The Status of the Greater Prairie-chicken (*Tympanuchus cupido*) in the Grand River Grassland Landscape of Iowa and Missouri, 2023

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ABSTRACT Greater Prairie-chickens were a gallinaceous grassland bird native to Iowa until they were extirpated in the 1950s. Globally this species' range has contracted from being abundant in 17 states to a total population of around 500,000 spread across 9 states but primarily concentrated in 3 states; Kansas, Nebraska and South Dakota (Vodehnal and Haufler 2008). The Iowa Department of Natural Resources along with several partners have undertaken to restore this species to the Grand River Grassland Landscape in southern Iowa and northern Missouri through three translocation efforts in the late 1980s, early 1990s and most recently in partnership with the Missouri Department of Conservation from 2012-2017. In conjunction with this most recent restoration effort a statewide species conservation plan has been developed (Iowa DNR 2013) and a more formal monitoring framework implemented. In 2023, two types of lek-based surveys were conducted and they resulted in a maximum of 22 Prairie-chickens being counted in Iowa at 3 leks. The average number of birds counted per lek was 7.3 birds and the average count per visit for active leks was 5.2. Active and stable leks were 9% of sites surveyed in Iowa, all of which are either former lek sites or areas with high potential for lek occurrence. Overall, greater prairie-chicken numbers in Iowa were low but comparable and steady with recent years numbers.

INTRODUCTION

Historical Review

Greater Prairie-chickens (*Tympanuchus cupido pinnatus*) commonly nested throughout Iowa from the time of European settlement in the mid-nineteenth century until about 1900. Numbers peaked about 1880 when most of Iowa was a mosaic of small grainfields, hayfields, pasture, and native prairie, which provided ideal habitat conditions (Dinsmore 1994). During the late nineteenth century, Greater Prairie-chickens (GPC) were the most abundant gamebird on Iowa prairies. Hunting and trapping them for food and market were very important to settlers. Bags of 25 to 50 a day were common, and some hunters took up to 200 per day.

By 1878, Iowa lawmakers were concerned that prairie chickens were being over- harvested. The Iowa Legislature passed a law that year limiting the daily bag of prairie chickens to 25 birds per person. This is believed to be the first time that bag limits were used as a tool to regulate the harvest of game in the United States. Additional restrictions followed, and the last open season for prairie chickens in Iowa was held in 1915 (Stempel and Rodgers 1960).

As agricultural land use intensified, populations of prairie chickens started to decline. By the 1930's, most prairie chickens found in the northwestern part of the state were migrant winter flocks. By the 1950's, the only known nesting prairie chickens were in Appanoose, Wayne, and Ringgold Counties in southern Iowa. The last verified nesting prior to reintroduction attempts was in Appanoose County in 1952 (Stempel and Rodgers 1960).

Restoration Efforts

In the early 1980's, the Iowa Conservation Commission, now the Iowa Department of Natural Resources (DNR), attempted to restore Prairie-chickens to west central Iowa. The DNR negotiated with the Kansas Fish and Game Commission (KFGC), now Kansas Department of Wildlife and Parks (KDWP), to trade wild turkeys for 100 prairie chickens (Table 1). The release site was located in the Loess Hills east of Onawa, Monona Co, IA. This is an area of steep to moderately rolling bluffs and hills bordering the Missouri River valley. These hills have large expanses of grassland interspersed with brush and small crop fields.

Fifty-three prairie chickens were released in 1980. Results from the first release were generally poor. No spring leks were located in the 2 years following the release, and no reproduction was reported.

In 1982, KFGC personnel decided to attempt a different trapping approach, using rocket- nets to trap chickens on the lek sites. This resulted in 48 more chickens being transported to Iowa for release at the same area in the Loess Hills. A greater effort to acclimatize the birds was made in the 1982 release. The birds were banded and put in a large holding pen with separate cells for each sex. They were kept in pens overnight for the males and a day longer for the females. It was hoped that males would be stimulated to remain near the release site by holding the females a day longer. Recorded lek calls were also played through speakers located near the pen about 45 minutes prior to releasing males. This was an attempt to induce chickens to establish a lek in the area.

