THE TREND TOWARD THE EXTIRPATION OF THE GREATER SAGE-GROUSE IN SASKATCHEWAN

DISCUSSION AND THOUGHTS OF MY EXPERIENCE WITH THIS SPECIES 50 YEARS LATER

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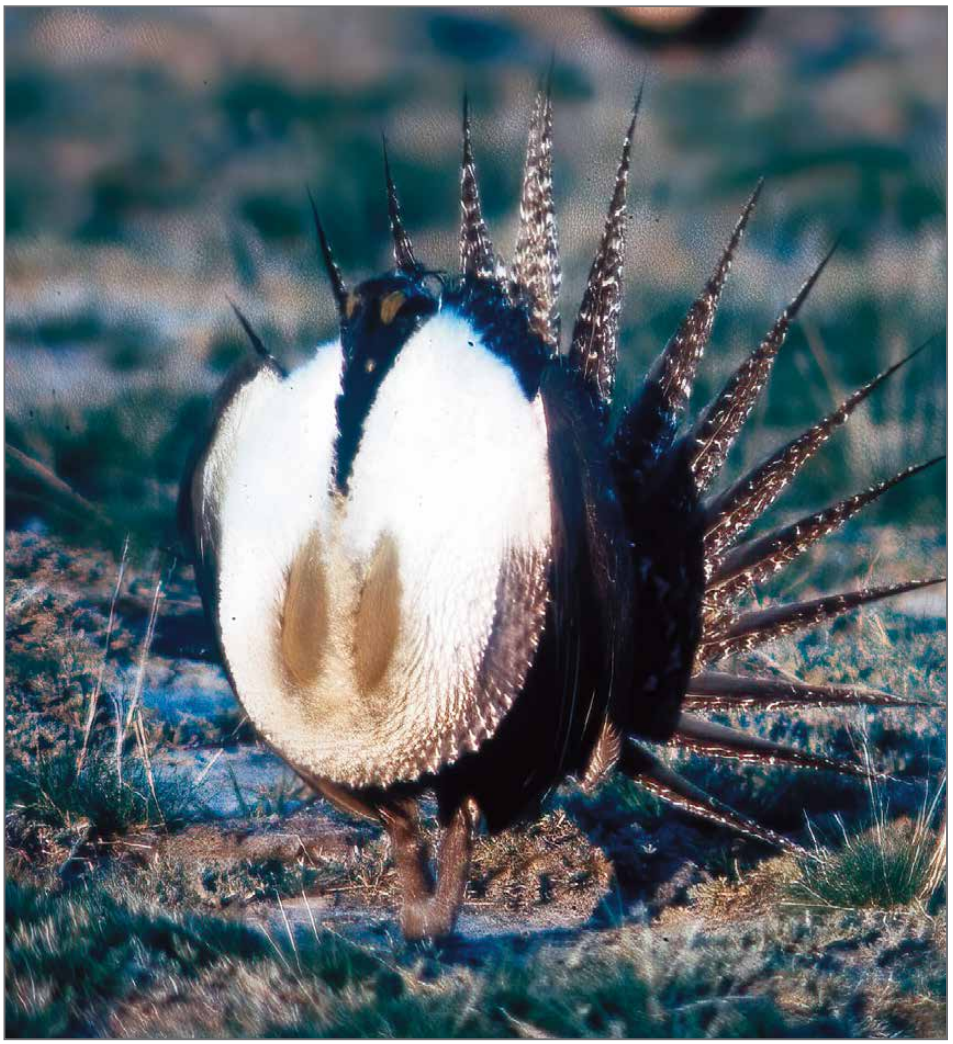

All photographs by L. Kerwin (1970/1971) unless noted otherwise.

Once as abundant as the ubiquitous sage brush on which they are dependent, Greater Sage-Grouse (*Centrocercus urophasianus*) have been so reduced in numbers that it seemed inevitable that they would become extinct in North America or, at the very least, extirpated in most of their historical range.

Their declining population has been intermittently documented since I first located and studied an existing Sakatchewan population of this species in what is now Grasslands National Park in 1970 and 1971. With their present existence now at critical levels, I would like to share my personal experience and thoughts, beginning more than 50 years ago, in the hope that an increased interest in this iconic species may result in a sustainable population through continuing provincial and federal conservation initiatives.

