QUAIL, PHEASANT, & TURKEY BROOD SURVEY - 2020

Performance Report

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QUAIL, PHEASANT, AND TURKEY BROOD SURVEY RESULTS – 2020

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INTRODUCTION

The Kansas Department of Wildlife, Parks, and Tourism (KDWPT) collects reproductive data for quail (*Colinus virginianus and Callipepla squamata*), ring-necked pheasant (*Phasianus colchicus*), and wild turkey (*Meleagris gallopavo*) statewide. Northern bobwhites provide nearly all the quail data; however, scaled quail can be found in extreme southwestern Kansas and observations are included in quail estimates (< 1% data). Summer brood surveys were initiated in 1986 focusing on pheasant and quail. Turkey data were not collected and reported until 2006. These summer brood surveys are used to forecast upcoming hunting seasons and to provide consistent monitoring of these important game species. Prairie chickens (greater and lesser; *Tympanuchus* spp.), though recorded opportunistically, cannot be easily assessed using the same methods because they generally do not associate with roads like quail, pheasants, and turkeys.

METHODS

Dates for the 2020 summer brood survey were from July 19 – August 29 (6 weeks). Survey protocol and methodology changed in 2012 to establish permanent brood routes averaging 35 miles (29-49 miles) in 74 randomly selected counties in Kansas (urban counties were removed from the original selection pool). Since the original selection, routes have been added to fill voids where staff has allowed, bringr the current number of routes to 77. Routes were positioned within each county to be representative of the average land cover (rangeland, crop, CRP, etc.) for that county. If public land (e.g., Wildlife Areas) occurred in the county, we attempted to place the route through or adjacent to the property. Routes were sampled 4 times beginning at sunrise, driving the route at a maximum of 25 mph until the entire route was sampled. The 6-week sampling period was separated into 2, 3-week periods where at least 2 samples occurred in each 3-week period. Additionally, observers were asked to have at least one sample completed on a morning with wet vegetation (dew or after a rain the evening/night before). This sampling protocol provides a more stringent standardization of collected data. Indices are reported on a per mile basis (e.g., pheasant/mile, etc.). If a quail or pheasant brood was detected, observers attempted to flush the brood to get the most accurate count of chicks possible. Age of chicks was visually estimated based on aging criteria and recorded in weeks.

Historic brood surveys (1986 – 2011) were collected by KDPWT personnel on an opportunistic basis as field personnel spent days in the field (out of the office and off paved roads). Counts were standardized by birds/observer-day and hand recorded. In 2012 we began collecting data with the Cybertracker (http://cybertracker.org/) program. This is a Windows™ Access database freeware which allows customized digital data capture and spatial referencing for all data. Data transfer occurs over the internet (FTP site), eliminating the need for paper copies and manual data entry.

This new protocol improved on historic data collection by:

1. Matching the survey time period with the time when game bird species are most active, during early morning periods, improving detection probabilities, while the old survey data was collected opportunistically throughout the day.
2. Standardizing the survey effort
3. Creating replication along a permanent route, resulting in more spatially comparable data for annual comparisons.
4. Providing a spatial reference for each count, allowing spatial analysis of the data.
5. Eliminates the need for manual data entry and associated errors.

Data Analysis

The indices to upland game bird densities were calculated as the mean number of birds observed per mile for each species along routes. Given that observations are recorded on permanently established routes, samples are not independent and thus a paired-sample t-test is used to make inter-annual comparisons. A two-tailed test with an alpha level of 0.10 was used to identify significant differences between years (current vs. previous year). Data was standardized by reporting counts per mile (e.g., pheasants/mile) for routes and regions. Ratio data (chicks/hen and chicks/brood) can help indicate population productivity, but sample sizes per route are generally limited; as such, ratio data are pooled across each Small Game Region (Figure 1). In considering the brood to hen ratios, broods that are observed without hens are removed to remove bias from the % of hens that successfully hatched broods. While many factors influence these ratios, the broods/hen index is generally an indicator of nest success, while chicks/brood is an indicator of brood survival after hatching. Quail ratio data was reported per adult (male and female) because males also will incubate nests and brood young. Turkey Management Regions (Figure 2) differ from Small Game Regions and data were reported accordingly.

Spatial comparisons were made using an ARC GIS Inverse Weighted Distance technique, which interpolates data across a landscape between known points. Inverse Distance Weighting was used per species by assigning the route-specific index to the centroid of the county sampled. This provides a unique map showing probable densities which are spatially relative. This provides a statewide estimate of upland bird densities but does not take into account localized populations and habitats.

RESULTS

Participants sampled 76 of 77 established routes between July 19 and August 31. The Cheyenne county route was not able to be completed this year due to road conditions following flash flooding. There were 5 of the remaining routes that were only completed 3 times during the survey period (Table1). Results are summarized by Kansas Small Game Regions (Figure 1) or Turkey Regions accordingly (Figure 2).

Pheasants

For 2020, there was a significant decrease in the statewide roadside index of pheasants (-23%) compared to 2019. A statistically significant decrease occurred in the Smoky Hills region (-34%, table 2). Pheasants per mile was highest in the Northern High Plains, with the highest index in Graham County (Table 2). Similar to last year, few pheasants were detected in the Flint Hills or Glaciated plains regions. Most notably, pheasants were not detected on the Marshall County route where they are typically observed in low densities. No pheasants were detected in the Osage Cuestas of southeastern Kansas.

Statewide production indices were all similar to 2019 (Table 3). Production indices were generally lowest in the Southern high plains region this year. Production indices in the remaining major pheasant regions remained good and were similar among them (Table 3). The Flint Hills region had the greatest production values but has few overall brood observations annually and are highly influenced by a few observations. Pheasant hatch peaked statewide in early to mid-June with nearly 40% of broods estimated hatch date in the first 2 weeks of June (Figure 3). Pheasant indices were generally highest in the Northern high plains and into the western portions of the Smoky Hills regions (Figure 4).

Quail

There was a non-significant increase in the statewide roadside index of quail (+5%) compared to 2019. A statistically significant increase occurred in the Glaciated Plains (+75%, Table 4). No other statistically significant regional changes were observed this year, however apparent large changes were recorded in the Osage Cuestas (-42%) and South Central prairies (+28%). While some regional patterns emerge, many regional changes were obscured by large offsetting changes on routes within the regions. Quail densities were greatest in the Smoky Hills followed by South-Central Prairie Region, with the highest index recorded in Rooks County (Table 4). Scaled quail were recorded on 2 routes this year in the Southern High Plains, with the highest number recorded on the Hamilton County route.

