QUAIL, PHEASANT, & TURKEY BROOD SURVEY - 2013

Performance Report

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QUAIL, PHEASANT, AND TURKEY BROOD SURVEY RESULTS – 2013

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, in extreme southwestern Kansas scaled quail do provide some (< 1%) of the 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 the other game birds.

METHODS

Dates for the 2013 Summer Brood Survey were from July 21 – August 31 (6 weeks). Survey protocol and methodology changed in 2012 to establish permanent 35 mile brood routes 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 Area) occurred in the county, we attempted to place the route through or adjacent to the property. Routes were sampled a minimum of 4 times beginning at sunrise and driving the route at a maximum of 20 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 also 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 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, which results 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 index to upland game bird densities was calculated as the mean number birds observed per route for each species. A folded F-test was used to determine if the variance differed between the 2012 and 2013 indices. If unequal variance existed ($P < 0.05$) then a Satterthwaite's adjustment was used to adjust the degrees of freedom prior to conducting a two sample t-test. If variance did not differ across years then a standard two sample t-test was used to draw comparisons. Data were 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, so ratio data are pooled across each Small Game region (Figure 1). Turkey management regions differ from small game regions and data were reported accordingly. Quail ratio data were reported per adult (male and female) because males can also incubate nests and brood young.

Spatial comparisons were made using an ARC GIS Inverse Weighted Distance technique, which interpolates data across a landscape between known points. This provides a unique map showing probable densities which are spatially relative. This is a large-scale view of upland bird densities, and does not take into account localized populations and habitats.

RESULTS

Participants sampled 69 of the 74 established routes between July 17 and September 4 (Table 1). Heavy rains and associated poor road conditions led to 5 of the 69 routes not being sampled 4 times. The Cherokee, Comanche, Montgomery, and Pawnee routes were sampled 3 times each and the Osage route was only sampled twice. All routes were sampled at least once during a wet vegetation morning (dew or rain the previous night). Birds/mile, chicks/mile, and broods/mile were all correlated, therefore only birds/mile is reported herein. Results are summarized by Kansas Small Game Regions (Figure 1) or Turkey Regions accordingly (Figure 2).

Pheasants

Statistically significant annual decreases in pheasant densities occurred in the Northern High Plains (72%) and the South Central Prairies (60%) (Table 2). Pheasants per mile were highest in

the Smoky Hills with the highest counts located in Mitchell County (Table 2). Few pheasants were detected in the Flint Hills and South-Central Prairies. No pheasants were detected in the Osage Cuestas.

Statewide production indices were improved this year compared to 2012 (Table 5). Chicks/adult Hen and chicks/brood were highest in the Flint Hills and Glaciated plains (Table 5). The chick/brood ratios for these regions are likely artificially high as a result of some gang broods being recorded without any observed Hens. The chick/adult hen ratio was relatively similar compared to last year in the remaining regions. The chick/brood ratio increased compared to last year in Smoky Hills and decreased in the Northern High Plains and south-central prairies. Pheasant hatch peaked toward the end of May or beginning of June (Figure 6). Pheasant densities will generally be highest in north-central Kansas during the fall of 2013 (Figure 3).

Quail

No region showed statistically significant changes in the quail indices compared to 2012 (Table 3). Apparent changes observed could have been solely due to variability associated with the sampling scheme. Quail densities were greatest in the Osage Cuestas and Glaciated Plains regions, with the higest densities in Coffey, Labette, and Neosho counties (Table 2). Scaled quail were recorded on the Stanton and Hamilton county routes in extreme southwest Kansas.

Statewide production indices decreased in all regions compared to last year (Table 6). No chicks were detected in the Southern High Plains this year. Chicks/adult was highest in the glaciated plains and chicks/brood were relatively consistent across regions where chicks were detected (Table 6). Quail hatch peaked in the last week of June and early July (Figure 7). The highest quail densities will generally be in the Flint Hills and Osage Cuestas during fall 2013 (Figure 4).

Turkey

Turkey densities decreased significantly in the Northeast (51%) and the North-central regions (57%) (Table 4). Despite observed decreases, the South-central and Northeast region had the highest densities while the Northwest and Southwest regions had the lowest densities with very few turkeys being observed. The counties with the highest indices were Bourbon, Jewell, Saline, and Harvey (Table 4).

The statewide poult/ hen ratio decreased this year compared to 2012 while the poult/brood ratio remained similar (Table 7). The poult/hen ratio decreased in all regions except the Southwest where no poults were observed in 2012. The poults/brood showed little change except in the Southeast where there was a slight decline (Table 7). The Southwest region had the highest poult/hen ratio while the Northeast showed the highest poult/brood ratio (Table 7). Turkey hatch peaked in late May (Figure 8). The highest turkey densities will generally be found in the Flint Hills and throughout central KS during fall 2013 (Figure 5).

DISCUSSION

Severe drought over the last 3 years has had its impact on upland game populations in Kansas. Pheasants have been hurt most by the drought conditions, especially in the high plains of western

Kansas. Quail have also seen declines, particularly in south-central and south-west Kansas. However, some areas have maintained or increased quail populations such as parts of the Osage Cuestas and Glaciated Plains (eastern Kansas). In these regions heavy precipitation in spring/summer often hinders bobwhite reproductive output, while during the drought enough cover was present for successful nesting without the associated weather related mortality. Turkey populations have seen general declines in the last few years due to inadequate precipitation (too much/too little). Southwest Kansas has seen the most severe declines were very few birds are being detected.

Pheasant populations are an important resource to Kansas. This year will likely be another below average harvest year. In 2010, pheasant populations reached our highest levels in nearly 20 years. Since 2010 harvest has steadily decreased as conditions have not been favorable for summer production. In 2012 harvest was at near all time lows, second only to the first modern pheasant season in 1957 which was a 3-day season in limited counties. With another severe drought year in 2013, reproduction was again limited for pheasants throughout the primary range in Kansas, and few carry-over birds will be available for harvest this fall. The Northern High Plains, which had retained the highest densities in 2012, had the sharpest declines this year with densities decreasing nearly 75%. The best hunting areas will be portions of the Smoky Hills region (Figure 3) with limited opportunities elsewhere.