Population declines and monitoring

Sage-grouse are the largest member of the *Phasianidae* family and were once widely distributed throughout the semi-arid plains of the intermountain and northwest states as well as the southern border of the three western Canada provinces. They were extirpated in British Columbia more than a century ago.

They are so dependent on sagebrush for food and habitat requirements that the original range of the species coincided with the distribution of the sagebrush plant (*Artemisia* spp.). The distribution of sage-grouse in Canada extends beyond that of Big Sagebrush (*A. tridentata*), so the role of sagebrush in the ecology of populations in Canada is assumed by other Artemisia species, mainly Silver Sagebrush (*A. cana*), Pasture Sage (*A. frigida*) and/or Prairie Sage (*A. gnaphalodes*).

Populations of sage-grouse remain in Alberta and in Saskatchewan almost exclusively in an area south of the Cypress Hills to the Wood Mountain plateaus, and tend to fluctuate due to various factors, including habitat loss, drought, extreme weather events, brood mortality, and disease. From 1967 to 1995 in Alberta, the species was classified as a game bird with an open season each autumn. Alberta closed the hunting season in 1996. Saskatchewan has not had a hunting season since the 1930s.

Despite their declining population and decreased range, sage-grouse were not confirmed as a *Threatened* species until 1997. The species was reassessed as *Endangered* in 1998 by The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and again in 2003 under the federal *Species at Risk Act* (SARA) in 2003.

It is estimated that sage-grouse now occupy only about seven per cent of their historical range in Canada. In Alberta, one survey estimates the number of individuals may have declined by as much as 85 per cent since 1968.

The census data for both the Alberta and Saskatchewan populations of sage-grouse is incomplete due to the inconsistencies in annual monitoring, but other studies estimate the population to have declined by 90 to 94 per cent since 1988. In 1988, the spring population in Saskatchewan was estimated to be as high as 4,151 birds. Based on lek counts in 2006,

the estimated remaining population of sage-grouse in Saskatchewan was 180 to 267 birds. One recent census in 2021 estimated the total Saskatchewan population at less than 50 birds, recorded at only two known active leks within the boundaries of Grasslands National Park near Val Marie.

It has been well documented that the number of birds present on any one lek may vary considerably from year to year and so may not be a reliable indication of bird populations. In addition, any yearly census of the population based on lek attendance will also vary depending on other factors such as weather and the date of the counts. Thus, this method of estimating the annual population of sage-grouse in any geographical area is not an exact science and the actual number of birds reported in any given year may vary considerably.

To be most accurate, the counts would have to be made over several weeks during the peak of attendance on the same leks each year. Peak attendance usually occurs for a few weeks beginning in April of each year but again can vary considerably depending on spring weather. One 1990 study of 122 locations confirmed only 48 known or possible leks and concluded that a provincial spring population of 2,000 sage-grouse is possible, but noted that the data base is incomplete.

Census data from Saskatchewan (Table 1) shows that annual counts were incomplete or not done consistently each year from 1970 to 2014, so population estimates varied significantly from year to year. Despite this lack of consistent information, there can be no disputing the significant decline of the sage-grouse population in Saskatchewan, especially during the last 20 years!

My study of the sage-grouse

During the summers of 1970 and 1971, I had the unique opportunity to study and report on the status of the Greater Sage-Grouse population in an area near Val Marie, Saskatchewan (Figure 1). Under the direction of Dr. George Mitchell (University of Saskatchewan) and with a Special Permit issued by the Saskatchewan Department of Natural Resources to observe, mark, trap and collect 50 specimens during the calendar year, I was able to document the location of various leks and their activity in a study area on the Dixon Ranch along the Frenchman River.

At that time, very little was known about the status of the existing sage-grouse population. Only in the last decade or so have provincial and federal governments had the resources and political will to audit and manage sage-grouse populations as they do for other resident and migratory game birds.

The location of the original study area (Figure 2) is now part of Grasslands National Park, which was established by the federal government in 1983. The area

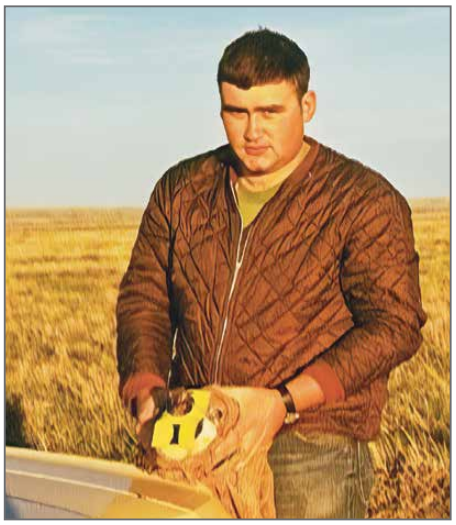

FIGURE 1. The author about to release a male sage-grouse fitted with a neck collar used to identify individual birds on the lek during 1970 study.