Statewide brood size and adults with broods remained similar to last year, but total chicks/adult declined, largely due to few overall chicks in the Osage cuestas region. (Table 5). Production indices were generally highest in the Smoky Hills where highest overall brood detections were as well. However, brood size was high across most regions. The greatest improvement in production indices occurred in the glaciated plains this year after being depressed during the past several years (Table 5). Quail hatch peaked in late June which coincided with widespread precipitation potential improving survival of birds hatching in this time frame. (Figure 5). The highest estimated quail densities are generally in the Smoky Hills (Figure 6).

Turkey

There was no change in the statewide roadside index of turkey (0%) compared to 2019. There was no statistically significant changes in any region this year (Table 6). The Northcentral region had the highest regional turkey index this year followed closely by the Northeast. Reno county had the highest roadside index to turkeys this year. Despite an apparent decrease in the southwest region, turkeys were observed on 4 routes in the region this year which is better then normal. Trego County route recording the highest relative roadside estimate this year (Table 6).

The statewide turkey production indices stabilized this year, however overall production has remained low and turkey populations continue to struggle (Table 7). The Northwest region had the highest production indices however with lowest overall turkey observations. After very poor production last year in the northcentral region, production indices increased this year, but remained relatively low (table 7). Turkey hatch peaked between mid-May (Figure 7). The highest turkey densities will generally be found in northeastern Kansas (Figure 8).

DISCUSSION

Kansas entered the fall of 2019 extremely wet. While this heavy precipitation throughout the breeding season had hampered 2019 production, it produced excellent cover for overwintering birds and abundant residual nesting vegetation heading into the spring of 2020. With a relatively mild winter there were no significant overwinter impacts recorded for either pheasant or quail. While residual cover from 2019 was in good condition the spring of 2020 remained relatively dry throughout most of the state through May. In Southwest Kansas dry conditions held on longer pushing the drought monitor for the area into extreme drought conditions. As June began precipitation began across much of the northern and central portion of the state. Timing of these rains were critical and greatly improved habitat for the hatching chicks. However, the rains were erratic creating inconsistent habitat across the region. Late summer rainfall was heavy and widespread greatly increasing the amount of late season cover and creating a lot of annual weed growth with pastures and crop fields. The heavy precipitation maintained ample brood cover for birds through the late summer and heavy renesting cover. Heavy summer precipitation also benefited the fall crops and should provide lots of good winter cover this year.

Pheasants are an important resource to Kansas. Within the last decade, estimated annual harvests have been at both extreme highs and lows. Despite a slightly reduced roadside index in 2019 the harvest rates increased to just above average. With heavy residual nesting cover and June rainfall there was a lot of optimism that roadside surveys would show increases across much of the range. However, the statewide index of pheasants showed a significant decrease. Several reports from field staff and residents had indicated pheasant observations were generally up in some regions. The disparity between these opportunistic observations and the survey results suggests that the patchy rainfall patterns contributed to inconsistent production across the area. While the overall densities are expected to be lower hunters may find areas that will provide much improved opportunity. The Northern High Plains had the highest regional estimate of pheasants in 2020 remaining similar to 2019. The roadside index for the Smoky Hills region continued to trend down (Figure 4).

Kansas continues to have one of the strongest quail populations in the country. Recent years have seen improved densities across many of the Great Plains states, including Kansas. This initial boom was caused by habitat changes associated with recovery from the extreme and expansive drought. While the benefits of these habitat changes have largely waned and some states have seen populations decline again, Kansas has largely maintained these higher densities thus far. Spring whistle surveys saw a significant increase this spring driven by large improvements in the north and south-central regions of the state. The improvements in the Smoky Hills was expected after increased production last summer in the region was followed by a mild winter, however the increase in the South-Central Prairies was a welcomed surprise. With the increasing to stable

trends across the state spring surveys, remained at or above the long-term averages for all regions except the Glaciated Plains. The precipitation that we received in the summer months was soon enough that quail were able to take advantage of it and maintain relatively good production indices and maintain a stable statewide roadside index this year. The only significant regional change occurred in the Glaciated Plains that had a much-needed increase. However, there was also an apparent decline in the Osage Cuestas which dropped the roadside index to new lows for the region. The remaining regions remained similar or trended back up this year with the Smoky Hills remaining very strong with the highest regional roadside estimate again this year (Figure 6). Based on roadside survey estimates we expect hunters to find a similar density to the last few years and have good hunter success.

Roadside estimates for turkeys remained the same this year, with no significant change in any of the major turkey regions. While stability is welcomed after several years of decline in this index, the current level is the lowest we have recorded since beginning this survey in 2012. The Northcentral saw some apparent improvement which was offset by declines in the Northeast. The state-wide production indices also remained stable remaining very low, particularly in the measure of chicks per hen. This continues the trend that we have seen in recent years with our turkeys struggling to recruit young into the population. Given the earlier nesting chronology of turkeys and the dry weather we had through the spring likely had a bigger impact on their production then it did on our other game birds. Turkey densities in the Northwest region made an apparent increase however remain extremely limited with only two routes recording birds. This is largely attributed to the limited roosting and associated nesting habitat in the region. The Northcentral region had the highest roadside estimate this year (Figure 8).

Table 1. Upland game bird brood routes and observers in Kansas, 2020.

