (known Columbian STGR; n = 108). Using a morphospace analysis and the Mahalanobis distance, we found that morphologically, the south-central Wyoming population was more similar to Columbian STGR than to plains STGR, though there was not much difference overall. Using a Structure analysis on microsatellite genotypes, we found that genetically, there was evidence for three groups. Additional genetic evidence suggests subpopulation structure within all sampled populations. Generally, the three identified groups represented Columbian, plains, and south-central Wyoming STGR, with some intermixing of populations. Our study suggests that Columbian and plains STGR represent separate subspecies, with the south-central Wyoming STGR not clearly fitting in with either Columbian or plains STGR.

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WHY DIDN'T THE CHICKEN CROSS THE ROAD? IMPACTS OF ENERGY DEVELOPMENT ON MOVEMENT AND SELECTION OF GREATER PRAIRIE-CHICKENS

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Many remaining grasslands are becoming increasingly fragmented by energy development. Structures associated with development can have important implications for wildlife populations as they may create barriers to movement or alter habitat selection. Our first objective in this study was to assess if greater prairie-chickens (Tympanuchus cupido), alter their movement behaviors (speed or direction of travel) or their habitat selection patterns relative to structures associated with oil and gas development using integrated step selection analysis (iSSA). Our second objective was to determine if changes in movement or selection behavior influenced the frequency at which greater prairie-chickens crossed roads or power lines. We assessed crossing rates by comparing the number of movements in observed greater prairie-chicken movement tracks that crossed these features to the number of movements that crossed these features in simulated movement tracks. Based on the iSSA analysis, we found that greater prairie-chickens avoided oil wells, power lines, and roads and altered their speed when near these structures but found little evidence for changes path tortuosity (direction of travel). Further, prairie-chickens crossed roads and power lines at lower rates than expected compared to simulated movement tracks. Consistent avoidance of development resulted in indirect habitat loss for greater prairie-chickens, and the avoidance of linear features has the potential to reduce connectivity across the landscapes for this species.

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AN INTRODUCTION TO THE U.S. GEOLOGICAL SURVEY'S ANNOTATED BIBLIOGRAPHY OF SCIENTIFIC RESEARCH ON GREATER SAGE-GROUSE

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Multiple laws and policies require that planning and management decisions on public lands be informed by a foundation of relevant, high-quality science. However, the time and resources needed to review the high volume of science products available for some topics can make it challenging for managers to find and use. Our goal for this project was to develop annotated bibliographies that support and facilitate the use of science in public lands decision-making. We conducted a literature search of multiple databases from 2019–2022 on greater sage-grouse (*Centrocercus urophasianus*), and composed objective, unbiased summaries of products for a management audience. The annotated bibliography will be made available via a public-facing online platform where managers can search summaries by management topics and output results in a user-friendly format for easy use in environmental planning decision-making, including NEPA analyses. We have previously published annotated bibliographies for greater sage-grouse 2015–2019, ventenata (*Ventenata dubia*), and pygmy rabbits (*Brachylagus idahoensis*), and are currently working to develop an annotated bibliography on Gunnison sage-grouse (*Centrocercus minimus)*.

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LINKING GREENESS (NDVI) TO LESSER PRAIRIE-CHICKEN REPRODUCTIVE HABITAT AVAILABILITY AND QUALITY

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**Winner of the 2022 John Toepfer Prairie Grouse Research Scholarship*

Patterns of the Normalized Difference Vegetation Index (NDVI) have been associated with wildlife use for decades, but recent technological advances highlight its potential for identifying reproductive habitat quality over broad scales, particularly for the grassland-obligate lesser prairie-chicken (Tympanuchus pallidicinctus). Lesser prairie-chickens are an at-risk species that relies on healthy grassland to reproduce. We evaluated the potential of NDVI and NDVI-based phenology metrics to predict reproductive habitat selection and nest survival. Using cloud-free Landsat 8 satellite imagery, mean NDVI estimates were derived at >70 nest locations from 2013- 2015 among two sites. Additionally, we evaluated the potential of 9 MODIS derived phenologymetrics to predict nest and brood habitat using values from 243 nest and 410 brood locations. Snapshot NDVI was not related to nest survival. However, amplitude and Maximum NDVI reliably predicted nest site and brood site selection, respectively. Nesting females selected sites with higher amplitude values and brood-rearing females selected sites with greater maximum NDVI. The selection for greater amplitude and maximum NDVI likely indicated greater food abundance and denser herbaceous cover at used locations than available. Our results suggest that NDVI phenology metrics have utility in predicting reproductive habitat within remaining grasslands.

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ACCELERATING TREE ENCROACHMENT THREATENS GROUSE HABITAT ACROSS THE U.S. GREAT PLAINS

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Tree encroachment is a growing conservation challenge for grassland biodiversity and habitat quality. In the U.S. Great Plains, tree encroachment shrinks remaining habitat for sage-grouse and prairie chickens, which are particularly sensitive to even low abundances of trees. Applying new satellite technology, we show that the loss of grassland bird habitat to expanding tree cover is equivalent to known impacts from cropland cultivation. In total, a quarter of U.S. grasslands are being invaded by trees and grassland tree cover has increased by 50% in the last 30 years. In Montana alone, we find roughly 8.3 million acres of tree encroachment into rangelands, much of which overlaps with sage-grouse habitat and core areas. The irreversible conversion of vast expanses of southern Great Plains grasslands to woodlands is a call to action for the coalition of grassland bird communities. In the northern Great Plains, where tree cover is beginning to exhibit exponential growth, land managers must rapidly embrace a proactive and coordinated strategy to interrupt encroachment before the problem becomes insurmountable. Acting now can simultaneously achieve unified conservation goals of preserving grouse habitat and grassland connectivity, while promoting economically sustainable outcomes for working grasslands.

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FACTORS AFFECTING SURVIVAL OF ATTWATER'S PRAIRIE-CHICKEN BROODS

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Previous research identified poor survival of chicks as a primary bottleneck for recovery of the Attwater's prairie-chicken (APC). We evaluated the relative importance of 26 factors (weather and topography, habitat, plant phenology, time and site, hen characteristics) on APC brood survival to 2 weeks post-hatch (the period when chick mortality is highest) and on the number of chicks per brood at 6 weeks post-hatch (when chicks are capable of independent survival). Broods were most likely to survive to 2 weeks if they hatched between early and late May and were located within areas (1) that were treated to suppress red imported fire ants, (2) where vegetation produced intermediate values for maximum Normalized Difference Vegetation Index, and (3) that supported high invertebrate biomass. The number of chicks per brood surviving to 6 weeks post-hatch was maximized at values of the average Keetch-Byram Drought Index (during the first 0–2 weeks post-hatch) ranging from 200–400 which indicates moderately depleted soil moisture, but not severe drought. Our comprehensive analysis of factors affecting APC brood survival provides valuable information to guide management and recovery efforts for this species.

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DEMOGRAPHIC EFFECTS OF A MEGAFIRE ON LESSER PRAIRIE-CHICKENS IN THE MIXED-GRASS PRAIRIE

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Studies have documented benefits of small, prescribed fire and wildfire for lesser prairie-chickens (Tympanuchus pallidicintus), but lesser prairie-chicken response to the scale and intensity of megafire (wildfire >40,000 ha) remains unknown. Limited available grassland habitat makes it imperative to understand if increasing megafire activity could reduce already declining lesser prairie-chicken populations. We leveraged demographic data from before (2014–2016) and after (2018–2020) a 2017 megafire in the mixed-grass prairie of Kansas, USA (Starbuck fire ~254,000 ha) and found a 67% decline in attending males on leks post-fire and a 46% decline in occupied leks. Adult female breeding season survival ($\hat{S}$) remained similar before ($\hat{S}$ = 0.63 ± 0.08 [SE]) and after the fire (0.61 ± 0.08), as did chick survival (before: 0.23 ± 0.07; after: 0.27 ± 0.11), while nest survival trended lower post-fire (before: 0.42 ± 0.06; after: 0.27 ± 0.07). Although we documented minimal effects on vital rates, reduced lesser prairie-chicken abundance and reproductive output suggest recovery may take >3 years. Increased propensity for megafire due to fire suppression, climate change, and woody encroachment may threaten lesser prairie-chicken populations.

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RELATING SAGE-GROUSE NEST SUCCESS AND AMERICAN BADGER OCCURRENCE IN SOUTH DAKOTA

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Nest success is a primary driver of sage-grouse populations, and predation is usually the leading cause of nest failure. We studied nest survival in relation to the mammalian predator community in South Dakota during 2016 and 2017. We fitted 76 female sage-grouse with VHF radio-collars and subsequently detected 71 nests. We deployed remotely triggered cameras at 48 of 71 nests (68%) to determine nest predators. Cause-specific nest failures could be determined for 12 of the 25 failed nests with cameras. American badger (Taxidea taxus) depredation caused 50% of known cause nest failures followed by coyote (Canis latrans) depredation, and abandonment. Since American badgers were the primary nest predator, we modeled their occurrence using data collected via remotely triggered camera stations located approximately 6.68 km apart (n=274). We then used presence only data (n=41) to model American badger habitat suitability. We extracted predicted probabilities of American badger presence for each nest and used in daily nest survival models. Neither the probability of American badger presence nor the presence of camera equipment explained significant variation in nest survival.

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MONTANA FISH, WILDLIFE AND PARKS HABITAT PROGRAMS FOR UPLAND GAME BIRDS

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Montana Fish, Wildlife and Parks has a long history of implementing habitat practices that benefit upland game birds on both public and private land. Since 1987, through its Upland Game Bird Enhancement Program, Habitat Montana program, Montana Sage Grouse Habitat Conservation Program and other wildlife habitat programs, Montana FWP and partners have conducted over 3,500 habitat projects. These projects protected, restored, or enhanced more than 1.8 million acres of habitat, provided over 5 million acres of hunting access, and expended over $143 million dollars to improve habitat for upland game birds and other wildlife. Practices have included nesting cover plantings, shelterbelts, grazing systems, aspen stand improvements, wetland enhancements, long-term leases of key habitats, perpetual conservation easements, and some permanent fee-title acquisitions. Most of these projects have been implemented with private landowners with a smaller number through coordination with public land managers. This discussion of program development, practices implemented, summary of key accomplishments, and future plans for the programs may provide insight to other upland game bird managers in their own implementation of habitat conservation programs.

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ORIGINS OF COLUMBIAN SHARP-TAILED GROUSE IN GRAND TETON NATIONAL PARK, WYOMING

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Sharp-tailed grouse (Tympanuchus phasianellus) are found throughout portions of northern North America, including the Intermountain West such as Grand Teton National Park (GTNP), Wyoming. This population was thought to be extirpated during the 1940's; during 2010, a single lek was found within GTNP (currently there are 2 known leks). Due to the reappearance of this population, the goal of our study was to determine whether the identified population was a remnant population that went undetected for 60–70 years or if individuals from the nearest population(s) repopulated the area. We collected tissue samples from road killed carcasses within the GTNP, tissue samples from hunter harvested wings in in Idaho, blood samples from Carbon County, Wyoming, and blood samples from eastern Wyoming. We used whole genome sequencing and will generate a maximum likelihood phylogenetic tree to identify the ancestry of the GTNP population. Understanding the ancestry of this population could provide a greater understanding of mountains driving vicariance of sharp-tailed grouse populations throughout the Intermountain West, which will help us improve population level management of this species.

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INVESTIGATING THE USE OF GRAZING DISTURBANCE TO RESTORE HABITAT FOR THE LESSER-PRAIRIE CHICKEN

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Anthropogenic influences (e.g., energy production and rangeland conversion) have fragmented and degraded the lesser prairie-chicken's (Tympanuchus pallidicinctus, LPC) habitat range wide. This project is focused on a 320-acre parcel of land in southern Roosevelt County, New Mexico that was once used for crop and oil and gas production before being allowed to naturally re-vegetate with native plant species. Previous land use has left soil health in poor condition and allowed for the invasion of undesirable plant species, resulting in high measures of bare ground throughout. The objective of this study is to determine if a high intensity/short duration grazing system can be economically and ecologically feasible in a low-rainfall area, and ultimately restore the property to suitable habitat for the LPC. From 2018 through 2022, we have utilized daily paddocks to move cattle through the test plot; cattle are then moved to the control plot to graze in the landowner's traditional pattern before the property enters a 10-month period of rest. Thus far, the system has been economically feasible. Ecologically, we have found a more stable response in desirable native species on the test plot in years of low rainfall. However, we have not reduced invasive species occurrence. We plan to continue our research in the coming years to better identify quantifiable trends with climatic variability.

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LESSER PRAIRIE-CHICKEN MOVEMENTS UNDER PATCH-BURN AND ROTATIONAL GRAZING MANAGEMENT

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Understanding lesser prairie-chicken (Tympanuchus pallidicinctus) response to different land management practices is necessary for continued viability of the species. Both patch-burn and rotational grazing practices are used by ranchers within the lesser prairie-chickens' range, creating different grazing distributions that result in spatially varying vegetation composition and structure across the landscape. Patch-burn grazing creates a more heterogeneous landscape of vegetation composition and structure, increasing the capacity of landscapes to provide all required habitats within a smaller area than rotational grazing. These conditions could decrease daily and total movements by lesser prairie-chickens, resulting in overall higher quality habitat. We hypothesized that under patch-burn management, birds would travel less to meet their daily resource needs; thus, average daily displacements would be smaller than on rotationally grazed land. We used data from 54 individual lesser prairie-chickens fitted with satellite transmitters between 2013 and 2019 in the Red Hills region within the Mixed-Grass Prairie Ecoregion of Kansas. We compared movement metrics between adjacent patch-burn and rotationally grazed ranches in Kiowa and Comanche counties. We applied a novel Bayesian nonstationary continuous-time animal movement model to estimate the birds' movement trajectories and compute movement descriptors including average daily displacement. We found that birds spent more time on average in patch-burn than rotational treatments, and that movement metrics differed between grazing treatments. Our results provide insight on lesser prairie-chicken response to different grazing management strategies within the Mixed-Grass Prairie Ecoregion.

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SUGGESTED PREVENTATIVE MEASURES TO LIMIT OLD-WORLD BLUESTEM INVASION OF THE NORTHERN GREAT PLAINS

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Caucasian bluestem (Bothriochloa bladhii) and yellow bluestem (B. ischaemum), together called Old World bluestems (OWB), are Eurasian/African mid-grasses deliberately introduced in the Southern Great Plains (SGP) in the early 1900's. They were widely seeded in the early years of the Conservation Reserve Program in Texas, Oklahoma, and New Mexico. Both are highly invasive and capable of transforming diverse native grassland ecosystems into monocultures, greatly reducing both forage and wildlife-habitat quality. The metastatic spread of OWB within and beyond the SGP has been facilitated by mowing, haying, hay transport, vehicles, and contaminated seed mixtures. Initial OWB establishment is typically along roadsides or in areas where hay is stored or fed. Once established in pastures, OWB coverage can increase 15% per year and become nearly impossible to eliminate. OWB could soon invade the Northern Great Plains (NGP) as winters become warmer with climate change. States, federal agencies, and conservation organizations in the NGP should proactively designate OWB as noxious, establish preventative surveillance protocols, and initiate educational programs to raise awareness of this threat. Once found, OWB infestations should be immediately killed, GPS marked, and seed heads carefully removed and destroyed. Surrounding areas should be checked for additional plants. Frequent follow-up monitoring and treatment over multiple years is necessary to eliminate even small infestations. Prevention remains possible on the NGP and is the only practical option.

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NEONICOTINOID PREVALENCE IN SHARP-TAILED GROUSE AND GREATER PRAIRIE-CHICKENS ALONG AN AGRICULTURAL GRADIENT

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Neonicotinoids have been detected in many wild birds; however, few studies have attempted to quantify population-level exposure. We examined population-level exposure to 7 neonicotinoids in sharp-tailed grouse and greater prairie-chickens in Minnesota, USA. We sampled fecal pellets at leks in spring and collected livers from hunter-harvested birds in fall. Most (93%) sharp-tailed grouse and (80%) prairie-chicken fecal pellets had detectable concentrations of >1 neonicotinoid. Similarly, most (90%) sharp-tailed grouse and (76%) prairie-chicken livers had detectable concentrations of >1 neonicotinoid. Imidacloprid (IMI) and clothianidin (CLO) were most commonly detected. Spring concentrations of IMI in fecal pellets of both species increased with the proportion of a 2-km buffer in cultivation surrounding sampling locations and detections occurred along the entire gradient of cultivation intensity. Spring CLO concentrations increased with Julian date in prairie-chickens, as expected with the progression of spring planting. In contrast, neonicotinoid detections from livers were not related to the proportion of area in cultivation. Fewer crops are planted in the fall and grouse may be exposed through routes other than treated seeds. High detections, even in areas with little cultivation, likely reflect selection of cultivated fields for food, but may also indicate that exposure risk extends beyond sites of application.

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SHARP-TAILED GROUSE RESPONSES TO FALL PRESCRIBED FIRE AND MOWING

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We examined sharp-tailed grouse responses to prescribed fire and mechanical treatment in the fall during 2015-2021 in northwestern Minnesota. We surveyed sharp-tailed grouse use and measured vegetation at 16 mowing/shearing treatments, 12 prescribed burns, and also at 22 control sites. We conducted fecal pellet transects and documented sharp-tailed grouse observed 0–28 (mean 9.1) days before management, and 1 week, 1 month, 1 year, and 3 years after management. Sharp-tailed grouse use increased following prescribed fire but did not change after mowing. Increased sharp-tailed grouse use following prescribed fire was temporary. Changes in vegetation metrics were also temporary with most metrics returning to pre-treatment levels after 1 year, although shrub height at mowed sites returned more slowly and the forb response at fall prescribed fire sites persisted >3 years. We suggest that prescribed fire is more effective at increasing sharp-tailed grouse use of sites, perhaps due to cues associated with fire that attract sharp-tailed grouse. However, mowing and shearing are important to maintain sharp-tailed grouse site use, otherwise, woody encroachment reduces sharp-tailed grouse habitat, and fall prescribed fires had no measurable effect on shrubs. Thus, prescribed fire and mowing/shearing produced different sharp-tailed grouse and vegetation responses in the fall and should be applied to meet different management goals.