Table 1 Saskatchewan Sage-Grouse Monitoring Data

Year	# Leks Checked	# Active Leks	Total # Males	# Males/Lek	Spring Popn. Low Estimate*	Spring Popn. High Estimate**
[1]1970	5	5	133	26.6		
[1]1971	8	7	199	28.4		
[2]1983	13	12	144	12.0		
1987	45	29	497	17.1		
1988	[3]170	61	934	15.3	2802	4151
1989	15	7	94	13.4		
1994	71	15	93	6.2	279	413
1995	56	16	105	6.6	315	467
1996	47	19	123	6.5	369	547
1997	26	10	61	6.1	183	271
1998	18	11	122	11.1	366	542
1999	27	8	101	12.6	303	449
2000	37	10	126	12.6	378	560
2001	19	10	106	10.6	318	471
2002	21	10	84	8.4	252	373
2003	17	10	81	8.1	243	360
2004	18	8	60	7.5	180	267
2005	11	8	62	7.8	186	276
2006	12	6	60	10.0	180	267
2007	13	6	56	9.3	168	249
2008	12	5	51	10.2	153	227
2009	12	5	45	9.0	135	200
[4]2010	5	2	42	21.0	126	187
[4]2011	4	3	35	11.7	105	156
2012	33	3	18	6	54	80
[4]2013	2	2	4	2	12	18
2014	13	3	8	2.6	24	36

[1] Data collected by Kerwin (1971)
[2] Data from Frenchman River Valley area only
[3] "Lek" was not clearly defined and this number may include potential and historical lek sites
[4] Weather conditions and access to lek sites was not optimal and affected survey results
*Low population estimate assumes a 2:1 ratio of females to males
**High population estimate assumes a 2:1 ratio of females to males, 90% of leks are censused, and 75% of males associated with the lek are included in the maximum count

TABLE 1. Government of Saskatchewan Fish and Wildlife Branch Technical Report 2012-01. M. Weiss and B. Prieto. February 2012 (updated June 2014).

is within the Canadian dry belt where annual rainfall may be as low as 25 mm and the region is distinguished from surrounding areas by less rain, longer periods of drought and a higher ratio of evapotranspiration to precipitation.

The area is also characterized by great extremes in temperature between summer and winter seasons and wide variations in temperature between day and night and from day to day in all seasons.

Topographically, the area is described as consisting of small undulating to very gentle rolling uplands separated by deep valleys and coulees. Most of the area supports typical short grass prairie vegetation dominated by sagebrush and cactus species. The Frenchman River runs through the area and many of the bottomlands have been planted to alfalfa and clover.

I am deeply indebted to Bruce and Stella Dixon and family for allowing me to camp on their ranch during the two years of the study, and for the unlimited access they gave me to their grazing lands. I would typically arrive there in early April to locate suitable leks for my study and continue through the summer months, documenting nesting locations, recording brood sizes, and analyzing habitat locations through to September.

It was not difficult to locate active leks in the immediate area during both the morning and evening activity. Active leks were confirmed first by an aerial survey of the proposed study area, followed by ground search on foot and by horseback.

During the courtship period, the number of birds on the study leks were counted each morning and evening. I was also aware of numerous other leks in the immediate area, but for practical and logistical reasons I was only able to complete daily counts on eight leks that were the nearest and most accessible to my camp. The location of the leks selected by sage-grouse could vary significantly, although the heavy use of the area over an extended period served to create permanent openings in the vegetation as a result of extensive trampling and feeding activities.

The unmistakeable sound of air sac plops or pops from strutting males as they released air from special esophageal sacs as part of their courtship display was often audible for several kilometres both in the early morning, usually beginning about an hour before sunrise, and after the main evening display, sometimes well after dark.