Two prairie chicken broods were reported near the release site in 1982, and up to six adults were observed near the Missouri River bottom the same year. Two leks consisting of only a few displaying males were located in 1983 and 1984. Most sightings were in the heavily agricultural Missouri River valley instead of the hills where they were released. Suitable grassland habitat was lacking in the valley. Only an occasional sighting has been reported in this region since 1984, leading to the conclusion that this reintroduction effort failed (Ron Munkel, DNR, *pers. comm.*). Recent habitat modeling efforts have strongly suggested that the habitat in this area of the Loess Hills is not currently appropriate (Vogel, et al. 2016).

In 1987, the DNR made a second restoration attempt at Ringgold Wildlife Area located two miles north of the Missouri border in Ringgold County. Wildlife personnel considered this region to be the best potential prairie chicken habitat in Iowa. In addition, the immediate vicinity was one of the last strongholds of prairie chickens in southern Iowa and northern Missouri (Christisen 1985, Stempel and Rodgers 1960). The surrounding portions of Ringgold County and adjacent Harrison County, Missouri, are cattle country, with 60% or more of the land in permanent grass.

Donald Christisen (1985) concluded that the demise of prairie chickens in this area was due to heavy utilization of grasslands by livestock, resulting in poor quality habitat. Recent years had brought some positive changes in the grasslands of the area including the restoration of around 200 ha of prairie on the Ringgold Wildlife Area.

Birds were again obtained from Kansas through a three-way trade in which DNR supplied wild turkeys to the Michigan Department of Natural Resources (MDNR) while a MDNR crew trapped prairie chickens in Kansas for translocation to Iowa. Prairie chickens were captured in the spring with funnel traps set on booming grounds in the Flint Hills region of Kansas. Every few days the captured birds were transported to Iowa and released the next morning utilizing a soft release box and artificial lek technique, which had been successfully used in Kansas to reintroduce sharptail grouse (Rodgers 1987). A total of 254 prairie chickens were translocated to the Ringgold Wildlife Area from Kansas during 1987, 1988, and 1989 (Table 1).

By the spring of 1988, leks had been established at the release site and a site 15 km south in Missouri. The Missouri site was on the Dunn Ranch, a cattle ranch operated by Forrest and Maury Meadows of Bethany, Missouri. The ranch included about 500 ha of well- managed native prairie pasture in addition to several hundred hectares of cool season pasture. This ranch contained a major lek before the disappearance of prairie chickens in the 1960's. The lek established in 1988 was on the same site as the historic lek, and the birds using it

were verified as Iowa release birds by the bands on their legs (Maury Meadows, *pers. comm.*).

During 1990 and 1991 reproductive conditions for gallinaceous birds were poor in this area; however, brood sightings were made each year. By 1991, prairie chickens appeared to be firmly established on Dunn Ranch, but only one lek of six males could be located in Iowa that year. The success of the reintroduction of prairie chickens to the Dunn Ranch was the bright spot of the project thus far. It was evident that reintroductions in this region could succeed.

Between 1992 and 1994, an agreement with KDWP once again allowed DNR crews to trap and translocate 100 prairie chickens a year. Instead of releasing all of the birds at one site, it was decided to release significant numbers on large grassland tracts in the region, while releasing a smaller number at the original Ringgold Wildlife Area. Birds were translocated to two new sites in 1992, Mount Ayr and Kellerton, respectively 28 and 24 km north of Ringgold (Table 1). Sites continued to shift in subsequent years and the Orient site (Adair County) was added in 1993. All of the sites contained high quality grasslands and open landscapes. Predominant land use at all three sites was a mixture of pasture, hay, and CRP.

A total of 304 Prairie-chickens were released in this three-year period (Table 1).

No additional stockings were anticipated following releases in 1994. However in 2001, South Dakota Game Fish and Parks (SDGFP) employees incidentally trapped three prairie chickens and offered them to DNR. One male and two female chickens were released at the Kellerton lek in April 2001. This additional release results in a total of 561 prairie chickens translocated to Iowa since 1987.