Route	Observer	Replicates	Route	Observer	Replicates
Allen	Justin Harbit	4	Marion	Jeff Rue	4
Atchison	Tim Urban	4	Marshall	Megan Smith	3
Barber	Kyle Austin	4	Meade	Aaron Andrews	4
Barton	Jeff Prendergast	4	Miami	Andy Friesen	4
Bourbon	Justin Harbit	4	Mitchell	Toby Marlier	4
Brown	Tyler Warner	4	Montgomery	Darin Porter	4
Butler	Tyler Burt	4	Morris	Brent Konen	4
Cherokee	David Jenkins	3	Morton	Kraig Schultz	4
Cheyenne	Abby Athen	NA	Neosho	Logan Martin	4
Cloud	Matt Farmer	4	Ness	Andy Nelson	4
Coffey	Alex Lyon	4	Norton	Luke Winge	4
Comanche	Matt Hanvey	4	Osage	Alex Lyon	4
Cowley	Kurt Grimm	4	Osborne	Chris Lecuyer	4
Decatur	Daniel Howard	4	Pawnee	Kevin Wood	4
Dickinson	Clint Thornton	4	Phillips	Eric Wiens	4
Doniphan	Jesse Morland	4	Pottawatomie	Corey Alderson	4
Elk	Viki Cikanek	4	Pratt	Jake George	4
Ellis	Megan Rohweder	4	Rawlins	Kevin Klag	4
Finney	Scott Schmidt	4	Reno	Kyle McDonald	4
Franklin	Ryan Tewllman	4	Republic	Rob Unruh	4
Geary	Clint Thornton	4	Rice	Steve Adams	4
Gove	Lynn Davigon	4	Rooks	Joe Lambert	4
Graham	Jake Brooke	4	Rush	Jason Wagner	4
Gray	Manuel Torres	4	Russell	James Svaty	4
Greeley	Kurt Meier	4	Saline	Pat Riese	4
Greenwood	Kent Fricke	4	Scott	Brent Clark	4
Hamilton	Kurt Meier	4	Seward	Jason Vajnar	4
Harvey	Charlie Cope	4	Sheridan	Kevin Klag	4
Haskell	Kelly Lazar	4	Sherman	Abby Athen	4
Hodgeman	Dan Haneke	4	Smith	Kirk Andrews	4
Jackson	Tyler Warner	4	Stafford	Charlie Swank	4
Jefferson	Andrew Page	4	Stanton	Kraig Schultz	4
Jewell	Brandon Tritch	4	Stevens	Kraig Schultz	4
Kearney	Zerick Kuecker	4	Thomas	Jared Ireland	4
Kingman	Troy Smith	4	Trego	Kent Hensley	4
Kiowa	Logan Shoup	4	Wabaunsee	Brad Rueschhoff	4
Labette	Rob Roggin	4	Wallace	Abby Athen	4
Lane	Kevin Lhman	4	Wilson	Bob Funke	4
Logan	Leonard Hopper	4			

Table 2. Annual regional changes in mean pheasants per mile (P/M), 2020.

Route	2019 P/M	2020 P/M	% Δ
	Flint Hills		
Butler	0.00	0.00	0
Cowley	NA	0.00	NA
Dickinson	0.09	0.06	-33
Elk	0.00	0.00	0
Geary	0.00	0.00	0
Greenwood	0.00	0.00	0
Marion	0.01	0.01	0
Morris	0.00	0.00	0
Pottawatomie	0.00	0.00	0
Wabaunsee	0.00	0.00	0
Region	**0.01**	**0.01**	**2**
	Glaciated Plains		
Atchison	0.00	0.01	NE
Brown	0.00	0.00	0
Doniphan	0.00	0.00	0
Jackson	0.00	0.00	0
Jefferson	0.00	0.00	0
Marshall	0.02	0.00	-100
Region	**0.00**	**0.00**	**1**
	Smoky Hills		
Barton	0.26	0.28	11
Cloud	0.23	0.05	-78
Ellis	0.21	0.19	-8
Hodgeman	0.72	0.33	-55
Jewell	0.11	0.26	140
Mitchell	0.04	0.26	600
Ness	0.12	0.15	25
Osborne	0.11	0.15	29
Phillips	0.10	0.04	-57
Republic	0.02	0.02	-25
Rice	0.31	0.36	16
Rooks	0.29	0.39	32
Rush	0.24	0.20	-15
Russell	0.18	0.09	-48
Saline	0.02	0.09	313
Smith	0.17	0.13	-22
Trego	0.36	0.16	-54
Region	**0.28**	**0.19**	**-34***

Route	2019 P/M	2020 P/M	% Δ
	Northern High Plains		
Cheyenne[a]	0.36	NA	NA
Decatur	0.68	0.34	-50
Gove	0.28	0.30	6
Graham	0.63	1.30	106
Greeley	0.53	0.28	-46
Lane	0.05	0.09	90
Logan	0.11	0.07	-40
Norton	0.49	0.21	-57
Rawlins	0.28	0.24	-13
Scott	0.23	0.35	48
Sheridan	0.08	0.22	180
Sherman	0.42	0.13	-70
Thomas	0.16	0.11	-33
Wallace	0.08	0.01	-82
Region	**0.27**	**0.28**	**5**
	South-Central Prairies		
Barber	-0.90	0.23	NE
Comanche[a]	NA	0.00	NA
Harvey	0.00	0.00	0
Kingman	0.00	0.04	0
Kiowa	0.09	0.21	150
Pawnee	0.26	0.04	-84
Pratt	0.34	0.14	-57
Reno	0.08	0.09	18
Stafford	0.06	0.13	111
Region	**0.14**	**0.10**	**-30**
	Southern High Plains		
Finney	0.07	0.14	100
Gray	0.27	0.21	-24
Hamilton	0.22	0.10	-55
Haskell	0.41	0.11	-74
Kearny	0.07	0.03	-60
Meade	0.32	0.05	-85
Morton	0.10	0.09	-7
Seward	0.24	0.51	109
Stanton	0.16	0.04	-77
Stevens	0.64	0.31	-51
Region	**0.26**	**0.16**	**-40**
Statewide	**0.19**	**0.15**	**-23***

* = Significant difference ($p < 0.1$)

**The Osage Cuestas region is outside of the pheasant range and is removed for analysis.

[a]Route was not sampled in consecutive years and wasn't included in regional or statewide comparisions

Table 3. Annual regional changes in pheasant chicks per hen (C/H), chicks per brood (C/B), and broods per hen (B/H), 2020.

Region	2019 C/H	2020C/H	%Δ	2019 C/B	2020 C/B	%Δ	2019 B/H	2020 B/H	%Δ
Flint Hills	2.00	6.00	200	6.0	6.0	0	0.33	1.00	200
Glaciated Plains	0.00	0.00	0	2.0	0.0	-100	0.00	0.00	0
Northern High Plains	5.59	5.69	2	4.5	4.7	4	0.62	0.66	6
Osage Cuestas	0.00	0.00	0	0.0	0.0	0	0.00	0.00	0
Smoky Hills	4.94	5.30	7	4.7	4.7	0	0.65	0.63	-3
South-Central Prairies	5.47	4.68	-14	5.5	4.7	-14	0.65	0.74	14
Southern High Plains	5.11	2.50	-51	3.5	2.6	-24	0.62	0.55	-11
Statewide	5.6	4.7	-16	4.6	4.3	-6	0.62	0.63	2

Table 4. Annual regional changes in mean quail per mile (Q/M), 2020.