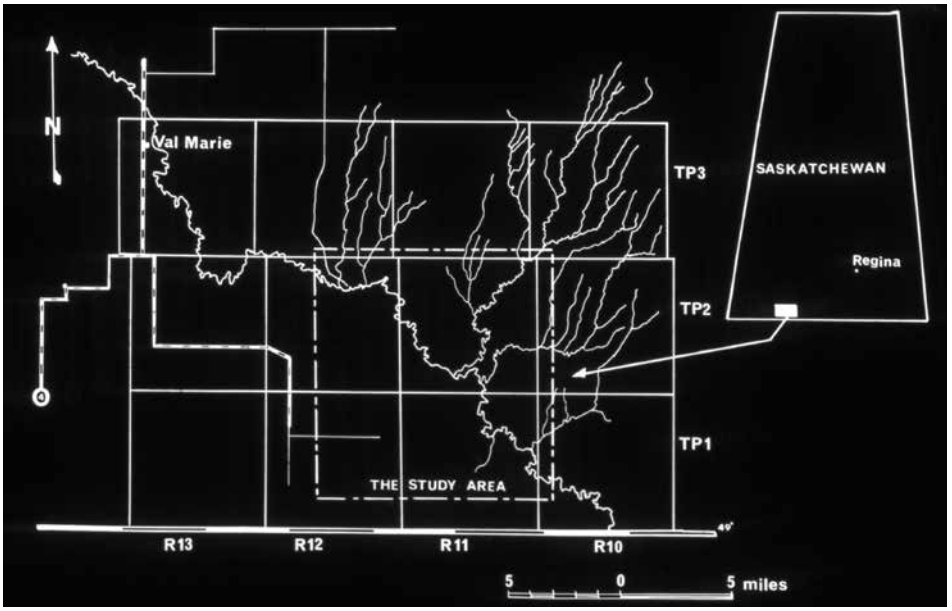

FIGURE 2. The study area.

While most of the field work was mainly completed on my own, there were times during the study that I was assisted by my wife, Betty, as well as other interested individuals from the University. On one occasion, Dr. Mitchell brought down a group of nine or 10 of his biology class students to observe the strutting activity of the males on the leks during the morning and evening display periods, and to help search the adjacent area for active nests during the day.

Using a long rope, the student volunteers (Figure 3) positioned themselves apart every 10 feet and walked through the adjacent sagebrush habitat to flush the nesting hens and locate their nests. Adult birds were captured on the leks using a cannon-projected net trap or night-lighting and were usually fitted with an identification collar or banded in order to properly identify individual males on the strutting grounds.

Birds were weighed and measured before releasing them and, as stressful as that might have been, they almost always appeared back on their leks within a day or two and assumed their original position in the established hierarchy of the attending males.

The leks were typically located in very open areas and the birds did not seem to be particularly bothered by the presence of a vehicle during their diurnal display periods. One lek was close to a dirt road and it was easy to slowly drive near to it and observe them from the vehicle. I had also constructed a portable blind of burlap (Figure 4) and placed it at the edge of the display area to see if it would disturb the birds or cause them to avoid their established territories. It did not and, in fact, at several locations I found myself not on the edge of the lek but surrounded by active males.

I have observed similar behaviours with Sharp-tailed Grouse on their dancing grounds. It seems that this instinctual mating behaviour is so strong in grouse that the active birds are not easily disturbed by vehicles or even the close presence of people observing them?

Each day that I monitored the active leks, I would enter my portable blind before daylight and remain there until the morning activities had concluded and the birds had left the area on their own. This allowed me to get accurate counts of the number of males and females on the lek as well as to document their activities. The same was true for the evening displays. I would have to take my place in the blind before the birds arrived on the site, usually about an hour before sunset. This did not seem to bother them and although I would leave the blind about

FIGURE 3. Nest search by volunteer students.

FIGURE 4. Portable blind on active lek.

an hour after sunset, some of the males remained on the lek overnight.

In the spring of 2020 and 2022, some 50 years after my original study, I returned to the Grasslands National Park along with avid naturalists and wildlife photographers, Joseph and Carolyn Harley, with the intention of observing and documenting the remaining population of this species and the changes in their habitat in the original study area. On both occasions, we failed to observe a single sage-grouse. The one known active lek in the West Block of the park had only identified a single male in 2022, and the area was closed during the morning and evening display periods in order to eliminate any possible disturbance to the site of the lek. It had been reported that there were possibly two active leks identified in the East Block of the park and the total male birds remaining in 2022 was estimated at less than 20 individuals.