In recent years, Kansas has harvested more wild bobwhites than any other state. Bobwhites in eastern Kansas have fared well during the drought. Populations in the Glaciated Plains and the Osage Cuestas have been steadily increasing over the last 3-4 years. Some areas of the Flint Hills also have maintained relatively good Bobwhite densities. A few counties in the Smoky Hills should provide some decent hunting opportunities (Figure 4). In 2010, the highest densities of Bobwhites were in the Southern High Plains and the South-Central Prairies. Densities have taken the sharpest declines in these two regions as Bobwhite populations have struggled with the severe drought.

Turkey populations in eastern Kansas have been responding relatively well to drought conditions, while production in western populations was limited where the drought was more severe. Production indices were somewhat reduced in all regions compared to last year except in the Southwest where no poults were recorded in 2012. Despite reduced production, indices were still relatively good for Eastern regions. Given the production indices, the reduced indicies in the eastern part of the state may be due to the combination of the reduced production and decreased sightability due to improved vegetation. The continued drought in the western regions prevented recovery of limited populations. The South-Central region and parts of the Southeast region showed the best overall populations this year (Figure 5).

Table 1. Upland game bird brood routes and observers in Kansas, 2013.

Route	Observer	Position	Route	Observer	Position
Allen	Justin Harbit	Biologist	Marshall	James Svaty	Public Lands
Atchison	Tim Urban[a]	Biologist	Meade	Jason Vajnar	Fisheries
Barber	Charlie Swank	Biologist	Miami	Andy Friesen	Biologist
Barton	Karl Grover	Public Lands	Mitchell	Toby Marlier	Public Lands
Bourbon	Justin Harbit	Biologist	Montgomery	Darin Porter	Public Lands
Brown[d]	Scott Stoughton	Law Enforcement	Morris	Brent Konen	Public Lands
Cherokee	David Jenkins	Public Lands	Morton	Kraig Schultz	Biologist
Cloud	Matt Farmer	Public Lands	Neosho	Logan Martin[a]	Biologist
Coffey	Bob Culbertson	Biologist	Ness	Aaron Baugh	Biologist
Comanche	Matt Hanvey	Law Enforcement	Norton	Blake Klema[b]	Public Lands
Cowley	Kurt Grimm	Public Lands	Osage	JR Glenn	Public Lands
Decatur	Alex Heeger	Non KDWPT (PF)	Osborne	Chris Lecuyer	Public Lands
Dickinson	Clint Thornton	Biologist	Pawnee	Matt Stucker	Law Enforcement
Doniphan[d]	Kirk Thompson	Public Lands	Phillips	Michael Zajic	Public Lands
Ellis	Mike Nyhoff	Public Lands	Pottawatomie	Corey Alderson	Biologist
Finney	Jon Heistand	Biologist	Pratt	Jake George	Biologist
Franklin	Jeff Cakin	Law Enforcement	Rawlins	Alex Heeger[a]	Non KDWPT (PF)
Geary	Clint Thornton	Biologist	Reno	Kyle McDonald	Biologist
Gove	Wes Sowards[a]	Biologist	Republic	Rob Unruh	Public Lands
Graham	Jake Brooke	Law Enforcement	Rice	Steve Adams	Biologist
Gray[d]	Manuel Torres	Public Lands	Rooks	Marc Gray	Biologist
Greenwood	Pat Riese[a]	Biologist	Rush	Katie McFerrin[c]	Biologist
Hamilton	Daryl Fisher	Biologist	Russell	Viki Cikanek	Biologist
Harvey	Charlie Cope	Biologist	Saline	Matt Smith[a]	Biologist
Haskell	Ali Rath	Non KDWPT (PF)	Scott	Michele Witecha	Non KDWPT (KFS)
Hodgeman	Dan Haneke	Law Enforcement	Seward	Josh Jagels	Fisheries
Jackson[d]	Eric Denault	Law Enforcement	Sheridan	Jake Brooke[a]	Law Enforcement
Jefferson[d]	Justin Anderson	Public Lands	Sherman	Kurt Meier[a]	Biologist
Jewell	Aaron Deters	Biologist	Smith	Brad Odle	Biologist
Kearney	Kurt Hudson	Law Enforcement	Stafford	Mike Mitchener	Biologist
Kingman	Troy Smith	Public Lands	Stanton	Kraig Schultz[a]	Biologist
Kiowa	Charlie Swank	Biologist	Thomas	Wes Sowards[a]	Biologist
Labette	Logan Martin[a]	Biologist	Trego	Kent Hensley	Public Lands
Lane	Mark Witecha	Non KDWPT (PF)	Wabaunsee	Brad Rueschhoff	Biologist
Logan	Leonard Hopper	Public Lands	Wallace	Kurt Meier[a]	Biologist
Marion	Jeff Rue	Biologist	Wilson	Bob Funke[a]	Law Enforcement

[a]New observer in 2013;

[b]Jordan Girard also helped on this route

[c]Katie McFerrin was a seasonal temporary employee in Hays

[d] Not survey in 2013

Table 2. Regional Changes in mean pheasants per mile (P/M), 2013.

