QUAIL, PHEASANT, & TURKEY BROOD SURVEY - 2017

Performance Report

A Contribution in Part of Pittman-Robertson
Federal Aid in Wildlife Restoration
Grant W-39-R-24

KANSAS DEPARTMENT OF WILDLIFE, PARKS, and TOURISM

Robin Jennison
Secretary

Keith Sexson
Assistant Secretary
Wildlife, Fisheries, and Boating

Jake George
Wildlife Division Director

Prepared by:
Jeff Prendergast
Small Game Specialist

September 2017

PERMISSION TO QUOTE

This is an annual progress report that may contain information that is subject to future modification or revision. Persons wishing to quote from this report, for reproduction or reference, should first obtain permission from the Chief of the Wildlife Section, Kansas Department of Wildlife and Parks, 512 SE 25th Avenue, Pratt, KS 67124.

EQUAL OPPORTUNITY STATEMENT

This program receives Federal financial assistance from the U. S. Fish and Wildlife Service. Under Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972, the U. S. Department of the Interior and its bureaus prohibit discrimination on the basis of race, color, national origin, age, disability or sex (in educational programs). If you believe that you have been discriminated against in any program, activity or facility, or if you desire further information, please write to:

U. S. Fish and Wildlife Service
Office of Diversity and Civil Rights Programs- External Programs
4040 North Fairfax Drive, Suite 130
Arlington, VA 22203

QUAIL, PHEASANT, AND TURKEY BROOD SURVEY RESULTS – 2017

Prepared by Jeff Prendergast, Small Game Specialist

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 2017 summer brood survey were from July 16 – August 26 (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). 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, broods/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 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 using Trimble™ Juno SB units. 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 all 75 established routes between July 12 and August 27. Results are summarized by Kansas Small Game Regions (Figure 1) or Turkey Regions accordingly (Figure 2).

Pheasants

For 2017, there was a non-significant decrease in the statewide roadside index of pheasants (-7%) compared to 2016. Regionally, a statistically significant increase occurred in the Smoky

Hills (42%) and a statistically significant decrease was recorded in the Southern High Plains (-40%, Table 2). Pheasants per mile was highest in the Northern High Plains, with the highest index in Scott County (Table 2). Few pheasants were detected in the Flint Hills region except in Dickinson County where the index was reduced by more than half from 2016. No pheasants were detected in the Osage Cuestas.

Statewide production indices were similar this year compared to 2016 (Table 3). All production indices were greatest in the Smoky Hills this year (Table 3). The chick/hen and brood/hen ratios were much lower in the Southern High Plains, indicating lower nest success in these regions (Table 3). Large decreases in all production ratios occurred in the Glaciated Plains and Flint Hills. These regions have fewer overall brood observations annually and are highly influenced by a few observations. Pheasant hatch peaked statewide in mid-June (Figure 3). Pheasant indices are generally highest in north-west and north-central Kansas (Figure 4).

Quail

There was a non-significant decrease in the statewide roadside index of quail (-8%) compared to 2016. A statistically significant increase occurred in the Smoky Hills (105%) and a statistically significant decrease was documented in the South Central Prairies (-42%, Table 4). Extremely large increases were observed on several routes across the state. This can largely be explained by areas where densities had become extremely low during the drought of 2011-2013 and habitat quality has since improved. However, several routes also saw large decreases, which were predicated by poor weather conditions for production. Quail densities were greatest in the Smoky Hills followed by South-Central Prairie Region, with the highest index recorded in Smith County (Table 4). Scaled quail were recorded on the 3 routes this year in the Southern High Plains, with the highest number recorded on the Hamilton County route.

All statewide production indices were slightly down but remained relatively similar to 2016 (Table 5). The chicks/adult ratio was highest in the Glaciated Plains; however, the broods/hen was very low, indicating that there were few broods but those that were observed were very large. (Table 5). Chicks/brood was highest in the Smoky Hills, but was good across many regions (Table 5). Quail hatch peaked in late June (Figure 5). The highest estimated quail densities are generally in the Smoky Hills (Figure 6).

Turkey

There was a non-significant decrease in the statewide turkey index compared to 2016. There were no significant changes in the regional indices this year. The Northeast Region had the highest regional index and Southwest Region had the lowest regional index, remaining extremely lower than any of the other 5 regions (Table 6). The Jackson County route recorded the highest relative roadside estimate this year (Table 6).

The statewide production ratios were generally better than 2016, but still poor (Table 7). The Northeast Region had the lowest poult/hen and brood/hen ratios, but the brood size was similar across all regions. There were no chicks observed on any routes in the Southwest Region. Turkey hatch peaked at the end of May (Figure 7). The highest estimated turkey densities will generally be found in northcentral and northeastern Kansas (Figure 8).

DISCUSSION

Conditions for upland game bird production within existing habitat has been ideal in recent years. Precipitation patterns and management over the past 5 years has altered vegetation, increasing both the quality and quantity of habitat. With little winter snowfall, soil conditions were dry entering spring 2017, but heavy precipitation occurred across the state through spring, and regular rainfall continued throughout early summer. This resulted in a lush landscape and copious amounts of arthropods, creating excellent cover for nesting and brooding hens. Weather events through spring and early summer, however, were extreme, and the timing of these events appears to have limited nest success. The western 1/3 of the state received a heavy spring snowstorm on April 30-May1, with accumulations of up to 20 inches of snow during a critical period (i.e., mating and nest initiation) for upland game birds. Heavy precipitation was recorded across eastern regions and in the Northern High Plains during June and early July. While some regions were plagued with these extreme weather events, the observed regional declines were offset by other reginal increases. Good cover and habitat conditions across the state, paired with the shift in regional densities, appears to have largely mitigated poor weather, thereby maintaining stable statewide brood counts for both pheasants and quail.