Route	2019 Q/M	2020 Q/M	% Δ
	Flint Hills		
Butler	NA	0.07	NA
Cowley	NA	0.27	NA
Dickinson	0.31	0.29	-5
Elk	0.13	0.04	-70
Geary	0.04	0.04	0
Greenwood	0.16	0.19	22
Marion	0.13	0.17	39
Morris	0.06	0.19	225
Pottawatomie	0.11	0.02	-81
Wabaunsee	0.14	0.21	58
Region	**0.13**	**0.15**	**10**
	Glaciated Plains		
Atchison	0.02	0.03	33
Brown	0.09	0.19	117
Doniphan	0.07	0.14	92
Jackson	0.24	0.43	80
Jefferson	0.04	0.08	88
Marshall	0.13	0.16	29
Region	**0.10**	**0.17**	**75***
	Northern High Plains		
Cheyenne	0.00	NA	NA
Decatur	0.21	0.15	-25
Gove	0.00	0.09	NE
Graham	0.07	0.20	189
Greeley	0.00	0.00	0
Lane	0.20	0.00	-100
Logan	0.00	0.00	0
Norton	0.04	0.15	300
Rawlins	0.19	0.00	-100
Scott	0.01	0.02	100
Sheridan	0.00	0.00	0
Sherman	0.02	0.00	NE
Thomas	0.00	0.00	0
Wallace	0.00	0.00	0
Region	**0.06**	**0.05**	**-17**
	South-Central Prairies		
Barber	0.04	0.27	567
Comanche	NA	0.00	NA
Harvey	0.01	0.01	0
Kingman	0.15	0.06	-57
Kiowa	0.43	0.59	37
Pawnee	0.04	0.04	-7
Pratt	0.17	0.09	-46
Reno	0.24	0.12	-50
Stafford	0.14	0.39	181
Region	**0.15**	**0.20**	**28**

Route	2019 Q/M	2020 Q/M	% Δ
	Smoky Hills		
Barton	0.18	0.13	-27
Cloud	0.46	0.39	-16
Ellis	0.50	0.19	-61
Hodgeman	0.26	0.34	29
Jewell	0.21	0.25	21
Mitchell	0.36	0.25	-31
Ness	0.21	0.15	-27
Osborne	0.36	0.19	-47
Phillips	0.18	0.43	132
Republic	0.03	0.16	425
Rice	0.23	0.05	-78
Rooks	0.65	0.68	5
Rush	0.28	0.47	69
Russell	0.09	0.16	85
Saline	0.09	0.21	125
Smith	0.13	0.29	130
Trego	0.34	0.22	-35
Region	**0.27**	**0.27**	**0**
	Southern High Plains		
Finney	0.01	0.04	150
Gray	0.04	0.01	-78
Hamilton	0.33	0.31	-7
Haskell	0.00	0.01	0
Kearny	0.00	0.00	0
Meade	0.30	0.17	-44
Morton	0.03	0.06	125
Seward	0.12	0.20	69
Stanton	0.06	0.14	150
Stevens	0.26	0.26	-3
Region	**0.12**	**0.12**	**3**
	Osage Cuestas		
Allen	0.10	0.08	-27
Bourbon	0.03	0.02	-25
Cherokee	0.00	0.00	0
Coffey	0.10	0.09	-8
Franklin	0.04	0.00	-100
Labette	0.02	0.02	0
Miami	0.04	0.00	-100
Montgomery	0.08	0.05	-32
Neosho	0.19	0.01	-97
Osage	0.14	0.04	-68
Wilson	0.03	0.14	375
Region	**0.07**	**0.04**	**-42**
Statewide	**0.14**	**0.14**	**5**

*Values are significant at a $P < 0.10$.

NA = Data Not availiable

NE = Not estimable

Table 5. Annual regional changes in quail chick per adult (C/A), chicks per brood (C/B), and broods/adult, 2020.

Region	2019 C/A	2020 C/A	%Δ	2019 C/B	2020 C/B	%Δ	2019 B/A	2020 B/A	%Δ
Flint Hills	1.4	1.3	-4	8.7	7.8	-10	0.08	0.13	71
Glaciated Plains	0.8	2.3	185	8.3	8.5	4	0.05	0.15	200
Northern High Plains	3.2	1.7	-48	8.5	8.2	-4	0.14	0.07	-52
Osage Cuestas	0.6	0.2	-67	7.1	3.7	-49	0.06	0.04	-41
Smoky Hills	2.9	2.0	-32	8.8	9.3	5	0.23	0.17	-27
South-Central Prairies	3.4	1.8	-49	11.1	9.3	-16	0.10	0.14	38
Southern High Plains	2.5	1.6	-35	8.0	9.5	19	0.14	0.07	-53
Statewide	2.1	1.6	-22	8.8	8.8	-1	0.14	0.13	-4