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PRIVATE LANDS STEWARDSHIP IN THE FLINT HILLS ECOLOGICAL REGION-IMPLICATIONS TO GREATER PRAIRIE-CHICKENS

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Private lands dominate the prairie grouse ranges in the United States making private landowners crucial for prairie grouse conservation. In 2010, we began to implement additional tallgrass prairie stewardship practices within a large production agriculture operation. This led us to seek collaboration with colleagues experienced in tallgrass prairie management and particularly those with experience researching species of conservation concern. This collaboration resulted in research addressing management questions and almost real time integration of data into our land management. Results include an increase in plant diversity, a 3-fold increase in greater prairie-chicken density, and a notable increase in other grassland birds such as Henslow's Sparrow. Further, we were able to make management changes without negatively affecting our business model. Ranch personnel and researchers remain engaged, communicate effectively, and develop adaptive management strategies during research activities. However, weather variability, market volatility, management flexibility, and the lack of confidentiality protecting mechanisms at the state level remain as challenges and barriers for private landowners who may wish to participate in conservation collaborations.

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INVASIVE ANNUAL GRASSES AND FIRE IN THE WEST: NEW INSIGHTS FROM REMOTE SENSING

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Rapidly expanding invasive annual grasses pose an urgent threat to sagebrush ecosystems of western North America where they displace keystone shrubs, alter natural fire regimes, and contribute to catastrophic wildfires. The accelerating loss and degradation of sagebrush ecosystems resulting from positive feedbacks between invasive annual grasses and fire is increasingly seen as an existential threat to sagebrush obligate wildlife such as sage-grouse. Halting this ecosystem transformation has vexed managers for decades. Using new, dynamic, remotely-sensed rangeland vegetation datasets, we track the 8-fold expansion of invasive annual grasses over the past 3 decades in the Great Basin, develop a fuels-based predictive fire forecasting tool, and refine our understanding of the relative contributions of biotic and abiotic factors in determining resistance to annual grass invasion and resilience following fire. Together, these insights will help managers target their efforts in the right places to maximize benefits to sagebrush ecosystems and sage-grouse habitat.

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LANDSCAPE-BASED EVALUATION OF HABITAT SUITABILITY FOR PRIORITIZING LESSER PRAIRIE-CHICKEN CONSERVATION IN THE MIXED-GRASS PRAIRIE

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Populations of lesser prairie-chickens (Tympanuchus pallidicinctus, hereafter "prairie-chickens") in the mixed-grass prairie ecoregion of the southern Great Plains are projected to go extinct in the next 100 years unless targeted conservation efforts are implemented to increase the size and connectivity of subpopulations through either translocation or habitat restoration. To expand on current conservation efforts, we used ensemble approaches to identify habitat for potential prairie-chicken conservation. We developed lek-based relative habitat suitability models within the mixed-grass prairie ecoregion using both resource selection functions and Random Forest classification trees and calculated ensembled predictions of relative habitat suitability across all models. Next, we conducted a least-cost path analysis to identify potential corridors connecting potentially suitable, unoccupied habitat to current subpopulations. Ensembled predictions identified 4,526 km 2 of potential prairie-chicken habitat both occupied and unoccupied. We identified three contiguous areas of potentially suitable and unoccupied habitat (28 – 74 km^2) that could potentially harbor a self-sustaining population. However, least-cost path analyses revealed a low degree of connectivity between areas of occupied and unoccupied habitat indicating a low probability of recolonization. Our ensembled predictions should assist future reintroduction and habitat restoration plans by identifying habitat conditions that predict the presence of prairie- chicken leks in the mixed-grass prairie ecoregion.

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A DEEP DIVE INTO THE GENETIC DIVERSITY OF GREATER AND LESSER PRAIRIE-CHICKENS

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Landscape management and climate change have resulted in the expansion of Greater and Lesser Prairie-chicken (Tympanuchus cupido and T. pallidicinctus, respectively) ranges and created a zone of sympatry in central Kansas. Within this region, hybrid leks have been observed to occur, and hybridization between the two species is suspected. With the recent US Fish and Wildlife Service proposed listing rule for the Lesser Prairie-chicken, understanding the potential management implication of hybridization is critical. We used two types of analyses to investigate the possible implications of hybridization on the distinctiveness of Greater and Lesser Prairie-chickens. Using a set of 12 rapidly evolving microsatellites we anticipate finding distinct alleles amongst the various species due to the rapid response in species to their environments. We are currently in the process of further exploring this dynamic using a whole genome sequence approach. This approach will allow us to delve more deeply into the coalescent history of the two species, to better understand the implications of hybridization on the distinctiveness of the two species.

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ASSESSMENT OF LESSER PRAIRIE-CHICKEN TRANSLOCATION THROUGH DEMOGRAPHICS, SPACE USE, AND RESOURCE SELECTION

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The Sand Sagebrush Prairie of southwestern Kansas and southeastern Colorado historically supported the largest density of Lesser prairie-chickens (Tympanuchus pallidicinctus), with estimates of 86,000 birds in the 1970s. By 2016, an estimated 1,479 birds remained. To supplement this population, 411 lesser prairie-chickens (204 males and 207 females) were translocated to the Cimarron (KS) and Comanche (CO) National Grasslands from 2016-2019. We equipped translocated birds with 279 VHF and 115 SAT-PTT transmitters. Nearly 23% of translocated birds died or went missing 2 weeks after release. Post dispersal, overall adult and nesting survival of translocated birds were decreased but comparable to previous estimates, however nesting survival decreased greatly in 2020. Lek counts decreased after translocation cessation by 24% in 2020 and 43% in 2021. After dispersal, translocated home range areas were similar to those previously studied, however translocated home ranges remained large in the nonbreeding season. Translocated birds used Conservation Reserve Program (CRP) more than what was available. Overall, National Grassland use was low due to dispersal; however, primarily males used Comanche more than Cimarron. This translocation had short-term success but current results indicate uncertainty around population persistence.

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ASSESSMENT OF LESSER PRAIRIE-CHICKEN HABITAT IN THE SAND SAGEBRUSH PRAIRIE

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Populations of lesser prairie-chickens (Tympanuchus pallidicinctus) in the Sand Sagebrush Prairie Ecoregion of southwest Kansas and southeast Colorado, USA, have declined sharply since the mid-1980s. Decreased habitat quality and availability are believed to be the main drivers of declines; however, no broad-scale assessment of landscape change has been conducted for the ecoregion. Our objectives were to reconstruct landscape-scale change in the ecoregion since 1985, and assess changes in vegetation structure and composition relative to management goals. We assessed landcover change and calculated landscape metrics using LCMAP layers and documented presence of anthropogenic structures including oil wells and transmission lines. We also compared historical and contemporary fine-scale vegetation survey data. Vegetation land cover and tree occurrence changed little since 1990. However, oil and gas wells increased by 88% and transmission lines increased by 237%, causing functional habitat loss as a result of displacement of lesser prairie-chickens. Quality vegetation structure has declined on Comanche National Grassland since 1985. Increased anthropogenic structures and decrease in vegetation vertical structure appears to have decreased available habitat as well as the quality of existing habitat for lesser prairie-chickens.

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ATYPICAL PRIMARY MOLT PATTERNS IN GREATER SAGE-GROUSE: IMPLICATIONS FOR AGE CLASSIFICATION

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Age-specific patterns of primary molt facilitate age classification of native North American upland gamebirds, a critical step in understanding their ecology, behavior, life history, population dynamics and harvest. However, deviations from typical molt patterns can create confusing plumages that complicate age classification. We examined data from live-captured greater sage-grouse Centrocercus urophasianus across seven studies in five U.S. states and wings from harvested birds in Oregon and Colorado for evidence of atypical primary molt. We documented atypical replacement through primary nine during preformative molt, atypical retention of juvenile primary 10 during second prebasic molt, and atypical retention of basic outer primaries during definitive prebasic molt. Atypical primary molts were observed more often in live-captured females (3.2%, n = 561) than males (0.8%, n = 494). Many individuals with atypical primary patterns, especially females, are difficult or impossible to reliably age by plumage or morphology and may bias research and harvest data.

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LONG-TERM POPULATION MONITORING OF SHARP-TAILED GROUSE IN NORTHEASTERN BRITISH COLUMBIA, CANADA: A FOCUS ON THE EFFECT OF WEATHER

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Populations of the plains subspecies of sharp-tailed grouse occur sporadically in the natural grasslands, shrub-steppe habitats, and agricultural areas of the Peace Lowlands in northeastern British Columbia, Canada. A long-term monitoring program was established to assess sharp-tailed grouse populations in two study areas with different habitat types and land uses: (1) native grassland and shrub-steppe habitats and (2) agricultural-dominated habitats. Between 2003 and 2022, annual lek surveys were conducted to measure lek attendance and lek density. Since 2003, there has been a significant decline in both lek attendance and density. I examined the effects of seasonal weather conditions (precipitation, temperature, and snowfall) on annual lek attendance. There was a significant positive relationship between lek attendance and snowfall during the nesting and winter season in the year prior to lek surveys. There was no evidence of weather effects during the brood-rearing period on the following year's lek attendance. These results suggest weather conditions contribute to annual population fluctuations. However, changes in habitat quality and distribution across the landscape since 2003 have likely contributed to population declines. I recommend that future analyses investigate the role of habitat change and the potential interaction between weather and habitat at a local and landscape scale.

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POSTER PRESENTATION ABSTRACTS

ATTWATER'S PRAIRIE CHICKEN RELEASE SITE CHARACTERISTICS, CONSIDERATIONS, AND CONCERNS

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Recovering Attwater's prairie-chicken (APC) will require restoring large habitat expanses, and releasing APCs on them. Our objective is to present release site characteristics important to recovering APCs. Since 1996, the U.S. Fish & Wildlife Service (USFWS) has released APCs on Attwater Prairie Chicken National Wildlife Refuge (refuge) in Colorado County, TX. Beginning in 2007, USFWS partnered with The Nature Conservancy and private landowners to release APCs on private ranchlands. While populations at the release sites are not viable, APCs released at each location have successfully produced offspring, which enjoy survival rates we expect of wild APCs. We are now considering desirable future release site characteristics including habitat patch size, genetic exchange potential, resiliency, management sustainability, and incompatible land use prevention. Ideally, potential release sites would include APC-prioritized habitat ownerships amidst broad, perpetually protected, privately owned, APC-compatible land uses. Endowments funding habitat management could perpetually maintain protected habitat. Distribution of several populations along the coast extending inland could provide redundancy with adequate proximity for genetic exchange and the potential for recolonization of areas within the historic range.

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USE OF WATER BIRCH BY WINTERING SHARP-TAILED GROUSE IN NORTH-CENTRAL WASHINGTON

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Sharp-tailed grouse (Tympanuchus phasianellus) in north-central Washington depend on shrubsteppe for year-round survival, and deciduous trees and shrubs during the snowiest times of the winter. In north-central Washington these habitats have been severely impacted by habitat conversion, degradation, and wildfire. Standardized lek counts have been used to monitor breeding populations, but observations of birds during winter have been opportunistic and anecdotal. For four straight winters (15 Dec-10 Mar), starting in 2017–2018, trail cameras were used to monitor areas of water birch, a tree species which appears to be critical for grouse in Washington. Cameras were placed for a total of about 11,500 daylight hours in 50 different locations within 23 water birch sites. Grouse were observed a combined total of 128 of those observation hours. Assessment of photos provided information on diurnal use (heaviest about 1 hour after sunrise), flock size (up to 25 birds), and distribution (observations of birds in areas with no known leks). These observations have subsequently aided our management efforts.

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CLASSIFICATION OF SAGE-GROUSE MOVEMENT MODES TO ACCOUNT FOR BEHAVIOR IN HABITAT-RESPONSE RESEARCH

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Greater sage-grouse have movement modes that constantly change to promote survival and reproduction. We evaluated the use of detailed movement properties to identify modes important for behavior-specific habitat responses such as survival or resource selection. We equipped 86 female sage-grouse with GPS transmitters that were programmed to record 4 locations per day. We calculated 7 movement properties during all sage-grouse phenological stages for up to 4 years per individual. We then used the 7 movement properties and statistical clustering to identify 8 distinct movement modes. One mode clearly represented exploratory movements and another mode clearly corresponded to incubating. The 6 other modes were less distinct but interpretable based on unique timing and correspondence with environmental variables. Detailed movement data can be used to identify movement modes to improve the behavior-based structure of habitat response models. For instance, the exploratory mode can be used to filter out transit or searching forays that contaminate other behavior or phenology modes such as brooding, summer ranging, and winter ranging. Behavior mode identification could also be used to remotely sense nesting behavior if nest site visitation were not possible.

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DEVELOPING AERIAL SURVEY PROTOCOLS FOR PRAIRIE GROUSE WHERE MIXED-SPECIES LEKS OCCUR

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Aerial surveys have been proposed as an alternative to ground counts of prairie grouse. Where mixed-leks occur, using aerial infrared imagery (AIR) to determine grouse species may present challenges. Our objectives were to compare aerial versus ground counts of displaying males, females, and total grouse of greater prairie-chickens, sharp-tailed grouse, and mixed-leks. We conducted surveys in Grand Forks County, ND and Polk County, MN in April 2022. We conducted flights with fixed wing aircraft equipped with a high-resolution dual infrared/electro-optical gimbal simultaneously with ground counts. We completed 15 double counts at prairie-chicken (n = 7), sharp-tail (n = 5), and mixed (n = 3) leks. The airplane conducted a blind survey to determine lek locations and compare detection rates between ground observers and thermal imagery. The airplane detected 60 birds at 6 leks. This is the first time AIR has been used to differentiate greater prairie-chickens and sharp-tail grouse, we suggest that AIR is a feasible method to conduct counts in mixed-species landscape.

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DEVELOPING METHODS FOR PRODUCING UNBIASED POPULATION ESTIMATES FOR THE "PRAIRIE GROUSE OF THE MOUNTAINS"

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Dusky grouse (*Dendragapus obscurus*) are the "prairie grouse of the mountains" (D. Dahlgren; PGTC 2019), but unlike their kin, no rigorous state-wide monitoring programs currently exist. Our objective was to evaluate sampling and analytical methods for producing annual unbiased state-wide estimates of population size. We compared point-counts vs. transect surveys, route type, and whether electronic playback increased detection. We evaluated and compared N-mixture models for point-counts and hierarchical distance sampling models for both point-counts and transect surveys. We used pilot data to obtain baseline estimates of probabilities of detection and abundance from hierarchical N-mixture and distance sampling models to inform our simulation study. We conducted simulations with different survey designs under different abundance and detection scenarios to evaluate the ability of our estimators to produce unbiased and precise abundance estimates. We found spring surveys with electronic playback had the highest probability of detection, and that surveys located along roads/trails best balanced the trade-offs between sampling effort and survey design requirements. For accurate state-wide population estimates, simulations using N-mixture models indicated that 300 point-counts with 4 repetitions or 1,700 point-counts using hierarchical distance sampling were needed. Our results will inform methods for state-wide monitoring in Montana and illustrate a process applicable for developing dusky grouse monitoring elsewhere.

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OFFSRPING OF TRANSLOCATED INDIVIDUALS DRIVE THE SUCCESSFUL REINTORODUCITON OF COLUMBIAN SHARP-TAILED GROUSE IN NEVADA AND QUANTIFYING THE IMPACTS OF TRANSLOCATION ON SOURCE POPULATIONS

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Successful avian translocations blend effective translocation methodologies with animal behavior. We performed a reintroduction of Columbian Sharp-tailed Grouse (CSTG; Tympanuchus phasianellus columbianus) in Nevada and performed three Greater Sage-Grouse (GRSG; Centrocercus urophasianus) translocations (California, Utah, and North Dakota) and tested traditional (i.e. pre-nesting) and novel (i.e. brood translocations) translocation methodologies as part of ongoing conservation projects. Use of integrated population models in a Bayesian hierarchical framework revealed that CSTG chicks hatched at the release site demographically exceeded their translocated progenitors, which resulted in the successful restoration of an extirpated population. With GRSG, we tracked individuals at augmented, source, and at neighboring control sites in a Before-After-Control-Impact (BACI) design to elucidate the benefit of translocations on population growth (λ). The translocation of females with broods resulted in increases of λ by 11 – 30% over traditional translocation methods, which produced higher λ estimates than if no translocations were conducted. Both translocation methodologies resulted in small reductions of λ in source populations. Our results from CSTG translocations in Nevada indicated that chicks of translocated individuals drove the successful population restoration project, and results from our brood translocations significantly increased λ in augmented populations compared with translocation of pre-nesting females. These findings are preliminary, provided for timely science communication and are subject to change.

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THE IMPLICATIONS FOR CONSERVATION AND MANAGEMENT WHEN THREE DISTINCT GROUSE SPECIES ARE FOUND IN A SINGLE MORPHOSPACE

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J.M. LAUTENBACH and J.L. BECK, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY 82071 USA,

The prairie-grouse species, Greater Prairie-Chicken, Lesser Prairie-Chicken, and Sharp-tailed Grouse found in the Great Plains and Intermountain West of the United States are considered unique based on distribution, physical appearance, and behavior but when they occur sympatrically have been observed to hybridize, increasing phylogenetic complexity. We employed a standard morphospace analysis, a common approach in paleontology, that uses evolutionary derived physical attributes to evaluate the uniqueness of the Bauplan of species. We used 28 morphometric features and ratios commonly applied to extant taxa to investigate the morphological distinctiveness of prairie-grouse with Northern bobwhite quail as an out-group. Ordered principal components analysis explained 80% of the variation in morphospace of each species in the analysis and identified bobwhite as having a distinct morphospace from the three prairie-grouse species. Similarly, the morphospace analysis provided weak support for Sharp-tailed grouse as occupying distinct morphospace but did not recognize a significant difference in the Bauplan of the Greater and Lesser Prairie-chickens. The principal component analyses show two morphospecies of Tympanuchus grouse: Sharp-tailed Grouse and the prairie-chicken, but recent co-ancestry and homoplasy should be considered before making any determinations.

