GROUSE NEWS

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IUCN-SSC Galliformes Specialist Group

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Chair Grouse Group within the IUCN-SSC Galliformes Specialist Group

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Editorial Board

Contents

From the Editors

Welcome to the latest edition of Grouse News. While the paucity of submitted notes and article continues, this issue does include a report of Greater Prairie-Chicken lek persistence in Kansas, USA, an interesting perspective article on Greater Sage Grouse, an interesting note on bilberry (blueberry, *Vaccinium* sp.) production and grouse population trends, summaries of reports on Willow Ptarmigan and White-tailed Ptarmigan, Spruce Grouse habitat management, and abstracts of Ph. D. and M. Sc. dissertations or theses on Greater Sage-Grouse, Greater Prairie-Chickens, and Dusky Grouse. But researchers everywhere would still benefit from additional progress reports, preliminary findings, etc., and those submitting such notes could likewise benefit from the readers. Indeed, we also encourage feedback and interactions, whether through public communication like Grouse News or the Galliformes website when it is back online, or through personal communication. For the relatively new readers of Grouse News, we want you to know that all previous issues are available in electronic form, and can be requested by contacting the editors. If any of the readers has the time to do so, perhaps the next few upcoming issues can include 10-year indexes of past issues (issues 1-20, 21-40, 41-60, and 60-current).

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From the Chair

The Western Association of Fish and Wildlife Agencies (WAFWA) will continue its 70-year tradition of holding the Biennial Sage & Columbian Sharp-tailed Grouse Workshop August 5 through August 8 in Wenatchee, Washington State, USA. This event will be hosted by the Washington Department of Fish and Wildlife with tremendous help from WAFWA and the Sage and Columbian Sharp-tailed Grouse Technical Committee (Tech Team). This event is rotated between the member states and the last time it was held in Washington State was in 2004. Details for the conference are available on the https://wafwa.org/workshops/wafwa-grouse-workshop website. I hope to see many of you there!

The workshop provides an opportunity for scientists, managers, and students to share results of their latest research, activities related to management and conservation, and strategies for dealing with the many issues impacting greater sage-grouse, Gunnison sage-grouse, and Columbian sharp-tailed grouse in western North America. During its 70 years of existence the Tech Team has accomplished a great deal, including the following:

- Produced four sets of guidelines for managing and conserving sage-grouse habitats.
- Produced guidelines for sage-grouse management practices.
- Produced two sets of guidelines for managing Columbian sharp-tailed grouse habitat.
- Formally identified sage-grouse population declines as a concern.
- Assessed the current and historic distribution of sage-grouse in North America.
- Produced a handbook for monitoring greater sage-grouse habitats and populations and subsequently guidelines for monitoring populations.
- Produced a conservation assessment of greater sage-grouse and sagebrush habitats.
- Collaboratively provided data that has provided the foundation for recent population assessments across the range, assessments of seasonal habitat selection, and numerous population models.
- Provided feathers for an assessment of genetic health and connectivity across the range of sage-grouse.
- Produced guidelines for translocations that provided structure for the states and provinces to evaluate and conduct translocations across state and provincial borders.
- Produced numerous white papers on topics such as invasive species, wildfire, and captive rearing.
- Authored, coauthored, and supported a large number of reports, peer-reviewed publications, and presentations at conferences, workshops, and public meetings.

Perhaps the most important accomplishment of the Tech Team is communication. By meeting regularly, the member agencies have fostered an atmosphere of collaboration that facilitates data sharing and cooperative research and management. The upcoming meeting in Wenatchee will continue that tradition.

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NEWS FROM GALLIFORMES SG

GSG is slowly adapting to significant changes in the Species Survival Commission and operating with new sets of guidelines and communication channels. We have been busy with a number of different activities. Most recently we signed an MOU with the World Pheasant Association. This moves us back to a model that we had starting from the earliest days of the creation of the original Galliformes specialist groups in the 1990s. Under a previous period SSC leadership did not want to see these types of organizational relationships and forced us to rescind our previous MOU. While in Indonesia in October for the International Galliformes Symposium we met with JP Rodriguez and he encouraged us to renew the formal agreement between GSG and WPA.

In other news, Rahul Kaul has retired from his position as Senior Director of the Wildlife Trust India. He plans to continue to be co-Chair of GSG going forward.

As many of you know in recent years BirdLife has been the Red List Authority for all bird for evaluation and re-evaluation of Red List status. This has evolved to something that is more consistent for evaluation of bird species among taxa, but has created another level of bureaucracy which has created at times some questions relating to who should be making decisions about changes in conservation status. The present period is open and no grouse species are on the list for comment.

BirdLife has put the following species forward for comment this year

No	Scientific Name	Common Name	Region	Current category	Forum link
1	*Arborophila rufipectus*	Sichuan Partridge	Asia	EN	https://forums.birdlife.org/2024-2-sichuan-partridge-arborophila-rufipectus/
2	*Perdicula manipurensis*	Manipur Bush-quail	Asia	EN	https://forums.birdlife.org/2024-2-manipur-bush-quail-perdicula-manipurensis/
3	*Ortygornis gularis*	Swamp Francolin	Asia	VU	https://forums.birdlife.org/2024-2-swamp-francolin-ortygornis-gularis/
4	*Tragopan satyra*	Satyr Tragopan	Asia	NT	https://forums.birdlife.org/2024-2-satyr-tragopan-tragopan-satyra/
5	*Crossoptilon crossoptilon*	White Eared-pheasant	Asia	NT	https://forums.birdlife.org/2024-2-white-eared-pheasant-crossoptilon-crossoptilon/
6	*Crossoptilon harmani*	Tibetan Eared-pheasant	Asia	NT	https://forums.birdlife.org/2024-2-tibetan-eared-pheasant-crossoptilon-harmani/
7	*Crossoptilon mantchuricum*	Brown Eared-pheasant	Asia	VU	https://forums.birdlife.org/2024-2-brown-eared-pheasant-crossoptilon-mantchuricum/

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CONSERVATION NEWS

THE GREATEST THREAT TO SAGE-GROUSE
Jack Connelly

Since Clait Braun and I drew attention to broad-scale sage-grouse population declines (Connelly and Braun 1997), I have witnessed many state, provincial, and federal efforts to further document sage-grouse population and habitat change, understand the causes of declines, and implement policies that would reverse these losses. Numerous studies have identified factors responsible for population declines and provided strong evidence that these factors may vary in their importance throughout the species' range. Here I argue that there is one overriding factor threatening both greater (*Centrocercus urophasianus*) and Gunnison (*C. minimus*) sage-grouse (hereafter sage-grouse) throughout the species' range and that this factor has been largely ignored by agencies responsible for conservation and management of sage-grouse populations and habitat.

Review of Threats

In March 2010, the United States Fish and Wildlife Service (USFWS) concluded that the greater sage-grouse was warranted for protection under the Endangered Species Act, but listing was precluded by higher priorities; a final determination was to be made by September 2015 (USFWS 2010). This listing decision identified habitat loss/fragmentation and lack of adequate regulatory mechanisms as key reasons for declines in sage-grouse populations (USFWS 2010). The USFWS also reported that sagebrush habitats were becoming increasingly degraded and fragmented due to multiple threats, including conversion, urbanization, infrastructure such as roads and powerlines, wildfire, invasive plants, grazing, and energy development. The agency further argued that many of these threats were exacerbated by the effects of climate change (USFWS 2010).

Based on extensive research, numerous lists have been compiled identifying various issues that pose substantial threats to sage-grouse. For example, the 2006 Idaho sage-grouse conservation plan listed wildfire, infrastructure, invasive grasses, livestock, and human disturbance as the top five threats to sage-grouse within the state. At about the same time, an expert panel convened by the United States Fish and Wildlife Service (USFWS) ranked invasive species, infrastructure, wildfire, agriculture, and grazing as the top five range-wide threats to sage-grouse. Similarly, Colorado Parks and Wildlife listed energy development, climate change, and residential/rural development as major threats to Gunnison sage-grouse.

All lists that I have seen recognize the serious impacts that invasive species, fire, and infrastructure/energy development have on sage-grouse and suggest the relative importance of each may vary across the species' range.

Attempts to Address Threats

Since the early 2000s, state wildlife agencies have developed plans for conserving and managing sage-grouse. Moreover, the USFWS convened a Conservation Objectives Team (COT) to produce a recommendation regarding the degree to which threats needed to be reduced to conserve greater sage-grouse so that the species would no longer be in danger of extinction for the foreseeable future. The COT report (USFWS 2013) addressed threats to greater sage-grouse and provided guidance for reducing or eliminating these threats. Additionally, the Western Association of Fish and Wildlife Agencies (WAFWA) produced numerous reports that addressed threats including a sagebrush conservation strategy (Remington et al. 2021) and a near-term greater sage-grouse conservation action plan (Range-wide Interagency Sage-grouse Conservation Team 2012).

In 2011, the Bureau of Land Management (BLM) released "A Report on National Greater Sage-Grouse Conservation Measures" (Sage-grouse National Technical Team 2011) and a "National Greater Sage-Grouse Planning Strategy" in response to the USFWS listing decision. Not to be outdone, the Natural Resources Conservation Service developed the Sage Grouse Initiative to aid in sage-grouse conservation on private land. While all of this planning was going on, universities and government agencies continued to conduct research on sage-grouse populations and states continued monitoring sage-grouse breeding populations.

It is now >25 years since the Connelly and Braun (1997) paper. Over the course of that time, states expanded research and monitoring and curtailed or closed hunting. Colorado closed two popular hunting units because of habitat loss and declining populations. Nevada reduced season lengths across several hunt units, closed some, and substantially decreased grouse hunting permits in one popular area.