Route	2012 P/M	2013 P/M	% Δ
	Flint Hills		
Cowley	0.00	0.00	NA
Dickinson	0.06	0.06	13
Geary	0.01	0.00	-100
Greenwood	0.00	0.00	NA
Marion	0.04	0.25	NA
Morris	0.00	0.00	NA
Pottawatomie	0.00	0.00	NA
Wabaunsee	0.00	0.00	NA
Region	**0.09**	**0.09**	**1**
	Glaciated Plains		
Atchison	0.00	0.01	NA
Brown	0.00	NA	NA
Doniphan	0.01	NA	NA
Jackson	0.01	NA	NA
Jefferson	0.00	NA	NA
Marshall	0.03	0.26	800
Region	**0.01**	**0.14**	**851**
	Northern High Plains		
Decatur	0.72	0.19	-73
Gove	0.26	0.00	-100
Graham	0.70	0.36	-48
Lane	0.40	0.01	-98
Logan	0.26	0.00	-100
Norton	0.15	0.06	-62
Rawlins	0.42	0.05	-88
Scott	0.23	0.19	-17
Sheridan	0.41	0.36	-12
Sherman	0.80	0.04	-95
Thomas	0.29	0.17	-40
Wallace	0.10	0.02	-80
Region	**0.40**	**0.12**	**-72***
	Southern High Plains		
Finney	0.07	0.04	-38
Gray	0.13	NA	NA
Hamilton	0.04	0.01	-67
Haskell	0.54	0.14	-73
Kearny	0.11	0.00	-100
Meade	0.09	0.16	75
Morton	0.01	0.00	-100
Seward	0.30	0.36	23
Stanton	0.13	0.00	-100
Region	**0.16**	**0.09**	**-43**
	Smoky Hills		
Barton	0.05	0.23	357
Cloud	0.71	0.14	-81
Ellis	0.27	0.08	-71
Hodgeman	0.01	0.03	300
Jewell	0.13	0.26	94
Mitchell	0.90	0.92	2
Ness	0.17	0.04	-78
Osborne	0.34	0.12	-64
Phillips	0.04	0.02	-50
Republic	0.06	0.24	300
Rice	0.65	0.10	-85
Rooks	0.07	0.22	200
Rush	0.70	0.04	-95
Russell	0.20	0.05	-73
Saline	0.01	0.22	2500
Smith	0.22	0.22	0
Trego	0.41	0.03	-92
Region	**0.29**	**0.17**	**-40**
	South-Central Prairies		
Barber	0.08	0.01	-82
Comanche	0.01	0.00	-100
Harvey	0.09	0.09	-8
Kingman	0.07	0.02	-68
Kiowa	0.09	0.06	-31
Pawnee	0.22	0.11	-47
Pratt	0.18	0.04	-80
Reno	0.22	0.09	-61
Stafford	0.10	0.01	-93
Region	**0.12**	**0.05**	**-60***
	Osage Cuestas		
Allen	0.00	0.00	NA
Bourbon	0.00	0.00	NA
Cherokee	0.00	0.00	NA
Coffey	0.00	0.00	NA
Franklin	0.00	0.00	NA
Labette	0.00	0.00	NA
Miami	0.00	0.00	NA
Montgomery	0.00	0.00	NA
Neosho	0.00	0.00	NA
Osage	0.00	0.00	NA
Wilson	0.00	0.00	NA
Region	**0.00**	**0.00**	**NA**
Statewide	**0.17**	**0.09**	**-46**

* = Significant difference ($p < 0.01$)

Table 3. Regional Changes in mean quail per mile (Q/M), 2013.

Route	2012 Q/M	2013 Q/M	% Δ
	Flint Hills		
Cowley	0.34	0.25	-26
Dickinson	0.14	0.01	-89
Geary	0.14	0.24	71
Greenwood	0.13	0.08	-35
Marion	0.26	0.04	NA[a]
Morris	0.08	0.08	0
Pottawatomie	0.24	0.12	-50
Wabaunsee	0.37	0.01	-96
Region	**0.21**	**0.12**	**-44**
	Glaciated Plains		
Atchison	0.01	0.10	1200
Brown	0.09	NA	NA
Doniphan	0.00	NA	NA
Jackson	0.00	NA	NA
Jefferson	0.34	NA	NA
Marshall	0.25	0.28	11
Region	**0.11**	**0.19**	**63**
	Northern High Plains		
Decatur	0.16	0.00	-100
Gove	0.10	0.10	8
Graham	0.21	0.00	-100
Lane	0.10	0.00	-100
Logan	0.00	0.00	NA
Norton	0.00	0.00	NA
Rawlins	0.18	0.00	-100
Scott	0.00	0.02	NA
Sheridan	0.00	0.00	NA
Sherman	0.00	0.00	NA
Thomas	0.00	0.00	NA
Wallace	0.00	0.00	NA
Region	**0.06**	**0.01**	-84
	Southern High Plains		
Finney	0.00	0.00	NA
Gray	0.00	NA	NA
Hamilton	0.01	0.05	250
Haskell	0.00	0.00	NA
Kearny	0.00	0.00	NA
Meade	0.02	0.00	-100
Morton	0.00	0.00	NA
Seward	0.07	0.02	-78
Stanton	0.00	0.01	NA
Region	**0.01**	**0.01**	**-16**

Route	2012 Q/M	2013 Q/M	% Δ
	Smoky Hills		
Barton	0.01	0.00	-100
Cloud	0.59	0.12	-80
Ellis	0.22	0.00	-100
Hodgeman	0.00	0.00	NA
Jewell	0.07	0.05	-30
Mitchell	0.01	0.02	220
Ness	0.00	0.00	NA
Osborne	0.18	0.00	-100
Phillips	0.04	0.00	-100
Republic	0.02	0.22	900
Rice	0.06	0.00	-100
Rooks	0.01	0.01	0
Rush	0.16	0.03	-82
Russell	0.12	0.03	-78
Saline	0.09	0.03	-73
Smith	0.19	0.27	39
Trego	0.06	0.00	-100
Region	**0.11**	**0.05**	**-58**
	South-Central Prairies		
Barber	0.07	0.01	-90
Comanche	0.06	0.00	-100
Harvey	0.04	0.02	-40
Kingman	0.04	0.01	-68
Kiowa	0.08	0.01	-91
Pawnee	0.01	0.00	-100
Pratt	0.27	0.01	-95
Reno	0.12	0.23	88
Stafford	0.18	0.06	-65
Region	**0.10**	**0.04**	**-59**
	Osage Cuestas		
Allen	0.10	0.05	-53
Bourbon	0.08	0.06	-21
Cherokee	0.00	0.03	NA
Coffey	0.21	0.44	108
Franklin	0.01	0.02	200
Labette	0.02	0.49	2075
Miami	0.10	0.09	-10
Montgomery	0.03	0.03	7
Neosho	0.02	0.35	2200
Osage	0.22	0.03	-88
Wilson	0.38	0.23	-39
Region	**0.11**	**0.16**	**57**
Statewide	**0.10**	**0.07**	**-34**

*Values are significant at a $P \leq 0.10$ level

Table 4. Regional Changes in mean Turkey per mile (T/M), 2013.