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INVESTIGATING THE UTILITY OF SOIL PROPERTIES AND VEGETATION MONITORING DATA FOR SAGE-GROUSE HABITAT MANAGEMENT

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The greater sage-grouse is a species of conservation concern requiring collaborative, range-wide efforts to understand and conserve sagebrush steppe habitats. However, local variation in soil and vegetation characteristics have demonstrated a need for region specific investigation of sage-grouse nesting habitats. We investigated the utility of existing rangeland monitoring protocols for sage grouse habitat management through vegetation and soil data collected at sage-grouse nests. Local habitat inferences may be gained through identification of the relationships between sage-grouse nest success, soil properties, and vegetation data as collected by the Assessment, Inventory and Monitoring (AIM) protocol used by land managers across the sage-grouse range. Of particular interest are the soil properties that produce the vegetation associated with sage-grouse nest sites and nest shrubs in a small-scale heterogenous region of north-central Montana. Shrub morphology is important for sage-grouse nest concealment and may be an important factor influencing nest success. Shrub morphology and density may be associated with local soil properties including: soil depth, texture, pH, organic matter, electrical conductivity (EC) and sodium absorption ration (SAR). We anticipate gaining an understanding of region-specific soil and vegetation properties associated with sage-grouse nests to potentially provide local land managers the ability to utilize existing, multiple-use rangeland monitoring data for region specific sage-grouse habitat management.

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COMPARATIVE EVALUATION OF TRANSMITTERS TO INFORM PRAIRIE GROUSE MONITORING

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The Motus Wildlife Tracking System is a collaborative research network that uses automated radio telemetry arrays to record transmitter detections remotely and distribute the data to researchers through the Motus database system. While Motus technologies have successfully been utilized to track the phenology and large-scale habitat use of migrating birds via Motus towers placed strategically worldwide, they have not yet been assessed for use in evaluating fine-scale space use, particularly of ground-dwelling birds. Our goal is to estimate the accuracy, precision, detection rates, and effective detection distances of Motus technology relative to standard VHF radio telemetry technology. We will evaluate how these measures of performance vary in relation to environmental and topographical conditions associated with prairie grouse seasonal habitat use by deploying 100 transmitters of each type randomly across four habitat strata in areas representative of sharp-tailed grouse habitat in western Montana. Field technicians who are unaware of the transmitter locations will use handheld receivers to triangulate transmitters. Additionally, we will test detection ranges of Motus towers to stationary ground-level targets by placing Motus transmitters at known distances and orientations from the Motus stations. Motus transmitters broadcast multiple times per minute and will be deployed during a 1-month period. We will use a GLM or GLMM to evaluate whether the measures of transmitter performance differ in relation to habitat strata for both the handheld triangulations and Motus tower detections. Our overarching objective is to assess the potential of Motus technology for evaluating space use and habitat selection of reintroduced sharp-tailed grouse in western Montana.

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IMPROVEMENTS TO WALK-IN TRAPS FOR CAPTURING PRAIRIE GROUSE ON LEKS

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For decades, various designs of walk-in traps have been used for capturing prairie grouse for relocation and telemetry studies. The basic design is a series of circular wire traps, each containing one or more funnel openings, usually attached to drift fences arranged in a large “W” manner across a prairie grouse lek. We will present some significant modifications we have developed, over the course of many years, to improve capture rate as well as detect captured birds when visibility of traps is limited. Other researchers and managers involved with the study or translocation of sage-grouse, sharp-tailed grouse, and prairie-chickens may also find these modifications advantageous, and some of these modifications may be applicable to other study species as well.

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MINUTES FROM 2019 BUSINESS MEETING

* 2019 MINUTES UNAVAILABLE

2019 FINANCIAL STATEMENT

Prairie Grouse Technical Council 2019

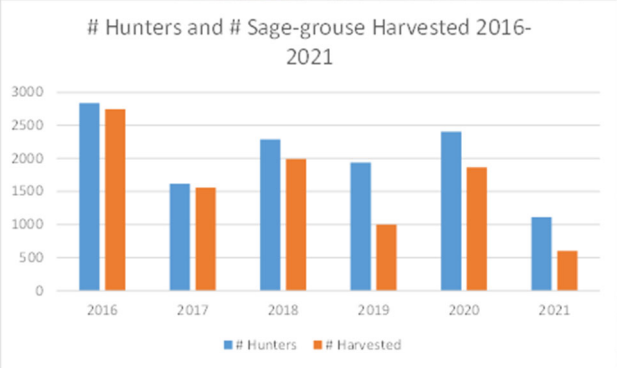
Transfer from PGTC account		$5,000.00
Income		
Early registrations ($150)	48	$7,200.00
Regular registrations ($200)	16	$3,200.00
Student early registrations ($75)	12	$900.00
Student registrations ($125)	7	$875.00
Vendors ($200)	3	$600.00
Extra banquet tickets/t-shirt	4	$175.00
Donations/sponsorships		$350.00
ODWC sponsorship		$4,750.00
Silent auction proceeds		$1,606.00
	Subtotal	$19,656.00
Expenses		
Credit card fees		$337.37
Swags		$7,422.68
Snacks		$346.25
Lunches		$1,488.43
Van rentals		$3,111.22
Plaques		$552.12
Hilton charges		$646.83
Misc supplies		$143.27
Woolaroc tours		$175.00
Banquet speaker		$683.13
	Subtotal	$14,906.30
Return to PGTC account		$ 9,749.70

STATE REPORTS

IDAHO

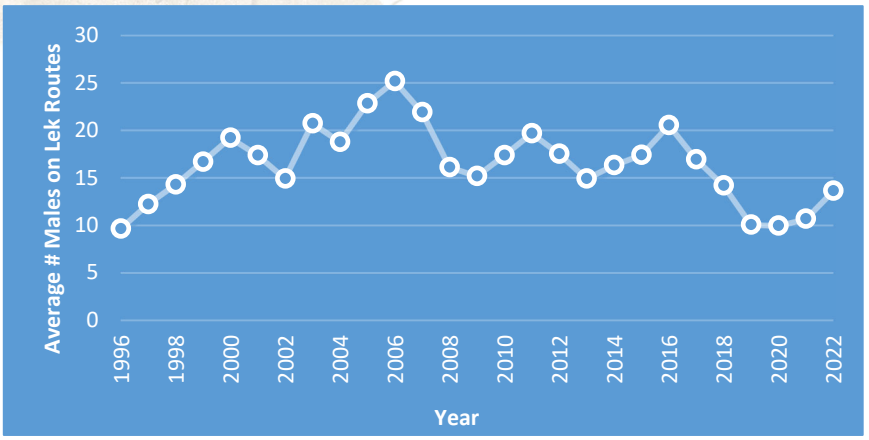
2022 Idaho Sage-grouse Status

Fall 2021 was the first year a game tag was required to hunt sage-grouse in Idaho. A total of 1,950 tags were available first-come, first-served across 12 management zones. Of the 1,950 tags available, 1,671 people purchased 1,945 tags. Only 67% of tag holders hunted and they harvested 605 birds (31% harvest rate), which represented <2% of the estimated fall population. The season ran from the September 18th through October 31st, which was several weeks longer than prior seasons. Tag numbers were set in each of 12 zones and anticipated harvest was not to exceed 5-8% of the estimated fall population, which was derived from the 2021 lek counts and predicted juvenile recruitment. The state was spilt between 2-tag zones (4 zones) and 1-tag zones (8 zones). Those wishing to purchase 2 tags had to purchase both tags in the same 2-tag zone and were the only ones eligible to purchase up to 2 tags.



In 2022, we evaluated the 2021 harvest estimates and 2022 spring lek counts and adjusted tag numbers to reflect the lower than expected harvest rate (90% expected, 31% observed) and increase in lek counts. Tag numbers were equal to 5-8% of the estimated fall population and 75% expected harvest rate. A total of 2,510 tags were available for the 2022 season and hunters were eligible to purchase up to 2 tags total in any zone (2 tags in 1 zone or 1 tag in 2 different zones).

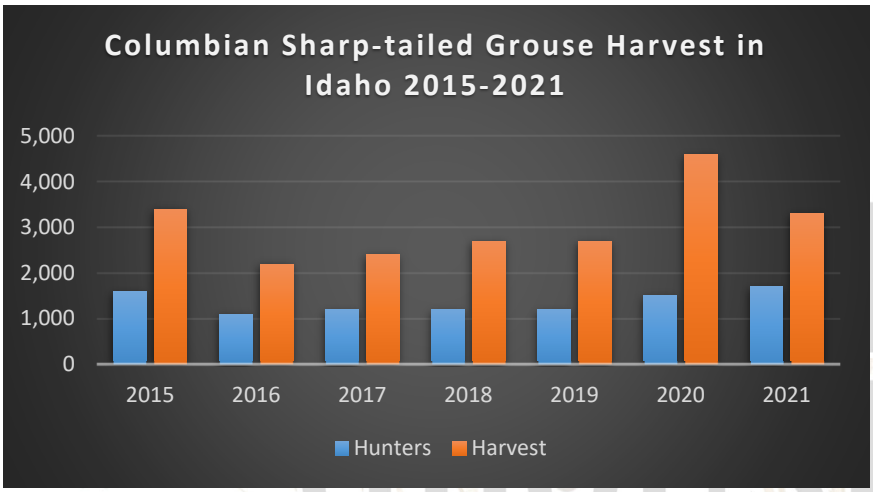
In spring 2022, we surveyed 1,366 sage-grouse leks across Idaho. Of all leks counted, 636 were active, 567 were inactive, and 163 were undetermined status (zero birds observed, but only 1 visit, so the count could not be verified). In addition, 6 pending new leks were reported. Male attendance on all leks was up 26% compared to 2021, while male attendance on lek routes was up 20% compared to 2021.



Idaho Department of Fish and Game in collaboration with University of Idaho is into the 9th year of a study called “Grouse and Grazing”. The objective of the project is to implement randomized grazing treatments to better document the relationship between spring cattle grazing and sage-grouse demographic traits, nest site selection, and habitat features. Final project completion reports should be available by 2024.

2022 Idaho Sharp-tailed Grouse Status

A sharp-tailed grouse validation is required to hunt Columbian sharp-tailed grouse in Idaho. This validation is available over-the-counter with no restrictions (anyone can purchase one when purchasing a license). The season runs from 1-31 October with daily bag and possession limits of 2/4, respectively. In fall 2021, an estimated 1,700 hunters harvested approximately 3,300 Columbian Sharp-tailed grouse in 4 management zones across east Idaho.



In spring 2022, 212 Columbian sharp-tailed grouse leks were counted across southern Idaho. Of all leks counted, 128 were active and 84 were inactive. Due to the way sharp-tailed grouse leks are counted, trend information is not available. Male lek attendance on the only area with consistent annual counts, but no harvest season, was down 36% compared to 2021 and down 28% over the past 5-years. This small, isolated population found in west-central Idaho may not represent trends from other populations to the east.

Idaho Fish and Game continues to collaborate with University of Idaho to analyze lek data, wing data, and harvest estimates to better monitor CSTG in Idaho. A paper titled "Multi-scale effects of land cover, weather, and fire on Columbian sharp-tailed grouse" has been submitted to the Journal of Wildlife Management. Fish Game continues to coordinate with University of Idaho staff to discuss further analyses.

Iowa

2021-2022 Greater Prairie-chicken Surveys
Stephanie Shepherd and Todd Bogenschutz, Iowa DNR

The state of Iowa employs four different survey techniques in order to obtain a complete picture of Greater Prairie-chicken (*Tympanuchus cupido pinnatus*) status in southern Iowa.

A winter flock survey was conducted on February 25, 2022, along three established routes surrounding three known active lek locations. One flock of 16 birds was recorded on one of the survey routes which is associated with the largest known lek site at Kellerton Bird Conservation Area (BCA) in Ringgold County (table 1).

A total of 33 sites across three counties in Southern Iowa were surveyed for lek activity between March 20 and April 20, 2022. Each site was surveyed twice using a route-based lek survey focused on shorter listening sessions at many sites. A subset of sites was surveyed a 3rd time for a longer listening session, all completed in one morning ("blitz" survey). Both of these surveys were conducted in conjunction with the Missouri Department of Conservation and The Nature Conservancy who conducted the same surveys on 27 sites mostly in Harrison county Missouri. Prairie-chicken activity was detected at three sites in Iowa mainly on the Kellerton BCA and a smaller satellite on private ground close by. A maximum of 20 birds were counted between these two leks, 16 males and 4 females (table 2).

Finally, cameras were deployed on the two stable lek sites and programmed to take pictures every minute from 6 - 9AM each morning during the peak leking season. These data are still being examined but preliminary results support data collected on the Winter and other lek surveys. A maximum of 15 birds were recorded on the main Kellerton lek and 5 on the smaller satellite lek.

Iowa and Missouri translocated birds from Nebraska between 2012 to 2017 into the Grand River Grasslands landscape (figure 1). The high count for birds on lek surveys was in 2017 at 103 and it has declined from there.

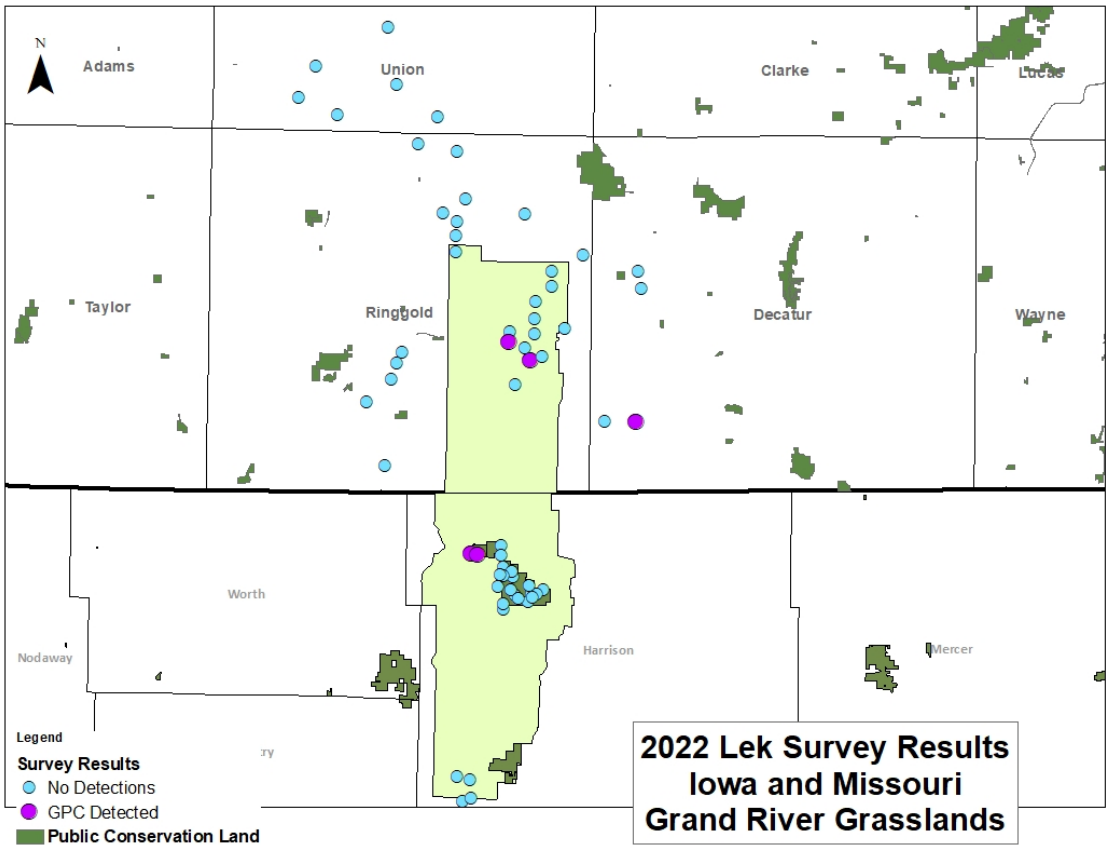


Figure 1. Landscape and sites surveyed with an indicator of sites with Prairie-chicken activity.

Table 1. Results of Winter Flock Surveys conducted in Iowa from 2019 through 2022.

	2019			2020			2021			2022		
	Kel	*Tin*	*Lam*	*Kel*	*Tin*	*Lam*	*Kel*	*Tin*	*Lam*	*Kel*	*Tin*	*Lam*
# Surveys	5	3	4	1	0	0	3	1	2	1	1	1
Biggest Flock	40	6	0	16	NA	NA	7	0	0	16	0	0
Max	42	6	0	19	NA	NA	14	0	0	16	0	0
Average	33.6	2	0	19	NA	NA	6.3	0	0	16	0	0
MAX TOTAL 1 DAY	46			19			14			16		

Table 2. Results of Lek-based surveys in Iowa and Missouri (Grand River Grasslands Landscape) from 2015 to 2022. No good count of birds was possible on the Missouri side in 2022 so total bird estimate is uncertain.

Year	Num. of Leks- All	Num. of Leks ->5	Max Chickens Counted (on a single Morning)	Average Birds per Active Lek	**Total Bird Estimate**
COMBINED					
2015	11	5	86	7.8	**186**
2016	13	6	101	7.8	**176**
2017	14	7	103	7.4	**200**
2018	13	5	82	6.3	**156**
2019	8	3	54	6.8	**108**
2020	8	4	60	7.5	**118**
2021	9	NA	40	4.4	**76**
2022	5	1	20	4.0	??
IOWA ONLY					
2015	5	3	46	9.2	
2016	6	3	54	9.0	
2017	5	3	39	7.8	
2018	7	2	49	7.0	
2019	3	2	31	10.3	
2020	4	2	25	6.3	
2021	3	1	13	4.3	
2022	3	1	20	6.7	
MO ONLY					
2015	6	2	40	6.7	
2016	7	3	47	6.7	
2017	9	4	64	7.1	
2018	6	3	33	5.5	
2019	5	1	23	4.6	
2020	4	2	35	8.8	
2021	6	NA	27	4.5	
2022	2	0	1	0.5	

Minnesota

2022 MINNESOTA PRAIRIE-CHICKEN POPULATION SURVEY

Charlotte Roy- Minnesota Department of Natural Resources

Greater prairie-chickens (*Tympanuchus cupido pinnatus*) were surveyed in all 17 survey blocks during the spring of 2022. Observers located 50 booming grounds and counted 606 males and birds of unknown sex in the survey blocks. Including areas outside the survey blocks, observers located 120 booming grounds, 1,336 male prairie-chickens, and 37 birds of unknown sex throughout the prairie-chicken range. Estimated densities of 0.07 (0.05–0.10) booming grounds/km^2 and 12.1 (9.6–14.6) males/booming ground within the survey blocks were similar to densities during recent years and during the 10 years preceding modern hunting seasons (i.e., 1993–2002).

Table 2. Prairie-chicken counts within survey blocks in Minnesota during spring 2022, and change in counts compared to 2021.