Oregon reduced the number of permits available to hunters for the 2020 season. Sage grouse hunting remains closed in parts of Idaho, Wyoming, the Dakotas, California, and Washington.

In contrast, federal agencies continued to promote projects likely to harm sage-grouse. These projects were seldom criticized and sometimes supported by state agencies. As an example, an Idaho Department of Fish and Game (IDFG) official predicted that a very problematic BLM project aimed at burning sagebrush "should improve the resilience of the…. sage steppe habitats that sustain not only iconic populations of mule deer, sage-grouse, elk and moose, but important ranching operations as well." The statement appears to ignore the agency's own research that concluded "Burning created a long-term negative impact on nesting habitat..." and disregards the fact that IDFG was adamantly opposed to this project just a few years earlier. The Wyoming Department of Game and Fish and BLM have been strong proponents of treating sagebrush for many years despite studies in Wyoming and elsewhere indicating likely negative effects (Hess and Beck 2014, Smith et al. 2023). Recently, Smith et al. (2023) assessed the response of greater sage-grouse to multiple sagebrush control projects in Wyoming and concluded that sage-grouse do not respond positively to sagebrush treatments. Possibly as a reaction, a report recently appeared in the agency's magazine Wyoming Wildlife extoling the virtues of treating sagebrush while ignoring the many publications demonstrating adverse or at least no positive impacts of treatments on sage-grouse (Bish 2024).

In 2015 the BLM released its final conservation plans for greater sage-grouse. Shortly after, then Secretary of Interior Sally Jewell announced that greater sage-grouse did not warrant Endangered Species Act Protection. This decision was largely predicated on the belief that the new state and federal conservation plans would succeed. In 2017, before the new BLM plans had any chance of success, then Secretary of Interior Ryan Zinke requested a review and possible revisions to those plans. More than 100 wildlife and natural resource professionals objected, encouraging the Department of Interior (DOI) to stick to the best available science before considering changes. Nevertheless, in 2019 the BLM released revised sage-grouse conservation plans, in some cases ignoring the science and removing some conservation measures from the 2015 plans. Lawsuits followed and in late 2019 a U.S. District Court Judge ruled that the BLM failed to fully analyze how these changes would affect sage-grouse. The BLM acknowledged their management plans were "potentially inconsistent with new science and rapid changes affecting the BLM's management of the public lands, including the effects of climate change." The agency expressed concerns about various threats including continuing drought, habitat loss, and wildfire. BLM announced its intention to review the current sage-grouse plans that were finalized in 2015 and amended in 2019.

Recently, the DOI announced "The Sagebrush Keystone Initiative" to make strategic restoration investments from across the Department's bureaus and offices in identified landscapes with existing partnership and investment. How this initiative will reduce threats to sage-grouse remains unclear.

Success of Conservation Efforts

Sage-grouse populations continue to decline and sage-grouse habitat continues to be lost and degraded. Since 2000, >20 percent of greater sage-grouse priority habitat management areas within the Great Basin has burned. Approximately 8 percent of all sagebrush habitats were directly affected by oil and gas development, with >20 percent of sagebrush habitats affected in the Rocky Mountain area. Only 22 percent of sagebrush occurs within priority habitat management areas for sage-grouse where most regulatory protections are in place, and threats are not well addressed through regulatory means (Remington et al. 2021).

Although wildfire has been identified as a substantial threat to sage-grouse, BLM fire suppression methods in sagebrush landscapes have not changed much for decades, nor been successful in protecting sage-grouse habitat. In 2021 a group of scientists and resource managers sent a letter to the DOI and BLM asking them to evaluate and test a new model for initial fire suppression in sage-grouse habitat, noting that without serious modifications to the current fire suppression program, all the planning efforts and on-the-ground projects will likely never outpace the loss of sage-grouse habitat to wildfire. Neither the BLM or DOI bothered to respond to this letter in any meaningful fashion.

Long term research and monitoring, some dating back over 75 years, should put agencies in a position to minimize or eliminate threats to sage-grouse populations and habitat. Moreover, state management plans, federal plans, and policies put in place over the last 20 years should by now show some positive results. Sadly, this is simply not happening. Coates et al. (2023) recently reported there were 80 percent fewer male greater sage-grouse at leks compared to 1965, an annual loss of about three percent—one percent more than what was previously believed. Further, half of that loss has come in the last 17 years. In 2014 the USFWS listed Gunnison sage-grouse as threatened. The current estimated population of Gunnison sage-grouse in Colorado is roughly 4,000 birds and this species is experiencing a long-term downward trend.

Conclusion

At this point a reasonable conclusion is that current state and federal efforts to reduce threats and stabilize or increase sage-grouse populations have utterly failed and that the extensive planning over the last 20 years has been nothing more than intellectual arm waving.

Federal agencies continue to plan and revise plans while state agencies more often than not prefer political rhetoric over biological reality. A state biologist summarized the situation well by noting that one western state is a "tough place to work on sage-grouse, and to be honest at the same time." Based on their review of the available scientific and commercial information, the USFWS concluded that existing regulatory mechanisms were inadequate to protect the species and will continue to be so in the foreseeable future (USFWS 2010). This statement is as close as any agency has come to recognizing the one overriding factor threatening sage-grouse.

Although threats to sage-grouse may vary across the species' range, one overarching factor is clearly damaging attempts by scientists and resource managers to conserve the species. This threat is the proliferation of state and federal administrators and policy makers that refuse to place a high priority on sage-grouse conservation and instead value politics over biology.

For the last 70 years, the Western Sage- and Columbian Sharp-tailed Grouse Technical Team has been engaged in many efforts to conserve and protect sage-grouse. The Team has, among many contributions, produced management guidelines, identified declines in sage-grouse populations, and produced a conservation assessment of greater sage-grouse and sagebrush habitats. The recent announcement that during their spring 2024 meeting WAFWA intends to vote to eliminate this Technical Team underscores the severity of the threat posed by state and federal agencies to sage-grouse.

Platitudes and planning will not save sage-grouse. Strong leadership and a commitment to science-driven solutions are necessary to conserve one of North Americas most iconic species and, so far, state and federal agencies are lacking on both counts.

Acknowledgments

I appreciate the comments and insight provided by two anonymous biologists, both with extensive experience with sage-grouse conservation and research.

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Interesting perspectives on lead ammunition
Don Wolfe

Among the many conservation similarities shared between North America and Eurasia is the issue of lead verses non-toxic ammunition. While the availability of non-toxic ammunition seems to be constantly improving, there will likely always be debates among sportsmen, akin to the controversies from decades ago when lead restrictions were established for waterfowl hunting, however, those debates are often based on preconceived biases rather than science or experience. I for one, only use non-toxic shot shells for the miniscule amount of hunting that I do, but have been promoting the use of non-toxic ammunition (solid copper bullets for big game, steel shot or other non-toxic shot for upland game), occasionally conducting live-shooting demonstrations into ballistic gel with both lead-core and monolithic copper bullets. For some interesting perspectives from the UK, you can read this online article by Mike Swan, GWCT Senior Advisor, along with the dozens of comments:

https://www.gwct.org.uk/blogs/news/2024/march/phasing-out-lead-where-are-we/.

Some additional perspective and informational sources on lead and non-toxic ammunition:

https://extension.okstate.edu/fact-sheets/effects-of-lead-ammunition-and-sinkers-on-wildlife.html
https://doi.org/10.1002/wsb.1445
https://doi.org/10.1002/wsb.1449
https://doi:10.1002/wlb3.01001
https://doi.org/10.1016/j.jenvman.2020.111438

We would encourage our readers to share their thoughts and experiences in the "Forum" section of future issues of Grouse News.

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Helping expand the range of black grouse in the uplands
Written by Phil Warren for Gamewise Spring 2024

Black grouse in England are now confined to the North Pennines, where low breeding success, habitat fragmentation and landscape configuration means that the remaining population has become increasingly isolated. Climate change in the form of wetter summers and more frequent extreme weather events may further threaten this already small and geographically isolated population.

A new two-year project, with £162,750 funding from Natural England's Species Recovery Programme, aims to safeguard against potential negative impacts of a changing climate, instigating measures to help increase breeding success, and by expanding the current range into the North York Moors using a conservation translocation technique. We aim to re-establish populations in places where environmental conditions of lower rainfall and warmer temperatures in June may now be more suitable than within their current North Pennines range.

For the full text see:
https://www.gwct.org.uk/blogs/news/2024/march/helping-expand-the-range-of-black-grouse-in-the-uplands/

RESEARCH REPORTS

The use of suture-style radio transmitters may bias chick survival for greater prairie-chickens

Kiera L. Kauffman, R. Dwayne Elmore and Jimmy Rutledge

Introduction

Chick survival is believed to be among the most important demographic parameters limiting grouse populations (Hagen et al., 2009; Morrow et al., 2022). Mortality of grouse chicks is highest within the first two weeks after hatching (Hannon & Martin, 2006; Schole et al., 2011; Barker et al., 2022), and less than 50% of chicks are estimated to survive to fledge (Bergerud & Gratson, 1988; Schole et al., 2011; McNew et al., 2012). Due to the importance of this life stage, information regarding chick survival is critical for evaluating population dynamics and viability (McNew et al., 2023).