Pheasants are an important resource to Kansas. Within the last decade, estimated annual harvests have been at the high and low extremes. With three consecutive years of increasing roadside estimates, harvest rates returned to approximately average during the 2016/2017 season. Despite good cover and a lengthy wheat harvest in 2017, the statewide index of pheasants remained stable. The westernmost regions were both largely plagued by the late spring snowstorm that occurred during a period when most hens are laying eggs. While the temperatures rose quickly, melting the snow prior to any major concerns for adult mortality, the event assumingly caused first nest failures for a large portion of hens across the western portion of the state. Heavy rainfall events following the snow compounded these losses, causing failures in additional nesting attempts. However the habitat conditions and precipitation created conditions that favored a long nesting season. Broods that successfully hatched had good resources available, thereby increasing odds of survival. Given this information, the 2017 hunting season will likely be similar to 2016. The Northern High Plains had the highest regional estimate of pheasants in 2017, with the Smoky Hills having the second highest regional estimate after great improvement from 2016. The Southern High Plains estimates decreased but maintained relatively good estimates. Opportunities are expected to be fair to good given habitat conditions and production indices were similar to last year (Figure 4).

In recent years, Kansas has harvested more wild bobwhites than any other state in the country. The 2016 hunting season saw high densities of quail across the Midwestern and southern states, including Kansas. The early successional annual vegetation created across much of Kansas following weather-induced habitat changes has produced more quail than observed in several years. Spring whistle survey results were good, except in the Southern High Plains, where the aforementioned snowstorm occurred after spring covey breakup and assumingly caused high levels of adult mortality. Despite conditions being good in the Southern High Plains, spring losses carried into the roadside brood survey, which showed declines. The easternmost regions of the state also had declines, likely attributed to heavy rainfall during nesting. Despite these setbacks, all regions retained above-average roadside estimates and the statewide roadside

estimate for quail was similar to 2016, which produced the highest hunter success rate recorded in nearly 2 decades. The Smoky Hills showed the highest regional roadside estimate this year, with good to fair regional estimates also being found in all of our other regions within the primary quail range (Figure 6). There should be good hunting opportunities across the state this year where appropriate habitat exists (Figure 6).

While the roadside estimate for turkeys decreased only slightly and there were no significant regional declines, observed estimates are still concerning. Production is improved from what it was during the height of the drought, but has remained relatively poor. Several consecutive years of poor production are contributing to the low roadside estimates. Poults/hen and broods/hen were both very poor again this year (Table 7), indicating nest success may have been poor. Timing of precipitation appears to have caused nest failures across large areas again in 2017. Turkey densities in the Southwest were already extremely limited, and with no recorded broods for the second year in a row, opportunities in coming years could be significantly impacted (Table 4 & 7). The Northeast Region had the highest estimates this fall with the Southeast having the second highest roadside estimate (Figure 8).

Table 1. Upland game bird brood routes and observers in Kansas, 2017.

Route	Observer	Replicates	Route	Observer	Replicates
Allen	Justin Harbit	4	Marion	Jeff Rue	4
Atchison	Tim Urban	4	Marshall	Megan Smith	4
Barber	Charlie Swank	4	Meade	Aaron Andrews	4
Barton	Jeff Prendergast[a]	4	Miami	Andy Friesen	5
Bourbon	Justin Harbit	4	Mitchell	Toby Marlier	4
Brown	Tyler Warner	4	Montgomery	Darin Porter	6
Cherokee	David Jenkins	1	Morris	Brent Konen	4
Cheyenne	Abigal Athen[a]	4	Morton	Kraig Schultz	4
Cloud	Matt Farmer	4	Neosho	Logan Martin	4
Coffey	Jake Christensen	4	Ness	Aaron Baugh	4
Comanche	Matt Hanvey	4	Norton	Luke Winge	4
Cowley	Kurt Grimm	4	Osage	Alex Lyon	5
Decatur	Daniel Howard	4	Osborne	Chris Lecuyer	4
Dickinson	Clint Thornton	5	Pawnee	Kevin Wood	4
Doniphan	Hunter Ballie[a]	4	Phillips	Michael Zajic	4
Elk	Viki Cikanek	4	Pottawatomie	Corey Alderson	4
Ellis	Mike Nyhoff	4	Pratt	Jake George	4
Finney	Angie Reisch	4	Rawlins	Kevin Flag	3
Franklin	Ryan Twellman	4	Reno	Kyle McDonald	4
Geary	Clint Thornton	4	Republic	Rob Unruh	4
Gove	Lynn Davigon	4	Rice	Steve Adams	4
Graham	Jake Brooke	4	Rooks	Eric Wiens	4
Gray	Manuel Torres	4	Rush	Jason Wagner	4
Greeley	Kurt Meier	4	Russell	James Svaty	4
Greenwood	Kent Fricke	6	Saline	Brian Serpan	4
Hamilton	Kurt Meier	4	Scott	Kurtis Meier[a]	4
Harvey	Charlie Cope	4	Seward	Jason Vajnar	4
Haskell	Jeff Sutton[a]	4	Sheridan	Kevin Klag[a]	3
Hodgeman	Dan Haneke	4	Sherman	Abigal Athen[a]	4
Jackson	Tyler Warner	4	Smith	Kirk Andrews[a]	4
Jefferson	Andrew Page	4	Stafford	Charlie Swank	4
Jewell	Luke Kramer	4	Stanton	Kraig Schultz	4
Kearney	Zerick Kuecker	1	Thomas	Kevin Klag[a]	3
Kingman	Troy Smith	4	Trego	Kent Hensley	4
Kiowa	Charlie Swank	4	Wabaunsee	Brad Rueschhoff	4
Labette	Rob Riggin	4	Wallace	Abigal Athen[a]	4
Lane	Kurt Hudson	2	Wilson	Bob Funke	4
Logan	Leonard Hopper	4			

Table 2. Annual regional changes in mean pheasants per mile (P/M), 2017.