Route	2012 T/M	2013 T/M	[a]% Δ	Route	2012 T/M	2013 T/M	[a]% Δ
	Northeast				Northcentral		
Atchison	0.43	0.04	-92	Barton	0.00	0.00	NA
Brown	0.17	NA	NA	Cloud	0.28	0.56	100
Dickinson	0.68	0.42	-38	Ellis	0.29	0.11	-61
Doniphan	0.39	NA	NA	Jewell	0.85	0.02	-97
Franklin	0.41	0.01	-97	Mitchell	0.25	0.25	1
Geary	0.82	0.22	-74	Osborne	0.49	0.32	-33
Jackson	0.53	NA	NA	Phillips	0.37	0.07	-82
Jefferson	0.33	NA	NA	Republic	0.31	0.06	-81
Marshall	0.41	0.19	-54	Rooks	0.47	0.00	-100
Morris	0.73	0.31	-58	Rush	0.03	0.06	125
Osage	0.71	0.76	7	Russell	0.08	0.00	-100
Pottawatomie	0.07	0.18	145	Saline	1.66	0.73	-56
Wabaunsee	0.71	0.29	-60	Smith	0.74	0.29	-61
Region	**0.55**	**0.27**	**-51***	**Region**	**0.45**	**0.19**	**-57***
	Northwest				Southcentral		
Decatur	0.00	0.09	NA	Barber	0.00	0.21	NA
Graham	0.17	0.00	-100	Comanche	0.00	0.11	NA
Norton	0.78	0.01	-98	Harvey	1.22	0.72	-41
Rawlins	0.67	0.34	-49	Kingman	0.12	0.11	-11
Sheridan	0.25	0.00	-100	Kiowa	0.08	0.01	-82
Sherman	0.02	0.00	-100	Meade	0.00	0.19	NA
Thomas	0.00	0.04	NA	Pawnee	0.15	0.32	110
Region	**0.27**	**0.07**	**-74**	Pratt	0.00	0.00	NA
	Southwest			Reno	0.72	0.40	-45
Finney	0.00	0.14	NA	Rice	0.59	0.60	1
Gove	0.07	0.07	0	Stafford	0.71	0.36	-49
Gray	0.00	NA	NA	**Region**	**0.33**	**0.28**	**-15**
Hamilton	0.00	0.00	NA		Southeast		
Haskell	0.00	0.00	NA	Allen	0.36	0.42	17
Hodgeman	0.00	0.00	NA	Bourbon	0.88	0.52	-40
Kearny	0.00	0.00	NA	Cherokee	0.19	0.03	-85
Lane	0.00	0.00	NA	Coffey	0.31	0.06	-79
Logan	0.00	0.00	NA	Cowley	0.12	0.33	189
Morton	0.00	0.00	NA	Greenwood	0.31	0.06	-80
Ness	0.00	0.04	NA	Labette	0.30	0.32	10
Scott	0.00	0.00	NA	Marion	0.42	0.20	NA
Seward	0.00	0.00	NA	Miami	0.96	0.17	-83
Stanton	0.00	0.00	NA	Montgomery	0.00	0.07	NA
Trego	0.06	0.00	-100	Neosho	0.32	0.44	40
Wallace	0.17	0.12	-29	Wilson	0.26	0.10	-62
Region	**0.02**	**0.02**	**31**	**Region**	**0.35**	**0.23**	**-34**
				Statewide	**0.31**	**0.17**	**-45**

*Values are significant at a $P \leq 0.10$ level

Table 5. Regional changes in Pheasant chicks per hen (C/H), chicks per brood (C/B), and broods per hen (B/H), 2013.

Region	2012 C/H	2013 C/H	%Δ	2012 C/B	2013 C/B	%Δ	2012 B/H	2013 B/H	%Δ
Flint Hills	2.0	10.5	425	3.0	21.0	600	0.33	1.00	200
Glaciated Plains	1.5	8.0	433	1.5	32.0	2033	1.00	NA	NA
Northern High Plains	5.0	4.8	-4	4.0	1.9	-52	0.53	0.33	-38
Osage Cuestas	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA
Smoky Hills	4.1	5.5	36	4.4	6.6	51	0.60	0.85	41
South-Central Prairies	3.8	4.0	5	4.4	2.0	-54	0.43	0.44	1
Southern High Plains	4.4	4.2	-5	3.3	4.2	27	0.53	0.69	30
Statewide	**4.3**	**4.6**	**9**	**4.1**	**5.3**	**32**	**0.55**	**0.60**	**8**

Table 6. Regional changes in quail chick per adult (C/A), chicks per brood (C/B), and broods/adult, 2013.

Region	2012 C/A	2013 C/A	%Δ	2012 C/B	2013 C/B	%Δ	2012 B/A	2013 B/A	%Δ
Flint Hills	3.0	0.6	-80	9.3	7.3	-21	0.27	0.08	-71
Glaciated Plains	7.2	5.6	-23	10.3	7.8	-24	0.30	0.14	-52
Northern High Plains	3.2	0.8	-76	10.4	6.0	-42	0.22	0.10	-54
Osage Cuestas	3.2	1.3	-59	12.6	7.5	-40	0.18	0.16	-10
Smoky Hills	4.1	1.2	-71	9.0	8.4	-6	0.27	0.10	-63
South-Central Prairies	3.1	1.6	-49	8.2	10.0	22	0.24	0.05	-78
Southern High Plains	1.8	0.0	-100	9.0	0.0	-100	0.00	0.00	0
Statewide	**3.4**	**1.2**	**-66**	**9.6**	**7.8**	**-18**	**0.24**	**0.12**	**-51**

Table 7. Regional changes in turkey poults per hen (P/H), poults per brood (P/B), and broods per hen (B/H), 2013.