The Missouri Department of Conservation (MDC) were also reintroducing prairie chickens in north central Missouri from 1993 to 2000. Approximately 100 birds were released each year through 1997 and again in 2000. They have released birds at eight sites located 60 to 100 km southeast of the Ringgold Wildlife Area and 10 to 40 km south of the Iowa border (Larry Mechlin, MDC, *pers. comm.*). Some of these birds were spotted in Iowa over the years.

In 2012, the Iowa Department of Natural Resources (Iowa DNR) developed a 30-year Greater Prairie-chicken Management Plan (Iowa DNR 2013) for the state which included plans to translocate birds from Nebraska as well as extensive habitat restoration goals focused in a priority Landscape. The goals established by the plan were a population in the Grand River Grasslands(GRG) landscape (Iowa and Missouri combined) of 800 birds, the establishment of three core protected areas of at least 2000 acres within a grassland matrix of 10,000-20,000 acres (focal areas), and the addition of 500-1,000 acres of permanently protected grassland in between these focal areas.

As a start, from 2012 to 2015, another 328 birds, half male and half female, were trapped in Nebraska and released in the Grand River Grasslands Landscape (Figure 1). The trapped birds were split in 2013- 2015 with roughly 60% of the birds being released near Kellerton, IA and 40% released at Dunn Ranch (TNC) in Harrison County, MO. The birds were documented moving between Dunn Ranch and Kellerton using transmitters.

In 2016 and 2017, the Missouri Department of Conservation extended the trapping and translocation project, successfully releasing 195 more birds from Nebraska across the two years. The ratio of released birds was reversed with 40% of the birds (50/50 male/female split) in IA at Kellerton WA and 60% in MO at Dunn Ranch. This cooperative work between Iowa DNR, Missouri Department of Conservation and The Nature Conservancy all took place in the roughly 140,000 acre Grand River Grasslands focal area that straddles the state line (Figure 1).

Table 1 Dates, numbers, and locations of greater prairie chicken releases in Iowa, 1980-2015.

Gamma (Γ) = male, Epsilon (E) = female. * KFGC = Kansas fish and Game Commission, KDWP = Kansas Department of Wildlife and Parks, SDGFP = South Dakota Game Fish and Parks Department, DNR = Iowa Department of Natural Resources, NGP = Nebraska Game and Parks, MDC = Missouri Department of Conservation. [1-5] Release sites indicated on county map

Release Date	No. Released	Source*	Release Location
February 1980	29Γ, 24E	KFGC	Loess Hills Wildlife Area, Monona Co.
April 1982	31Γ, 18E	KFGC	Loess Hills Wildlife Area, Monona Co.
April 1987	20Γ, 9E	KFGC	Ringgold Wildlife Area, Ringgold Co.
April 1988	48Γ, 75E	KFGC	Ringgold Wildlife Area, Ringgold Co.
April 1989	40Γ, 62E	KFGC	Ringgold Wildlife Area, Ringgold Co.
April 1992	18Γ, 21E	KDWP (DNR trapping)	Mount Ayr, Ringgold Co., Price Twp., Sec. 13
April 1992	31Γ, 20E	KDWP (DNR trapping)	Kellerton, Ringgold Co., Athens Twp., Sec. 8
April 1992	9Γ, 9E	KDWP (DNR trapping)	Ringgold Wildlife Area, Ringgold Co., Lotts Creek Twp., Sec. 24
April 1993	13Γ, 33E	KDWP (DNR trapping)	Kellerton, Ringgold Co., Athens Twp., Sec. 8
April 1993	24Γ, 24E	KDWP (DNR trapping)	Orient, Adair Co., Lee Twp., Sec. 36
April 1994	10Γ, 17E	KDWP (DNR trapping)	Kellerton, Ringgold Co., Athens Twp., Sec. 8
April 1994	31Γ, 34E	KDWP (DNR trapping)	Orient, Adair Co., Lee Twp., Sec. 36
April 2001	1Γ, 2E	SDGFP	Kellerton, Ringgold Co., Athens Twp., Sec. 16
April, 2012	12Γ, 8E	NGP (DNR Trapping)	Kellerton, Ringgold Co., Athens Twp., Sec. 16
April, 2012	10Γ, 17E	NGP (DNR Trapping)	Kellerton, Ringgold Co., Athens TWP., Sec. 6
April 2013	16Γ, 10E	NGP (DNR Trapping)	Kellerton, Ringgold Co., Athens TWP., Sec. 16
April 2013	5Γ, 9E	NGP (DNR Trapping)	Kellerton, Ringgold Co., Athens TWP., Sec. 6
April 2013	17Γ, 16E	NGP (DNR Trapping)	Dunn Ranch, Harrison Co., Missouri
April 2014	26Γ, 31E	NGP (DNR Trapping)	Kellerton, Ringgold Co., Athens TWP., Sec. 16
April 2014	25Γ, 20E	NGP (DNR Trapping)	Dunn Ranch, Harrison Co., Missouri
April 2014	6Γ, 1E	NGP (DNR Trapping)	Kellerton, Ringgold Co., Athens TWP., Sec. 6
April 2015	13Γ, 25E	NGP (DNR Trapping)	Kellerton, Ringgold Co.,Athens TWP., Sec. 16
April 2015	13Γ, 5E	NGP (DNR Trapping)	Kellerton, Ringgold Co., Athens TWP., Sec. 6
April 2015	4Γ	NGP (DNR Trapping)	Kellerton, Ringgold Co., Monroe TWP., Sec. 1
April 2015	19Γ, 20E	NGP (DNR Trapping)	Dunn Ranch, Harrison Co., Missouri
April 2016	20Γ, 20E	NGP (MDC Trapping)	Kellerton, Ringgold Co., Athens TWP., Sec. 16
April 2016	29Γ, 30E	NGP (MDC Trapping)	Dunn Ranch, Harrison Co., Missouri
April 2017	19Γ, 17E	NGP (MDC Trapping)	Kellerton, Ringgold Co., Athens TWP., Sec. 16
April 2017	28Γ, 33E	NGP (MDC Trapping)	Dunn Ranch, Harrison Co., Missouri