Route	2016 P/M	2017 P/M	% Δ
	Flint Hills		
Cowley	0.00	0.00	0
Dickinson	0.22	0.09	-59
Elk	0.00	0.01	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	0.01	0
Wabaunsee	0.00	0.00	0
Region	**0.03**	**0.01**	**-50**
	Glaciated Plains		
Atchison	0.00	0.01	NA
Brown	0.00	0.00	0
Doniphan	0.00	0.00	0
Jackson	0.01	0.00	-100
Jefferson	0.00	0.00	0
Marshall	0.04	0.00	-100
Region	**0.01**	**0.00**	**-85**
	Smoky Hills		
Barton	0.44	0.32	-28
Cloud	0.16	0.11	-35
Ellis	0.03	0.27	925
Hodgeman	0.28	0.85	200
Jewell	0.14	0.21	58
Mitchell	0.40	0.74	82
Ness	0.31	0.44	43
Osborne	0.25	0.84	238
Phillips	0.31	0.19	-38
Republic	0.06	0.02	-75
Rice	0.54	0.28	-49
Rooks	0.32	0.57	75
Rush	0.41	0.30	-26
Russell	0.37	0.30	-20
Saline	0.00	0.12	NA
Smith	0.33	0.53	58
Trego	0.27	0.48	77
Region	**0.27**	**0.39**	**42***

Route	2016 P/M	2017 P/M	% Δ
	Northern High Plains		
Cheyenne	0.47	0.42	-10
Decatur	0.64	0.74	15
Gove	0.15	0.08	-47
Graham	0.55	1.07	96
Greeley	0.32	0.74	130
Lane	0.52	0.28	-47
Logan	0.14	0.20	50
Norton	0.24	0.12	-52
Rawlins	0.47	0.23	-51
Scott	1.58	1.08	-32
Sheridan	0.23	0.20	-13
Sherman	0.42	0.18	-57
Thomas	1.00	0.24	-76
Wallace	0.06	0.13	100
Region	**0.48**	**0.41**	**-16**
	South-Central Prairies		
Barber	0.22	0.14	-34
Comanche	0.00	0.00	0
Harvey	0.01	0.01	0
Kingman[a]	NA	0.06	NA
Kiowa	0.25	0.21	-14
Pawnee	0.26	0.21	-19
Pratt	0.17	0.22	29
Reno	0.14	0.16	10
Stafford	0.14	0.13	-9
Region	**0.15**	**0.14**	**-9**
	Southern High Plains		
Finney	0.15	0.07	-52
Gray	0.54	0.38	-31
Hamilton	0.19	0.15	-19
Haskell	0.86	0.34	-60
Kearny	0.75	0.56	-25
Meade	0.12	0.13	12
Morton	0.18	0.25	38
Seward	1.33	0.57	-57
Stanton	0.23	0.16	-31
Region	**0.48**	**0.29**	**-40***
Statewide	**0.27**	**0.25**	**-7**

* = Significant difference (p < 0.1)

**The Osage Cuestas region is outside of the pheasant range and was 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), 2017.

Region	2016 C/H	2017 C/H	%Δ	2016 C/B	2017 C/B	%Δ	2016 B/H	2017 B/H	%Δ
Flint Hills	3.8	1.8	-53	5.8	4.5	-22	0.67	0.40	-40
Glaciated Plains	5.0	0.0	-100	5.0	0.0	-100	1.00	0.00	-100
Northern High Plains	7.7	6.1	-20	5.4	4.5	-17	0.65	0.61	-7
Osage Cuestas	0.0	0.0	0	0.0	0.0	0	0.00	0.00	0
Smoky Hills	8.4	7.8	-7	5.2	5.7	10	0.84	0.84	0
South-Central Prairies	4.6	6.3	36	3.4	4.6	33	0.63	0.68	9
Southern High Plains	4.5	3.2	-30	4.7	4.3	-10	0.50	0.39	-22
Statewide	6.4	6.0	-6	5.0	5.0	0	0.64	0.64	0

Table 4. Annual regional changes in mean quail per mile (Q/M), 2017.

Route	2016 Q/M	2017 Q/M	% Δ	Route	2016 Q/M	2017 Q/M	% Δ
	Flint Hills				Smoky Hills		
Cowley	0.56	0.40	-28	Barton	0.56	0.46	-19
Dickinson	0.16	0.12	-27	Cloud	0.52	0.49	-5
Elk	0.12	0.54	342	Ellis	0.11	0.53	376
Geary	0.27	0.07	-75	Hodgeman	0.01	0.38	5400
Greenwood	0.34	0.27	-19	Jewell	0.56	0.39	-31
Marion	0.28	0.12	-59	Mitchell	0.32	0.41	30
Morris	0.35	0.05	-85	Ness	0.01	0.34	2200
Pottawatomie	0.20	0.03	-86	Osborne	0.33	0.58	76
Wabaunsee	0.04	0.06	60	Phillips	0.04	0.22	500
Region	**0.26**	**0.18**	**-28**	Republic	0.09	0.31	242
	Glaciated Plains			Rice	0.01	0.06	350
Atchison	0.19	0.26	35	Rooks	0.04	0.63	1600
Brown	0.26	0.21	-20	Rush	0.61	0.46	-24
Doniphan	0.00	0.14	NA	Russell	0.05	0.05	14
Jackson	0.52	0.15	-71	Saline	0.18	0.03	-81
Jefferson	0.02	0.03	100	Smith	0.41	1.44	254
Marshall	0.36	0.09	-74	Trego	0.08	0.13	63
Region	**0.22**	**0.15**	**-35**	**Region**	**0.23**	**0.47**	**105***
	Northern High Plains				South-Central Prairies		
Cheyenne	0.00	0.00	NA	Barber	0.66	0.24	-63
Decatur	0.19	0.22	15	Comanche	0.46	0.16	-64
Gove	0.00	0.01	0	Harvey	0.00	0.05	NA
Graham	0.11	0.14	20	Kingman[a]	NA	0.32	NA
Greeley	0.00	0.00	NA	Kiowa	0.59	0.11	-80
Lane	0.01	0.06	400	Pawnee	0.16	0.01	-95
Logan	0.00	0.00	0	Pratt	0.16	0.12	-26
Norton	0.22	0.30	37	Reno	0.66	0.63	-4
Rawlins	0.02	0.01	-50	Stafford	0.35	0.43	23
Scott	0.00	0.00	0	**Region**	**0.38**	**0.22**	**-42***
Sheridan	0.00	0.02	0		Osage Cuestas		
Sherman	0.00	0.00	0	Allen	0.06	0.07	25
Thomas	0.00	0.00	0	Bourbon	0.11	0.09	-18
Wallace	0.00	0.00	0	Cherokee	0.00	0.00	0
Region	**0.04**	**0.05**	**36***	Coffey	0.07	0.18	144
	Southern High Plains			Franklin	0.05	0.01	-71
Finney	0.10	0.14	47	Labette	0.20	0.01	-94
Gray	0.02	0.17	667	Miami	0.01	0.10	750
Hamilton	1.96	0.53	-73	Montgomery	0.06	0.31	421
Haskell	0.03	0.01	-50	Neosho	0.41	0.12	-70
Kearny	0.00	0.00	0	Osage	0.26	0.19	-27
Meade	0.56	0.15	-73	Wilson	0.30	0.05	-83
Morton	0.01	0.10	600	**Region**	**0.14**	**0.10**	**-26**
Seward	0.29	0.27	-5				
Stanton	0.15	0.08	-48	**Statewide**	**0.21**	**0.20**	**-8**
Region	**0.35**	**0.16**	**-53**				

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

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

Table 5. Annual regional changes in quail chick per adult (C/A), chicks per brood (C/B), and broods/adult, 2017.