Region	2012 P/H	2013 P/H	%Δ	2012 P/B	2013 P/B	%Δ	2012 B/H	2013 B/H	%Δ
Northcentral	1.5	1.1	-27	5.6	6.7	19	0.27	0.15	-46
Northeast	2.8	2.5	-10	6.3	7.3	15	0.41	0.34	-16
Northwest	1.5	0.4	-72	5.2	5.5	6	0.28	0.08	-72
Southcentral	3.6	2.1	-43	6.3	6.9	9	0.57	0.28	-50
Southeast	2.5	1.6	-37	5.8	4.5	-23	0.41	0.35	-14
Southwest	0.0	4.0	NA	NA	5.3	NA	0.00	0.75	NA
Statewide	**2.3**	**1.7**	**-27**	**6.0**	**6.1**	**2**	**0.37**	**0.26**	**-29**

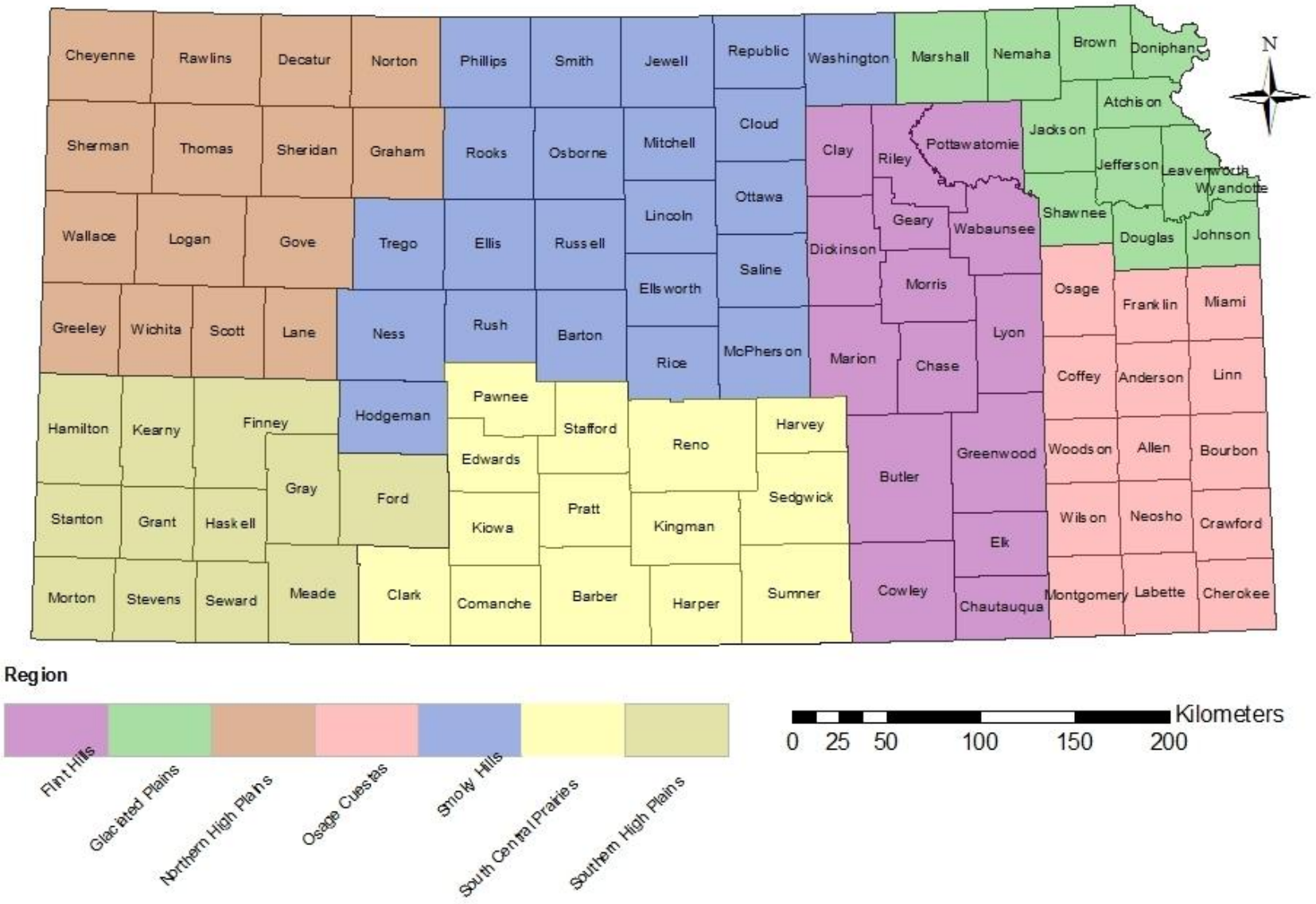

Figure 1. Kansas Small Game Regions, 2013.