Radio transmitters are increasingly used to improve survival estimates of grouse chicks (Burkepile et al., 2002; Manzer and Hannon, 2008; Dahlgren et al., 2010*a*; Barker et al., 2022). This method is believed to provide reliable estimates of age-specific and cause-specific mortality (Burkepile et al., 2002; Schole et al., 2011), providing advantages over other less reliable monitoring techniques, such as flush counts (Dahlgren et al., 2010*b*; Orange et al., 2016; Kubečka et al., 2021). One of the most common attachment methods involves suturing the transmitter to the back of a chick (Burkepile et al., 2002). This method is believed to reduce the risk of infection and trauma associated with subcutaneous attachment methods (Larson et al., 2001; Burkepile et al., 2002). However, factors such as handling time, capture stress, transmitter weight, and snagging on vegetation may influence survival indirectly (Baxter et al., 2013; Barker et al., 2022). If radio transmitters or the attachment procedure alter a chick's survival risk, this may result in biased survival estimates (Amundson and Arnold, 2010) that hinder accurate assessments of population demography.

As part of a larger study on the chick ecology of greater prairie-chickens (*Tympanuchus cupido pinnatus*, hereafter prairie-chickens), we evaluated the impact of suture-style radio transmitters on chick survival during the first few days after hatching. On a subsample of prairie-chicken broods, we randomly assigned half of the chicks to receive a suture-style radio transmitter and the other half to receive a non-invasive leg mark. Our objective was to determine whether survival estimates obtained using radio transmitters would be biased relative to those obtained using un-sutured chicks.

Methods

Study area

We monitored female prairie-chickens and their chicks in the Flint Hills ecoregion of Oklahoma, USA. The site comprises broad, flat prairies and rolling hills ranging from 200-400 m in elevation. It is dominated by herbaceous plant species characteristic of the tallgrass prairie, including big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), and tall dropseed (*Sporobolus compositus*). The area receives an average annual rainfall of 100.8 cm, most of which falls between April and June (PRISM Climate Group, 2023), and has an average growing season length of 192 days (Oklahoma Climatological Survey, 2024).

Field methods

We captured adult female prairie-chickens on active leks using walk-in funnel traps (Schroeder and Braun, 1991) and fitted each with a rump-mounted, 12-g solar-powered ARGOS GPS transmitter (GeoTrak, Inc., Apex, North Carolina, USA). The transmitters acquired location data according to a pre-programmed schedule and transmitted the data to the ARGOS satellite every 2-3 days. Each GPS transmitter was equipped with a very high frequency (VHF) transmitter (3.5 g; Advanced Telemetry Systems, Isanti, Minnesota, USA) that allowed us to monitor female prairie-chickens in real-time. All captured prairie-chickens were processed and released at the capture site.

Using the spatial data downloaded from the GPS transmitters, we monitored the movements of female prairie chickens remotely to identify the onset of nesting. When a female was observed at a given point for multiple consecutive locations, we approached the location using VHF telemetry and flushed the female to confirm the nest. We estimated a hatch date by projecting forward 25 days from the estimated start of incubation. During the final week of incubation, we checked nests daily using VHF telemetry. When the female was located off the nest, we approached the nest to examine its contents. We determined nest fate and the number of hatched eggs by examining the eggshells for signs of pipping.

*Figure 1. Field personnel set up corral panels at dawn around the flush point of a female greater prairie-chicken (*Tympanuchus cupido pinnatus*) to capture her chicks in Osage County, Oklahoma.*

with the aid of a forward-looking infrared (FLIR) camera (FLIR Systems, Inc., Nashua, New Hampshire, USA) and captured chicks by hand. When necessary, we removed vegetation within the corral by hand to facilitate the detection of chicks. We placed the chicks in a soft-sided cooler that was kept at a suitable brooding temperature (35-37°C; McEwen et al., 1969; Barker et al., 2022) using hot water bottles wrapped in clean towels. We attempted to capture the entire brood based on the size estimated from the hatched clutch. After about 5-10 minutes of searching, two personnel would start weighing and marking the chicks while others searched for the remaining chicks. After a thorough search of the area around the flush location (including the use of the FLIR camera and vegetation removal, up to 30 minutes), any chicks not located were assumed to have perished since leaving the nest. We weighed each chick to the nearest gram before marking.

We captured each hatched brood on two occasions to evaluate the influence of suture-style radio transmitters on chick survival. The first capture was performed in the morning following a successful hatch (Day 1). We conducted captures at dawn when chicks were expected to be brooding under the hen. We flushed the hen from the brood and set up corral panels around the flush site to contain the chicks (Fig. 1). The corral panels were made of PVC frames and 0.5-inch (1.27-cm) plastic hardware cloth. Each frame was 1.5 feet tall by 5 feet long (0.46 m tall by 1.5 m long), and frames were connected using zip ties to form three, three-panel segments. These segments could be folded up and carried to the flush site. Once the hen flushed, field personnel unfolded the segments and set them up around the flush point. Personnel approached the flush site carefully and checked for chicks before parting the vegetation and placing the panels flush with the ground surface. Once the panels were in place, we searched for the chicks

*Figure 2. A greater prairie-chicken (*Tympanuchus cupido pinnatus*) chick captured in Osage County, Oklahoma, in 2022 receives a suture-style radio transmitter to monitor its survival.*

Half of the chicks in each brood were randomly assigned to receive a 0.75-g suture-style VHF transmitter (model #A1035; Advanced Telemetry Systems, Isanti, Minnesota, USA), which was placed between the shoulder blades and secured using two sterile sutures (Fig. 2; Burkepile et al., 2002). To compare the survival of sutured chicks with that of un-sutured chicks, we marked the other half of the brood using a non-invasive method. We used a black, non-toxic permanent marker to mark each chick with a distinct combination of rings on their legs (Fig. 3). Once each chick had received a transmitter or leg-mark, we placed the brood under nearby vegetation cover with a hot water bottle from the cooler (35-37°C and wrapped in a towel) to keep the chicks warm. We then left the area quickly to allow the female to retrieve the chicks.

Between the first and second captures, we located the brood each day using VHF telemetry to determine the survival of the sutured chicks. If a sutured chick was detected away from the hen, we homed to its location to determine its survival status.

The second capture was performed approximately three days after the first (Day 4) following the same protocol as the first capture. We attempted to locate all surviving sutured chicks and all leg-marked chicks from the first capture. We weighed each chick again and counted the number of surviving sutured and leg-marked chicks to calculate the proportion of each group that survived. Because our objective was to examine transmitter bias on survival, we included in our calculations all chicks that were suspected to have died from capture myopathy. All capture and handling protocols were approved by the Oklahoma State University Institutional Animal Care and Use Committee (IACUC-21-80).

*Figure 3. A view of the leg-marks used to identify greater prairie-chicken (*Tympanuchus cupido pinnatus*) chicks in Osage County, Oklahoma. This chick received a unique combination of leg markings relative to its brood-mates: 2 rings on the left leg and none on the right leg.*

Results

During the breeding seasons of 2022—2023, we captured 74 chicks from 7 broods (Table 1). Of those captured chicks, 29 received suture-style transmitters, and 40 received leg-marks. The five remaining chicks did not receive identifying markers due to capture mortality. At the time of the first capture, the weights of sutured chicks ranged from 13—17 g with a mean of 15.6 g (n = 29), and the weights of leg-marked chicks ranged from12—17 g with a mean of 15.1 g (n = 31; Table 2). Based on the estimated brood size from hatched eggs, we successfully captured an average of 96% of the chicks in each brood on Day 1 (n = 6; range 87—100%). For broods that survived to Day 4 (n = 5), we estimated that the largest possible number of chicks we could capture was the number of chicks marked on Day 1, minus any sutured chicks known to have died. Based on this estimate, we successfully captured an average of at least 76% of the surviving chicks in each brood on Day 4 (range 57—100%). This estimate is conservative, acknowledging that any leg-marked chicks missing on Day 4 either died since Day 1 or evaded capture. Weights of leg-marked chicks were greater on average at Day 4 (mean 17.1 g, range 13.5—21.5) than they were at Day 1 (Table 2). Although weight also appeared to increase for sutured chicks (19.8 g), only one of the four sutured chicks that survived to Day 4 was weighed, making it difficult to compare weight changes between marking methods. Missing weight data within broods generally resulted from efforts to reduce handling time or capture mortalities for which a weight was not recorded (Table 2).

We adjusted the proportion of sutured and un-sutured chicks in each brood over time in response to observations of chick survival. Only one successful brood was captured in 2022, and each of the ten captured chicks received a suture-style transmitter. None of those chicks survived to Day 4 (Table 1). In

2023, we captured and marked six broods. For the first three broods, we marked half of the chicks with suture-style transmitters and the other half with leg-marks. After observing disproportionately high mortality of sutured chicks relative to leg-marked chicks (21% and 65%, respectively; Table 1), we chose to stop using suture-style transmitters to prevent potential impacts on survival. Therefore, all chicks in subsequent broods received only leg-marks for the duration of the project. Notably, one of the three leg-marked broods could not be captured on Day 4 because the brooding female had died. Without radio transmitters, we could not confirm whether the chicks in that brood perished or were adopted into nearby broods. Therefore, this brood was censored from survival calculations. Survival rates for the two leg-marked broods were both 71% (Table 1). Across both years and six uncensored broods, survival from Day 1 to Day 4 was lower for sutured chicks (14%, $n = 29$) than for leg-marked chicks (68%, $n = 31$; Table 1).