Region	2016 C/A	2017 C/A	%Δ	2016 C/B	2017 C/B	%Δ	2016 B/A	2017 B/A	%Δ
Flint Hills	1.9	1.7	-8	8.6	6.7	-22	0.19	0.23	22
Glaciated Plains	3.6	3.4	-7	9.4	5.8	-38	0.26	0.08	-68
Northern High Plains	4.0	2.5	-38	8.6	7.7	-11	0.33	0.29	-14
Osage Cuestas	1.3	1.3	-1	7.6	9.3	23	0.14	0.11	-21
Smoky Hills	2.7	3.0	11	8.9	9.5	7	0.18	0.22	20
South-Central Prairies	2.4	1.8	-28	7.8	8.6	10	0.22	0.18	-21
Southern High Plains	4.9	1.7	-64	10.2	8.2	-20	0.17	0.03	-81
Statewide	2.6	2.2	-14	8.8	8.5	-3	0.19	0.18	-6

Table 6. Annual regional changes in mean turkey per mile (T/M), 2017.

Route	2016 T/M	2017 T/M	[a]% Δ	Route	2016 T/M	2017 T/M	% Δ
	Northeast				Northcentral		
Atchison	0.04	0.05	17	Barton	0.15	0.04	-73
Brown	0.21	0.21	0	Cloud	0.42	0.30	-29
Dickinson	0.19	0.07	-60	Ellis	0.07	0.27	273
Doniphan	0.08	0.00	-100	Jewell	0.93	0.23	-75
Franklin	0.09	0.12	31	Mitchell	0.25	0.26	3
Geary	0.99	0.60	-39	Osborne	0.30	0.21	-31
Jackson	0.72	0.95	33	Phillips	0.27	0.10	-65
Jefferson	0.24	0.47	94	Republic	0.12	0.05	-56
Marshall	0.25	0.23	-9	Rooks	0.15	0.07	-50
Morris	0.31	0.86	179	Rush	0.11	0.11	0
Osage	0.49	0.46	-6	Russell	0.13	0.13	5
Pottawatomie	0.10	0.47	367	Saline	0.27	0.56	110
Wabaunsee	0.31	0.26	-18	Smith	0.36	0.00	-100
Region	**0.31**	**0.37**	**18**	**Region**	**0.27**	**0.18**	**-34**
	Northwest				Southcentral		
Cheyenne	0.40	0.35	-14	Barber	0.18	0.37	112
Decatur	0.21	0.36	75	Comanche	0.00	0.00	0
Graham	0.00	0.00	0	Harvey	0.26	0.33	26
Norton	0.12	0.06	-50	Kingman[a]	NA	0.29	NA
Rawlins	0.44	0.01	-98	Kiowa	0.00	0.00	0
Sheridan	0.22	0.15	-33	Meade	0.00	0.00	0
Sherman	0.00	0.00	0	Pawnee	0.26	0.16	-39
Thomas	0.13	0.05	-61	Pratt	0.00	0.00	0
Region	**0.19**	**0.12**	**-36**	Reno	1.21	0.31	-75
	Southwest			Rice	0.15	0.11	-29
Finney	0.03	0.00	-100	Stafford	0.49	0.49	1
Gove	0.00	0.00	0	**Region**	**0.25**	**0.18**	**-31**
Gray	0.00	0.00	0		Southeast		
Greeley	0.00	0.00	0	Allen	0.08	0.17	118
Hamilton	0.00	0.00	0	Bourbon	0.08	0.01	-92
Haskell	0.00	0.00	0	Cherokee	0.15	0.00	-100
Hodgeman	0.10	0.08	-14	Coffey	0.00	0.03	NA
Kearny	0.00	0.00	0	Cowley	0.28	0.76	177
Lane	0.00	0.00	0	Elk	0.10	0.18	92
Logan	0.00	0.00	0	Greenwood	0.10	0.20	97
Morton	0.00	0.00	0	Labette	0.25	0.12	-52
Ness	0.19	0.09	-54	Marion	0.11	0.08	-25
Scott	0.00	0.00	0	Miami	0.34	0.43	29
Seward	0.00	0.04	0	Montgomery	0.03	0.08	133
Stanton	0.01	0.00	-100	Neosho	0.16	0.33	103
Trego	0.00	0.00	0	Wilson	0.30	0.30	1
Wallace	0.09	0.06	-31	**Region**	**0.15**	**0.21**	**37**
Region	**0.02**	**0.02**	**-34**	**Statewide**	**0.19**	**0.17**	**-9**

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

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

Table 7. Annual regional changes in turkey poults per hen (P/H), poults per brood (P/B), and broods per hen (B/H), 2017.

Region	2016 P/H	2017 P/H	%Δ	2016 P/B	2017 P/B	%Δ	2016 B/H	2017 B/H	%Δ
Northcentral	1.4	2.2	53	4.5	5.7	28	0.32	0.36	11
Northeast	0.7	1.2	62	5.1	5.4	7	0.13	0.19	49
Northwest	2.3	1.6	-30	4.8	4.2	-13	0.45	0.29	-35
Southcentral	0.9	1.8	99	6.4	6.0	-6	0.13	0.29	126
Southeast	1.1	1.3	16	4.9	5.2	5	0.22	0.26	16
Southwest	0.0	0.0	0	0.0	0.0	0	0.00	0.00	0
Statewide	1.1	1.4	35	5.0	5.4	8	0.20	0.25	21

