2018 MOURNING DOVE POPULATION AND RESEARCH STATUS REPORT

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Migratory Bird Harvest Information Program (HIP)

The national migratory bird harvest information program (HIP) was developed to fill the need for reliable harvest data to guide management decisions for all migratory game birds in addition to numerous post-season mail harvest surveys conducted by individual states. Although federal waterfowl harvest surveys existed since 1952, historical surveys lacked a reliable sampling frame of names and addresses of all migratory bird hunters and, therefore, did not adequately address webless migratory game birds (e.g., mourning doves, woodcock). Since 1998, the HIP harvest survey has provided reliable estimates of hunter activity and harvest at national and regional scales for all migratory game bird species, and provides comparable harvest estimates at the state scale.

This status report uses the most current data available. Because federal regulations setting meetings for mourning doves now take place in October, the harvest strategy uses predictive information for estimated dove abundance on 1 September, 2017 to inform regulation decisions for the 2018-19 seasons.

During the 2016-17 mourning dove season, as estimated by the HIP survey, Texas led the Central Management Unit (CMU; Figure 1) in mourning dove harvest with 5.1 million birds killed by 278,700 dove hunters (Table 1). During 2016-17, Missouri was fourth in CMU mourning dove harvest with 321,600 doves killed by 25,200 dove hunters; behind Texas, Kansas and Oklahoma (Table 1).

Missouri's Small Game Post-season Harvest Survey

Starting in 2009, it was decided that the Small Game Post-season Harvest Survey would be conducted every two years instead of annually. It was felt that annual differences were not as critical to decision making as the long term trends and that auxiliary sources of data (such as the road side surveys and selected area harvest checks for doves) would adequately supplement information collected from a biennial small game survey. A survey was conducted in 2016 and results from this survey are presented below.

Harvest data for Missouri during 2016 showed 32,158 mourning dove hunters harvested 556,154 doves statewide; a 2.4% increase in hunters and a 0.2% increase in harvest from 2014. Statewide, dove hunters averaged 4.6 doves per day and 3.8 days of hunting per season in 2016 compared to 4.4 doves per day and 4.0 days per season in 2014. Average season bag for 2016 was 17.3 mourning doves compared to 17.7 in 2014. Data for 2016, by zoogeographic region, showed

Northeastern Riverbreaks and Mississippi Lowlands with the largest harvests (136,740 and 125,075 doves, respectively) and North West Prairie with the lowest (14,285 doves; Figure 2).

Long-term trends of harvest and hunters continue to appear to be leveling off over the past few years (Figure 3), with daily bag and average days afield staying relatively stable (Figure 4). Although the number of hunters and harvested doves has declined since the 1970s, remaining dove hunters are hunting about the same number days, while gradually increasing their daily harvest.

2017 MOURNING DOVE POPULATIONS TRENDS/SURVEYS

Up until 2013, the Department annually conducted two mourning dove surveys in Missouri, the National Mourning Dove Call-Count Survey (CCS) and the Roadside Dove Survey (RDS). The CCS was a national survey conducted annually in cooperation with the states and the USFWS. The CCS was established in 1966, and annually surveyed nearly 1,500 routes nationally. The CCS was established to provide regional and national population indices. However, with the adoption of the new harvest management strategy protocols in 2013 that rely on abundance estimates rather than indices, the CCS was no longer needed and was discontinued. The RDS is an independent statewide dove survey conducted annually by Department staff; the survey contains usable data going back to 1948. The RDS provides an index of doves seen, rather than calling, along standardized routes throughout the state (some urban counties have been excluded through time because of traffic concerns). The RDS provides regional data for Missouri that the CCS could not supply. There was a very strong long-term relationship between both surveys over several decades; however, it is not unusual for the two surveys to show relatively small opposite trends within a given year.

National Mourning Dove Call-Count Survey

The Mourning Dove Call-count Survey (CCS) was conducted from 1966 to 2013. The CCS was developed to provide an annual index of abundance specifically for mourning doves. The CCS was discontinued because the harvest strategy adopted for mourning doves in 2013 does not make use of data from the CCS, but rather relies on absolute abundance estimates. The relative trend of doves heard calling and trend of doves seen while conducting CCS routes in the CMU showed different trajectories (Figure 6) lending suspicion to the value of the data in a harvest management decision-making process. This is one of the reasons why the current long-term harvest strategy has been based on vital rates derived from banding, harvest, and wing collection data starting in 2013.