Table 1. *Survival of greater prairie-chicken (*Tympanuchus cupido pinnatus*) chicks marked using different individual marking methods: suture-style transmitter vs. leg marking with permanent marker. Percent survival indicates the percentage of marked chicks from each brood that survived from Day 1 to Day 4. Broods that failed before Day 1 were censored for this analysis, along with one brood for which chick fates were unknown. The capture year for each brood is indicated next to the female band number: [a] 2022 and [b] 2023.*

		Suture-style transmitter			**Leg marking**		
Female band no.	**Days between captures**	**No. chicks marked on Day 1**	**No. chicks captured on Day 4**	**Survival (%)**	**No. chicks marked on Day 1**	**No. chicks captured on Day 4**	**Survival (%)**
462[a]	N/A	10	0	0%	N/A	N/A	N/A
316[b]	3	6	3	50%	6	5	83%
381[b]	4	7	1	14%	6	3	50%
349[b]	3	6	0	0%	5	3	60%
376[b]	2	N/A	N/A	N/A	7	5	71%
390[b]	3	N/A	N/A	N/A	7	5	71%
Total		**29**	**4**	**14%**	**31**	**21**	**68%**

Table 2. *Weights of greater prairie-chicken (*Tympanuchus cupido pinnatus*) chicks that were marked using different individual marking methods: suture-style transmitter vs. leg marking with permanent marker. Broods that failed before Day 1 were censored for this analysis, along with one brood for which chick fates were unknown. Superscripts indicate where some chick weights were missing due to logistical constraints: [a] 4 of 10 sutured chicks were weighed for 462 on Day 1; [b] none of the 3 sutured chicks in brood 316 were weighed on Day 4; [c] 2 of 3 leg-marked chicks were weighed for 381 on Day 4; [d] 4 of 5 leg-marked chicks were weighed for 376 on Day 4.*

	Suture-style transmitter		**Leg marking**	
Female band no.	*Day 1*	*Day 4*	*Day 1*	*Day 4*
	Mean (Range) (g)	**Mean (Range) (g)**	**Mean (Range) (g)**	**Mean (Range) (g)**
462	15.3 (13.0—17.0)[a]	N/A	N/A	N/A
316	15.3 (15.0—16.0)	N/A[b]	14.8 (12.0—16.0)	17.7 (14.0—20.5)
381	16.1 (15.0—17.0)	19.8 (19.8—19.8)	16.5 (16.0—17.0)	20.8 (20.0—21.5)[c]
349	15.4 (14.9—16.5)	N/A	14.0 (12.9—14.5)	14.5 (13.5—15.1)
376	N/A	N/A	14.9 (14.0—15.5)	17.0 (16.0—18.0)[d]
390	N/A	N/A	15.1 (15.0—15.5)	16.8 (14.0—18.5)
All broods	**15.6 (13.0—17.0)**	**19.8 (19.8—19.8)**	**15.1 (12.0—17.0)**	**17.1 (13.5—21.5)**

Discussion and implications for future research

Effective marking methods are critical for evaluating population demographics and habitat use in Galliform species. Methods that impact survival can result in biased survival estimates, as well as wasted time and resources. Our findings indicate that suture-style transmitters have the potential to bias survival estimates of grouse chicks by increasing mortality risk.

*Figure 4. A suture-style transmitter on an adult female greater prairie-chicken (*Tympanuchus cupido pinnatus*) in Osage County, Oklahoma. This female received the suture-style transmitter as a chick in June of 2023 and retained it until she was captured on a lek as an adult in April 2024.*

Although several previous studies have used suture-style radio transmitters to study Galliform chicks, only a few have explicitly evaluated the impact of transmitters on survival estimates. The results of those evaluations have been mixed. Schole et al. (2011) observed a weak negative effect of radio transmitters on chick survival in greater prairie-chickens, but no transmitter bias was observed in studies on willow ptarmigan (*Lagopus lagopus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) chicks (Manzer and Hannon, 2007; Steen and Haugvold, 2009). Nevertheless, even studies that did not examine transmitter effects acknowledge that transmitters likely have sublethal effects on chicks that could influence survival risk (Burkepile et al., 2002; Manzer and Hannon, 2007; Terhune et al., 2020). Our results support this idea, as only a small fraction of sutured chicks in our study survived to Day 4, while more than half of the un-sutured chicks survived. Although the sample size of chicks in our study was small, the survival difference between the two groups was large enough to cause concern about the reliability of survival estimates obtained from radio-marked chicks at our study site.

The presence and magnitude of a transmitter bias on grouse chicks likely varies due to multiple factors, including individual chick characteristics and environmental conditions. For example, Barker et al. (2022) reported a possible impact of initial chick weight on the survival of Columbian sharp-tailed grouse (*T. p. columbianus*) chicks, hypothesizing that transmitters may have compounded the risks already faced by chicks with low body weight. Some individual chicks may also exhibit a stronger stress response than others during the suturing process. Larson et al. (2001) described a ruffed grouse (*Bonasa umbellus)* chick that was censored from analysis because it died from stress within two days of attachment. The remaining sutured chicks (n = 12) either survived or died of causes not attributed to stress. For some species, environmental conditions such as weather or local vegetation may influence survival estimates of sutured chicks. Suture-style transmitters have been reported to snag on vegetation, leading to transmitter detachment or chick mortality (Terhune et al., 2020; Barker et al., 2022). Either outcome might bias survival estimates, as detached transmitters could be mistakenly classified as mortalities. In our own study, the brood monitored in 2022 was captured and radio-marked in a pasture with dense herbaceous vegetation. The brood did not make it out of that pasture and failed before Day 4. We suspect that the dense vegetation, combined with rainy weather, slowed the chicks down and prevented them from reaching brooding cover. In that case, the transmitters could have exacerbated poor mobility by snagging onto vegetation as the chicks traveled. These observations suggest that transmitter attachment may interact with other factors to influence survival. Further study into these potential

interactions could help researchers determine the appropriate marking methods for studies on grouse chicks.

Radio transmitters are powerful tools that enable researchers to address important questions about cause-specific mortality in grouse chicks. Despite the small sample size of broods, our findings indicate that suture-style radio transmitters could interact with other factors to influence the survival of grouse chicks in some situations. This is not to imply that previous studies have reported biased estimates. Rather, we report these findings to caution future researchers that, in some situations, suture-style transmitters may lead to unreliable survival estimates. Before selecting a marking method or attachment style, we recommend that researchers carefully consider species-specific and site-specific factors that could interact with transmitters to impact real and/or estimated chick survival.

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A Lek Check-up: An historical assessment of prairie-grouse lek persistence in Kansas

Andrew B. Whetten, David A. Haukos, Daniel Sullins, Kent Fricke and Rachel Rusten

Grassland birds of North America have experienced unprecedented population declines (BLI 2018). For the lesser prairie-chicken, listing uncertainty and steady accrual of multidecadal survey data demand further assessment of population viability. Kansas has the largest remaining tracts of land that show promise of naturally sustaining lesser prairie-chicken populations in North America (Hagen et al. 2020, Sullins et al. 2018). For decades, lesser and greater prairie-chicken courtship site (i.e., lek) surveys have been conducted across Kansas to monitor lek occurrence, abundance, and inform population status for both species (Van Ee et al. 2022). The location and count of prairie grouse on leks provide a fundamental characterization of local population structure (Haukos and Smith 1999). After decades of data collection and advances in data extraction from satellite-derived environmental data, we are well-positioned to improve our understanding of lek persistence (i.e., the ability of a lek site to continue supporting annual courtship rituals) and continue our assessment of long-term viability of prairie grouse species in Kansas (Winder 2015).

Quantifying lek persistence (i.e., probability of lek persistence after t years) provides fundamental information to support our understanding of localized population decline and extinction (Simberloff 1993). In this study, we conducted a machine learning-based survival analysis to characterize relationships among lek persistence and other environmental attributes, such as localized indices of tree cover, drought severity, percent grassland, and lek attendance (Ishwaran 2008). Our analysis uses all ground-surveyed lesser and greater prairie chicken leks across Kansas from 1993-2023. To the best of our knowledge, Kansas has the longest and most geographically expansive survey database for a grouse species totaling 180 lesser prairie-chicken leks and 502 greater prairie-chicken leks, spanning an area of almost 200,000 km.

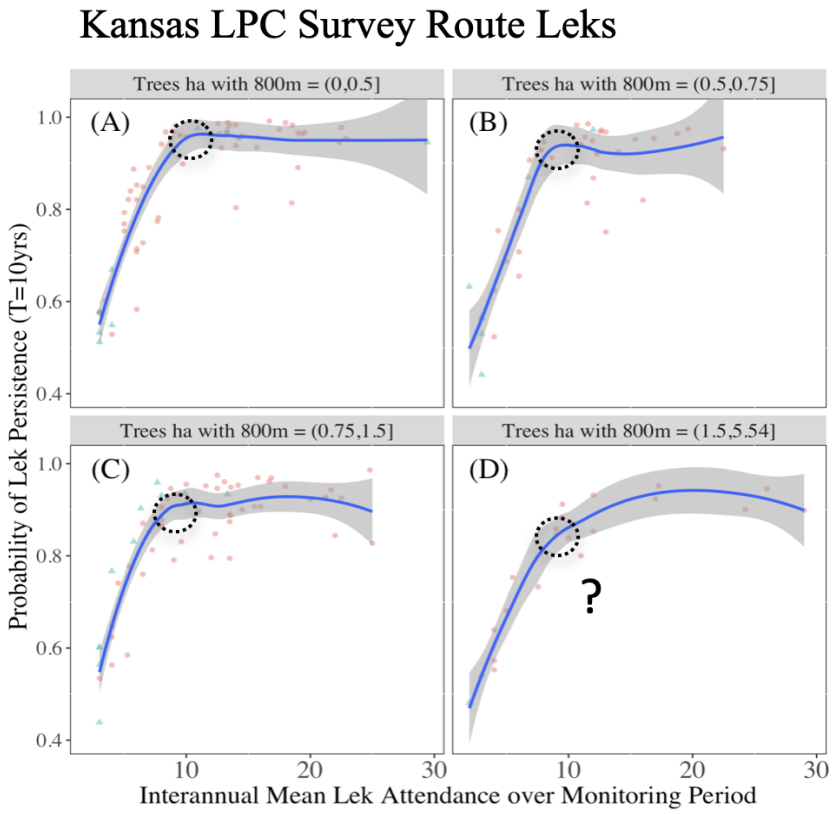

Figure 1: Lesser prairie-chicken lek attendance vs. persistence curves are plotted with respect to hectares of tree cover within 800 meters. Triangles denote leks that failed to meet our definition of a lek by end of their monitoring period. Circles denote leks that have persisted over the course of their monitoring period. For the first three panels, there is a clear sill at an average attendance of 10 birds with an average probability of persistence after 10 years of 0.96, 0.94, 0.88, as indicated by the black dashed circles in each panel. In the fourth panel, it is unclear if a sill exists, which identifies that higher levels of tree cover within 800 meters alter the relationship between lek attendance and persistence.