During the 2012-2015 translocation of birds, a research project was initiated primarily to examine Prairie-chicken habitat usage. Part of the reason GPC responded so dramatically to changes in the Iowa landscape is their requirement of a very large, mostly intact grassland landscape. The acres of grassland required to support a self-sustaining population of GPC ranges from 4,000 acres to 225,000 acres (Svedarsky et al. 2003, Vodehnal and Haufler 2008). Within this large landscape distinct differences in grassland vegetation structure are required for four life stages: mating, nesting, brood-rearing and wintering. The data collected confirmed that the only area of Iowa that can feasibly meet these demanding habitat requirements is southwestern Iowa, specifically, Ringgold, Decatur and surrounding counties (Vogel 2016). The habitat model built has also helped

with structuring bird surveys and prioritizing management to meet the goals of the Management Plan (Iowa DNR 2013).

In order to monitor progress in implementing the Prairie-chicken Plan (Iowa DNR 2013), the Iowa DNR and Missouri Department of Conservation (MDC) perform annual surveys during the GPC breeding season when birds gather on leks for male display and mating. In addition, members of the Prairie-chicken Management Plan committee meet annually to review the plan and summarize accomplishments in the year past and establish goals for the year to come.

This report will summarize the results of the 2023 monitoring surveys to provide a snapshot of the current status of prairie-chickens in Iowa.

STUDY AREA

The central focus of GPC conservation efforts is the Grand River Grasslands Landscape which encompasses 156,744 acres and includes area in Ringgold County, Iowa and Harrison County, MO (Figure 1). In Iowa, the GRG contains two areas of state-owned land that serve as core conservation areas for GPC; Kellerton Wildlife Management Area (WMA) and Ringgold WMA. Kellerton WMA is a little over 2,000 acres of mostly grass (90%) and Ringgold WMA is 2,480 acres but only roughly 1,150 acres of this on the east side is potential GPC habitat. In Missouri, Dunn Ranch (managed by The Nature Conservancy) and Pawnee Prairie (managed by MDC) total over 4,300 acres of protected habitat, 95% of which is grassland.