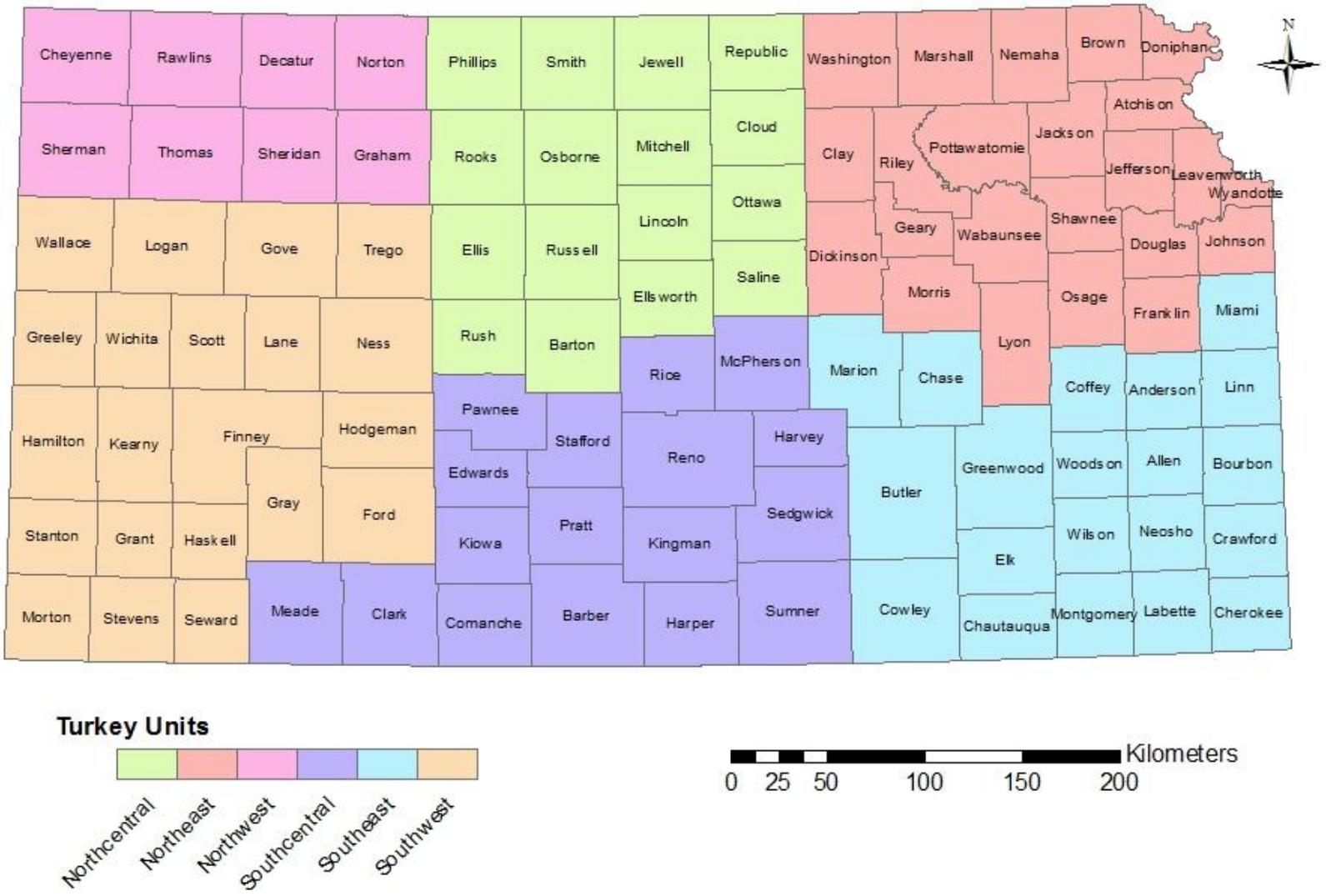

Figure 2. Turkey Management Regions, 2013.

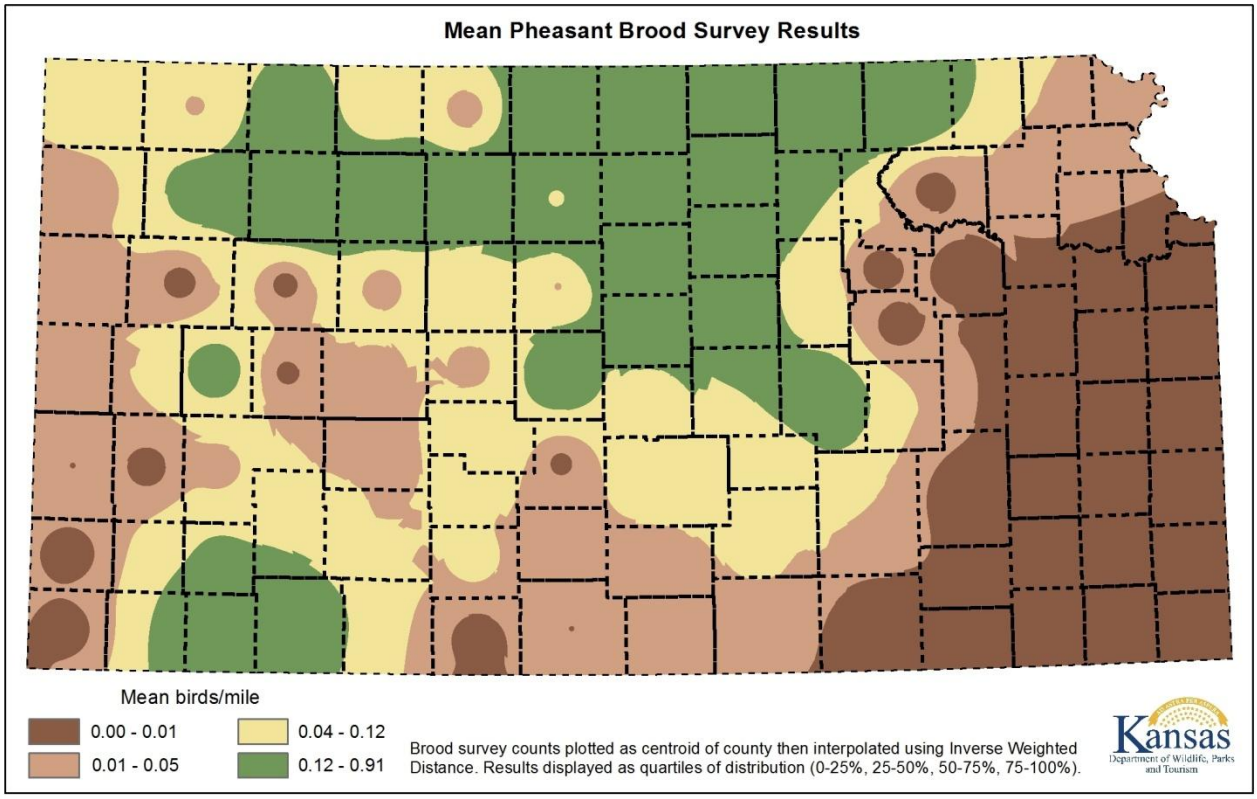

Figure 3. Relative pheasant densities recorded from brood survey routes in Kansas, 2013.