So far, our assessment of lek persistence provides the following contributions:

A quantitative definition for sensitive leks: The relationship between lek attendance and persistence is characterized by a curve with a "sill" at approximately ten attending birds. On these curves, the probability of lek persistence declines substantially as the interannual average number of attending birds decreasing below ten (Figures 1 and 2). In a risk assessment, the cost of any further decrease in attendance for leks averaging [3,10] birds is alarmingly greater than any decrease in lek attendance for larger leks averaging [10, 30]. For these larger leks, fluctuations in average interannual attendance virtually yield no change to probability of lek persistence.

A. **Quantifying the interactive relationship between tree cover, lek attendance, and lek persistence:** Increasing presence of trees on the landscape has a negative effect on lek attendance and occurrence. Increasing hectares of trees within an 800 meter radius of a lek site lowers the sill for lek attendance vs. persistence curves for prairie grouse (Figures 1 and 2). For lesser prairie-chickens, increasing tree cover eventually alters the relationship between lek persistence and attendance. For lesser prairie-chickens, the greatest observed levels of tree cover near lek sites substantially increase the risk of lek failure independent of lek attendance (Figure 1D). In short, greater levels of tree cover prevent leks from having a "safe" number of attending birds at lesser prairie-chicken leks. This change in the relationship between lek attendance and persistence for the greatest observed levels of tree cover is not evident for greater prairie-chickens (Figure 2D). This difference between prairie grouse species is possibly a result of ecoregion differences inherent to their historical and current range.

B. **Identification of increasing lek persistence over the past 30 years:** There is a general upward trend in lek persistence. We need to reconcile this conclusion with the dramatic overall decline of prairie grouse. Ground survey routes used in this analysis are in core prairie-chicken areas, so

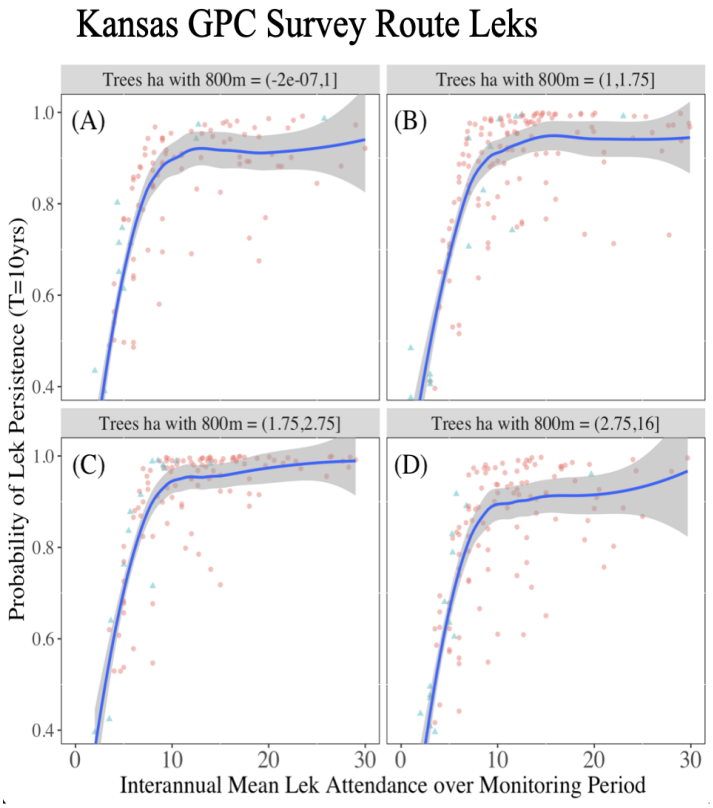

Figure 2: Greater prairie-chicken lek attendance vs. persistence curves are plotted with respect to hectares of tree cover within 800 meters. Triangles denote leks that failed to meet our definition of a lek by end of their monitoring period. Circles denote leks that have persisted over the course of their monitoring period. For all panels, there is a clear sill at an average attendance of 10 birds. We note that the variation of predicted probability of persistence for greater prairie-chickens was substantially greater than predicted probabilities for lesser prairie-chickens, which is a result of a handful of greater prairie-chicken leks with significantly low probability of persistence independent of lek attendance. Because of this, we avoid reporting sill locations in the same manner as Figure 1. We emphasize that the fourth panel, comprised of leks with the highest observed tree cover, maintains the sill relationship between lek attendance and persistence, which was not the case for lesser prairie-chickens as illustrated in Figure 1D.

we expect greater lek persistence than elsewhere. Further, our analysis only characterizes a trend in the past 30 years, and therefore doesn't illustrate the known disappearance of prairie grouse from their historical range over the past 30-100 years.

C. **The ability to monitor trends in lek persistence over many years with messy data using practical and transferable methodology:** To implement or reproduce such an approach, we only require the location of the lek, a max count of attending birds for at least 1 year, and the same environmental indices derived from remote sensing imagery. Our model, trained on standardized ground survey data, can be used to make predictions of lek persistence for any opportunistic lek sightings across the state.

As we press forward in assessing the viability of prairie-grouse populations in Kansas, we believe that such work provides vital information to quantitatively support our understanding of localized population persistence and define sensitive leks with respect to risk of failure.

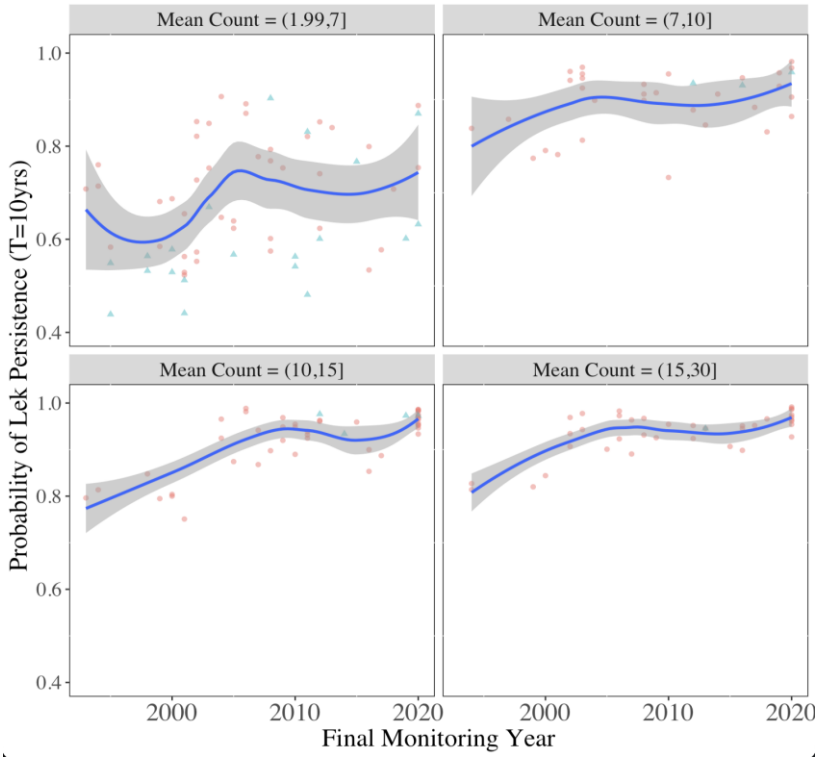

Figure 3: For leks with an interannual average attendance greater than 7 birds, our model indicates that probability of lek persistence has increased over the past 30 years. We are currently investigating the drivers of this trend. This may be related to consolidation of lek strongholds in cores areas across Kansas as populations diminish on the fridges of their historic range and/or an increased awareness and improved effort by stewards of private and public land to support lek

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Assessing the Use of Long-Term Lek Survey Data to Evaluate the Effect of Landscape Characteristics and Wind Facilities on Sharp-Tailed Grouse Lek Dynamics in North Dakota and South Dakota

Jill A. Shaffer, Deborah A. Buhl, and Wesley E. Newton

Abstract

The contribution of renewable energy to meet worldwide demand continues to grow. In the United States, wind energy is one of the fastest growing renewable energy sectors. Throughout the Great Plains of the United States, wind facilities often are placed in open landscapes of high-elevation grasslands, and those same habitats support sharp-tailed grouse (*Tympanuchus phasianellus*), a resident gamebird species. To assess the feasibility of using independently derived, long-term datasets gathered in North Dakota and South Dakota to determine whether wind facilities affected lek metrics, the U.S. Geological Survey obtained six datasets and identified 37 study sites, 9 of which contained wind turbines at varying densities. The association between explanatory variables that described geographic, landscape, and climatic attributes with two primary response metrics that described lekking activity within study sites—lek density (leks per square kilometer) and mean number of males per lek—was examined. The explanatory variables included number of turbines, geographic location, elevation, land-cover attributes available from satellite-derived land-cover data, soil moisture, precipitation, and temperature. Sampling units consisted of township-sized blocks, and lek information came from roadside surveys. Low sample sizes of constructed wind facilities available at the time of analysis did not lend itself to advanced statistical techniques, such as employing a rigorous design structure or assessing accuracy on landscape, geographic, or climatic variables. Given the quality of the data, the estimates obtained for lek density and mean number of males per lek should be considered approximations; however, these estimates have value in designing future studies, such as providing estimates for power analyses to determine sufficient sample size. No strong associations were found between the included explanatory variables and response variables (when these variables were measured as described in this report for township-sized blocks). The strongest association was that lek density and mean number of males per lek increased from South Dakota to North Dakota. Owing to the highly unbalanced distribution of turbine and nonturbine study sites across the study area, the analysis with wind turbines was inconclusive. The constraints under which the analysis can be used and the limitations of the independently derived datasets in attempted applications are discussed.