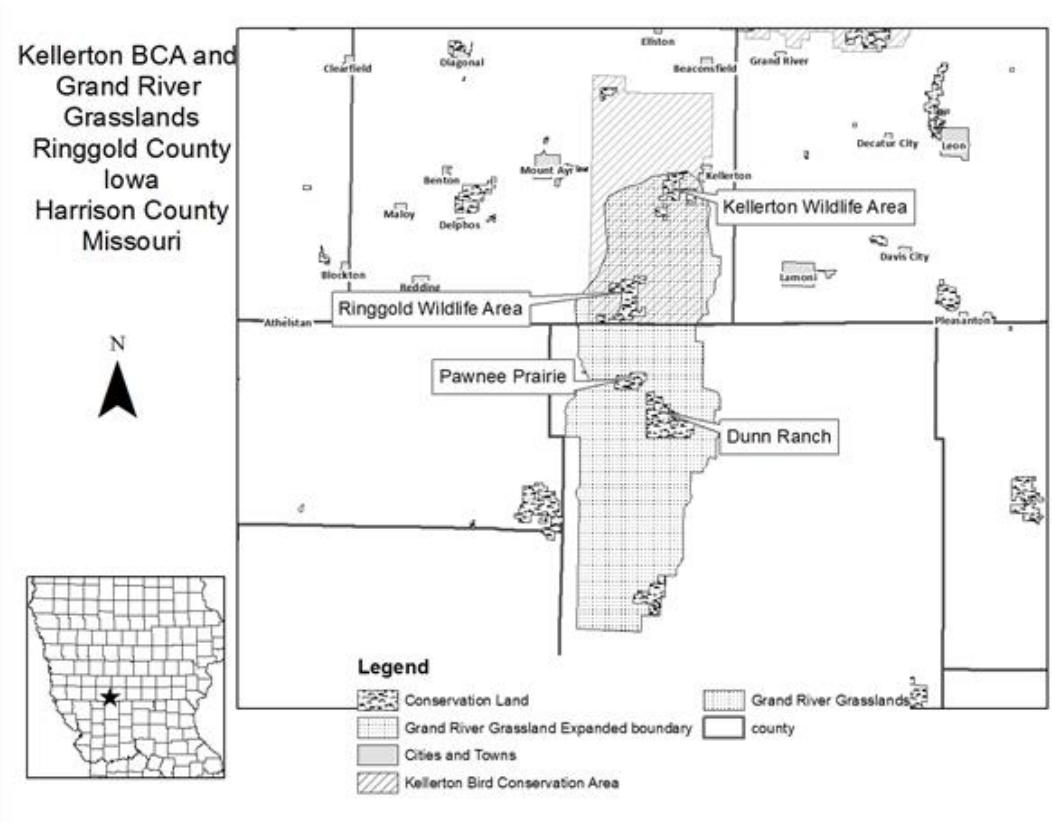
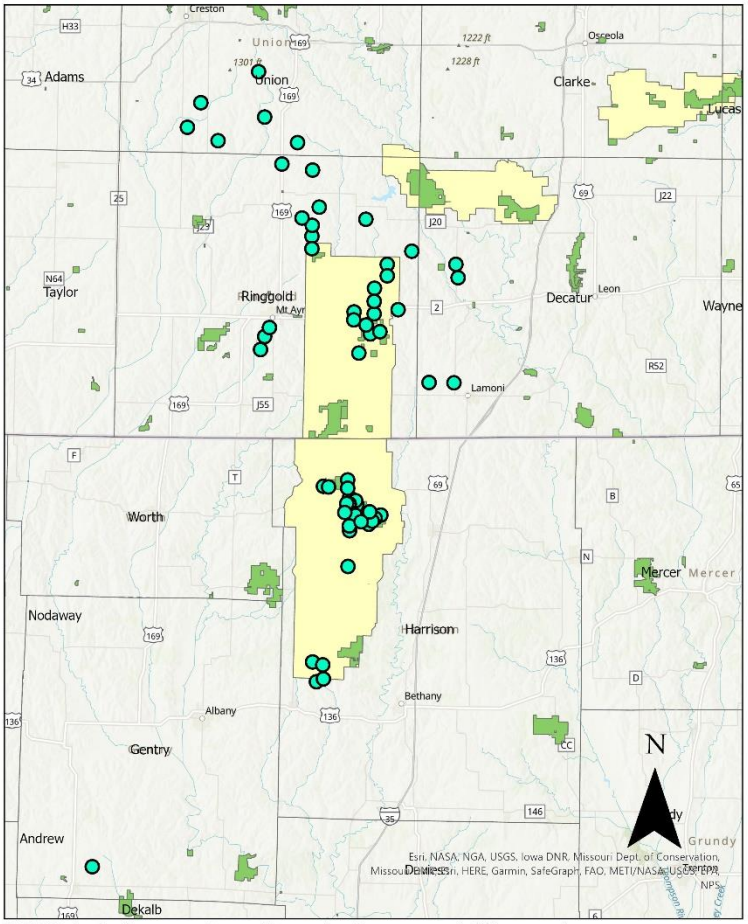