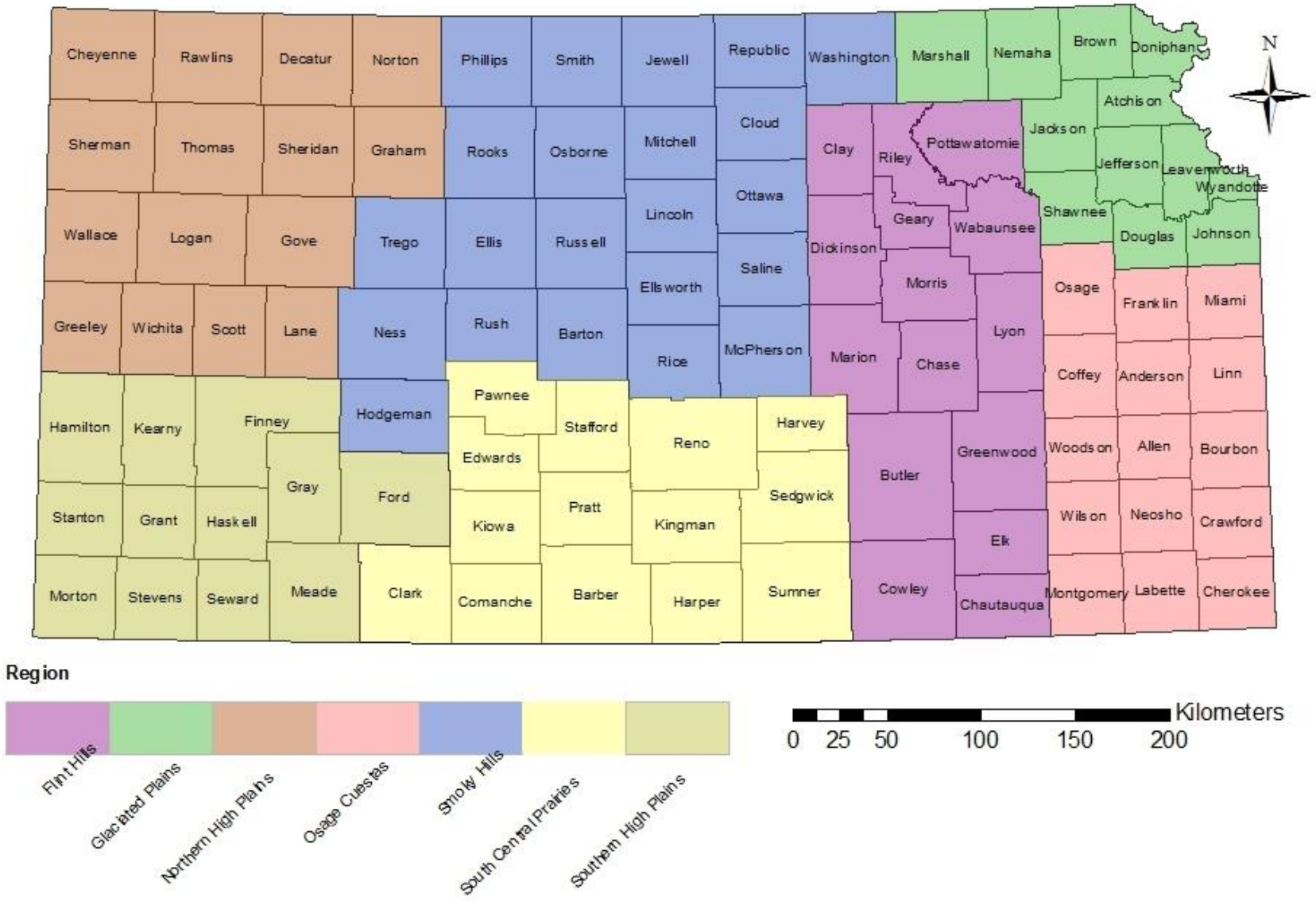

Figure 1. Kansas Small Game Regions.