Coinciding with the apparent disappearance of the sage-grouse was a significant change in the typical sagebrush habitat I had remembered due to the expanded Black-tailed Prairie Dog (*Cynomys ludovicianus*) towns or colonies. It was shocking to say the least! It was not that I had expected everything to be the same as I remembered in 1970 and 1971, but I never imagined that it could be so different.

Included in my original study was the documentation of the existing prairie dog colonies and their relationship to the existing sagebrush habitat. In 1970, only 16 known colonies in an area occupying an estimated 503 hectares were recorded. By 1996, their range had expanded to 931 hectares and 22 colonies and by 2007 they occupied more than 1,044 hectares.

Estimates of the prairie dog population have varied throughout the last 25 years due to drought and the presence of sylvatic plague. Obviously, the present population has increased significantly and yet the prairie dog is now listed under the *Species at Risk Act*. One must wonder what effect this degradation of previously occupied habitat at this site has had on the declining population of sage-grouse in Grasslands National Park.

Factors affecting the sage-grouse population

Sage-grouse in Saskatchewan are particularly vulnerable because the population size is small, occurs at the periphery of their range, has a relatively low density and because habitat is fragmented. Populations are more likely to become extirpated near the periphery of their range. The current population may also be below the minimum size needed to withstand natural fluctuations and may be vulnerable to density-dependent factors such as predation and increased human activity.

The most likely threats to the sage-grouse population include:

(a) Habitat loss or degradation as a result of agriculture, urbanization and industrial development is likely the most significant factor.

(b) Drought. Recent changes in normal precipitation in this region due to climate change has adversely affected sagebrush habitat and will likely continue to do so.

(c) Severe or inclement weather. Cold and wet spring conditions can lead to poor hatch rates and juvenile mortality. Extreme winter weather, freezing temperatures and heavy snow can result in low survival rates for females.

(d) Disease. The arrival of the West Nile Virus to the area has brought a new and unpredictable threat to sage-grouse populations. The occurrence of internal parasites, particularly the tapeworm (*Raillietina centocerci*) in juvenile and adult birds may also be another factor leading to higher mortality rates.

Sage-grouse conservation

A conservation plan for sage-grouse was completed in 2012, and updated in 2014, by the Government of Saskatchewan. Similar conservation measures were also proposed in Alberta in 2013. Despite these efforts, sage-grouse range and populations have continued to decline and sage-grouse remain listed as *Endangered* both federally and provincially.

Several recent recovery efforts have been focused on the assessment, management, and protection of sage-grouse habitat, including the collection

FIGURE 5. Hens tend to ignore the strutting males until ready to mate.

FIGURE 6. Hen posturing in front of a dominant male when ready to mate. Note the leg band identifying the dominant male bird.

of Silver Sagebrush seed and replanting efforts. In 2014, the Calgary Zoo began a unique breeding and reintroduction program by establishing a successful sage-grouse breeding facility with a population of 54 individuals as the breeding flock. In 2018, the Calgary Zoo released 66 birds at two protected locations, one in Alberta and one site provided by Parks Canada in Grasslands National Park in Saskatchewan.

Despite these continuing efforts, there has been no measurable increase in the sage-grouse population. In fact, according to Beatriz Prieto, Terrestrial Ecologist with the Saskatchewan Ministry of the Environment, recent spring population surveys using high tech methods such as Automated Recording Units (ARUs) and Cooled Infrared technology failed to confirm a single active sage-grouse lek in the province, outside of Grasslands National Park!

While the species is non-migratory, there is evidence of birds using other seasonal habitats, which may further influence their distribution. Recent research has documented movements of up to 120 km for sage-grouse in Grasslands National Park when moving to wintering habitat in Montana. Maintaining suitable corridors between these seasonal habitats may be essential in recovering the existing population in Saskatchewan. Genetic studies indicate that the Saskatchewan, Alberta, and northern Montana sage-grouse are a single population.

Rare sightings of individual birds in Saskatchewan may still be possible for some years to come; however, a full recovery of the population to historical numbers seems very unlikely.

Acknowledgements

Special thanks to Beatriz Prieto (Terrestrial Ecologist, Saskatchewan Ministry of the Environment) and Stefano Liccioli (Species at Risk Scientist, Grasslands National Park) for their interest and cooperation in this paper. This article is dedicated to the memory of Dr. George J. Mitchell (1926-2017), Professor of Biology, University of Regina, and Bruce Dixon (1936-2021).

Statistical and other information in this paper were made available from the following sources:

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