Figure 1. Grand River Grassland Landscape in Iowa and Missouri

Lek surveys in Iowa and Missouri expand outside of the GRG area a bit, to survey areas where active leks have been discovered beyond the boundary (Figure 2).



2023 Lek Survey Locations in Iowa and Missouri

Figure 2. GPC Lek Survey locations in Iowa and Missouri. Yellow areas are designated conservation landscapes and green areas are conservation land.

METHODS

In 2023, greater prairie chickens in Iowa were surveyed using several different methods. A traditional, route-based surveys of leks, a blitz-style survey with a more intense concentrated count and a winter flock survey were all employed to get an idea of numbers. Excepting the winter survey, these counts were also conducted in southern half of the GRG in Missouri.

Lek Surveys

Sixty-one sites were surveyed for GPC activity in Harrison and Gentry County, MO and Ringgold, Decatur and Union County, IA (Figure 2). Thirty-four of these sites are in Iowa. These survey sites represent current and historic GPC lek locations with the addition of a handful of randomly selected sites in good habitat. A handful of sites, which no longer have adequate habitat, were checked once for continued unsuitability but the rest of the sites were surveyed at least twice between March 20 and April 20. The blitz-style survey, which involved many staff all surveying the most suitable lek locations for a longer period, took place on April 6.

Surveys are conducted from the road between sunrise and two hours post sunrise. For route surveys, on clear calm mornings, each surveyor covers 10-12 sites, listening and visually scanning the area around each site for three minutes. Blitz surveys are done on a preset date and 20 minutes is spent at a subset of sites, looking and listening. If GPC are detected either by auditory or visual means, a count of the number of birds is recorded. In cases of an auditory only detection, the count may be an estimate.

The goal of this surveys is to establish occupancy of leks, particularly across the breeding season and to identify new active lek sites. The blitz survey is done to get a snapshot census on one morning, with time to detect leks that are variably active. The count on those mornings is usually the highest for the survey.

Winter Flock Survey

The winter flock survey is conducted in the months of January and February after a snowfall. Pre-determined routes are driven in a 6 km radius around three existing lek locations: Kellerton, Tingley and Lamoni. Any prairie-chickens seen are mapped and counted and a note is made of the landcover they are using. In 2023, one survey was conducted in the Kellerton area.

RESULTS

A total of 61 sites were surveyed across the GRG landscape (IA and MO) during both route lek and blitz lek surveys. Seven of those sites had prairie chicken activity in 2023. However, one of these only had one bird seen or heard and at least one is a satellite lek of another. Three of these active sites were in Iowa and four were in Missouri. Missouri counted a maximum of 10 birds across all sites and Iowa recorded a maximum of 22. Only one lek site had a maximum of 5 or more displaying males which is generally considered the minimum number needed for a lek to persist. In Iowa, this translates to only 3% of the surveyed sites being a stable, active lek.