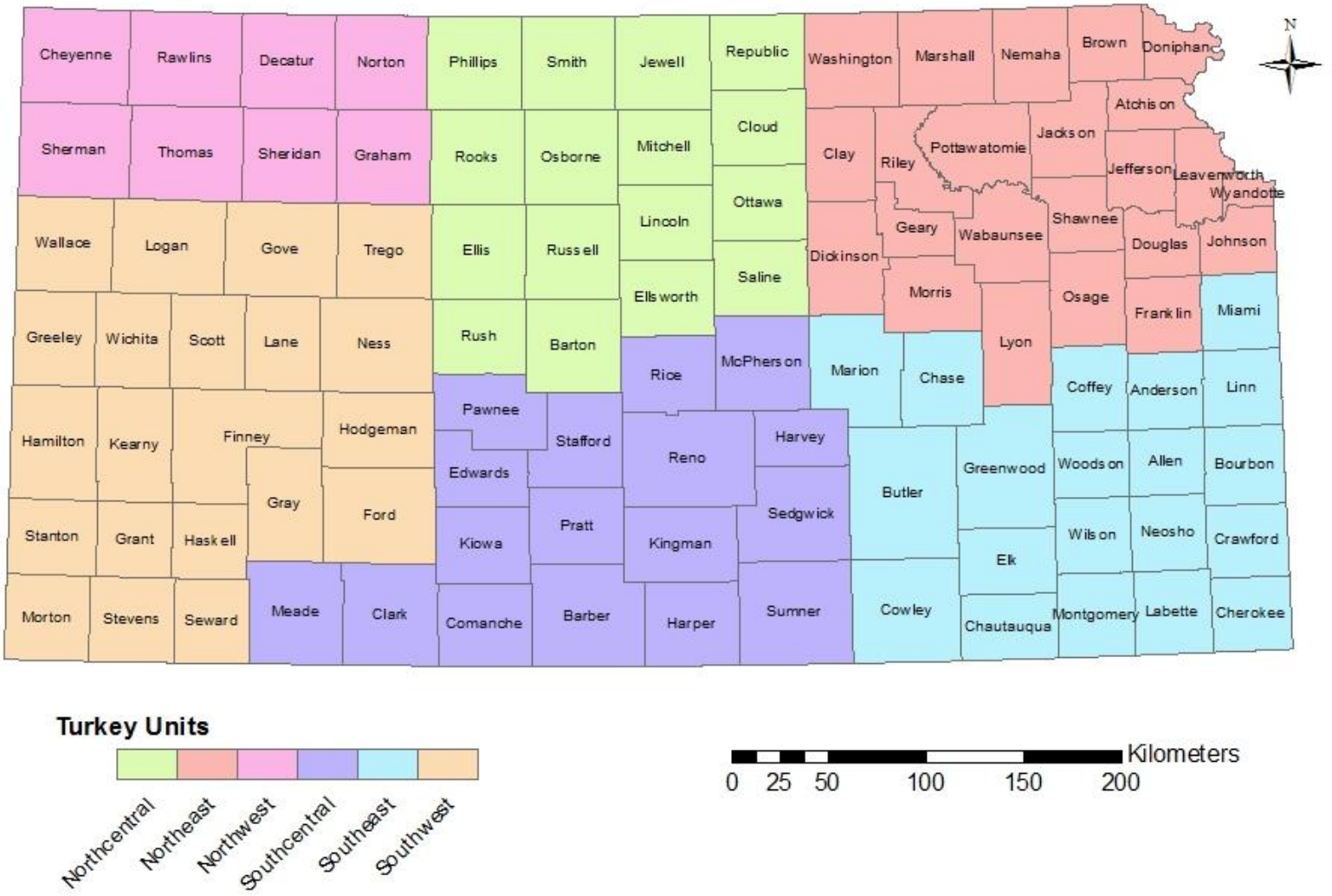

Figure 2. Turkey Management Regions.

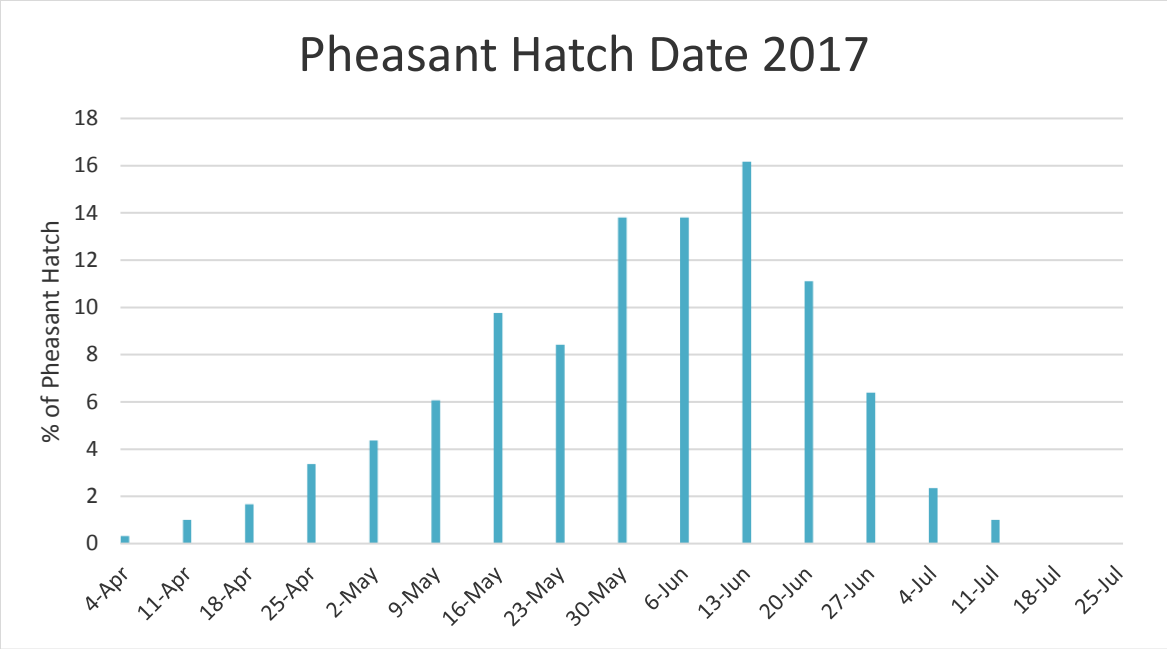

Figure 3. Weekly hatch dates of pheasant broods estimated from age at detection.

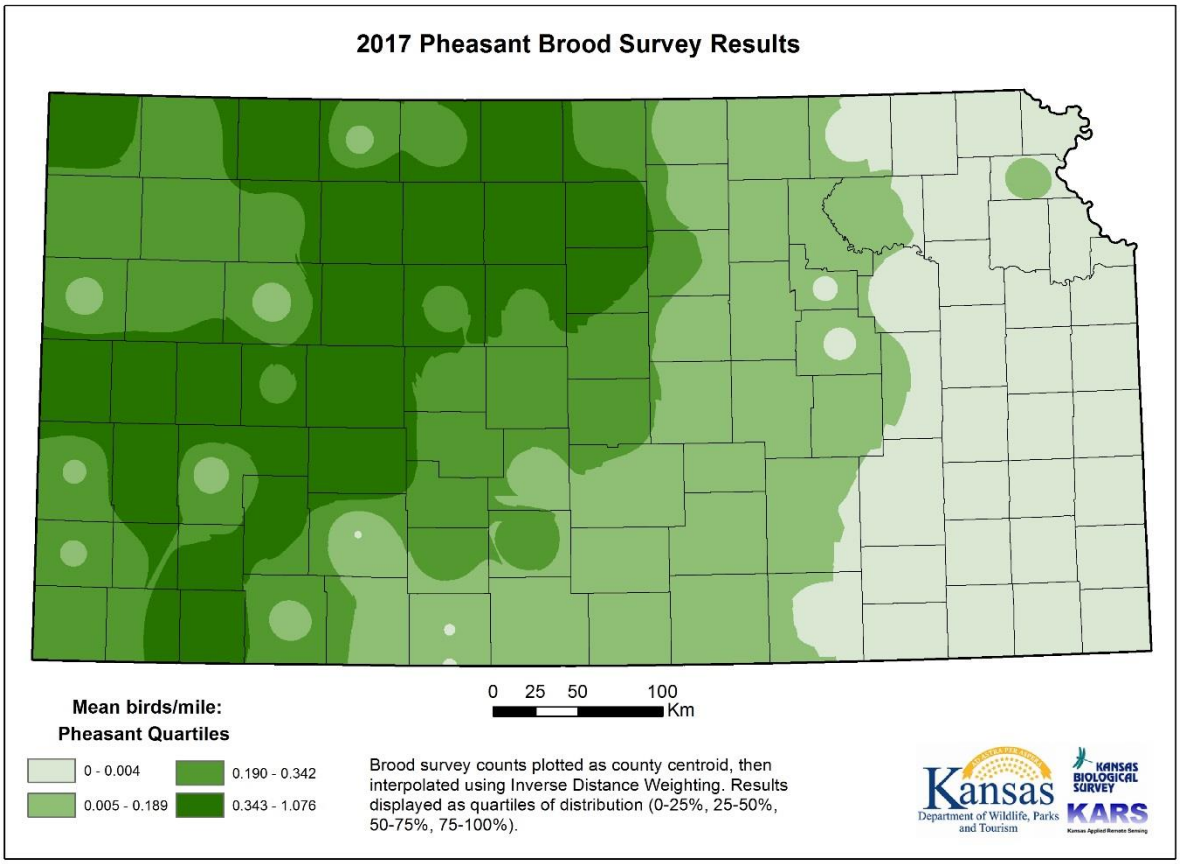

Figure 4. Relative pheasant densities estimated from brood survey routes in Kansas, 2015.