			2022		Change from 2021[a]	
Range[b]	Survey Block	Area (km^2)	Booming grounds	Males[c]	Booming grounds	Males[c]
Core	Polk 1	41.2	1	11	-1	-4
	Polk 2	42.0	4	32	0	-18
	Norman 1	42.0	2	11	0	7
	Norman 2	42.2	2	12	0	-4
	Norman 3	41.0	5	65	0	16
	Clay 1	46.0	9	168	-3	-31
	Clay 2	41.0	4	67	0	-25
	Clay 3	42.0	6	79	1	-2
	Clay 4	39.0	0	NA	-1	NA
	Wilkin 1	40.0	3	34	0	-15
	Core subtotal	415.0	36	479	-4	-82
Periphery	Mahnomen	41.7	3	52	1	11
	Becker 1	41.4	4	35	0	-1
	Becker 2	41.7	2	4	1	-2
	Wilkin 2	41.7	2	13	1	9
	Wilkin 3	42.0	2	17	0	-5
	Otter Tail 1	41.0	1	6	0	0
	Otter Tail 2	40.7	0	NA	-2	NA
	Periphery subtotal	290.6	14	127	1	-15
Grand total		705.5	50	606	-3	-97

[a] The 2021 count was subtracted from the 2022 count, so positive values indicate increases.
[b] Survey blocks were categorized as within the core or periphery of the Minnesota prairie-chicken range based upon bird densities and geographic location.
[c] Includes birds recorded as being of unknown sex but excludes lone males.

For full report, visit
https://files.dnr.state.mn.us/recreation/hunting/prairiechicken/2022-survey.pdf

2022 MINNESOTA SHARP-TAILED GROUSE SURVEY

Charlotte Roy- Minnesota Department of Natural Resources

The Minnesota DNR coordinates sharp-tailed grouse (*Tympanuchus phasianellus*) surveys each spring with the help of wildlife staff and cooperating biologists in the Northwest (NW) and East-Central (EC) survey regions. Sharp-tailed grouse surveys were conducted between 1 April and 11 May 2022, with 1,984 birds (males and birds of unknown sex) observed at 163 leks. Additionally, 6 birds were observed at 1 lek just south of the traditional NW survey region, and 22 birds were observed at 3 leks in southwestern Minnesota. The mean numbers of sharp-tailed grouse/lek were 9.8 (7.0 – 13.0) in the EC survey region, 12.5 (11.2 – 13.9) in the NW region, and 12.2 (11.0 – 13.4) statewide (EC and NW combined). Comparisons between leks observed in both 2021 and 2022 indicated similar numbers of birds/lek were observed in the NW region ($t = 1.50$, $P = 0.13$), more birds/lek in the EC region ($t = 2.3$, $P = 0.03$), and more birds/lek statewide ($t = 2.3$, $P = 0.03$). The increase in birds/lek in the EC region should be regarded cautiously, because only 21 leks were observed in 2022, which remains low compared to 30 leks in 2019 and 70 leks as recently as 2010. Such small populations are vulnerable to stochastic events like catastrophic storms, extreme flooding, and disease outbreaks.

Table 2. Difference in the number of sharp-tailed grouse / lek observed during spring surveys of the same lek in consecutive years in Minnesota.

	Statewide			Northwest[a]			East Central[a]		
Comparison[b]	Mean	95% CI[c]	*n*[d]	Mean	95% CI[c]	*n*[d]	Mean	95% CI[c]	*n*[d]
2004 – 2005	-1.3	-2.2 – -0.3	186	-2.1	-3.5 – -0.8	112	0.0	-1.0 – 1.1	74
2005 – 2006	-2.5	-3.7 – -1.3	126	-3.6	-5.3 – -1.9	70	-1.1	-2.6 – 0.6	56
2006 – 2007	2.6	1.5 – 3.8	152	3.3	1.7 – 5.1	99	1.2	0.1 – 2.3	53
2007 – 2008	0.4	-0.8 – 1.5	166	0.0	-1.6 – 1.6	115	1.2	0.1 – 2.5	51
2008 – 2009	0.9	-0.4 – 2.3	181	1.8	-0.1 – 3.8	120	-0.8	-2.1 – 0.6	61
2009 – 2010	-0.6	-1.8 – 0.6	179	-0.8	-2.6 – 1.0	118	-0.1	-1.2 – 1.0	61
2010 – 2011	-1.7	-2.7 – -0.8	183	-1.8	-3.1 – -0.5	124	-1.5	-2.8 – -0.3	59
2011 – 2012	-2.0	-2.9 – -1.1	170	-1.7	-2.9 – -0.4	112	-2.4	-3.3 – -1.6	58
2012 – 2013	-0.8	-2.0 – 0.4	140	0.4	-1.3 – 2.3	88	-2.9	-4.2 – -1.8	52
2013 – 2014	1.4	0.1 – 2.7	121	1.6	-0.3 – 3.5	79	1.1	-0.1 – 2.3	42
2014 – 2015	-0.2	-1.4 – 0.9	141	-0.3	-1.9 – 1.3	102	-0.1	-1.1 – 1.1	39
2015 – 2016	-1.3	-2.3 – -0.2	167	-1.6	-2.9 – -0.2	129	-0.2	-1.3 – 0.9	38
2016 – 2017	-0.3	-1.5 – 0.9	166	-0.3	-1.8 – 1.2	128	-0.2	-1.2 – 0.8	38
2017 – 2018	-2.2	-3.3 – -1.1	159[e]	-2.4	-3.9 – -0.4	123	-1.4	-2.8 – 0.2	36
2018 – 2019	-0.3	-1.5 – 1.0	132	0.0	-1.5 – 1.6	101	-1.4	-3.0 – 0.1	31
2019 – 2020[f]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2019 – 2021[g]	-0.7	-2.2 – 0.7	124	-0.5	-2.3 – 1.3	96	-1.6	-2.9 – -0.3	28
2021 – 2022	1.6	0.2 – 3.0	122	1.3	-0.3 – 3.0	96	2.7	0.5 – 5.0	26

[a] Survey regions; see Figure 1.
[b] Consecutive years for which comparable leks were compared.
[c] 95% CI = 95% confidence interval
[d] *n* = number of leks in the sample. Here, a lek can have a 0 count in 1 of the 2 years and still be considered.
[e]One lek was located just south of the NW region in Clearwater County.
[f]No data were collected in 2020 due to the Governor's Stay at Home Order during the COVID-19 pandemic.
[g]Comparisons were made between 2019 and 2021 because the survey was not conducted in 2020.

For full report, visit
https://files.dnr.state.mn.us/wildlife/grouse/reports/sharptail/stail_survey_2022.pdf

Montana

Montana Prairie Grouse Status Update 2022

By Heather Harris, Montana Fish, Wildlife & Parks

Sharp-tailed Grouse Population Summary

Sharp-tailed grouse (STGR) are surveyed each spring in regions 4, 6, 7 and a few in 5 (Figure 1), on known leks.

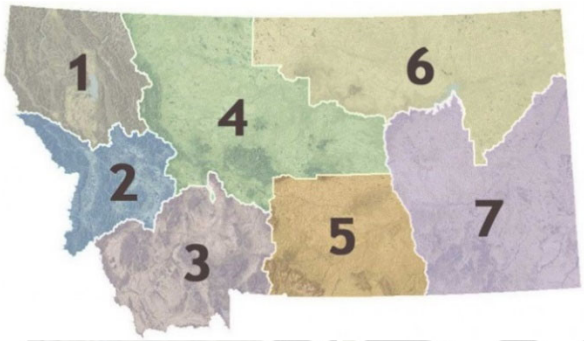


Figure 1: Montana Fish, Wildlife and Parks Regions.

Three methods are generally used to conduct these surveys 1) block surveys where the survey unit is defined by the distinct boundaries and survey coverage is complete for the geographic area 2) route surveys that have a predetermined route and geographic coverage is linear, 3) count opportunistic leks locations not included in block or route surveys, or in areas where activity is suspected but no previous surveys have been conducted.

Although numerous lek locations are known across the state, annual trends are estimated from established block areas and routes using total number of males observed as well as the average number of males per lek within each trend area.

STGR lek surveys are conducted from late March through mid-May. Timing varies between regions and spring weather conditions but leks are generally surveyed from ½ hour before sunrise to 2 hours after sunrise, depending on the date of the survey and weather conditions. Optimal counts are usually obtained from ½ hour before sunrise to 45 minutes after sunrise.

The number of STGR leks surveyed varies annually and not all leks are visited. Many observers attempt to count each lek 3 times to get the highest male count, however this is not always possible.

Most counts are done from a vehicle, although some counts are conducted by observers on foot, in blinds or from an aircraft. Flush counts may need to be conducted, depending on height of grass or topography of the lek location. When counting grouse from the air, it is more difficult to get multiple counts in a single visit without flushing the birds. Often males are counted while displaying and then the aircraft will swoop in on the lek, flush the birds and another count is done while the birds are in the air.

Statewide databases were established in 2002 and are currently housed in the Wildlife Information System (WIS). STGR lek survey data is entered into a statewide database on an annual basis. Starting in 2002, individual lek counts are entered into the database, whereas prior to 2002, only the highest male count was entered, even if a lek had multiple observations each year.

Montana Fish, Wildlife and Parks does not have a dedicated statewide game bird biologist and there are multiple methods to conduct surveys for STGR. Different surveys methods are used both between and among FWP Regions and therefore data reporting is not comparable between Regions. The data presented here is rough and presented as raw data ONLY. It should be used solely as a generalization for trend. There is no statistical viability, and this does not represent a population estimate. It 2021-2022, the total males counted was 2235 and the average males/lek was 8.1 (Figure 2).

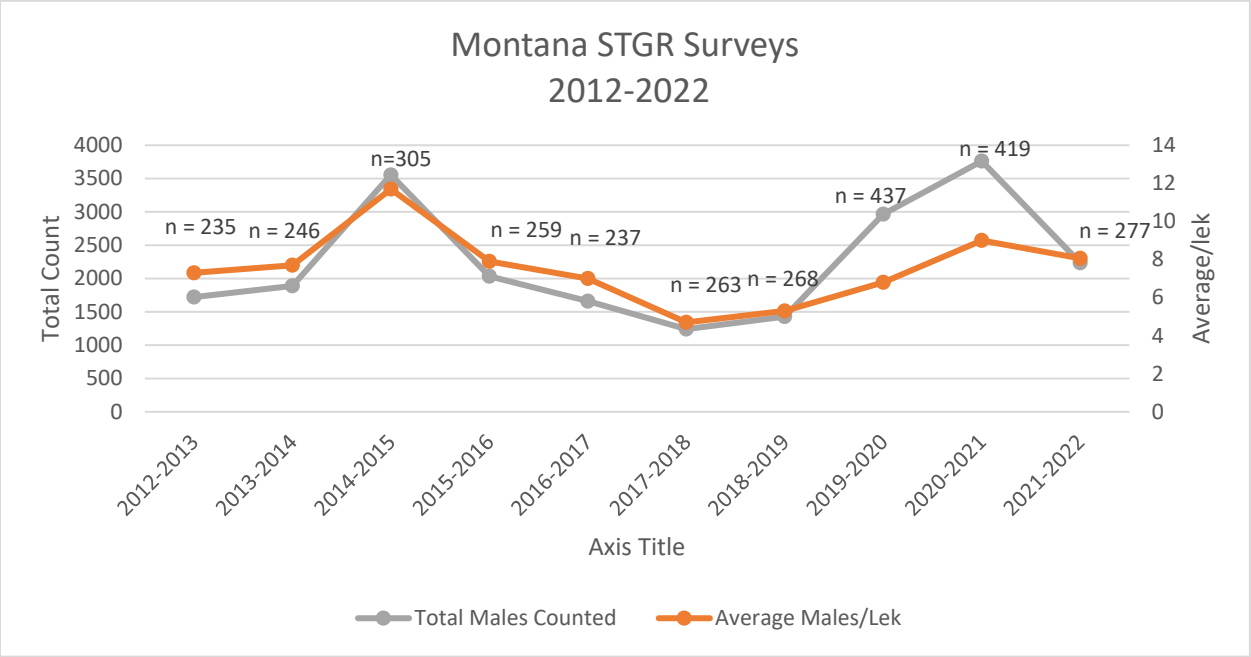


Figure 2: Statewide STGR surveys from 2012-2013 total count and average male/lek. Sample size (n) represents the total number of leks visited and does not include repeat visits. If repeat visits to leks occurred, the high-male count was used.

Sage-Grouse Population Summary

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.

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.

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 2). 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).

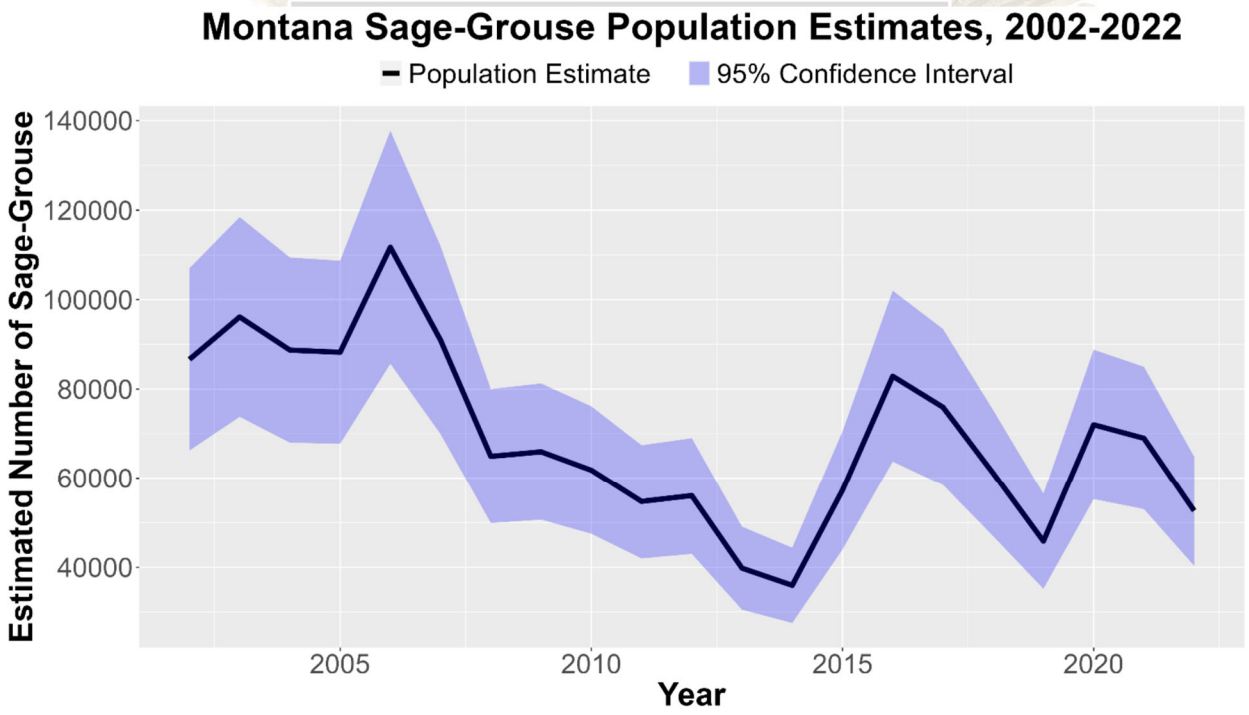


Figure 2. Greater sage-grouse population estimates and associated uncertainty (95% credible intervals) from *N*-mixture models in Montana, 2002-2022. In general terms, credible intervals describe the

uncertainty around the population estimate due to imperfect detectability of grouse on leks and variable lek count effort each year.

In conjunction with the broader sage-grouse lek survey efforts annually, a subset of leks that meet more rigorous survey standards have been designated as Adaptive Harvest Management (AHM) leks. Greater effort is made to ensure this subset of leks is surveyed annually. In spring of 2022, Montana FWP and collaborators completed counts of displaying males on these specific leks, surveying 81 of the 88 leks that are designated for Adaptive Harvest Management (AHM) statewide. Average sage-grouse male count on AHM leks in spring 2022 was 21.8 males/lek (Figure 3). Estimates in 2022 are 23% below long-term average statewide on these specific leks.

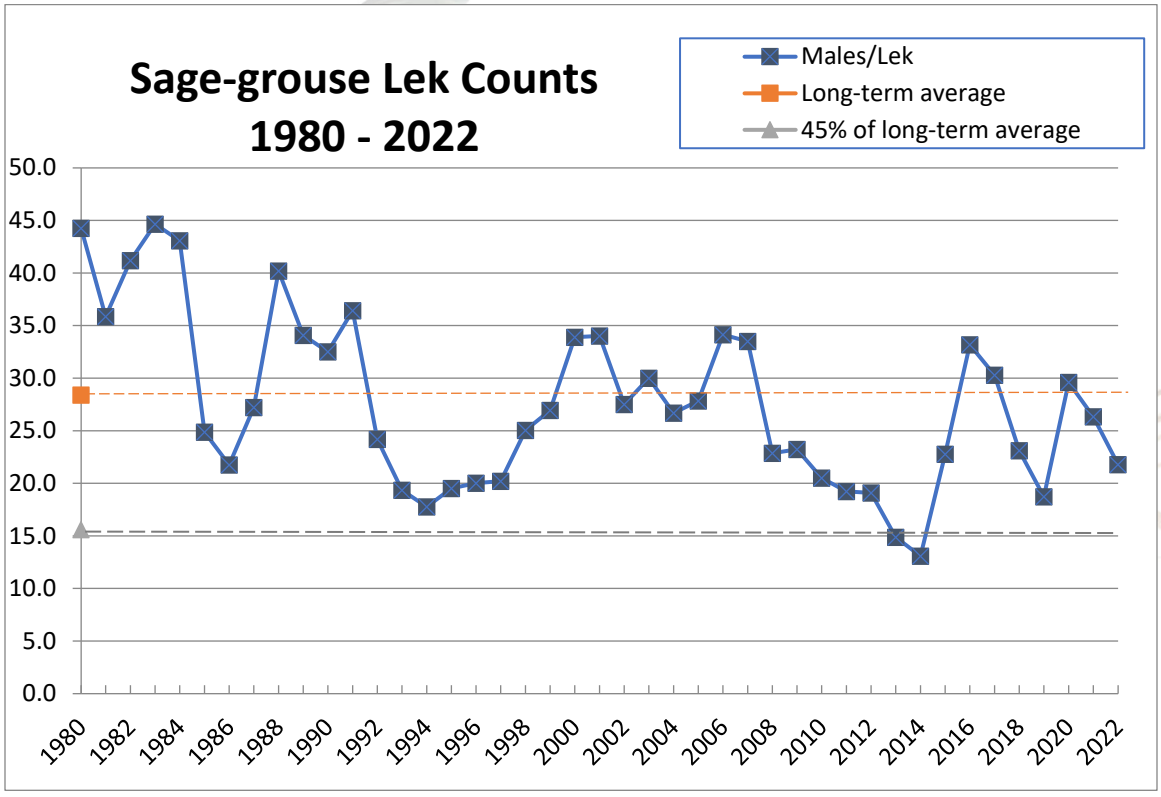


Figure 3. Annual average male counts on leks with 10 or more years of count data statewide (n = 34-88 surveyed leks). Long-term average (1980-2013; red dotted line) is 28.4 males/lek; 45% of long-term average (green dotted line) is 15.6 males/lek.