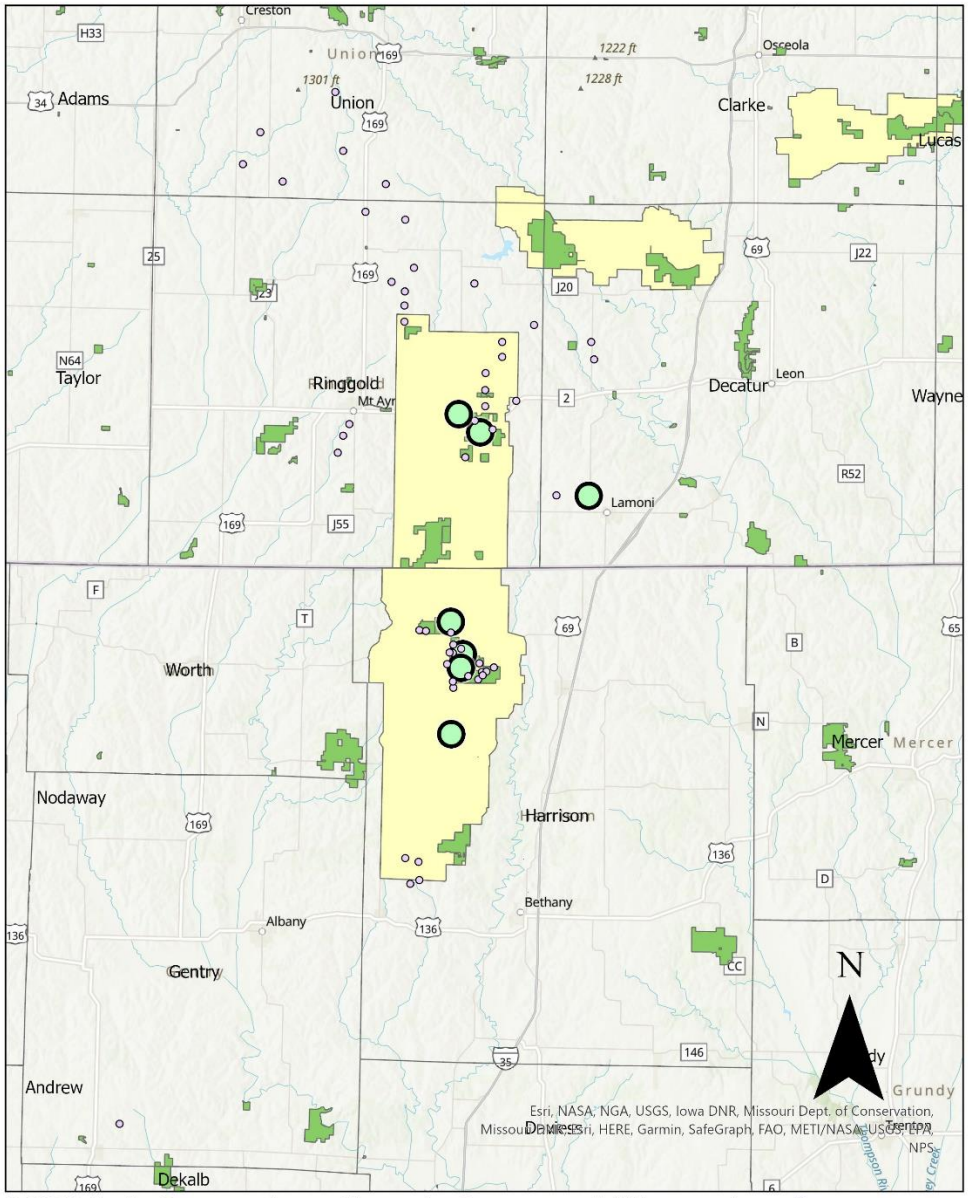
On the surveys, the maximum one time count of birds on the largest lek site (Kellerton BCA) was 17 birds. The total of the maximum number counted across the entire landscape and surveys (so double counting birds is a possibility) was 32 birds, 26 of which were males and 5 hens and 1 unknown (Table 2, Figure 3). The highest total count across sites in one morning was during the blitz survey. In Iowa alone, a total of 22 birds were counted, 16 males, 5 hens and one unknown.

The winter flock survey was conducted once around Kellerton January 23, 2023. One flock of 17 birds was seen on this route.

Table 2. Summary of combined survey data (both blitz and traditional lek) from 2015-2023 in Missouri and Iowa.