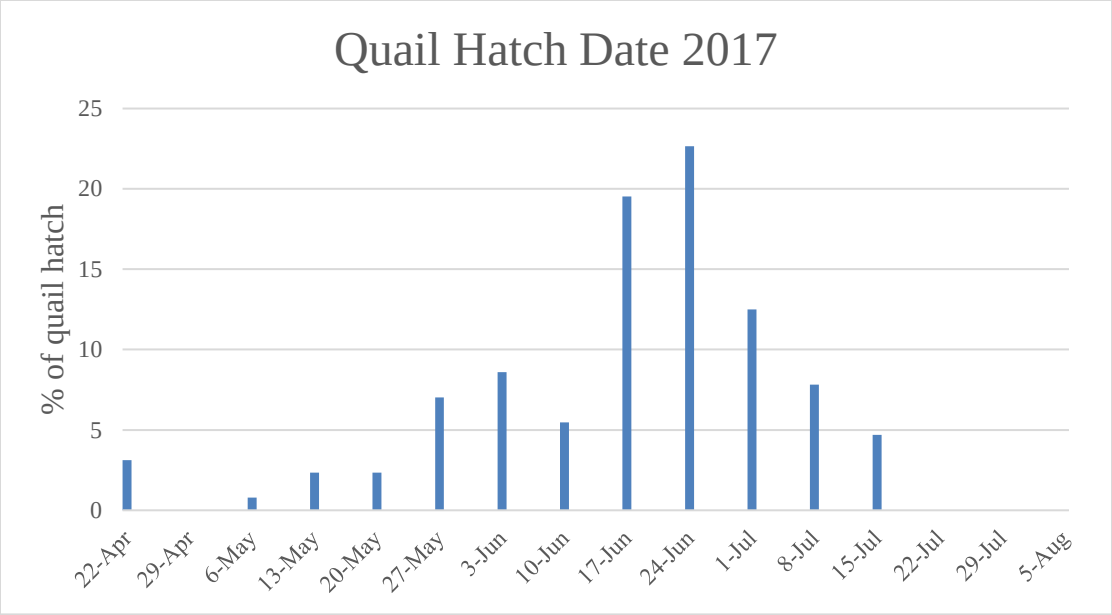

Figure 5. Weekly hatch dates of quail broods estimated from age at detection.

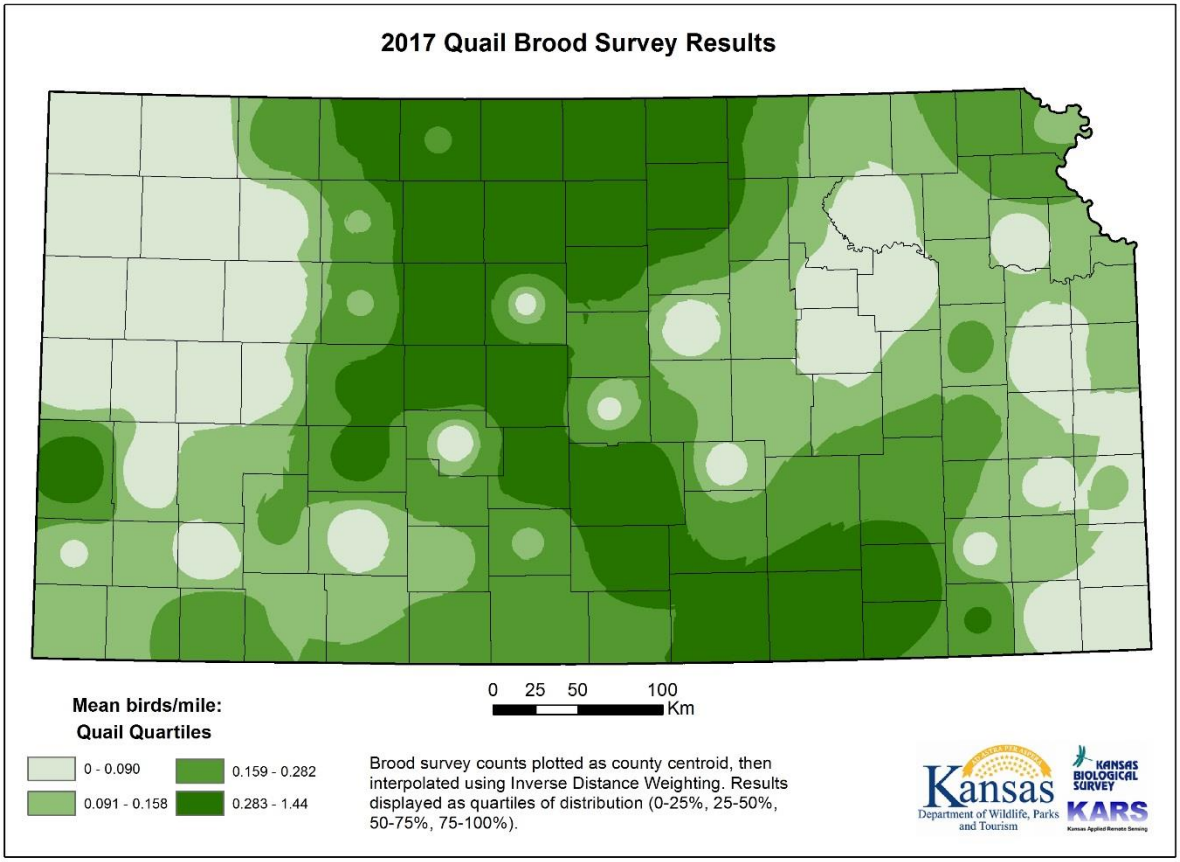

Figure 6. Relative quail densities estimated from brood survey routes in Kansas, 2017.