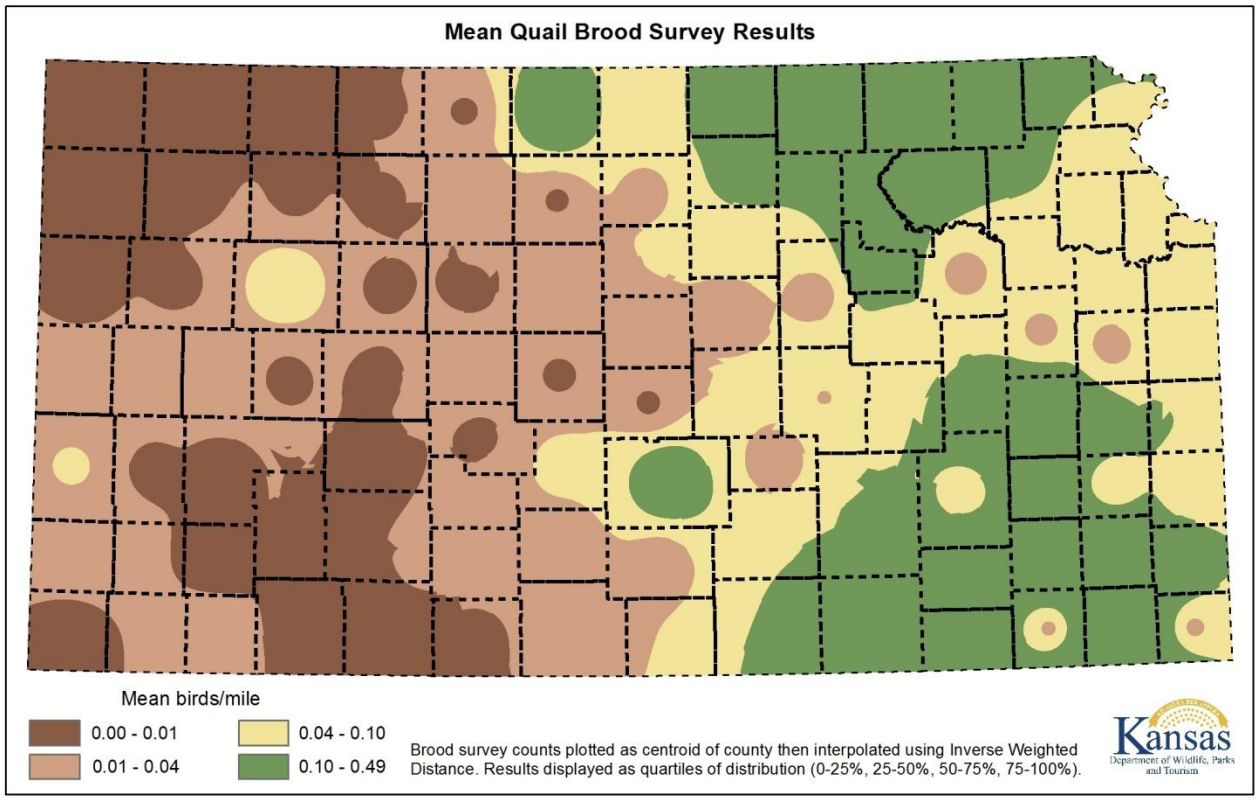

Figure 4. Relative quail densities recorded from brood survey routes in Kansas, 2013.

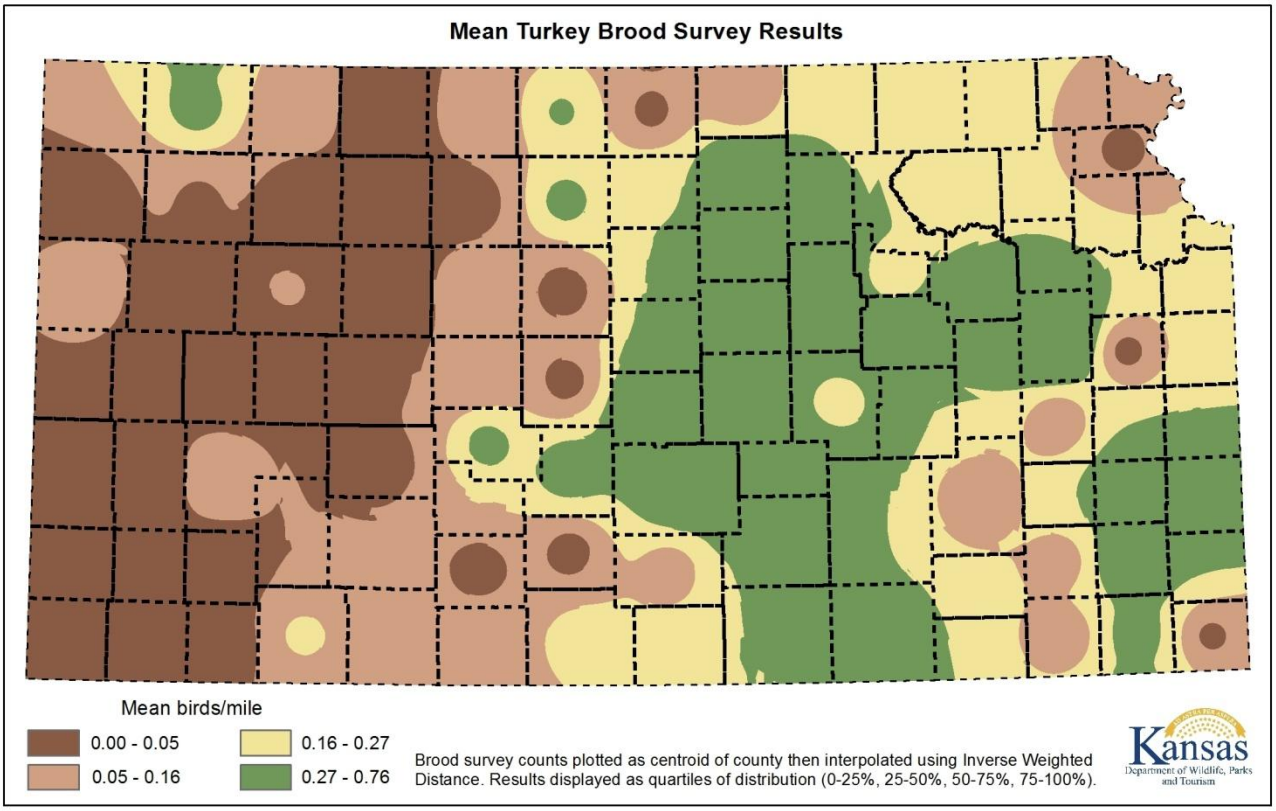

Figure 5. Relative turkey densities recorded from brood survey routes in Kansas, 2013.