Table 6. Annual regional changes in mean turkey per mile (T/M), 2020

Route	2019 T/M	2020 T/M	[a]% Δ	Route	2019 T/M	2020 T/M	% Δ
	Northeast				Northcentral		
Atchison	0.22	0.10	-57	Barton	0.06	0.00	-100
Brown	0.05	0.35	571	Cloud	0.11	0.21	88
Dickinson	0.00	0.13	NE	Ellis	0.13	0.00	-100
Doniphan	0.07	0.05	-28	Jewell	0.52	0.62	19
Franklin	0.26	0.17	-33	Mitchell	0.02	0.01	-33
Geary	0.08	0.28	242	Osborne	0.34	0.58	72
Jackson	0.68	0.44	-35	Phillips	0.15	0.07	-50
Jefferson	0.21	0.02	-93	Republic	0.00	0.02	NA
Marshall	0.29	0.10	-63	Rooks	0.03	0.10	240
Morris	0.15	0.03	-81	Rush	0.01	0.21	1400
Osage	0.48	0.09	-82	Russell	0.28	0.05	-81
Pottawatomie	0.24	0.14	-44	Saline	0.18	0.49	167
Wabaunsee	0.19	0.48	158	Smith	0.04	0.09	150
Region	**0.39**	**0.22**	**-42***	**Region**	**0.25**	**0.14**	**-42**
	Northwest				Southcentral		
Cheyenne	0.47	NA	NA	Barber	0.06	0.14	131
Decatur	0.11	0.00	-100	Comanche	NA	0.00	NA
Graham	0.00	0.00	0	Harvey	0.45	0.32	-29
Norton	0.09	0.00	-100	Kingman	0.06	0.04	-38
Rawlins	0.00	0.34	NE	Kiowa	0.00	0.03	0
Sheridan	0.00	0.00	0	Meade	0.00	0.00	0
Sherman	0.00	0.00	0	Pawnee	0.14	0.06	-60
Thomas	0.00	0.13	NE	Pratt	0.00	0.00	0
Region	**0.09**	**0.08**	**-7**	Reno	0.32	0.63	96
	Southwest			Rice	0.00	0.00	NE
Finney	0.00	0.00	0	Stafford	0.03	0.05	100
Gove	0.00	0.08	NE	**Region**	**0.21**	**0.11**	**-48**
Gray	0.00	0.00	0		Southeast		
Greeley	0.00	0.00	0	Allen	0.06	0.01	-89
Hamilton	0.00	0.00	0	Bourbon	0.05	0.03	-29
Haskell	0.00	0.00	0	Butler	NA	0.02	NA
Hodgeman	0.00	0.00	0	Cherokee	0.08	0.00	-100
Kearny	0.00	0.00	0	Coffey	0.00	0.21	NE
Lane	0.00	0.00	0	Cowley	NA	0.01	NA
Logan	0.00	0.00	0	Elk	0.09	0.14	57
Morton	0.00	0.00	0	Greenwood	0.10	0.21	107
Ness	0.00	0.32	NE	Labette	0.00	0.00	0
Scott	0.00	0.00	0	Marion	0.04	0.17	317
Seward	0.00	0.00	0	Miami	0.69	0.36	-48
Stanton	0.00	0.03	NE	Montgomery	0.14	0.09	-40
Stevens[a]	0.00	0.00	0	Neosho	0.04	0.00	-100
Trego	0.91	0.00	-100	Wilson	0.21	0.20	-5
Wallace	0.01	0.06	300	**Region**	**0.12**	**0.12**	**-5**
Region	**0.03**	**0.05**	**88**	**Statewide**	**0.12**	**0.12**	**0**

*Values are significant at a $P < 0.10$.

NA = Data Not Available

NE = Not estimable

Table 7. Annual regional changes in turkey poults per hen (P/H), poults per brood (P/B), and broods per hen (B/H), 2020.

Region	2019 P/H	2020 P/H	%Δ	2019 P/B	2020 P/B	%Δ	2019 B/H	2020 B/H	%Δ
Northcentral	0.3	1.0	193	4.0	3.8	-5	0.08	0.22	200
Northeast	1.9	2.2	14	5.0	6.0	20	0.32	0.34	6
Northwest	1.4	2.8	97	3.5	8.5	140	0.34	0.25	-27
Southcentral	1.7	0.6	-63	4.2	3.9	-9	0.40	0.16	-60
Southeast	0.6	0.7	19	4.5	4.9	9	0.13	0.14	9
Southwest	2.4	0.8	-66	5.4	2.8	-48	0.45	0.29	-35
Statewide	1.1	1.1	-2	4.6	4.7	3	0.23	0.22	-4

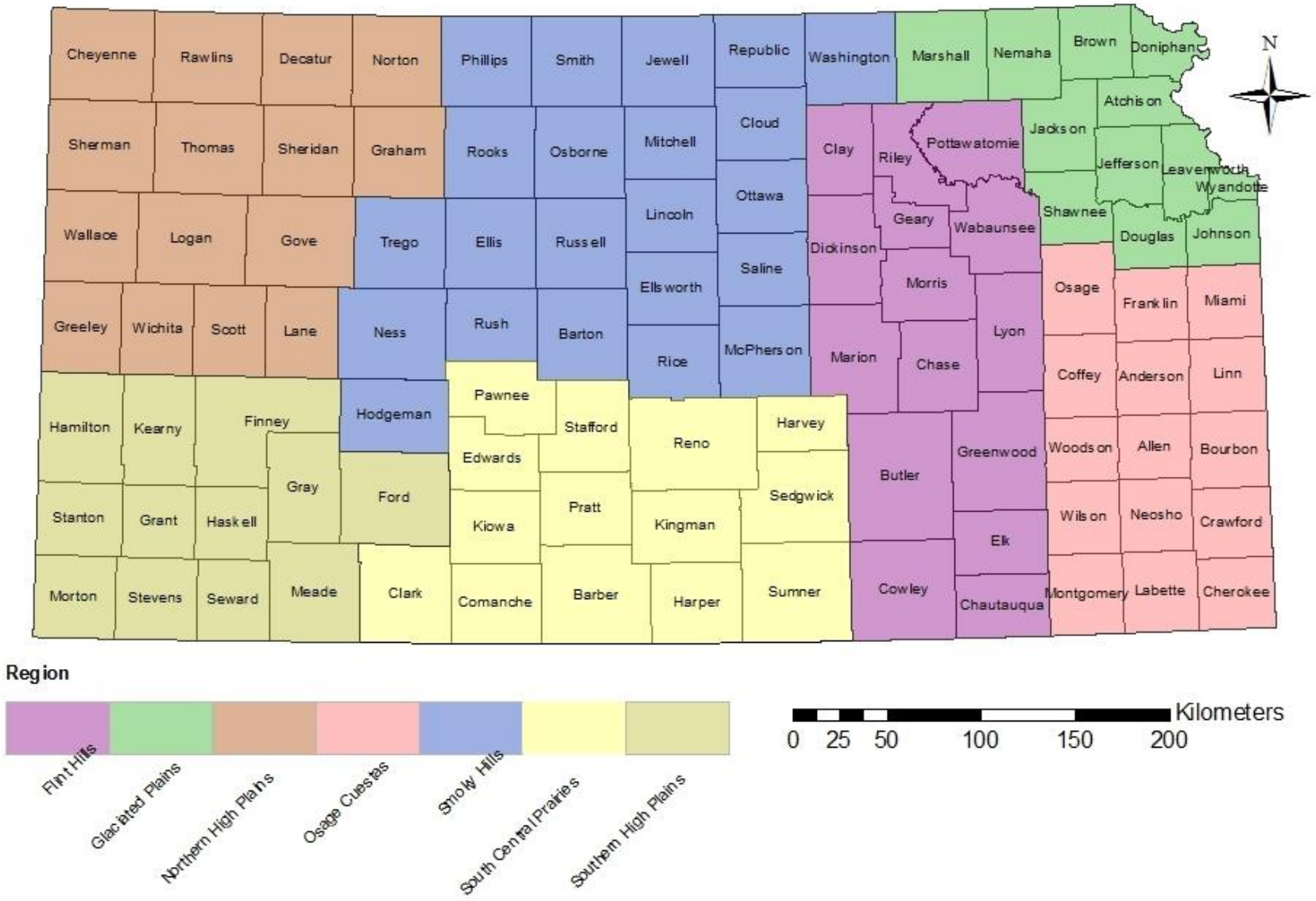

Figure 1. Kansas Small Game Regions.