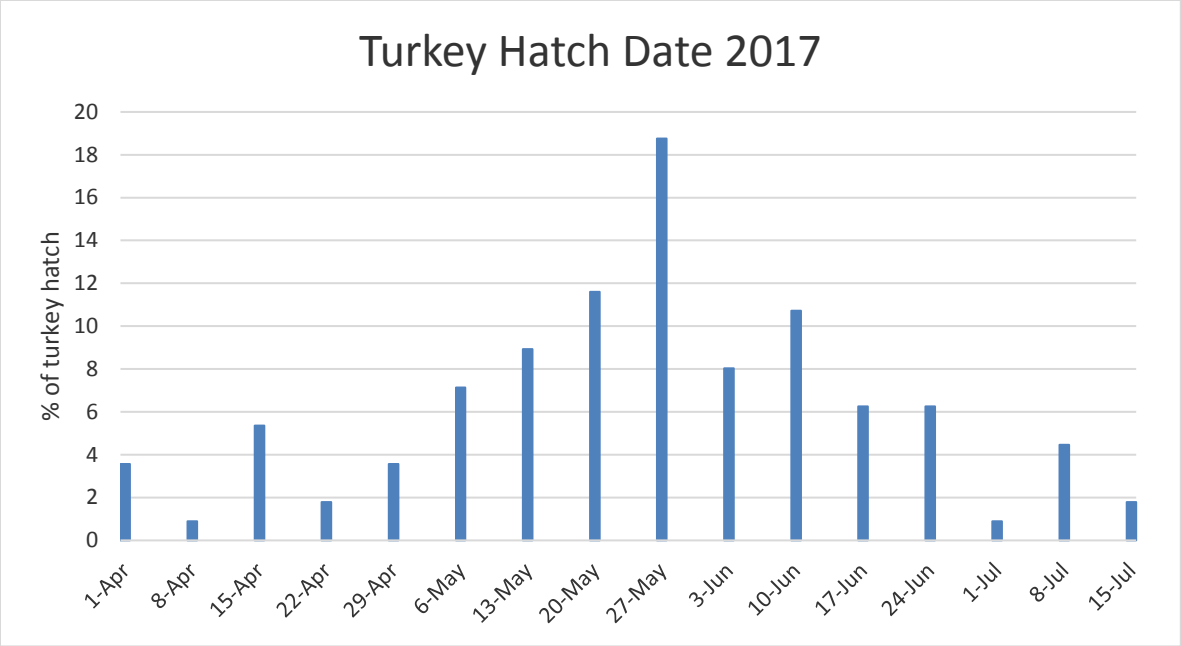

Figure 7. Weekly hatch dates of turkey broods estimated from age at detection.

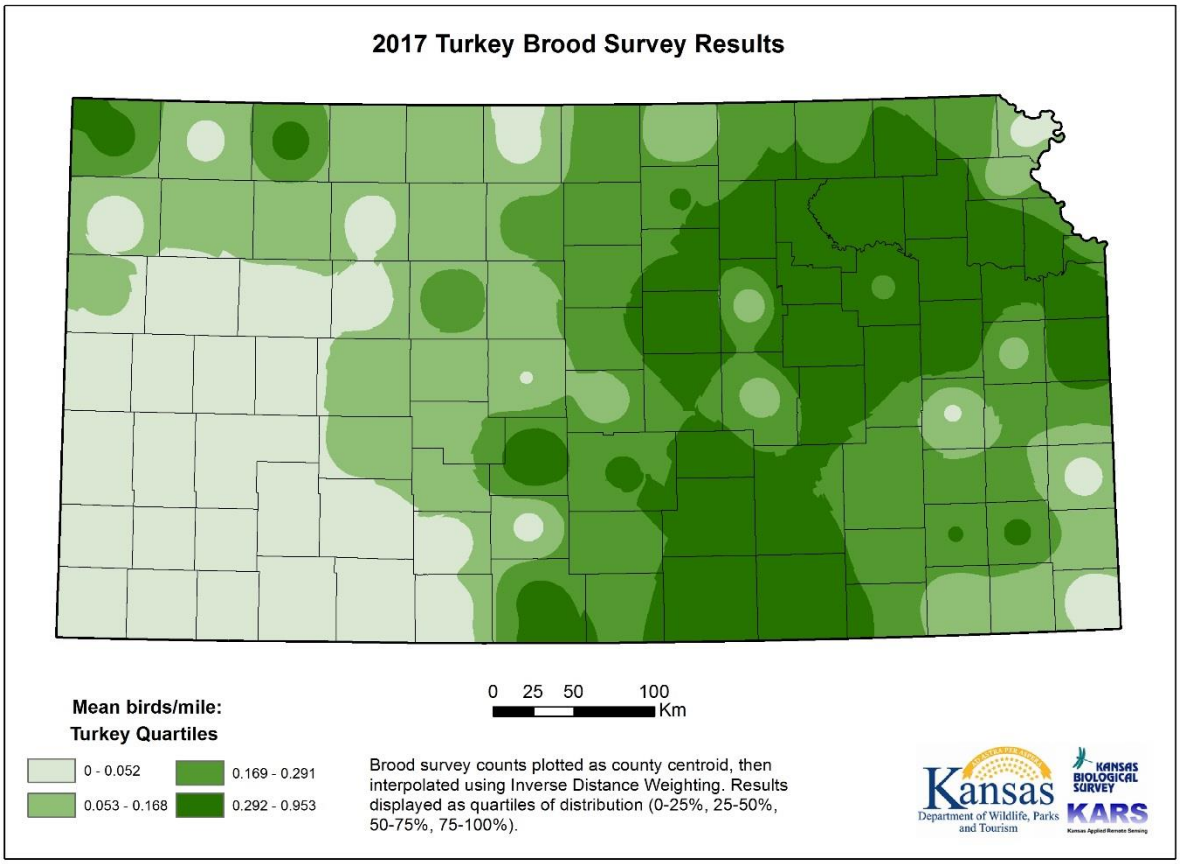

Figure 8. Relative turkey densities estimated from brood survey routes in Kansas, 2017.