2018 Missouri's Roadside Mourning Dove Survey

Statewide results of the 2018 RDS showed 1.47 doves/mile; a 3.05% decrease compared to 2017 (Figure 5), a 4.00% increase over the statewide 5-year average (2013-17; 1.41 doves/mile, SD 0.07), and a 5.85% increase over the statewide 10-year average (2008-17; 1.38 doves/mile, SD 0.14; Table 2). The northern part of the state rebounded from last year's declines to show increases or only slight declines compared to 2016. Most of the state showed increases comparted to last year except for the east-central part of the state which saw a sharp decline (Table 2). The North and East Ozark Border showed the biggest decline, while all the other zoogeographic regions exhibited fairly stable or increasing index values compared to 2016 (Figures 12-19). The Northwest Prairie Zooregion (north-west region of the state) showed the biggest increase over last year (Table 2). Survey results are also provided by Department management regions (Figure 2; Table 2).

This year the RDS index showed moderate to slight decreases in 5 of the 8 zooregions after last year's general increases. Index increases were observed across the central part of the state as well

as along the east central and north east zooregions. The largest decreases from last year were observed in the north central and north west portions of the state. These reductions were significant enough that they continued on when compared to the 5 and 10 year averages for these regions of the state. Apart for the north/north west regions of the state, when compared to the 5 and 10 year averages, this year, in general, tends to be better than average for most of the State. Depending upon weather conditions the last week of August and early September and food availability to concentrate doves, hunting opportunities are anticipated to be at or slightly above average in the central, east central and north-east parts of the state and average in the east-central and southern parts of the state this dove season. Hunters may in the north central and north west part of the state may find slightly reduced dove numbers.

Long-Term Population Trends

Long-term mourning dove trends from both RDS and CCS surveys provide an interesting picture (Figure 5). Since 1966, both surveys show a strong relationship to each other ($r = 0.76$; 1966-2012). If we assume that these 2 surveys are tracking similar aspects of the mourning dove population, we see 3 things emerging from Figure 5. First, although trends have declined since 1966, the RDS trend has been relatively stable, or even slightly increasing, over the last 10 years. Second, although trends are lower today than during the late 1960s, RDS trends are near levels similar to the late 1940s and early 1950s. Third, some phenomena occurred during the late 1950s and early 1960s that caused trends to climb rapidly. Regionally, we can speculate that some beneficial and broad scale land use changes occurred in the Mississippi Lowlands, Northeast Riverbreaks, Northeastern Riverbreaks, and Western Prairie during the late 1950s and early 1960s (Figures 12–19). Regardless, the important point is that roadside trends are problematic at best when trends of similar variables contradict each other (Figure 6). Also, trends in such data change with no apparent explanation for the change.

From a national perspective, some uncertainty exists about the relative merits of the North American Breeding Bird Survey (BBS) and CCS surveys (i.e., CCS doves heard, and CCS doves seen), and the actual ability of the surveys to track real changes in mourning dove population trends. Although the CCS protocol is specifically designed for doves, the number of survey routes is less compared to the BBS, which leads to concerns about the sensitivity of the survey to detect trends. In addition, these trend declines may not be indicative of actual changes in populations, but rather an index to unmated males in the breeding population, changes in habitat along standardized survey routes, or a wide range of other factors. Although uncertain in some respects, these data provide a useful and generalized picture of relative population trends for use in providing regional and statewide hunting forecasts for Missouri. These uncertain data, however, show the need for improving the reliability of the information used in the harvest management decision making process (i.e., establishing and changing hunting regulations). This was the primary motivation for the establishment and approval of the Mourning Dove National Harvest Management Plan adopted by all flyway councils and the Association of Fish and Wildlife Agencies (AFWA), and the emerging and ongoing national mourning dove banding and wing collection programs.

MOURNING DOVE HARVEST MANAGEMENT STRATEGY AND IMPACTS ON THE 2018 MOURNING DOVE HUNTING SEASON REGULATIONS

The hunting regulation for the 2018 mourning dove hunting season in Missouri remains the same as in 2017. The dove season is 90 days long, running from September 1st through November 29th. Daily bag (15 birds) and possession limit (45 birds) remain the same as in 2017. Following is the rationale for the season structure and how the regulation decision is made. In 2013, a change was

made to the possession limit, increasing it from 2-times (30 birds) to 3-times (45 birds) the bag limit. This change was made to increase hunting opportunity for those hunters that may travel long distances to hunt. It is not anticipated this change will have any significant impact on harvest rates and/or total birds harvested. The dove season was extended by 20 days to the end of the season in 2016 to increase uniformity of season lengths across the Management Units nation-wide and to also increase hunting opportunity with minimal anticipated impact on harvest rates and/or total birds.