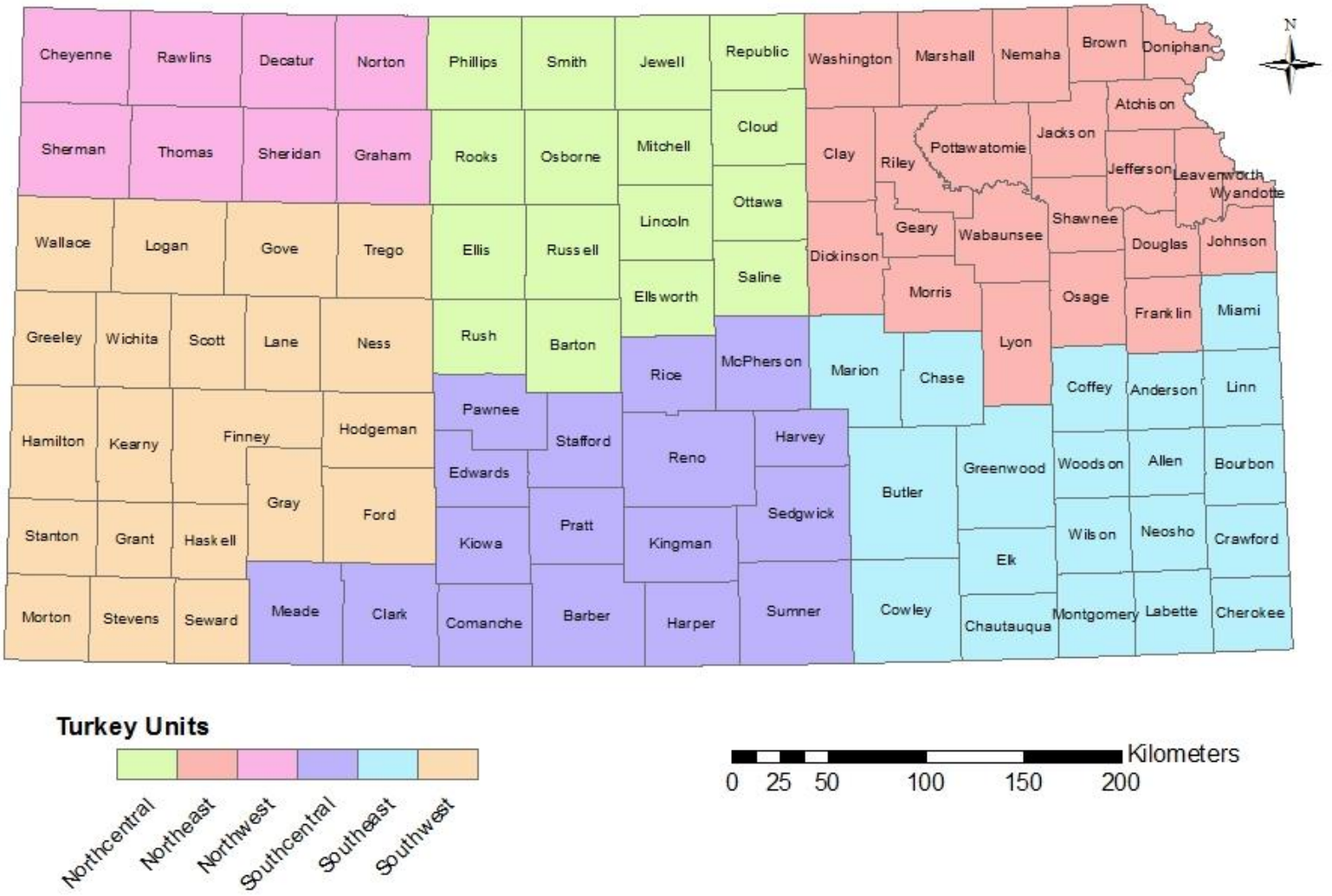

Figure 2. Kansas Turkey Management Regions.

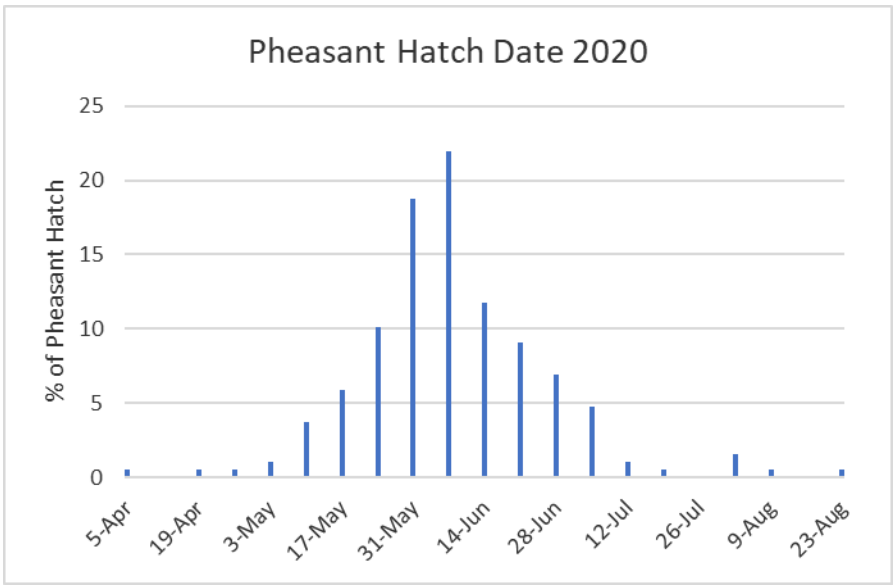

Figure 3. Weekly hatch dates of pheasant broods estimated from age at detection.