Suggested citation:

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Associated data for this publication:

Shaffer, J.A., 2023, 12-year (2003–2014) Sharp-tailed Grouse and Greater Prairie-Chicken lek data collected near wind facilities in North Dakota and South Dakota: U.S. Geological Survey data release, https://doi.org/10.5066/P99NWAL5.

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Rypeår og blåbærår (Willow ptarmigan peak years and bilberry peak years)

Vidar Selås,

Summary

Several studies have shown that there is a positive relationship between seed production of bilberry (*Vaccinium myrtillus*), an important food plant for grouse, and the breeding success of willow ptarmigan (*Lagopus lagous*), black grouse (*Tetrao tetrix*) and capercaillie (*T. urogallus*) in the following year. Myodes-voles, which feed on dwarf shrubs in winter, also increase in number after berry peak years. This pattern supports the plant stress hypothesis, which states that the proportion of easily digestive proteins in bilberry plants increases after a high berry production. Nevertheless, the correlation between grouse and

voles is still commonly interpreted solely as a result of varying predation pressure on grouse during the vole cycle, the so-called alternative prey hypothesis.

A negative correlation between grouse indices and summer temperatures in the two previous years has also been reported. This may be because bilberry plants are more stressed after high seed crops if summer temperatures are low, and need longer time to recover. Cosmic rays are another possible plant stress factor. Cosmic ray fluxes vary, among other things, with a 9.3-year lunar cycle, and are also negatively related to atmospheric pressure. The fluxes are highest in winter, so fluctuations during that time of the year are of greatest interest.

A ptarmigan index, calculated as the relative annual change in the hunting bag in south-eastern Norway during 1872–2013, was best explained by a bilberry index of the previous year, calculated based on information given in newspapers and other sources. In multiple regression models, there was also a positive effect of a small rodent index of the current year, a negative effect of mean summer temperatures (June–September) of the two preceding years, and a negative effect of mean atmospheric pressure in the second last winter (December–February). In a path-analysis, the strongest direct effect was of the bilberry index on the ptarmigan index and on the small rodent index, but there also was a direct effect of previous summer temperatures and winter atmospheric pressure on the ptarmigan index, and of atmospheric pressure in June two years earlier on the small rodent index. In addition, there was a direct effect of the small rodent index on the ptarmigan index.

The relative change in autumn census data for ptarmigan close to Møsvatn, Telemark, was also positively related to the bilberry index of the previous year. In addition, there was a tendency for a negative relationship with atmospheric pressure in the second last winter, and a positive relationship with an index for the 9.3-year lunar cycle. If the number of chicks observed per two adult birds was used as explanatory variable, there was no correlation with bilberry or atmospheric pressure. The correlation with the lunar index became significant, possibly because this factor is more important for winter survival than for chick production. The chick production was positively related to the bilberry index of the previous year and to the mean temperature in May in the current year, and negatively to atmospheric pressure in the second last winter. Path-analyses gave essentially the same results.

A high seed production of bilberry seems to be a prerequisite for good reproduction of ptarmigans in the succeeding year, but still no guarantee, because other factors may turn out negatively. Ptarmigans are hardly so productive that they during only one breeding season are able to reach the new carrying capacity after a berry peak year. The highest population peaks were observed after 2–3 succeeding years with high berry production, or in connection with a combination of berry peak years and intervening cold summers. For all cases with strong growth in the ptarmigan index two years after a berry peak year, there were low summer temperatures in the intervening year, which may have prevented the recovery of bilberry plants.

Although the results are in accordance with the plant stress hypothesis, predators may enhance the decline phase after peak years, as predicted by the alternative prey hypothesis. If population increases are caused mainly by increased food quality, and to a less extent by relaxed predation, it is unlikely that grouse populations are favoured by high population peaks of small rodents. This is because predators will increase in numbers during the vole peak, and then increase the predation pressure on grouse when the rodent population collapses.

It has been suggested that lower population peaks of ptarmigans in recent years are due to higher hunting pressure and/or higher population levels of predators. These factors can probably reduce the abundance of breeding birds, while predation can also slow down the population growth rate, but this is unlikely to be the whole explanation. We still have years with high production of bilberries, but the possible additional effect of cold summers on forage quality seems to have become less common.

Annual surveys of grouse are conducted at several sites in Norway. However, these surveys should be supplemented with counts of bilberries in fixed sample areas. This would increase the scientific value of the work, and be valuable also for grouse management.

KEY WORDS
Willow ptarmigan, bilberry, plant stress, summer temperature

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Contrasted impacts of weather conditions in species sensitive to both survival and fecundity: A montane bird case study

Coline Canonne, Ariane Bernard-Laurent, Guillaume Souchay, Charlotte Perrot and Aurélien Besnard

Abstract

There is growing evidence that the Earth's climate is undergoing profound changes that are affecting biodiversity worldwide. This gives rise to the pressing need to develop robust predictions on how species will respond in order to inform conservation strategies and allow managers to adapt mitigation measures accordingly. While predictions have begun to emerge on how species at the extremes of the so-called slow-fast continuum might respond to climate change, empirical studies for species for which all demographic traits contribute relatively equally to population dynamics are lacking. Yet, climate change is expected to strongly affect them throughout their entire lifecycle. We built a 21-year integrated population model to characterize the population dynamics of the rock partridge (*Alectoris graeca*) in France, and tested the influence of nine weather covariates on demographic parameters. As predicted, both annual survival and breeding success were affected by weather covariates. Thick snow cover during winter was associated with low survival and small brood size the following breeding season. Brood size was higher with intermediate winter temperatures and snowmelt timing, positively correlated to breeding period temperature, but negatively correlated to temperature during the coldest fortnight and precipitation during the breeding period. Survival was positively correlated to winter temperature, but negatively to breeding period precipitation. Large-scale indices indicated that cold and wet winters were associated with small brood size the following breeding season but with high survival. Expected changes of weather conditions due to climate change are likely to impact demographic traits of the rock partridge both positively and negatively depending on the traits and on the affected weather variables. Future population dynamics will thus depend on the magnitude of these different impacts. Our study illustrates the difficulty to make strong predictions about how species with a population dynamic influenced by both survival and fecundity will respond to climate change.

KEYWORDS

Climate change, fecundity, IPM, montane birds, rock partridge, survival, weather conditions

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Vosges Mountain in France: A Capercaillie population reinforcement from Norwegian birds.

Emmanuel Ménoni, Jean-Jacques Pfeffer and Gwenaël Jacob.

The Vosges are a small mountain range in northeastern France where is living a Capercaillie population that is on the verge of extinction (less than 10 individuals detected in 2023). This population has been steadily declining since the 1930s when it was estimated at about 1500 cocks. The causes of this process are fairly well known, starting with considerable habitat loss, particularly at lower elevations, as a result of deep changes in forests by forestry from the end of the Second World War until the 2000s. In recent decades, considerable efforts have been made to reverse the trend, in particular through in-depth work

with foresters, as well as to reduce the very high human pressure on these mountains due to the high human densities in this region.

These efforts have been carried out in particular by the "Groupe Tetras Vosges" and the "Ballons des Vosges Regional Nature Park". However, genetic work carried out 10 years ago confirmed that the population size was very small (around a hundred) and showed that the Capercaillie here had low genetic variability compared to those of other spontaneous French populations with a better genetic status. The above findings have led to a project to translocate wild Capercaillie, similar to what is being done in Poland and Germany. However, the National Scientific Council of Nature Protection and the Regional Scientific Council of Nature Protection have given an unfavorable opinion to this project. But the administration, with the help of experts, has provided answers to the arguments put forward by these councils. . Thus, the project is in the process of emerging, thanks to the support of Norway, and the first captures should take place as early as April. This project provides for the translocation of 40 birds per year for five years. A very important point is that it will be accompanied by strong conservation actions, including on limiting factors that have not been taken into account or insufficiently taken into account previously (e.g. collisions of overhead cables and fences, reduction in the density of marked trails, efforts to reduce deer and wild boar populations), not to mention the continuation of efforts on habitats, in particular on forest aging.

Climate change is certainly affecting the Vosges forests, in particular the dense spruce formations, which may have medium-term benefits for the Capercaillie. Forest changes in the coming decades will depend heavily on the management choices made by foresters in the face of climate change. According to Piedallu (a specialist in modelling plant distribution and tree growth and health, associated as an expert in this project), there is no reason to presume that the Capercaillie habitat will disappear within 30-40 years in the Vosges.

It is therefore the last chance operation, rather well received by the local populations and managers, which has the advantage of continuing and amplifying the efforts in favor of the conservation of nature and the Vosges forests, thanks to the very charismatic side of the Capercaillie in the French mountains.