Year	Num. of Leks- All	Num. of Leks ->5	Max Chickens Counted (on a single Morning)	Average Birds per Active Lek	**Total Bird Estimate**
COMBINED					
2015	11	5	86	7.82	**186**
2016	13	6	101	7.77	**176**
2017	14	7	103	7.36	**200**
2018	13	5	82	6.31	**156**
2019	8	3	54	6.75	**108**
2020	8	4	60	7.50	**118**

Year	Num. of Leks- All	Num. of Leks ->5	Max Chickens Counted (on a single Morning)	Average Birds per Active Lek	**Total Bird Estimate**
2021	9	NA	40	4.44	**76**
2022	5	1	20	4.00	??
2023	7	1	32	4.57	52
IOWA ONLY					
2015	5	3	46	9.20	
2016	6	3	54	9.00	
2017	5	3	39	7.80	
2018	7	2	49	7.00	
2019	3	2	31	10.33	
2020	4	2	25	6.25	
2021	3	1	13	4.33	
2022	3	1	20	6.67	
2023	3	1	22	7.33	
MO ONLY					
2015	6	2	40	6.67	
2016	7	3	47	6.71	
2017	9	4	64	7.11	
2018	6	3	33	5.50	
2019	5	1	23	4.60	
2020	4	2	35	8.75	
2021	6	NA	27	4.50	
2022	2	0	1	0.50	
2023	4	0	10	2.50	



2023 Lek Survey Locations in Iowa and Missouri and Greater Prairie-chicken Detections

Figure 3. Results in Iowa and Missouri of both the Route-based and Blitz-based surveys. Smalls dots represent all surveyed locations and large dots are where chickens were detected.

DISCUSSION

This survey season could be interpreted as a recovery from the instability of 2022, particularly in MO. Overall numbers were slightly higher and the chickens were booming again at some traditional lek sites in Missouri.

Iowa appears to have about 16 males around the primary breeding area. The birds reported from MO were not identified as male or female but assuming all 10 reported were male this would mean a rough population estimate of 52 birds is possible for the entire GRG population. We know that at a minimum there are 32 birds in the population.

The conclusion is that while the population remains very small it is capable of maintaining or even slightly increasing in number. The count during the blitz survey was good despite it being a windy morning and those numbers were support by other counts during the route lek surveys and public events such as the prairie chicken day.

Overall, since the end of the translocation efforts in 2017, the GPC population in the GRG has showed a decline, steep in the two years following and then more gently in the last four years though there are some signs of stability. Five years from the efforts to restore the population the numbers are only about 20-30% of the initial counts. Population numbers have shown the ability to rebound slightly (2020, 2022 and 2023) but no significant increases indicating a truly growing population have been recorded. It's important to note that while the goal of these surveys is a census, there are possibly unidentified leks in the landscape. Resources do not exist to employ the needed amount an effort to adequately census this rare species despite their visible breeding behavior.

MANAGEMENT IMPLICATIONS

Work should continue on conservation lands to preserve 30% of an area for nesting, and 30% for brood-rearing. Fields should be monitored to keep leaf litter below 25% and vegetation height around 12-14" for nesting habitat. Brood rearing habitat should also have an open understory and a high diversity of flowering plants to attract insects. An examination could be done in protected areas to identify possible features that serve as habitat for predators of chickens and their nests (brushy fencerows or draws, cattle or vehicle trails) and eliminating these features if possible.

On private lands, landowners should be assisted with converting their land to more favorable habitat for GPC either by improving grazing practices or creating habitat directly. Encouraging disturbance of CRP acres in rotation if possible, particularly within 5 km of active lek sites, would be ideal for supporting Prairie-chickens. Land protection efforts would also benefit this species.

ACKNOWLEDGMENTS

The restoration and conservation of Greater Prairie-chickens has been a true team effort. All of the habitat management and much of the data collection is conducted by Iowa DNR and MDC management and private lands staff, staff of The Nature Conservancy and Pheasants Forever. A huge thank you to Chad Paup (DNR), Josh Rusk (DNR), Andi Rittel (MDC), Kent Wamsley (TNC) and many more for all the work that they accomplish for chickens. Todd Bogenschutz, Upland Game Biologist with Iowa DNR also provides guidance on management and data collection, as well as helping conduct surveys. We'd also like to recognize the Iowa Natural Heritage Foundation for their contributions to land protection in the Grand River Grasslands. Thank you.

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