Full report available at: https://fwp.mt.gov/binaries/content/assets/fwp/conservation/sage-grouse/sage-grouse-population-report-2022.pdf

Montana Prairie Grouse Harvest Summary (Fall 2021)

Hunter harvest and effort for upland game birds in Montana are calculated from annual telephone surveys of hunters, which have been conducted since the late 1980s. Due to the survey methodology, the number of hunters pursuing prairie grouse may be confounded by hunters also pursing pheasants or gray partridge, therefore hunter numbers and hunter day estimates for each species may not be precise.

Sharp-tailed grouse Harvest

There were an estimated 10,547 hunters that went afield targeting sharp-tailed grouse in the fall of 2021. Those hunters harvested approximately 50,918 STGR and spent 69,429 days afield in 2021 (Figure 4). Hunter effort and harvest has increased slightly the last few years. Sharp-tailed grouse are the most harvested native game bird in the state, and the second most hunted and harvested upland bird after pheasants.

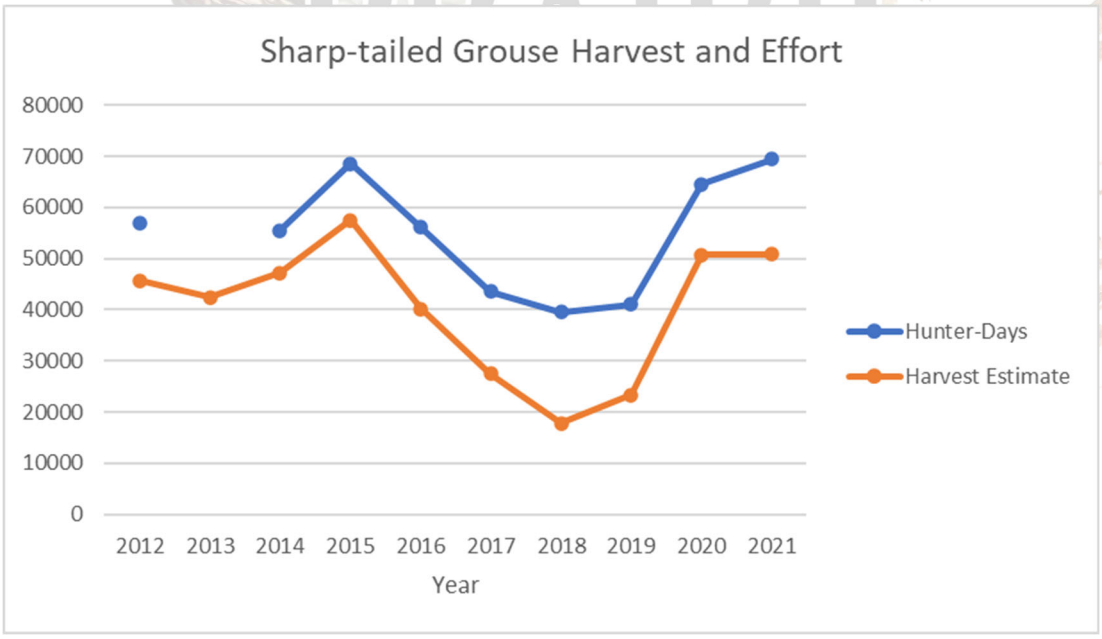


Figure 4. Sharp-tailed grouse harvest and hunter effort in Montana, 2012-2021. FWP did not collect hunter effort information in 2013.

Sage-grouse Harvest Estimate

There were an estimated 1,578 hunters chasing sage grouse in Montana in the fall of 2021. They hunted an estimated 8,622 days and harvested roughly 2,504 sage grouse across the state (Figure 5).

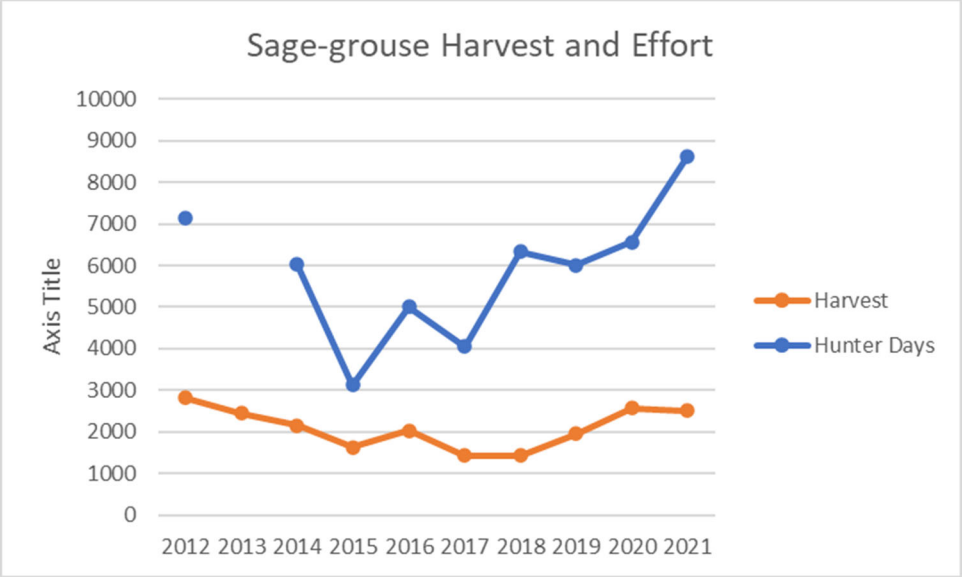


Figure 5. Sage-grouse harvest and hunter effort in Montana, 2012-2021. FWP did not collect hunter effort information in 2013.

Sharp-tailed Grouse Project Reintroduction Update

By Brad Balis, Montana Fish, Wildlife & Parks

Spring 2022 Trapping Efforts

In April 2022 the Sharp-tailed Grouse Project conducted trapping on Bureau of Land Management (BLM) and private lands located near Roy and Zortman, Montana. Spring 2022 trapping efforts took place primarily in FWP administrative Region 4 with one trapping location falling within the boundaries of Region 6. We trapped for 4 consecutive days, April 7-10.

Over 4 days of trapping, we captured 47 STGR, including 44 males and 3 females. Many male STGR were released on-site because we met our male quota at source leks. As a result, 29 grouse were released in Western Montana, 26 males and 3 females. Birds were released in the upper Blackfoot Valley near Helmville and the Bitterroot Valley near Florence.

We fitted each bird with an individual sequence of colored bands and an aluminum band stamped with a unique Band ID number. Hens were outfitted with Motus radio transmitters. We had 1 mortality on April 7th during transport between the lek and processing site. We retained the body and transferred it to the Wildlife Health Lab for necropsy and are currently awaiting results. We had 1 additional mortality at the release site in Drummond. During a pre-release check a bird struggled to pull away from its handler and its leg was broken while attempting to secure the bird. The bird was euthanized on site. Both mortalities were male STGR.

With Highly Pathogenic Avian Influenza (HPAI) being detected in Montana, the STGR project decided to halt any further spring captures/relocations.

Spring 2022 Monitoring

In Florence 4 male STGR have been observed on two separate occasions and seem to have established on DNRC ground approximately 5.5 miles Southeast of the Florence release site in the Three Mile area. We had an additional report of a STGR grouse observed in the Lolo area but were unable to relocate the bird during a site visit.

Birds released in the upper Blackfoot have been monitored through visual observations and tracking with telemetry. 4 male STGR were observed exhibiting lekking behaviors and dancing on a ridgeline adjacent to the upper Blackfoot release location. The 3 hens captured this year were fitted with transmitters and released at the upper Blackfoot site. They have been detected by our Motus Stations as well as hand-held telemetry equipment. One of these hens (Transmitter ID 191) has not been visually observed since the release. She was detected using the hand-held telemetry receivers at the upper Blackfoot release site, but we were unable to detect her signal after the first week of May. On May 29th her transmitter was detected by the Motus tower located just south of Drummond and has since been recorded on several later dates by the tower. Although we've made many attempts to locate her with handheld yagi antennas and whip antennas, we have been unable to visually observe her and confirm that she dispersed to the Drummond area. The two remaining hens (Transmitter IDs 177 and 194) have been observed in the same general area on several occasions in the upper Blackfoot Valley.

Summer 2022 Update

Hen 177 nested successfully in the Upper Blackfoot Valley (Figure 1). She laid 13 eggs with 12 of them hatching successfully. During a 14-day follow-up flush count, we located 177's transmitter. There was no carcass, feathers, or bands nearby. The transmitter and shock cord were in pristine condition and the event was labeled as a "censor" since we were unable to confirm a mortality event. Hen 194 also nested successfully in the Upper Blackfoot. Her nest was a second attempt (Figures 2 & 3). She laid 10 eggs, all of which hatched. She was observed incidentally with 5 live chicks in her brood (Figure 4). One chick was a mortality and was located near the nest site. Upon following up for a 14-day flush count hen 194 was observed with 9 chicks, 8 flushed and 1 was observed running along the ground. Hen 194 was then observed with 4 chicks on a 30-day flush count.

Figure 1. Hen 177's hatched nest

Figure 2. Hen 194's second nest attempt

Figure 3. Hen 194's hatched nest

Figure 4. Hen 194 with her brood

Nebraska

John Laux, Nebraska Game and Parks Commission (NGPC)

Prairie Grouse Hunting and Harvest Trends

Prairie grouse hunting activity and harvest (greater prairie-chickens and sharp-tailed grouse combined) have been estimated through the NGPC's Hunter Success Survey (HSS) dating back to 1955. Prairie grouse harvest peaked in 1979 (116,303 birds) and reached an all-time low in 2013 (9,571 birds) following a prolonged drought period. Hunter numbers have followed similar trends – with a peak in 1982 (21,901 hunters) and low in 2014 (3,427 hunters). According to the HSS, approximately 13,529 hunters (72%-R) harvested an estimated 25,024 prairie grouse (in aggregate) during the 2021-22 season (Figure 1).

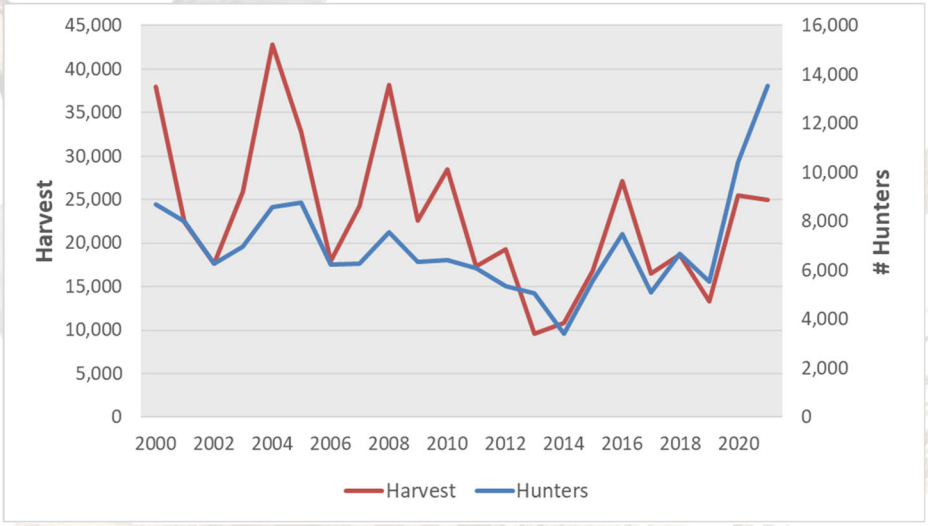


Figure 1. Prairie grouse hunter participation and harvest in Nebraska, 2000-2021 (Source: NGPC HSS).*
**Recent change to HSS methodology likely contributed to increase in hunters observed during the 2021-22 season.*

Although increases in hunter participation have been observed in recent years (see footnote above), harvest success (i.e., harvest per day) has declined steadily since 2016-17 (Figure 2). During the 2021-22 season, the average hunter hunted 4.9 days and harvested 1.85 prairie grouse.

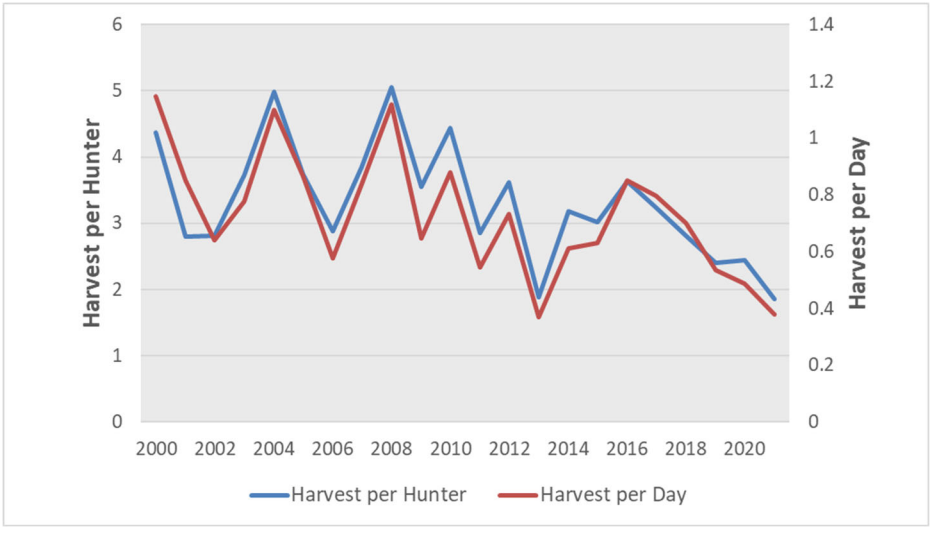


Figure 2. Prairie grouse harvest success metrics in Nebraska, 2000-2021 (Source: NGPC HSS)

Statewide Prairie Grouse Monitoring Effort

The NGPC has been collaborating with the Rainwater Basin Joint Venture on a 3-year study to determine how various landscape and environmental factors influence prairie grouse populations across the state. Ground-based surveys were conducted each spring within randomly-selected, square-mile sections following protocol developed by Runia et al. (2021) and sampling effort was stratified across 4 ecoregions and by percent (%) grass/tree cover. From 2020-2022, a total of 659 sections were surveyed by NGPC staff, partners, and volunteers. Greater prairie-chickens and sharp-tailed grouse occurred in 133 (20.2%) and 90 (13.7%) of the sections surveyed, respectively (Figure 3).

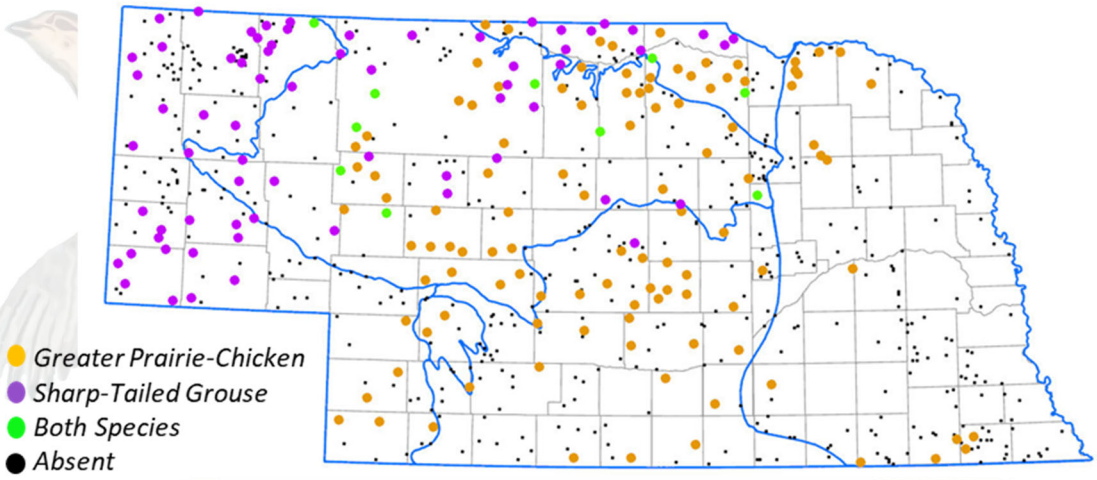


Figure 3. Prairie grouse occurrence during Nebraska's Statewide Prairie Grouse Monitoring Effort, 2020-2022.

Spatial modeling is currently underway and will be used to predict prairie grouse occupancy and densities across Nebraska, describe habitat preferences and associated thresholds, and estimate population sizes. These models will be used to develop decision support tools that will (1) predict population responses to future land-use and environmental changes, and (2) aid in the prioritization of future conservation delivery efforts.