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Developing a Monitoring Program for Dusky Grouse in Montana

Elizabeth Leipold

Dissertation Abstract

Rigorous state-wide monitoring programs for dusky grouse (*Dendragapus obscurus*) are lacking across their range, including in Montana. Difficult-to-reach habitat and low probability of detection makes monitoring dusky grouse inherently difficult. Our objectives were to 1) evaluate dusky grouse habitat associations and generate a state-wide map predicting dusky grouse habitat for Montana, 2) evaluate sampling methods and survey conditions for maximizing dusky grouse detection, and 3) evaluate protocols (*i.e.*, number of sites and visits) and analytical methods for producing annual unbiased and precise indices of abundance. We created our habitat model using resource selection functions, random forest, and an ensemble approach. We compared spring v. summer sampling, the use of electronic playback to increase detection, effect of route type (off-trail, trail, road) on point counts, and the effect of weather, background noise, day, and time on probability of detection. We conducted simulations with different survey designs and under different abundance and detection scenarios to evaluate and compare four analytical methods for producing unbiased and precise indices of abundance: time-to-detection model with hierarchical distance sampling, N-mixture model, raw count (naïve) and hierarchical distance sampling model. Multiple habitat characteristics affected relative probability of dusky grouse use including tree height and conifer forest vegetation types. Both habitat modeling methods were highly predictive and therefore we used an ensemble (frequency histogram) approach to create a state-wide map of dusky grouse habitat that was used to identify appropriate sampling sites for population monitoring. Spring point-count surveys conducted with electronic playback were most effective. Surveys located along roads/trails best balanced the trade-offs between sampling effort and survey design requirements, despite limiting inferences to dusky grouse populations located in prime habitat along roads/trails. Detection of dusky grouse was highest on clear days, with little wind and background noise, with surveys

occurring 9–162 minutes post-sunrise during 3–23 May. Under high probablity of detection scenarios, simulation results indicated that N-mixture models where 80 sites visited four times resulted in unbiased estimates of population size with the highest precision. Transect-based distance sampling survey protocols during the spring also produced unbiased and acceptably precise (≤15% CV) estimates of grouse density when ≥35 transects of ≥2.6-km length were surveyed per area of inference (*e.g.*, administrative region). Our results provide baseline information necessary for the development of a state-wide monitoring program for Montana.

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The full dissertation is available for download at:
https://www.wildlifehabitatecologylab.com/uploads/1/1/9/8/119890489/leipold_dissertation_final.pdf.

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Reinforcements of a Greater Sage-Grouse Population in Utah: Applications for Range-Wide and Local Conservation Translocation Efforts

Melissa S. Chelak Ph. D. Dissertation, Utah State University

Abstract:
In a small, isolated Greater Sage-Grouse (*Centrocercus urophasianus*) population in the Sheeprock Mountain Sage-Grouse Management Area (SGMA) located in Utah's West Desert, peak male lek counts declined from 190 males in 2006 to 23 males in 2015. A collaborative effort across all federal, state, and local partners yielded 146 (40 male, 106 female) sage-grouse captured, marked with either a very-high frequency or global positioning systems (GPS) transmitter, and translocated into the Sheeprock sage-grouse management area between 2016 and 2019, complete with radiotelemetry monitoring during the spring and summers of 2016-2020 translocated individuals in addition to radiotelemetry monitoring of 39 (12 male, 27 female) resident Sheeprock sage-grouse. Coincident management efforts included extensive habitat restoration, predator control, and monitoring off-highway vehicle (OHV) recreation.

To evaluate the movements, habitat selection, demographics, and genetics of this population, I performed a behaviorally segmented, movement-based habitat selection analysis, an integrated population model (IPM) of the Sheeprock SGMA and the translocation source populations, and analyses quantifying allelic richness, allelic frequency, and genetic heterogeneity. Additionally, I evaluated the GPS transmitters' performance to monitor the grouse, which is essential for quantifying and accounting for fix error for GPS-based spatial models. The probability of sage-grouse beginning in the exploratory phase at the time of release was marginally lower for adult females than yearlings. The analysis also suggested that to reduce post-release dispersal, practitioners should prioritize release sites to maximize the restricted state selection in areas closer to mesic habitat, higher elevation, and lower tree cover. The IPM predicted declining populations following translocations due to low recruitment, dictated by low chick survival, and estimated population abundance of 22 individuals (95% CI: 2 – 63) by 2027. However, we also detected an increase in allelic richness and the potential for the increased admixture of the source population genetics in the reinforced population.
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Southern White-tailed Ptarmigan *(Lagopus leucura altipetens)* Colorado Parks and Wildlife Interim Monitoring Report

Amy Seglund and Jon Runge

The southern white-tailed ptarmigan *(Lagopus leucura altipetens)* is an alpine endemic grouse that was petitioned to be listed under the Endangered Species Act (ESA) in 2010 and has been identified as a Species of Greatest Conservation need in Colorado's State Wildlife Action Plan. In response to the 2010 petition, Colorado Parks and Wildlife (CPW) initiated a seven-year research project to help inform the USFWS 12-month status review (Seglund et al. 2018). This project incorporated a number of metrics to determine distribution, abundance, seasonal survival, site fidelity, reproductive success, and genetic structure. CPW's research found that the southern white-tailed ptarmigan was occupying all suitable habitats in the alpine, with stable populations in Colorado that contained high genetic diversity, and low predicted extinction risk into the future. Based largely on the results of CPW's findings, the USFWS determined by means of a thorough Species Status Assessment, that the southern white-tailed ptarmigan was not warranted for listing in 2020 (USFWS 2020).

Though populations appeared to be healthy, CPW has continued to monitor the statewide population to assess changes in distribution and to evaluate demographic parameters as environmental changes become more pronounced and recreation in the alpine increases. To develop a baseline distribution and inventory of the species, we first conducted statewide occupancy surveys (Mackenzie and Royle 2005) in 2011 with subsequent surveys completed in 2021 and 2022 in northern, central, and southern Colorado. We evaluated changes in male and female occupancy across the state and calculated adult sex ratios based on birds encountered during surveys. We also estimated occupancy rates of chicks, and the ratio of the number of chicks to hens across all survey years. We conducted an *a posteriori* analysis of weather variables as covariates to assess potential impacts of climate change on occupancy rates for both sexes and chicks.

Estimates of occupancy for males increased from 2011-2022 (Table 1). Conversely, female and chick occupancy declined from 2011-2022 (Table 1 and 2). Female occupancy was similar in 2021 and 2022 whereas chick occupancy almost doubled from 2021 to 2022, however, it did not reach the 2011 occupancy values. Chick occupancy declined the most in the southern portion of the state (Table 2). Estimated sex and age class ratios showed similar patterns with estimated sex ratios of 128.9 males per 100 females (95%CI: 83.4–199.4) in 2011, 245.9 males per 100 females (95%CI: 190.9–306.7) in 2021, and 306.3 males per 100 females (95%CI: 248.7–377.3) in 2022. We estimated age ratios of 206.6 chicks per 100 females (95%CI: 159.8–267.1) in 2011, 45.9 chicks per 100 females (95%CI: 26.1–80.7) in 2021, and 150.6 chicks per 100 females (95%CI: 106.9–212.2) in 2022.

A posteriori analysis of weather variables for female-only and chick-only analyses found that female and chick occupancy decreased as minimum temperatures in the breeding season increased. Male occupancy appeared to be unaffected by weather conditions. Lower female occupancy associated with increased minimum breeding temperatures may be due to reproductive costs associated with uniparental care. In this species, the female is solely responsible for incubating and raising broods, and thus may encounter physiological challenges such as hyperthermia, reduced body condition, and dehydration with increases in temperature (Wiebe and Martin 1997, Coe et al. 2015, Carroll et al. 2018, Oswald et al. 2019, Strinella et al. 2020, Martin et al. 2020). The lower number of chicks counted and estimates of occupancy may be a result of fewer females nesting during an abnormally hot, dry breeding season and lower nest success for females that did nest. During brood rearing, the lack of summer moisture and warmer conditions may have caused the desiccation of vegetation affecting foraging opportunities. Loss of persistent snowfields caused by higher temperatures could have resulted in chicks and hens traveling greater distances to find cool microclimates and mesic vegetation potentially exposing them to increased predation rates.

Our surveys also documented additional threats of potential concern for southern white-tailed ptarmigan, including an increase in human recreation and numerous large wildfires in surrounding forested areas that produced heavy smoke at high elevations. Because of the accelerated changes apparent in the alpine, CPW plans to continue to monitor the southern white-tailed ptarmigan population and incorporate conservation measures to reduce threats, especially for females, to help preserve this alpine dependent species.

Table 1. Occupancy rates for male and female southern white-tailed ptarmigan in Colorado with lower (LCI) and upper (UCI) confidence intervals.

Sex	2011	2021	2022
Male	0.600 (95% CI: 0.472–0.717)	1.00 (95% CI: undefined)	0.980 (95% CI: 0.738–0.999)
Female	0.918 (95% CI: 0.349–0.996)	0.688 (95% CI: 0.445–0.858)	0.714 (95% CI: 0.509–0.857)

Table 2. Occupancy rates for chicks-only, with lower (LCI) and upper (UCI) confidence intervals, for each year and strata.