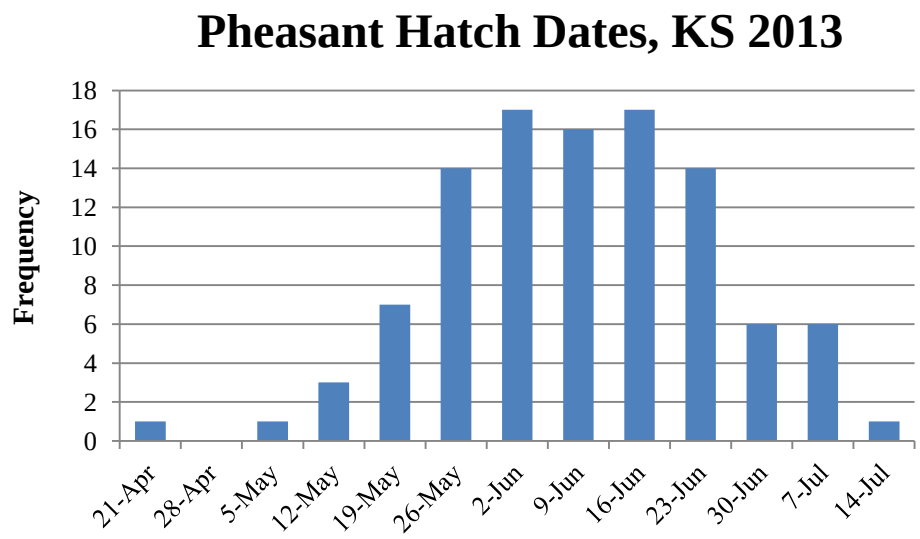

Figure 6. Weekly hatch dates of pheasant broods estimated from age at detection.

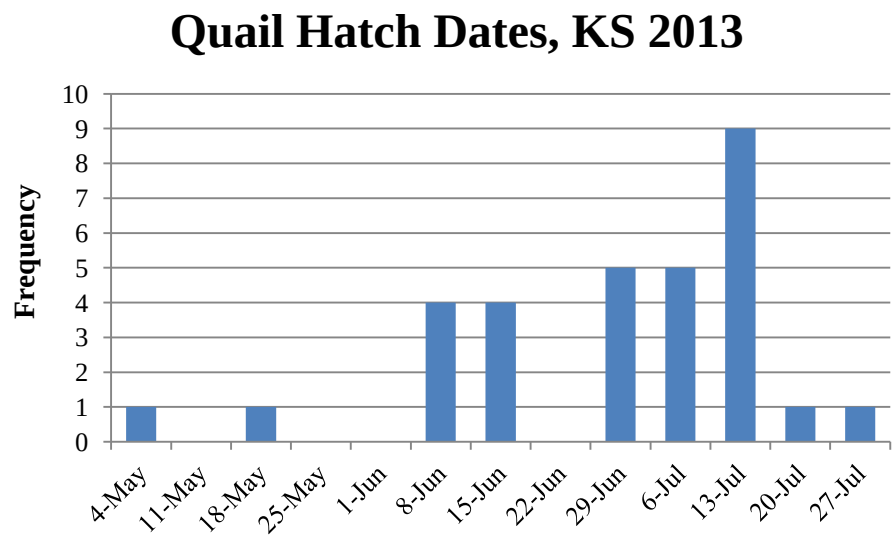

Figure 7. Weekly hatch dates of quail broods estimated from age at detection.

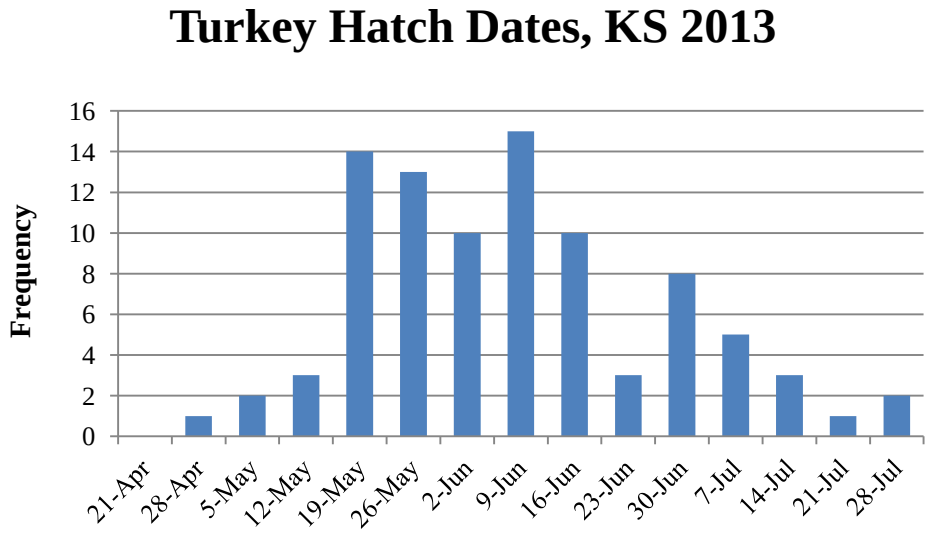

Figure 8. Weekly hatch dates of turkey broods estimated from age at detection.