Prairie Grouse Habitat Initiatives

NGPC is involved in the following initiatives that have been/will be positively impacting prairie grouse across their range in Nebraska (summarized from 1/1/2020 to present):

- Working Lands for Wildlife (WLFW)/PR Grouse
  - 1 invasive shrub control project (900 acres)
  - 4 prescribed fire projects (2,228 acres)
  - 42 mechanical tree removal projects (43,834 acres)
  - 37 additional projects at some stage totaling just under 32,000 acres (not yet completed)

- PR Grouse West/Great Plains Grassland Initiative (GPGI)
  - No projects completed yet – in progress
  - 1 signed agreement on 867 acres (mechanical tree removal)

- Nebraska Natural Legacy Project (NNLP)

- 88 mechanical tree removal projects (19,559.5 acres)
- 48 prescribed fire projects (17,648.4 acres)
- 1 grassland seeding project (48.9 acres)
- 4 invasive shrub control projects (935 acres)
- Over 50 additional projects under contract not yet completed

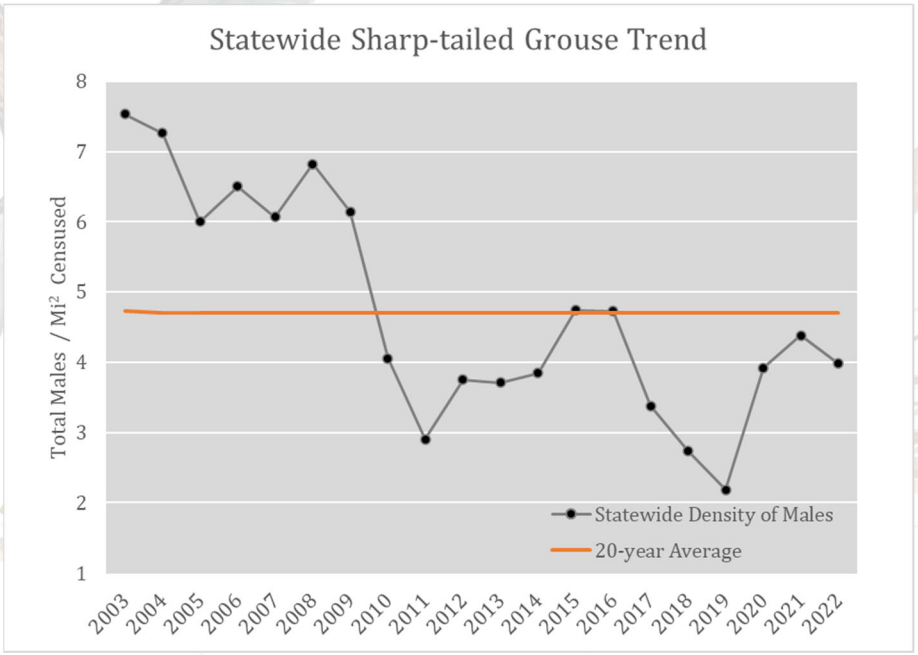
- WILD Nebraska program
  - 16 tree mechanical tree removal projects (16,055 acres)
  - 2 prescribed fire projects (153.2 acres)
  - Over 15 additional projects in various stages of progress

North Dakota

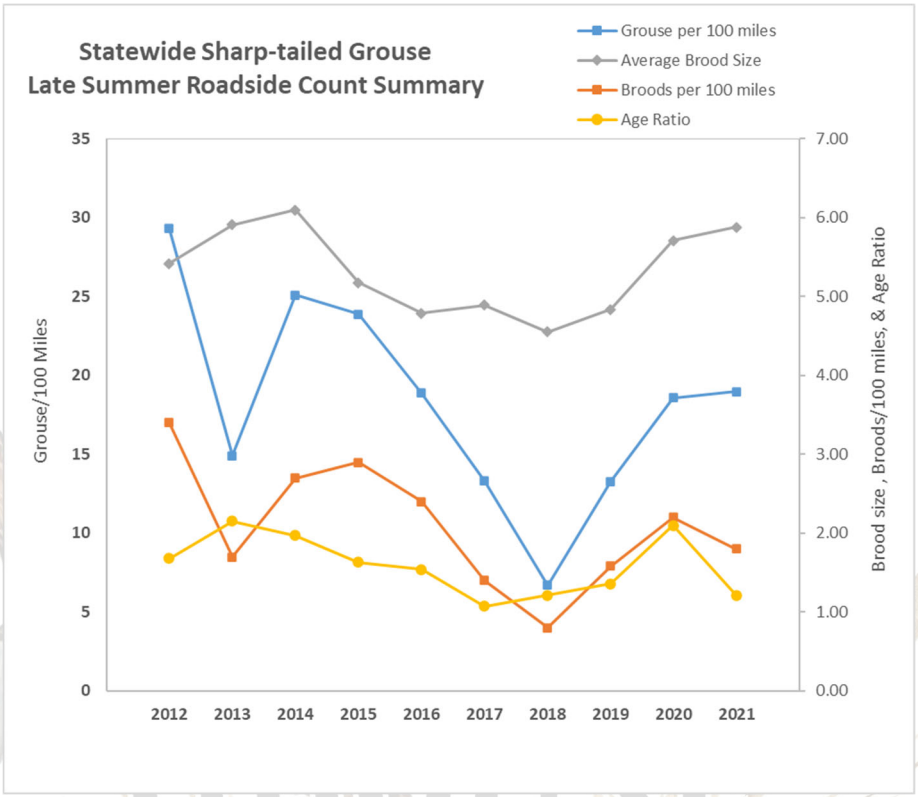
Jesse Kolar, Upland Game Management Supervisor, Dickinson, ND

Sharp-tailed grouse

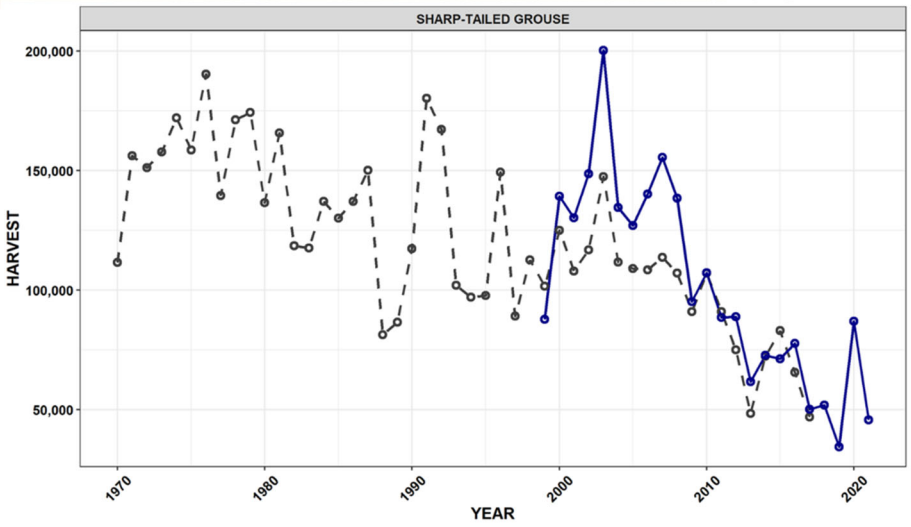
The North Dakota Game and Fish Department monitors sharp-tailed grouse via: spring lek census blocks, late summer roadside counts (brood counts), hunter questionnaires and hunter-submitted wings/feathers. Trends in spring population index, reproduction, and harvest are shown below.



North Dakota spring density of sharp-tailed grouse males counted on census blocks (n=25 blocks; approximately 36 mi^2 per block). Lek counts are conducted in April, and peak counts are used for each lek.



Summary of sharp-tailed grouse observations and brood sizes in North Dakota, 2012-2021. Brood routes are run from July 20th through August 31, and observers are encouraged to drive routes on calm mornings with heavy dew. Routes are run on fixed, 20-mile "pheasant" routes and 15-40 mile "random" routes.



Statewide sharp-tailed grouse harvest trends in North Dakota between 1970 and 2021. The gray, dashed line represents harvest estimates derived from bag sizes adjusted with an Atwood correction (see, Atwood 1959); the blue, solid line represents harvest estimates derived from a Poisson regression model.

Greater prairie-chicken

Greater prairie-chickens are only found in two island populations in North Dakota in Grand Forks County, and around the Sheyenne National Grasslands. NDGF contracts the University of North Dakota and Dough Hedtke to monitor booming grounds at Grand Forks and around the SNG proper. USFS counts booming grounds on the SNG. The hunting season for prairie chickens has been closed in ND since 2009.

Prairie chickens were translocated to the Grand Forks population from 1992-1998, and the population expanded to the point that there was a permitted hunting season from 2002-2009. The population has been in decline since 2006, and most recently, observers in photography blinds confirmed much higher rates of sharp-tailed grouse X greater prairie-chicken hybrids than what was previously expected. Eight of nine grouse on a single lek, that were identified as prairie chickens during lek counts (via spotting scope from 200 yards away) turned out to be hybrids. In 2022 observers could only find 6 pure prairie chickens in the Grand Forks population and 49 prairie chickens on and around he Sheyenne National Grasslands.

Oklahoma

Lesser and Greater prairie-chicken update for 2020, 2021, and 2022

The data below is from the Oklahoma Department of Wildlife Conservation's (ODWC) internal ground survey data; volunteer ground surveys that include Sutton Avian Research Center, Pheasants and Quail Forever, The Nature Conservancy, U.S. Fish and Wildlife Service, and Oklahoma City Zoo; and WAFWA lesser prairie-chicken range-wide conservation plan aerial surveys.

2020

Lesser prairie-chicken ground surveys

102 lesser prairie-chicken ground survey points from ODWC for 0.069 leks per square mile.

A total of 245 points were surveyed and 17 leks were detected.

Greater prairie-chicken ground surveys

127 greater prairie-chicken ground survey points from ODWC for 0.087 leks per square mile.

A total of 514 points were surveyed and 51 leks were detected.

2021

Lesser prairie-chicken ground surveys

90 lesser prairie-chicken ground survey points from ODWC for 0.044 leks per square mile.

A total of 163 points were surveyed and 20 leks were detected.

Greater prairie-chicken ground surveys

127 greater prairie-chicken ground survey points from ODWC for 0.071 leks per square mile.

A total of 496 points were surveyed and 28 leks were detected.

2022

Lesser prairie-chicken ground surveys

100 lesser prairie-chicken ground survey points from ODWC for 0.010 leks per square mile.

A total of 180 points were surveyed (not counting Sutton ground surveys) and 10 leks were detected.

New ground survey grant with Sutton Avian Research Center and they surveyed most of our lesser prairie-chicken surveyed areas in the panhandle (Cimarron, Texas, and western Beaver Counties) to detect approximately 10 leks.

10 leks were located and permissions granted to flush. Six leks were located and flushed for an average of 9.33 birds total per lek and 8 males per lek.

Greater prairie-chicken ground surveys

114 greater prairie-chicken ground survey points from ODWC for 0.132 leks per square mile.

A total of 404 points were surveyed and 38 leks were detected.

2020-2021 Lesser prairie-chicken aerial surveys

The aerial survey shows a population estimate for the Mixed-Grass Prairie Region of 4,516 in 2020 and 3,132 in 2021.

OREGON

Oregon
Greater Sage- and Sharp-tailed Grouse Report 2022
Prairie Grouse Technical Council Meeting, August 15, 2022

Mikal Cline, Upland Game Bird Coord. – (503) 947-6323, mikal.l.cline@odfw.oregon.gov
Skyler Vold, Sage-grouse Conservation Coord. – (541) 573-6582, skyler.t.vold@odfw.oregon.gov
Nigel Seidel, Sage-grouse Mitigation Coord. – (503) 947-6074, nigel.e.seidel@odfw.oregon.gov

Population Status

Both greater sage- and Columbian sharp-tailed grouse are native to Oregon. Sharp-tailed grouse were extirpated from the state by the 1960s due to bunchgrass prairie conversion to crop production. A translocation in the 1990s showed promise in restoring a flock in northeastern Oregon, but without a current viable source population, the flock has dwindled to undetectable levels. The remainder of this report will focus on sage-grouse.

Greater sage-grouse (sage-grouse) occupy the arid southeastern portion of the state. The state classifies sage-grouse as a Sensitive species in the Oregon Conservation Strategy. Oregon infers sage-grouse population trends from spring lek surveys performed between 15 March and 30 April. Each year biologists from ODFW, BLM, USFWS, Burns Paiute Tribe, Pheasants Forever, and Oregon State University, along with volunteers monitor a portion of known lek sites. Aerial lek surveys using infrared imaging are conducted every 2-3 years to survey inaccessible leks. Additionally, aerial lek searches by helicopter are conducted annually to locate new leks or document lek location shifts. Details of techniques and results are summarized yearly in the *Oregon Greater Sage-Grouse Population Monitoring Annual Report* at https://www.dfw.state.or.us/wildlife/sagegrouse/.

In spring 2022, biologists and volunteers conducted 1,642 ground and 163 aerial lek surveys at 789 individual lek sites, comprising 525 lek complexes. Good weather and road conditions throughout most of the count period allowed staff, partners, and volunteers to achieve high survey effort, similar to 2020 and 2021.

Overall, the 2022 spring statewide estimate is 17,508 birds, up ~10% from the 2021 population estimate. This is the third consecutive year of sage-grouse population increases in Oregon and the highest population estimate since 2018. In 2022, each BLM District saw slight to moderate population increases except the Lakeview District, which declined by ~10%. Baker RA also saw an apparent moderate population decline, but the estimator does not do well with small sample sizes; Baker appears to be stable again in 2022. Vale District saw a large population increase (~36%), mostly driven by the 7 new complexes discovered in the Louse Canyon PAC this past spring.

Since 2006, the sage-grouse population in Oregon has cycled on a 6 to 7-year period, most recently peaking in 2016. Thus, it appears that the population low in 2019 may represent the bottom of the current population cycle, with populations increasing over the last 3 years.

Production--Summer brood counts have been retired as a viable measure of production due to minimal detection rates and lack of congruence with age ratios from hunter-harvested wing returns.

Following the 2021 hunting season, 150 greater sage-grouse wings were received from hunters. Production in 2021 (as measured by percent juveniles in the harvest) was 41%, slightly below the long-term average of 47% (1993–2020). The number of chicks per hen in 2021 was 1.07, similar to the 2020 production value of 1.12, and lower than the long-term (1993–2020) average production of 1.47 chicks per hen. Apparent nest success in 2021 was below average, based on retention of primary 9 of harvested females (P9 Nest Success: 2021 = 37%, 1993–2020 Average = 43%). Production data collected from hunter-harvested wings in 2021 suggests that sage-grouse populations should be stable in 2022.

Hunting--The state allows a very conservative controlled hunt in 10 of the 14 sage-grouse management units. Permits are calculated based on projected fall population, allowing harvest of 5% or less (typically 2-3%) of the population. Participating hunters are surveyed regarding hunt success and effort first via an email survey with two reminders, then a follow-up postcard for non-respondents. Hunters are also mailed two postage-paid wing return envelopes. Biologists examine the wings post-season to determine age, sex, hatch date for juvenile birds, nest success for adult females, and annual turnover. Results are included in the annual report referenced above.

The 2021 controlled sage-grouse hunt was conducted from Sept. 11-19. Tags offered (635) were increased slightly from 2020 (630 tags). Of the 635 tags offered, all were drawn, and 381 people participated in the hunt. An estimated 225 birds were harvested, averaging 0.59 birds/hunter, based on the email and postcard survey.

Core Area (PAC) Update

ODFW is in the process of updating sage-grouse PAC/core area boundaries. With the discovery of new leks, research telemetry projects, and large-scale habitat changes, our understanding of the distribution of sage-grouse in Oregon has improved since the last update in 2015. Changing PAC boundaries will have implications for development siting in sage-grouse range. This process will begin with the initial mapping exercise, but will include input from the Local Implementation Teams and other stakeholders. The 2011 Oregon Sage-Grouse Conservation Assessment and Strategy (CAAS) will also be updated in conjunction with the Core Areas.

Mitigation

Oregon Department of Fish and Wildlife (ODFW) has a Sage-grouse Mitigation Program (Program) that administers state rules and policies regarding development within sage-grouse habitat. The program coordinates with other state and federal agencies to determine project specific development impacts to sage-grouse habitat and identify appropriate mitigation offsets that meet both the biological needs of sage-grouse and principles and standards of state policy.

- The Program developed a quantitative methodology and tool to determine the change in sagebrush habitat function related to the implementation of development or conservation actions.
- The Program has created a cost calculation and established an In-Lieu Fee mitigation option that project proponents can choose over conducting permittee-responsible mitigation.
- There are 2 sage-grouse mitigation banks being established in Oregon. The Program is working with the banking entity to ensure compliance with state mitigation policies and will certify credit releases when appropriate.
- To date, no development project has gone completely through the Program, though two projects are anticipated to be finalized within the next year.
    - Types of development within sage-grouse habitat include lithium exploration, gold mining, aggregate mining, communication towers, electrical transmission, solar, residential, and recreational areas.
    - Development project footprints range from a couple acres (homes) to over 7,000 acres (lithium) in size.

Saskatchewan

Greater Sage-grouse – Bea Prieto Diaz

Spring population of Greater Sage-Grouse in Saskatchewan in 2022 is estimated between 90 and 133 individuals in two active leks inside Grasslands National Park. These population levels are similar to 2016, after 5 years of decline. However, one of the currently active leks is down to only one male from 5 in 2016.

Yearly surveys of active Greater Sage-grouse leks are undertaken by Parks Canada every year. The province has a non-invasive survey program that uses Automated Recording Units (ARUs) and drones to survey inactive and historic leks on a rotational basis.

The province is focused on habitat management by working collaboratively with producers and the Ministry of Agriculture. Federally designated Critical Habitat in the province also goes through specific process for development. For more detailed information, please contact me at bea.prieto@gov.sk.ca

Sharp-tailed Grouse – Katherine Conkin

In general, sharp-tailed grouse populations continue to recover across most of the province. In 2021, an estimated 6,400 hunters harvested approximately 17,000 birds. This represents a decrease in hunters, but an increase in harvest, from the five-year average. In 2020, hunter harvest surveys became mandatory for all licenced hunters. For additional years' harvest survey results, see https://www.saskatchewan.ca/residents/parks-culture-heritage-and-sport/hunting-trapping-and-angling/hunting/hunter-harvest-survey.

Although annual lek surveys were discontinued in the province in the early 2000's, recent research on habitat selection and population trends in Saskatchewan was undertaken by Brandon Burda. In early 2022, we published *Lek habitat suitability for the sharp-tailed grouse (Tympanuchus phasianellus jamesi) on the Northern Great Plains* (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0265316). Mr. Burda's full thesis can be found at https://ourspace.uregina.ca/handle/10294/14320?show=full.

South Dakota

South Dakota has prairie chickens and sharp-tailed grouse; hereafter prairie grouse. Prairie grouse are most abundant in central and western South Dakota (Figure 1).