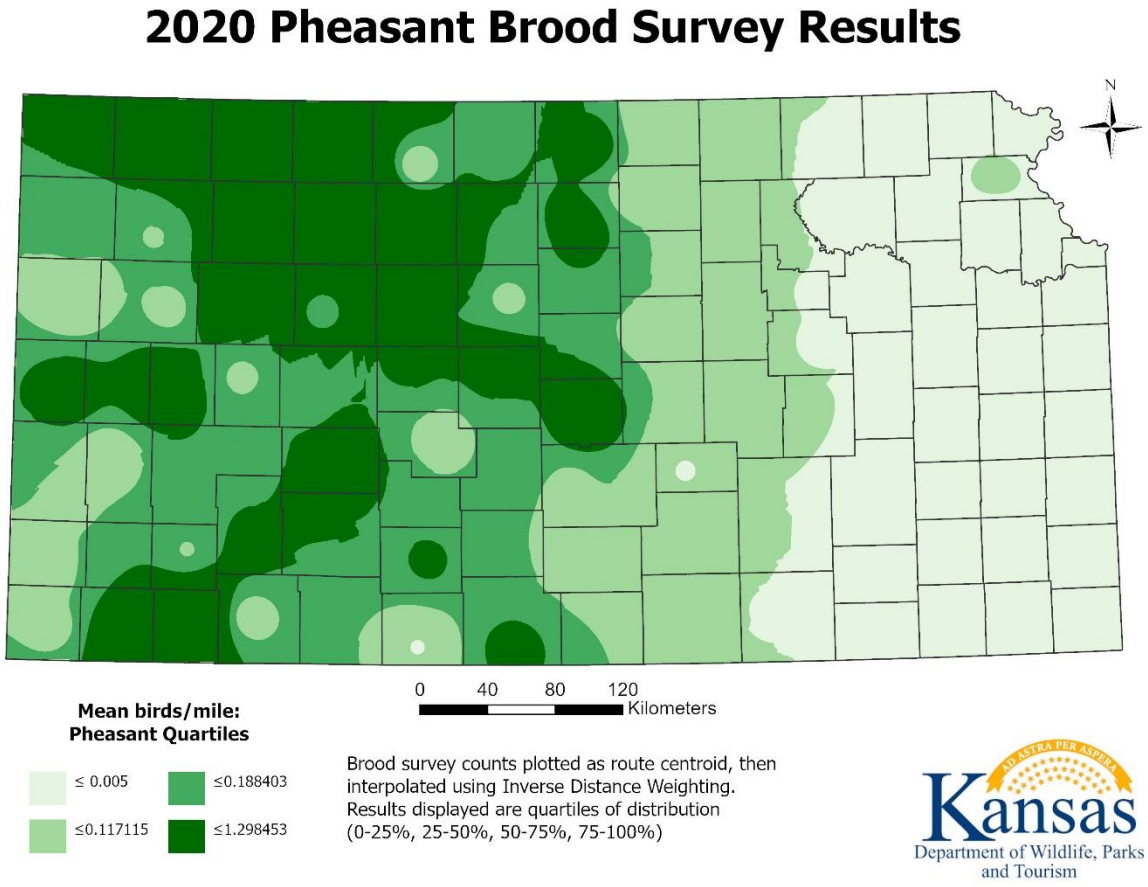

Figure 4. Relative pheasant densities estimated from brood survey routes in Kansas, 2020.

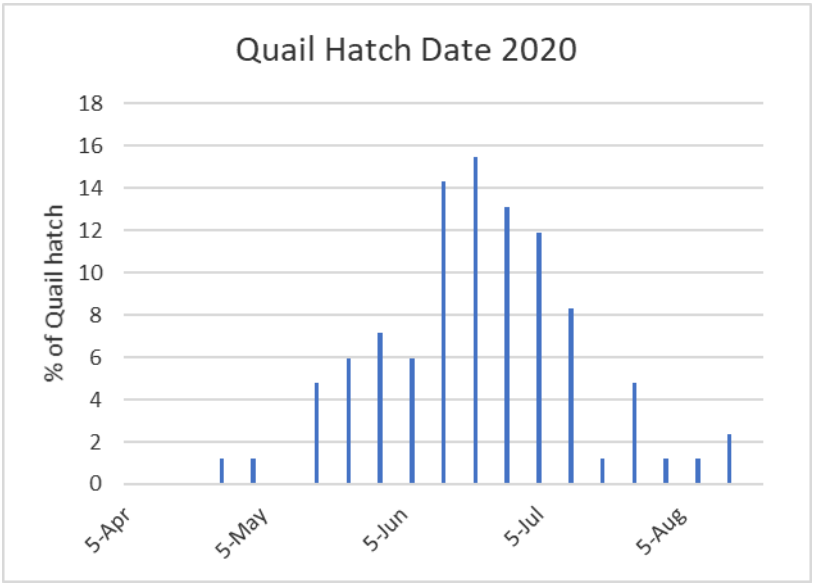

Figure 5. Weekly hatch dates of quail broods estimated from age at detection.