Year	Strata	Occupancy	LCI – UCI
2011	North	0.997	0.972 – 1.000
2021	North	0.417	0.133 – 0.769
2022	North	0.670	0.342 – 0.889
2011	Central	0.997	0.983 – 1.000
2021	Central	0.510	0.220 – 0.793
2022	Central	0.748	0.363 – 0.939
2011	South	0.989	0.887 – 1.000
2021	South	0.174	0.058 – 0.418
2022	South	0.375	0.157 – 0.658

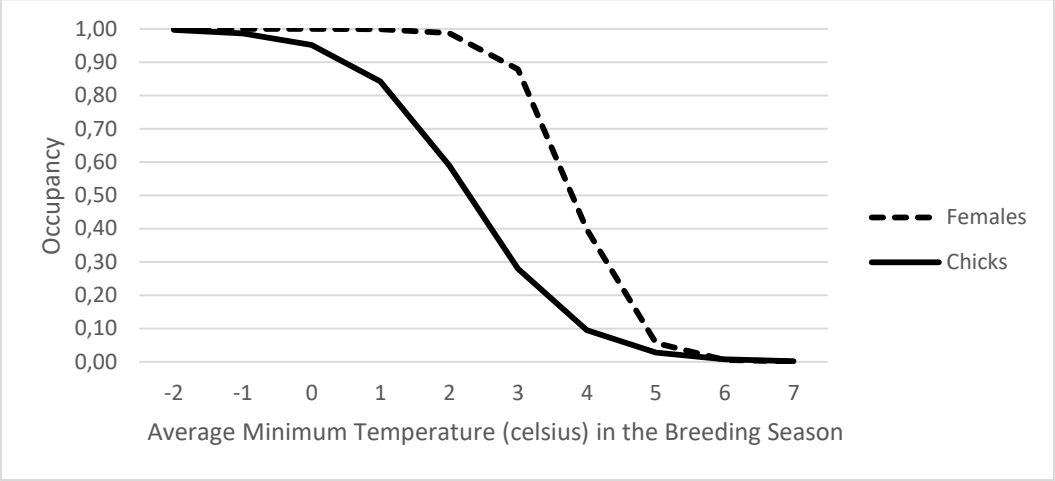

Figure 1. Results of a posteriori analysis examining the effects of minimum temperature during the breeding season on female and chick southern white-tailed ptarmigan occupancy at the plot-level in 2011, 2021, and 2022. Monthly temperature variables were averages of daily temperatures from May-July.

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The report may also be downloaded at
https://cpw.state.co.us/Documents/WildlifeSpecies/Southern_White-tailed_Ptarmigan_Interim_Monitoring_Report.pdf

Night-Lighting: Factors Influencing the Capture of Greater Sage-Grouse (*Centrocercus urophasianus*)

Janae Radke, Randy T. Larsen, Steven L. Petersen, and Brock R. McMillan

Night-lighting (i.e., spotlighting or night-netting) is a widely used method to capture greater sage-grouse (*Centrocercus urophasianus*). However, there are few formal analyses of what factors influence capture success using this method. We evaluated environmental conditions, grouse behavior, and capture crew characteristics expected to influence capture of sage grouse using night-lighting in Strawberry Valley, Utah, during 2020-2022. We made 115 capture attempts in 31 nights and captured 83 grouse with an overall capture success of 61% (SE ± 4.6%). We found that precipitation, the presence of frost, thicker vegetation, and increased flock size decreased capture success. Capture success increased as capture crew size increased until a crew of four, then decreased. Capture success increased when the crew initiated capture attempts on foot rather than out of a vehicle. We also had more success capturing female sage grouse than male sage grouse. Moon phase, cloud cover, wind speed, temperature, season, time of night, and time and distance to grouse after initial detection had no influence on capture success. Our study provides information on optimal conditions, equipment, and technique that can be used to increase capture success while night-lighting for sage grouse. We recommend capture crews of three to four attempt capture of small flocks and avoid thick vegetation, precipitation, and heavily frosted or snow-covered ground, without being concerned about moon phase, cloud cover, or wind speed.

Janae Radke, wizardjanae@gmail.com, Randy T. Larsen, Steven L. Petersen, and Brock R. McMillan

An assessment of grassland loss, woody encroachment, and pesticide use on North American grassland bird populations

Rachel Rusten (M.S. May 2024) – Advised by Dan Sullins

The North American Breeding Bird Survey monitoring effort has consistently documented grassland bird declines since 1966. Within Kansas, greater prairie-chicken (*Tympanuchus cupido*) surveys suggest declines over the past 30 years. Grassland loss has largely been cited as the main driver of declines; however, I predicted other factors, such as pesticide application and woody encroachment, may have induced additive and interactive effects. I evaluated grassland loss, woody encroachment, and pesticide use as potential threats to meadowlarks (*Sturnella magna* and *S. neglecta*) and greater prairie-chickens (*Tympanuchus cupido*) within the Great Plains and Kansas, respectively.

I examined meadowlark abundance throughout the Great Plains of the United States to assess the relative influence of each potential threat between 1996 and 2019. The linear least square regressions showed strong relationships between observed meadowlarks and the three factors. With consideration of different starting populations between Bird Conservation Regions, the grassland model performed best based on the slope of the beta coefficient ($\hat{\beta}_1$ = 0.513, 95% CI [0.463, 0.562]; ΔRMSE = 3.46), while the woody encroachment model reported the highest predictive accuracy ($\hat{\beta}_1$ = -0.453, [-0.487, -0.419]; ΔRMSE = 6.52). The pesticide model had a negative relationship with observed meadowlarks ($\hat{\beta}_1$ = -0.292, [-0.328, -0.256]; ΔRMSE = 0.09), and indicated negative effects beyond grassland loss alone, the only correlated factor (r = -0.70).

To evaluate these three threats on greater prairie-chickens in Kansas, I used a random forest modeling approach to compare grassland, woody cover, and pesticide use between occupied (n = 5,552) and "pseudoabsent" (n = 11,223) greater prairie-chicken lek site locations from 1993 to 2020. My best-supported variables were the amount of grassland at 5 km, woody cover percentage within 800 m, and pesticide application rates within 5 km of lek locations. I validated the model fit using independent holdout data (~25%) and ROC curve (AUC = 0.956); the model correctly predicted the use or absence of leks with 89.95% accuracy. My analysis suggests that though the amount of grassland has slightly declined, the amount of available habitat could have increased on average in Kansas. However, I estimated a 15% loss of greater prairie-chicken habitat in the Flint Hills coinciding with woody encroachment and increased pesticide use. My greater prairie-chicken species distribution model likely overestimates expected habitat without considering finer-scale factors (i.e. anthropogenic features) and vegetation structure but provides a foundation for local assessments. These results supported my hypotheses that grassland loss, woody encroachment, and pesticide use all present negative demographic consequences for meadowlarks, greater prairie-chickens, and other grassland birds within Kansas, and across the Great Plains. Current trends may be altered with grassland conservation action. The findings emphasize the importance of reducing the consequences of agricultural intensification and promoting bountiful grasslands for wildlife and producers alike.

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Forest management for Spruce Grouse shows promising results in New York

Angelena M. Ross

The Spruce Grouse is endangered and the population is declining in New York, in part, as a result of maturing coniferous forests. Estimates of spruce grouse numbers are likely below 175 individuals that are limited to 15 extant subpopulations. To help identify effective forest management methods that can be applied to help reverse the species' decline, we experimentally thinned <2% of a large forest patch (>800 ha) near the core of the species' remaining distribution in 2008, where spruce grouse only transiently occupied the patch from 2002-2008. Experimental forest management consisted of thinning, using mechanized equipment, five 1-ha squares with at least a 100 m leave strip in between each treatment area. Tree density was reduced to approximately 25% of the original tree density after treatments ($X_{\text{original density}}$=1068 trees/ha, $X_{\text{treatment density}}$=260.4 trees/ha). We reserved two similar-sized forest patches (reference patches) nearby where no management took place. One reference patch had steady occupancy and the other had transient occupancy across 2002-2008. Repeat surveys from 2008-2013 indicated that spruce grouse use of the patch increased 3 x after management, a response that was not observed in the

two reference forest patches. We contend that setting back succession in a relatively small area of coniferous forest can have a relatively large positive impact on spruce grouse use of a forest patch. We recommend further study across additional conifer forest patches to determine if this pattern is repeatable.

Displaying male spruce grouse found during a playback survey in New York (photo by A. Ross).

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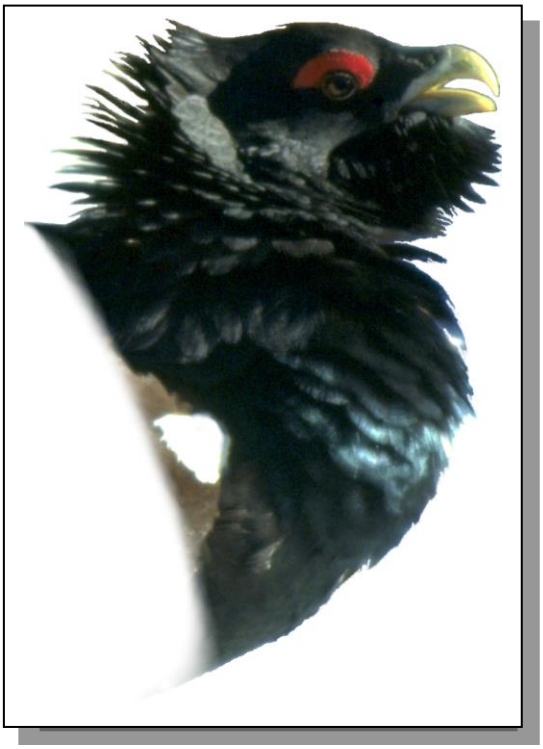
SNIPPETS



Grouse News
Newsletter of the Grouse Group of the IUCN-SSC Galliformes Specialist Group

What is Grouse News

Grouse News is a biannual newsletter of Grouse Group (GG) of the IUCN-SSC Galliformes Specialist Group (GSG) which is one of many specialist groups within Species Survival Commission (SSC) in IUCN. The primary function of this newsletter is to publish short papers and under way reports from research projects and conservation news. This will not prevent you from publishing in international review journals. Also short notes telling who you are and what you are doing is of interest. Information of upcoming conferences dealing with any grouse species and review of new books may be published. Also news from GSG and GG is published.

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Grouse News index of issue 1-4

The indexes of the first four issues of Grouse News are presented below.

Issue 1 March 1991

Issue 2 December 1991

Issue 3 June 1992

Issue 4 December 1992