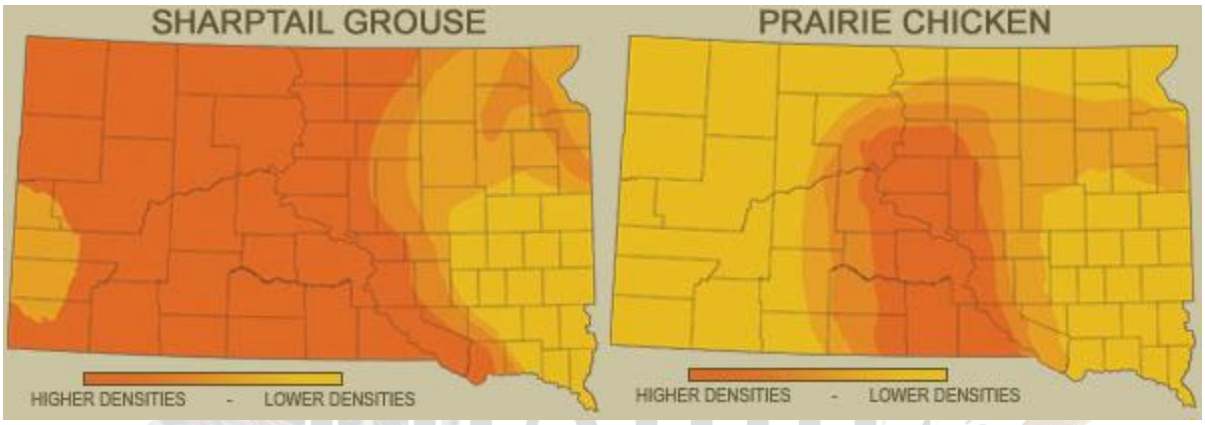


Figure 1. General distribution of prairie grouse in South Dakota.

Surveys and monitoring

The South Dakota Department of Game, Fish and Parks (SDGFP) historically conducted annual prairie grouse lek surveys within established survey areas approximately 40 mi^2 (104 km^2) for prairie grouse leks and counted all males attending each lek throughout the state. This survey was discontinued in 2019 except for one route located in central South Dakota, an area that overlaps high hunting effort. Lek counts and high male counts from this route and additional counts from the United States Forest Service on the Ft. Pierre National Grasslands are used as a tool to help develop a fall hunting forecast.

In lieu of traditional lek monitoring, data collection began in 2014 in South Dakota to develop a spatially explicit habitat-based occurrence/density model. SDGFP collaborated with North Dakota Department of Game and Fish to collect similar data between both states. Data were collected by determining presence or absence of prairie grouse leks on 1 mi^2 (2.56 km^2) sample units (Figure 2). Samples were spatially balanced and occurred along a gradient of landscape-level grassland availability. Each section was searched 2–3 times per year. If a lek(s) was present, the number of males was also counted. A total of 865 sections were searched between the to two states. Models were developed to predict occurrence and density of prairie grouse based on landscape level habitat characteristics and climate variables (Runia et al. 2021).

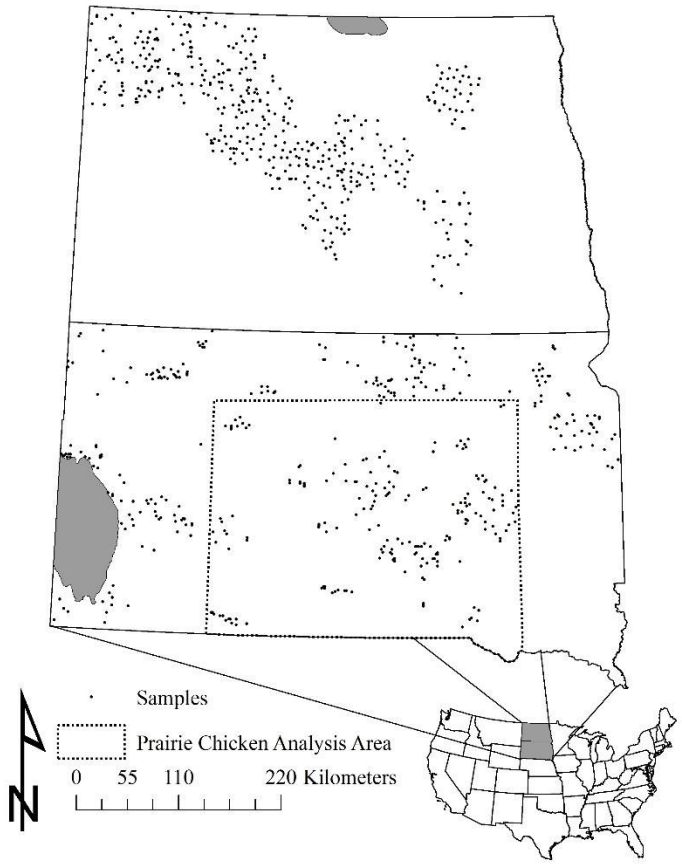


Figure 2. Areas surveyed for estimating occurrence and density of sharp-tailed grouse and greater prairie-chickens in South Dakota and North Dakota, USA, 2010–2016 (Runia et al. 2021). Samples were 1 mi^2 (2.56-km^2) Public Land Survey System sections.

As expected, prairie grouse were positively associated with grasslands, including Conservation Reserve Program (CRP), and negatively associated with developed areas such as roads and dwellings. Spatially-explicit habitat-based occurrence and density maps were developed from the models (Figure 3). In addition to providing insight into broad-scale habitat selection, spatially explicit habitat models can be valuable tools for identifying and prioritizing areas for conservation treatments such as protection, restoration, or enhancement of habitat. Model-based estimates of the distribution and abundance of prairie grouse can also serve as a baseline for population monitoring. It is our intent to repeat this methodology periodically in the future, ideally in collaboration with adjacent states to conduct population monitoring across large portions of the species' range with similar methods.

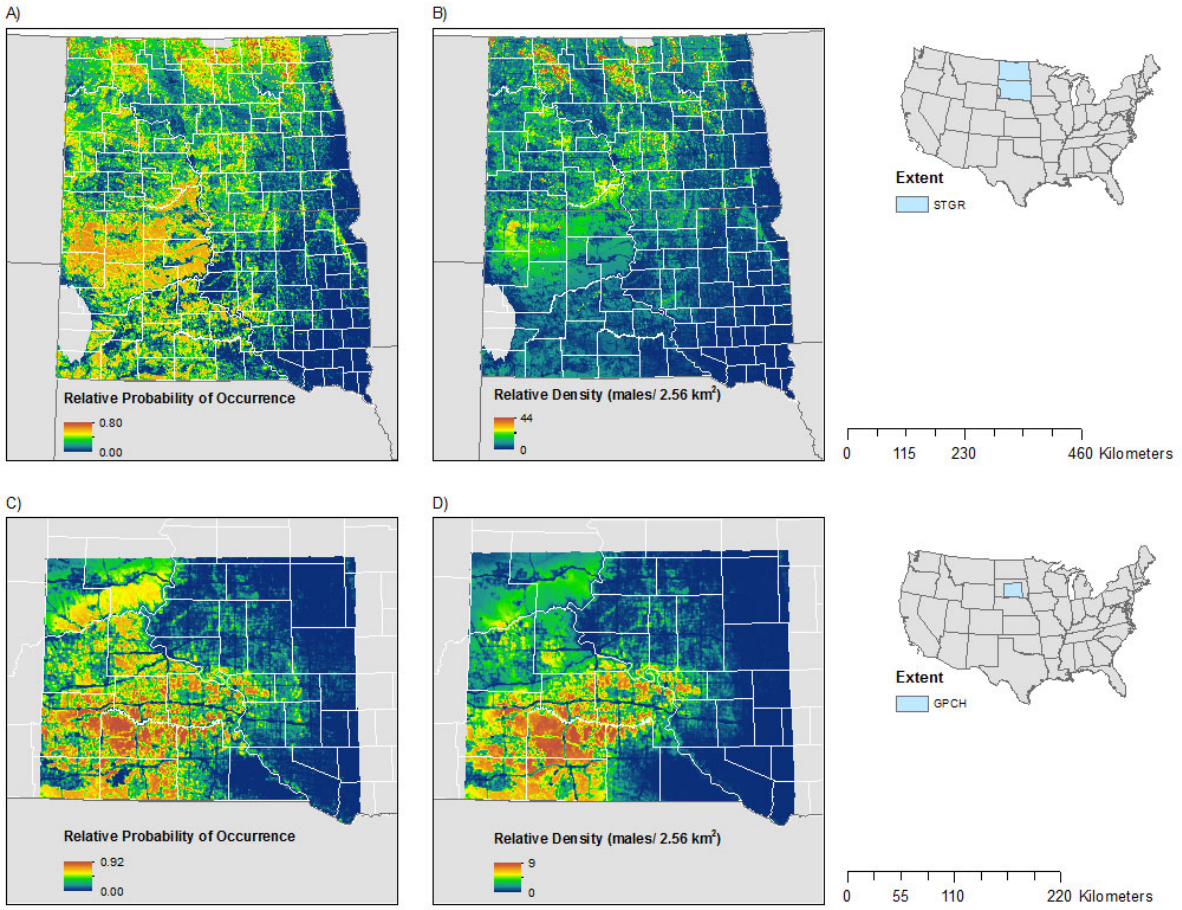


Figure 3. Maps of predicted probability of occurrence and relative density of sharp-tailed grouse (A and B) and greater prairie-chicken (C and D) in North and South Dakota, USA, 2010–2016 (Runia et al. 2021). Gray indicates areas outside the region of analysis.

Harvest

The 2021 grouse season was 18 September 2021 - 2 January 2022, statewide. An estimated 15,000 hunters harvested 53,000 prairie grouse (Figure 4). Harvest was above South Dakota's 20-year average. Most prairie grouse harvest occurred in the central and western portions of the state (Figure 5).

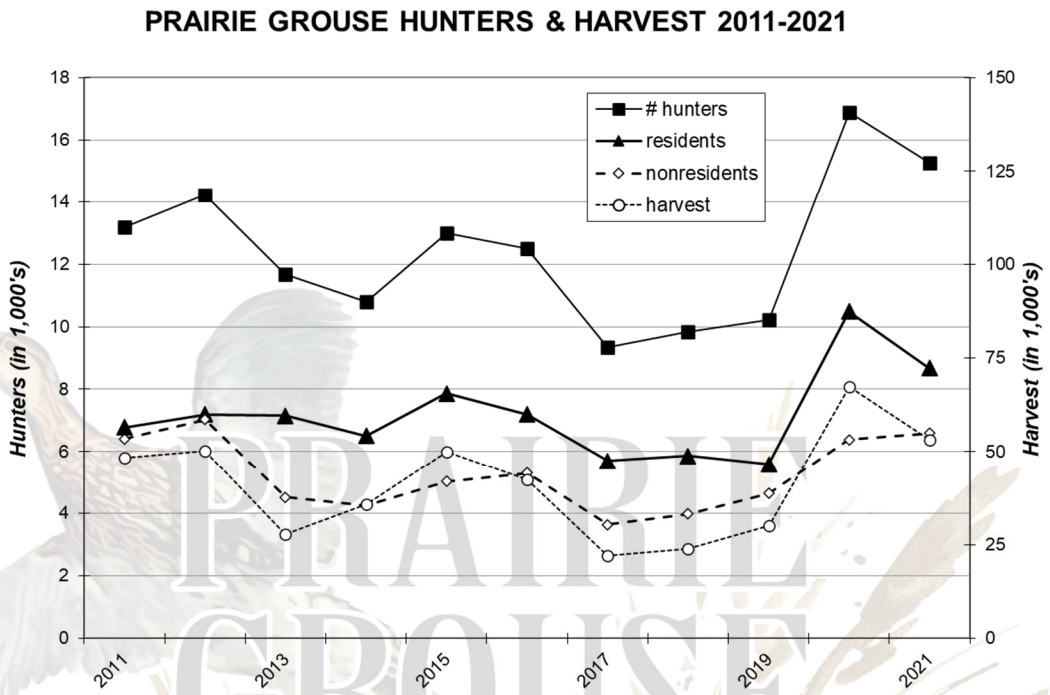


Figure 4. South Dakota prairie grouse harvest 2011 – 2021.

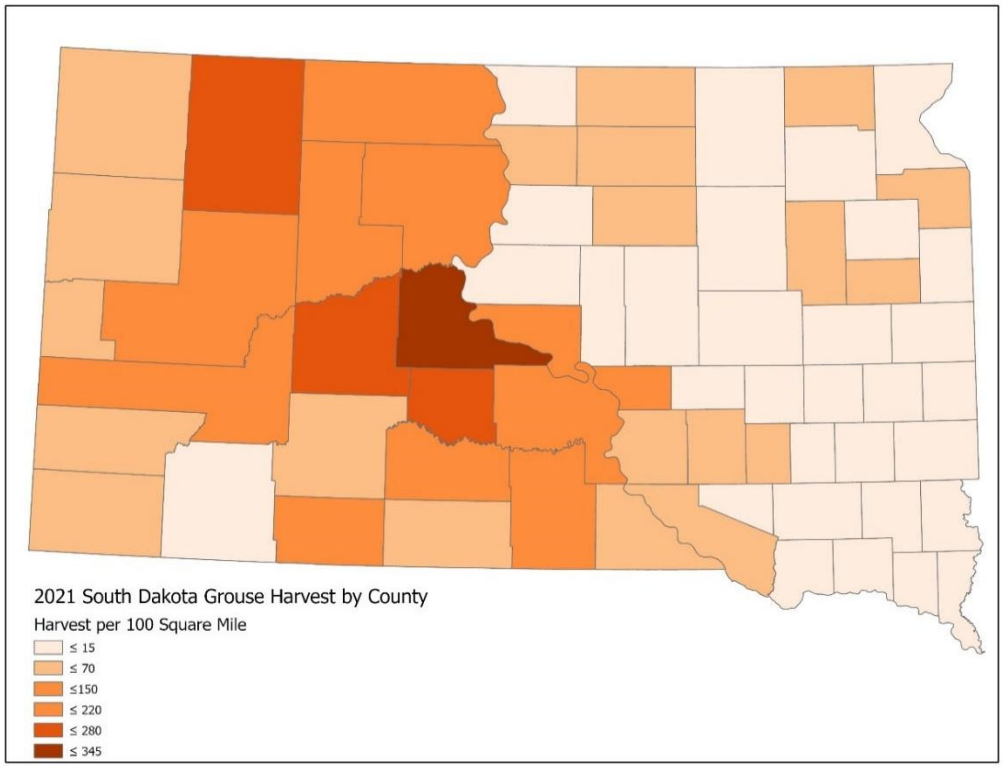


Figure 5. Distribution of the 2021 prairie grouse harvest (harvest/100mi^2) in South Dakota.

Wings from hunter-harvested birds are collected throughout the state to estimate annual productivity. The statewide production index of young of year wings/adult wings sharply declined to 0.92 in 2021 when compared to 2.12 on 2020 (Figure 6). The previous 5 years average was 1.71. Severe to extreme drought in much of South Dakota's prairie grouse range during the summer likely reduced production. However, overall harvest remained above average from the suspected high levels of adults in the population. The winter of 2020-2021 was relatively mild, likely resulting in above average winter survival as witnessed by historically high lek counts in the spring of 2021.

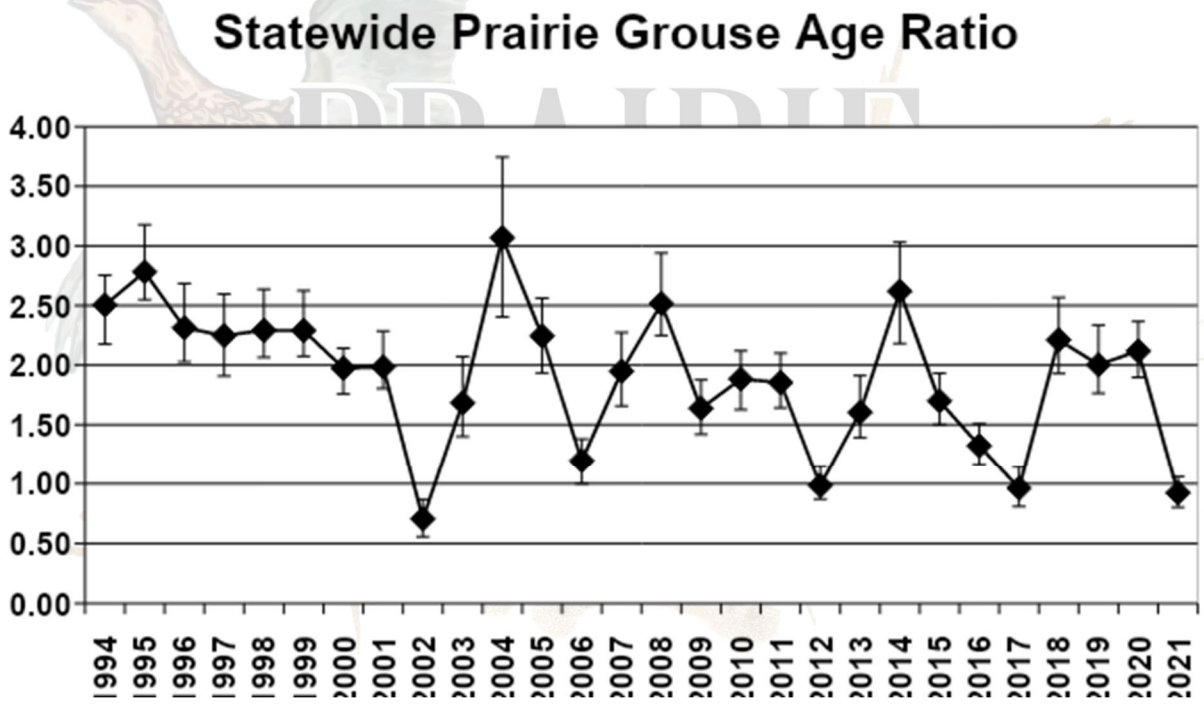


Figure 6. Statewide prairie grouse age ratio (± 95% confidence interval) from fall hunter-harvested sharp-tailed grouse and greater prairie-chickens 1994–2021.

Detailed harvest reports can be found here: https://gfp.sd.gov/hunt-surveys/.

The loss of grassland is at the forefront of concern on long-term prairie grouse populations. Grassland loss has certainly reduced the distribution and abundance of these area-sensitive birds, and this is most apparent in our long-term statewide harvest trends.

Literature Cited:

Runia, T.J., A.J. Solem, N.D. Niemuth, and K.W. Barnes. 2021. Spatially explicit habitat models for prairie grouse: implications for improved population monitoring and targeted conservation. Wildlife Society Bulletin 45:36–54.