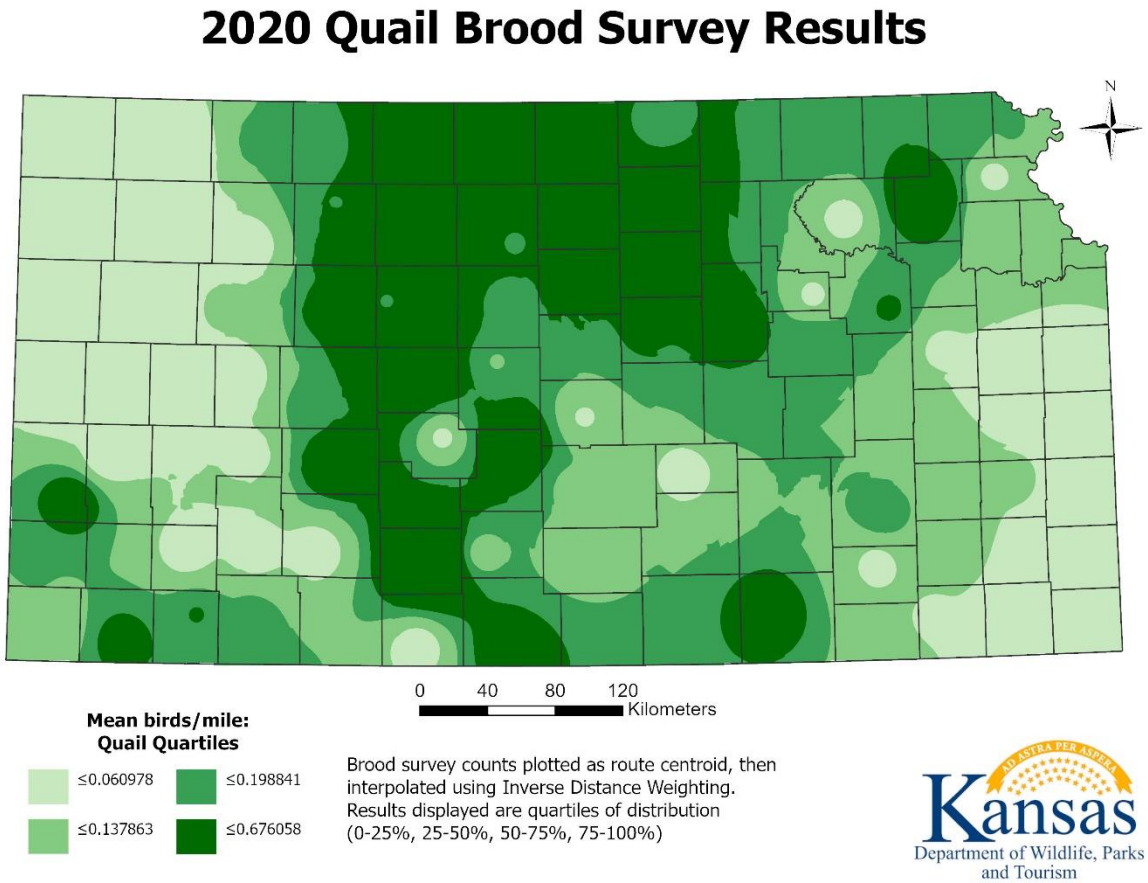

Figure 6. Relative quail densities estimated from brood survey routes in Kansas, 2020.

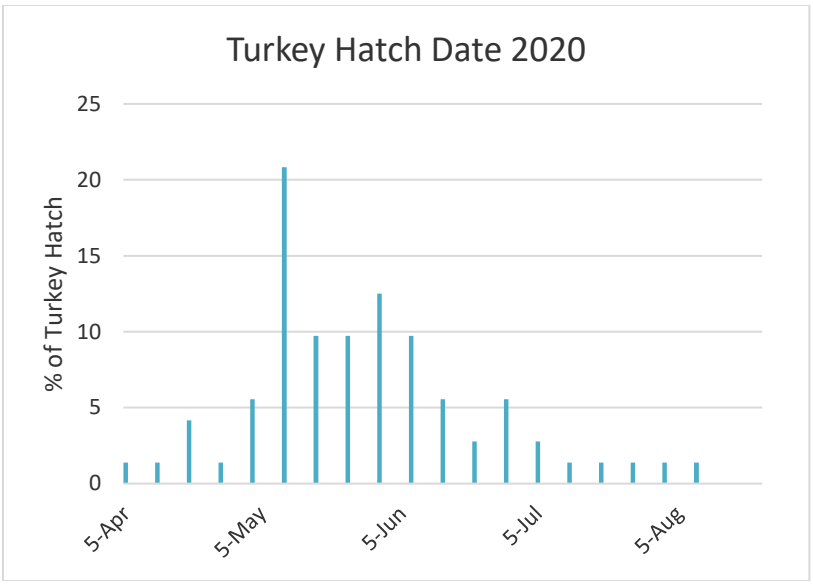

Figure 7. Weekly hatch dates of turkey broods estimated from age at detection.

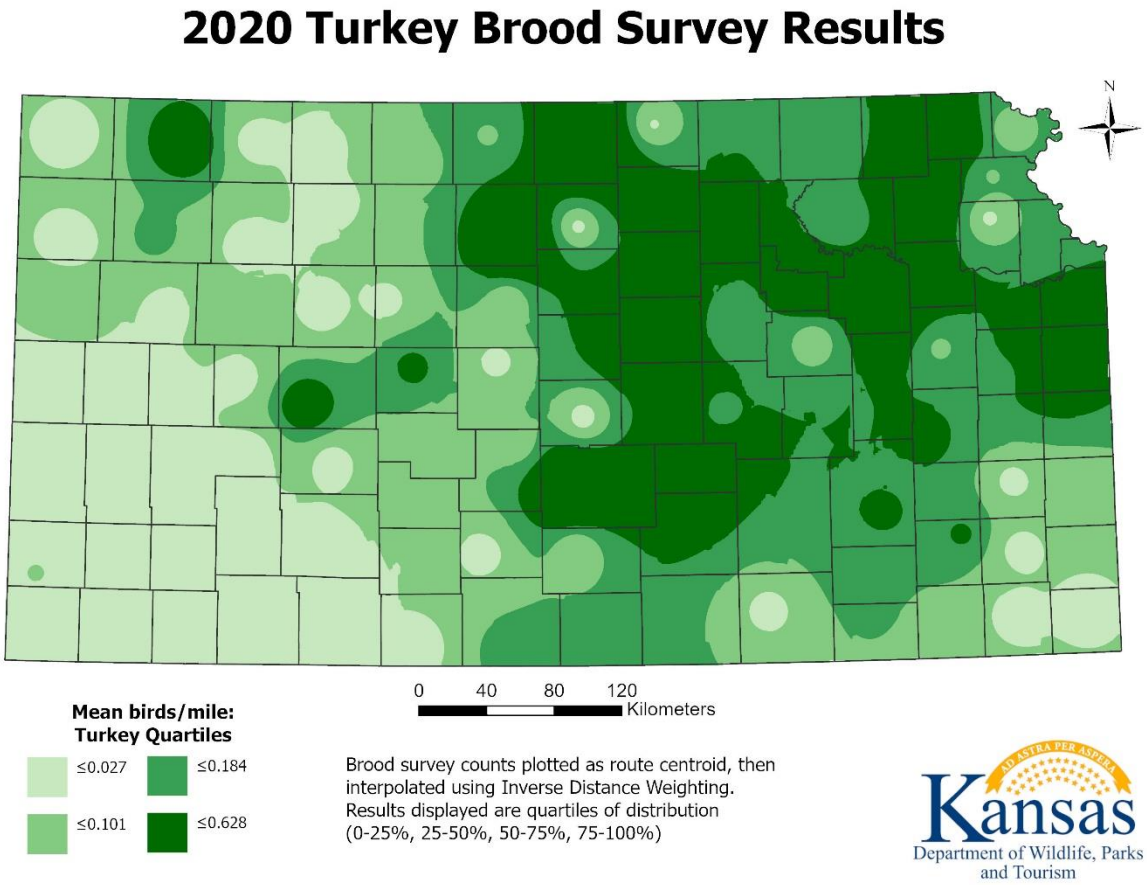

Figure 8. Relative turkey densities estimated from brood survey routes in Kansas, 2020.