Texas

2022 Lesser Prairie-Chicken Report

Background

The Texas Parks and Wildlife Department has used a variety of tools to monitor and manage the state's LPC population since the 1950's. The Department has used roadside counts, intensive lek surveys on survey areas, and aerial surveys to monitor the LPC population trends since 1999. The long-term trend for the LPC in Texas is that of range contraction and population decline. The bird was estimated to historically occupy approximately 75 counties in Texas stretching from the banks of the Pecos River as far south as Terrell County and west to Loving County with an eastern limit of Clay County; aerial and ground surveys confirmed the bird to be in only 5 counties as of spring 2022. Similarly, the historic population estimate in Texas likely exceeded one million birds, however, recent estimates based on aerial surveys suggest that there may only be approximately 2,000 LPC in Texas. The Texas Parks and Wildlife Commission has also opened and closed the LPC season; the LPC season was closed in 2008 and no LPC have been harvested in Texas since then. TPWD staff have developed and implemented interagency programs to manage and conserve remaining LPC habitat in Texas, namely the Texas Lesser Prairie-Chicken Candidate Conservation Agreement with Assurances, which currently has 90 properties enrolled covering nearly 650,000 acres of private land.

Lek Surveys

Lesser prairie-chicken lek surveys were conducted on two survey areas during March - April 2022. During the 2022 survey season, combining results for both survey areas indicate the Texas LPC density was an estimated 0.76 LPC/mile^2. Total lek density/mile^2 was 0.08 (Table 1). The Southwest Panhandle surveys estimated density at 1.27 LPC/mile^2. Lek density was 0.16 leks/mile^2 (**Error! Reference source not found.**). No LPCs were observed in the Terry County portion of the survey area, and 51 LPCs were observed on 6 leks in Yoakum County. Twenty-two birds were observed on 3 leks in Cochran County in 2022. The Northeast Panhandle surveys estimated LPC density at 0.50 individuals/mile^2 and lek density at 0.04 leks/mile^2 for 2022 (Table 3). Fifty-eight birds (33 males, 4 females, and 21 unknowns) were observed on 5 leks in the Hemphill County portion of the study area. No birds were observed in Wheeler or Gray Counties in 2022.

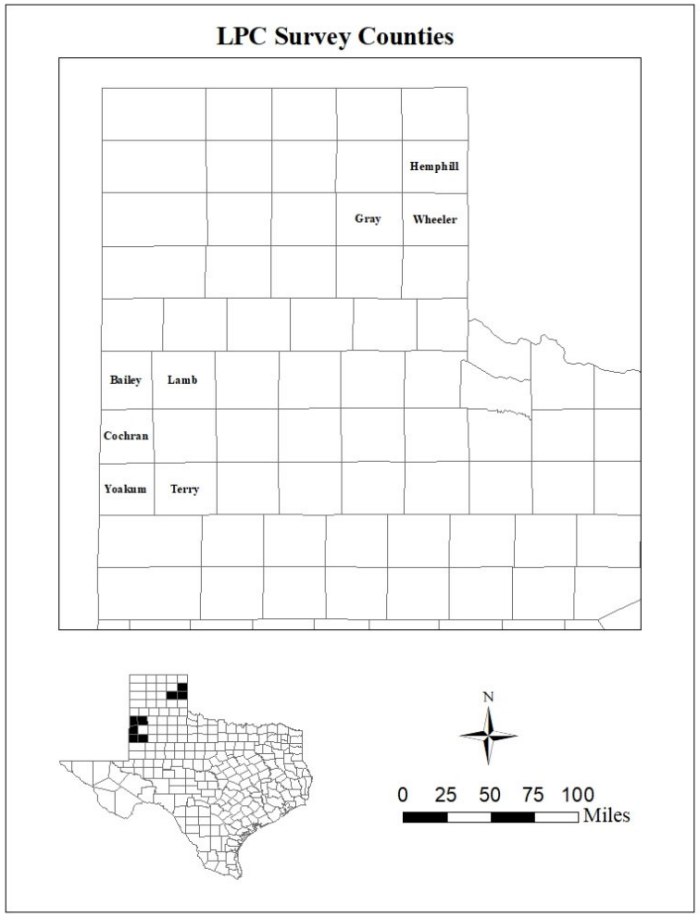
Road Surveys

Roadside surveys were completed in Bailey, Lamb and Cochran counties, outside the designated survey area in 2022. Thirty-nine LPCs were recorded on five leks in CRP fields in southwest Bailey County, and 16 LPCs were recorded right off county roads in northern Cochran County. No leks were recorded in Lamb County during the driving surveys.

Table 1. Texas Survey Area Population Data (continued on following page)

Year	Survey Ac	No. leks	No. males	No. females	No. unknowns	Males/lek	LPC/lek	Leks/mi2	Ac/lek	LPC/ mi²	% Δ LPC/ mi²	% Δ Lek/ mi²
1997	96,679	23	160	24	0	7.0	8.0	0.15	4,203	1.22		
1998	103,219	51	489	51	11	9.6	10.8	0.32	2,024	3.42	180%	108%
1999	115,597	52	538	93	18	10.3	12.5	0.29	2,223	3.59	5%	-9%
2000	115,597	60	672	80	62	11.2	13.6	0.33	1,927	4.51	25%	15%
2001	115,597	64	677	85	21	10.6	12.2	0.35	1,806	4.34	-4%	7%
2002	115,597	58	562	70	25	9.7	11.3	0.32	1,993	3.64	-16%	-9%
2003	115,597	59	624	106	45	10.6	13.1	0.33	1,959	4.29	18%	2%
2004	115,597	57	548	58	32	9.6	11.2	0.32	2,028	3.53	-18%	-3%
2005	115,597	60	486	65	62	8.1	10.2	0.33	1,927	3.39	-4%	5%
2006	102,157	52	405	49	116	7.8	11.0	0.33	1,965	3.57	5%	-2%
2007	107,211	36	179	12	74	5.0	7.4	0.21	2,978	1.58	-56%	-34%
2008	97,990	31	130	26	79	4.2	7.6	0.20	3,161	1.53	-3%	-6%
2009	97,990	29	165	14	21	5.7	6.9	0.19	3,379	1.31	-15%	-6%
2010	97,990	22	161	12	8	7.3	8.2	0.14	4,454	1.18	-10%	-24%
2011	97,990	23	163	35	11	7.1	9.1	0.15	4,260	1.37	15%	5%
2012	86,216	19	79	6	9	4.2	4.9	0.14	4,538	0.70	-49%	-6%
2013	90,036	16	85	16	2	5.3	6.4	0.11	5,627	0.73	5%	-19%
2014	92,129	11	71	5	0	6.5	6.9	0.08	8,375	0.53	-28%	-31%
2015	99,702	15	89	9	0	5.9	6.5	0.10	6,646	0.63	19%	26%
2016	118,205	22	165	19	0	7.5	8.3	0.12	5,372	1.00	58%	24%
2017	118,205	25	180	22	18	7.2	8.8	0.14	4,728	1.19	20%	14%

2018	110,589	26	106	33	91	4.1	8.8	0.15	4,253	1.33	12%	11%
2019	110,589	23	84	3	94	3.7	7.9	0.13	4,808	1.04	-21%	-12%
2020	110,589	19	152	14	35	8.0	10.6	0.11	5,820	1.16	11%	-17%
2021	110,589	16	119	7	7	7.4	8.3	0.09	6,911	0.77	-34%	-16%
2022	110,589	14	88	8	35	6.3	9.3	0.08	7,899	0.76	-2%	-13%



Wisconsin

2022 Wisconsin Greater Prairie-Chicken Survey

Lesa Kardash, Wisconsin Department of Natural Resources

We conducted surveys for Greater Prairie-chickens (*Tympanuchus cupido*) in central Wisconsin in March and April of 2022. We detected 34 booming grounds and counted a mean of 281 (range 250-310) males on those booming grounds (Table 1, 2). Each booming ground was observed on a mean of 2.6 different days (range 1-6 days). We observed a mean of 8 males per booming ground (range 2-24) based on the mean count.

Table 1. Number of male Greater Prairie-Chickens* in central Wisconsin, 2015-2022**.

Area	2015	2016	2017	2018	2019	2021	2022
Buena Vista	133 (125-141)	114 (106-123)	135 (127-145)	135 (113-158)	113 (105-123)	168 (154-180)	208 (195-223)
Leola	17 (15-20)	21 (18-23)	19 (18-20)	19 (10-26)	25 (21-30)	20 (19-20)	10 (10-10)
Paul J. Olson	90 (85-95)	88 (78-95)	83 (75-90)	71 (61-81)	55 (46-65)	59 (57-62)	63 (45-77)
Mead	13 (12-14)	17 (15-19)	13 (11-15)	18 (14-21)	12 (11-12)	4 (3-4)	0 (0-0)
McMillan	0	0	0	—	—	—	—
Outlying Areas[1]	0	0	0	—	—	—	—
Totals**	**253 (237-270)**	**240 (217-260)**	**250 (231-270)**	**243 (198-286)**	**205 (183-230)**	**251 (233-266)**	**281 (250-310)**

* Mean (Low count – high count)

** No surveys were conducted in 2020 due to COVID-19 policies.

[1] Includes Clark and Taylor Counties

— Did not survey

Table 2. Number of Greater Prairie-Chicken booming grounds in central Wisconsin, 2015-2022*.

Area	2015	2016	2017	2018	2019	2021	2022
Buena Vista	18	16	18	17	18	19	20
Leola	3	3	4	4	5	3	2
Paul J. Olson	11	13	13	12	14	13	12
Mead	4	4	3	4	2	1	0
McMillan	0	0	0	—	—	—	—
Outlying Areas[1]	0	0	0	—	—	—	—
Totals**	**40**	**36**	**38**	**37**	**39**	**36**	**34**

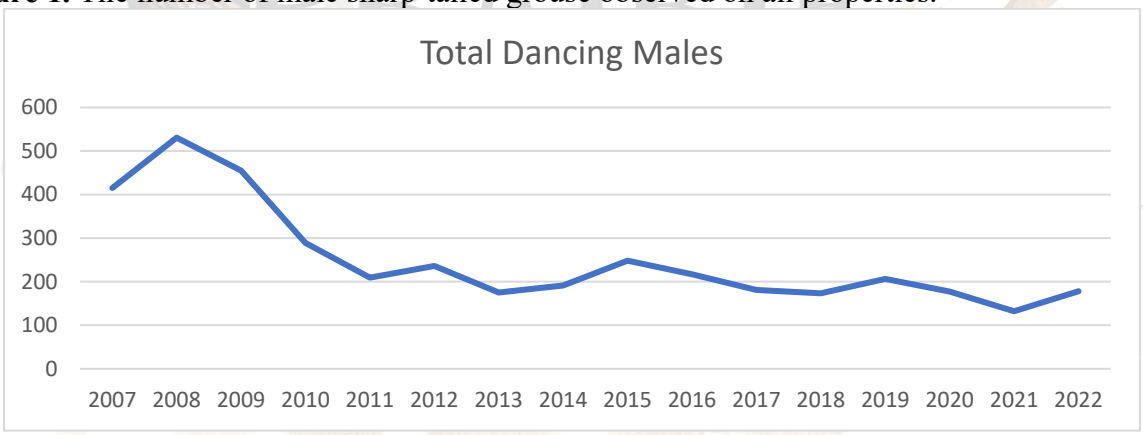
* No surveys were conducted in 2020 due to COVID-19 policies.

[1] Includes Clark and Taylor Counties
— Did not survey

2022 Wisconsin Sharp-Tailed Grouse Survey
Robert Hanson, Wisconsin Department of Natural Resources

Sharp-tailed grouse (*Tympanuchus phasianellus*) surveys are conducted each year in April and May. Surveys are conducted on 3 different property types: DNR managed properties, non-managed properties, and private lands. In 2022, there was a 35% increase in the number of males observed statewide compared to 2021. We documented a 59% increase in the number of males on DNR managed lands and a 50% decline on non-managed lands from 2021 to 2022. On private lands surveyed, no grouse were detected in 2022 compared to one male in 2021. The current increase in survey numbers is coming off an all-time low count in 2021, and survey trends still indicate a long-term decline.

Figure 1. The number of male sharp-tailed grouse observed on all properties.*



* No DNR Surveys were conducted in 2020 due to COVID Protocols. Volunteers through the WI Sharp-tailed Grouse Society conducted and recorded surveys for 2020.

Table 1. The number of dancing males observed on Sharp-tailed Grouse Management Areas.*

Managed Property	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Crex Meadows W.A.	24	14	5	16	25	22	17	25	25	19	68
Douglas County W.A.	25	25	23	31	24	14	23	25	13	8	6
Kimberly Clark W.A.	8	n/a	3	4	6	0	0	0		0	0
Moquah Barrens W.M.A.	6	3	4	3	2	10	15	23	22	7	3
Namekagon Barrens W.A.	40	42	56	81	62	47	44	53	56	57	66
Pershing W.A.	3	7	5	3	3	1	0	0		1	0
Riley Lake W.M.A.	33	25	19	27	16	21	6	24	12	7	
Wood County W.A.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		n/a	n/a
Dike Seventeen	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		n/a	n/a
Barnes Barrens M.A.**	6	8	10	19	31	23	12	11		4	15
Total	145	124	125	184	169	138	117	161	128	103	164
% Change	n/a	-14	1	47	-8	-18	-15	38	-20	-20	59

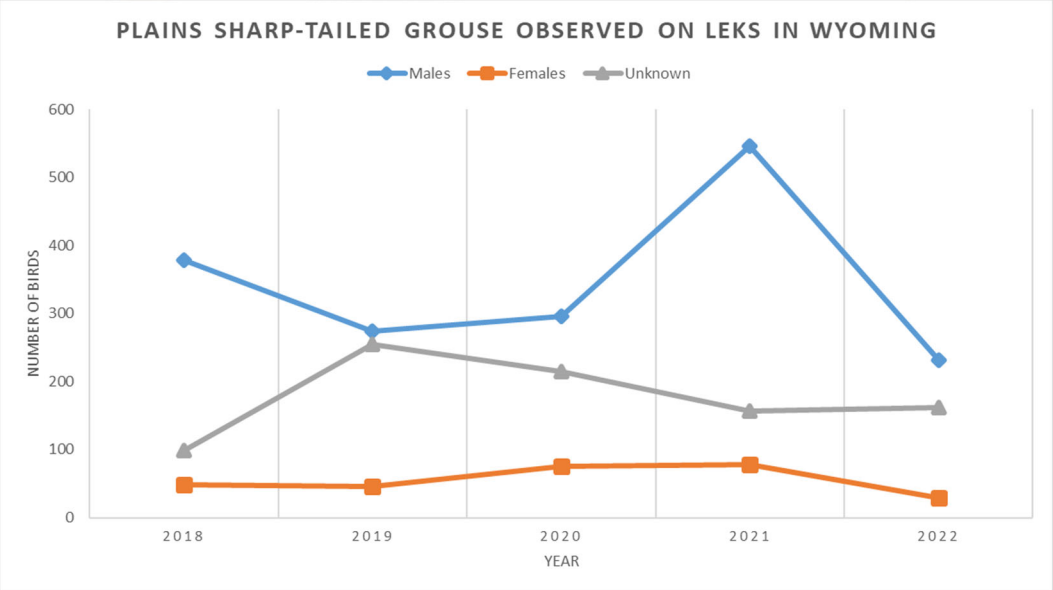
* No DNR Surveys were conducted in 2020 due to COVID Protocols. Volunteers through the WI Sharp-tailed Grouse Society conducted and recorded surveys for 2020.
**Barnes data were separated out for this table beginning in 2007 and first reported in this way beginning in 2014.

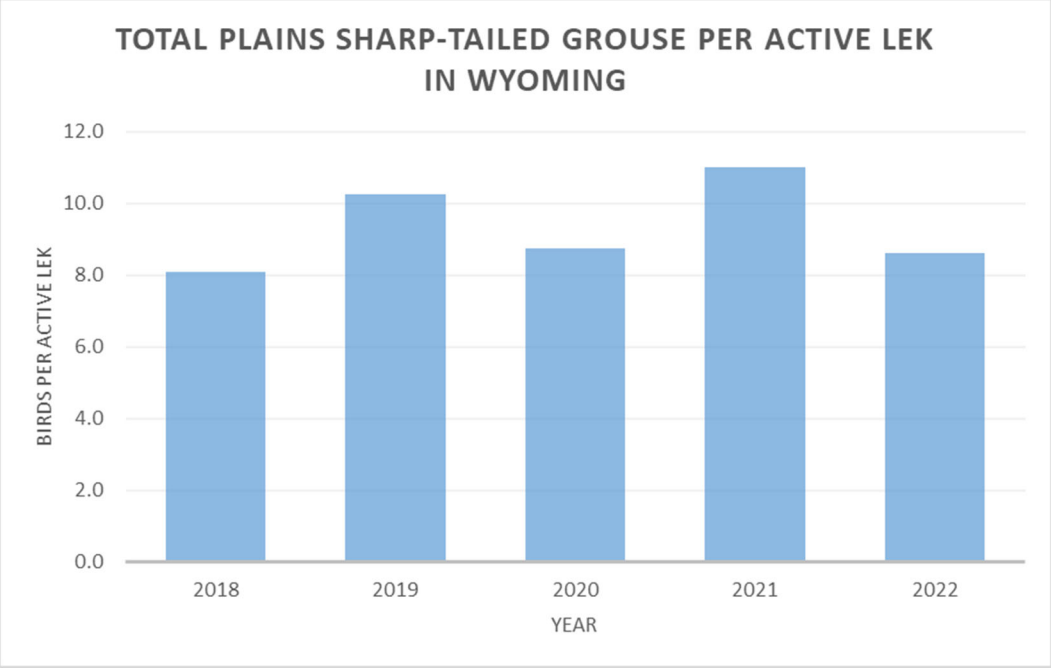
Wyoming

2022 Wyoming Plains Sharp-tailed Grouse Monitoring

Nyssa Whitford, Wyoming Game and Fish Department

Plains Sharp-tailed grouse observations were conducted between March 23 and May 8th, 2022, with 426 birds observed on 49 leks, or 8.6 birds per active lek. In 2022, there were fewer birds per active lek and less birds observed overall compared to 2021 with 781 birds observed on 71 leks, or 11 birds per active lek. In 2021, Plains Sharp-tailed grouse range in eastern Wyoming experienced exceptionally dry conditions and this likely contributed to the recent population decline. Population trends for the last 5 years remain relatively steady.





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