Mourning dove harvest strategies were endorsed by the Flyway Councils and Service Regulations Committee in 2013 for each of the three Management Units (Eastern, Central, and Western), with implementation beginning with the 2014-2015 seasons. The harvest strategies replace the interim strategies that have been used to prescribe regulatory alternatives since 2009. These new strategies represent a more informative approach to managing harvest of mourning doves as envisioned in the Mourning Dove National Strategic Harvest Management Plan approved by the Flyway Councils in 2003.

For the harvest strategy, a discrete logistic model in Bayesian framework is used to estimate population parameters (intrinsic rate of growth, carrying capacity) and predict mourning dove abundance in the year subsequent to the data time series. The procedure involves repeated sampling and results in a distribution of predicted abundance estimates (posterior probability distribution). The posterior probability distribution is used in a decision analysis framework for setting harvest regulations relative to threshold abundance values. The harvest strategy requires that 85% of the distribution (confidence in the parameter estimate) must be above the critical abundance threshold to prescribe that regulatory alternative. This corresponds to a credible interval (CI) of 70% for the parameter estimate (i.e., central 70% of the posterior probability distribution plus one half of the remaining distribution [the upper half]). Thus, if the lower 70% CI for the predicted abundance is below the critical abundance threshold value then the more restrictive regulatory alternative is prescribed.

Critical abundance thresholds for all management units are based on 30% and 50% of approximate maximum sustainable yield for each respective management unit (Table 3). Alternative regulatory packages involve changes to season length and bag limit, and also differ by management unit (Table 4).

Based on the current assessment (Table 5), the prescribed regulatory alternative for each Management Unit during the 2018–19 hunting season is the standard regulatory alternative. This represents no change from the previous year.

MONITORING DOVE SHOOTING FIELD MANAGEMENT

Mourning doves provide abundant hunting opportunities close to where urban residents live. Unlike other game animals that require relatively large areas of habitat management for hunting, mourning dove shooting field management routinely occurs on sunflower fields ranging in size from 5–30 acres. However, considerable uncertainty has existed concerning harvest management strategies; e.g., half day vs. all day hunting, large daily harvests in relatively short periods vs. small daily harvests spread out over a longer interval.

To address this range of management questions, biologists from several conservation areas with active dove shooting management programs met in July, 1999 to develop a long-term Adaptive

Resource Management (ARM) effort; the program was expanded to include additional areas in 2003 (Figure 20). The ARM process works best with management problems such as this one because the problem is small enough to explicitly define a management objective, and develop a meaningful and efficient monitoring program. Thus, the overall goal of the ARM program is to learn how different dove management strategies impact our objective of maximizing dove hunting opportunities on public areas. As a part of the monitoring program, dove hunters on these areas are required to report the number of doves killed, shots fired, hours hunted, zip code (to obtain an estimate of distance traveled to hunt), and number of doves shot but not retrieved; an orange-colored daily hunting card is used by dove hunters on these areas to help collect the necessary monitoring information.

To monitor our success in meeting our objective, we are collecting information on various harvest related metrics (Tables 6–9; Figures 7–11). For example, 78.7% of dove hunters went hunting once during September 2017, 15.6% went twice, and 4.0% went three times (Table 8). Average data during 1998–2017 showed considerable variation among participating areas (Figure 7) for number of hunts (or hunters; Figure 8), hours hunted (Figure 9), shots fired (Figure 10), and doves harvested (Figure 11). Average distance traveled by dove hunters to these areas during September, 2017 are given in Table 9.

It is important to note that the few areas involved in this long-term monitoring program represent just a few of the numerous mourning dove hunting opportunities on public areas found in Missouri. The Department provides managed mourning dove hunting opportunities on approximately 5,000 acres located on 150 fields located on over 90 public conservation areas scattered around the state. Check the public web sometime after the middle of August to locate the managed areas near you (https://www.mdc.mo.gov/).

MOURNING DOVE RESEARCH UPDATE

National Banding Study

To improve future harvest management decisions at the national, regional, and statewide levels, population information is needed to make better informed decisions. A harvest management strategy has been approved using banding, wing collection and harvest data to help make more informed harvest management decisions. The national mourning dove banding program continues to obtain modern information on band reporting rates and harvest rates for use in the population models, which in turn will be used in making decisions about future changes in hunting regulations and harvest management strategies. To date, these efforts have received widespread support (e.g., flyway technical committees, flyway councils, joint flyway councils, and the AFWA subcommittees and its working groups).

Over the last 10 years Missouri has banding doves on 14-16 Conservation Areas, and attached bands to 1,500–3,000 birds annually. During the ten year period, 2008–2017, the number of mourning doves banded in Missouri ranged from 1,547 in 2017 to 3,170 in 2010, with a total of 25,486 doves banded (Table 10). During 2008–2017, the number of all recoveries from doves banded in Missouri ranged from 92 in 2017 to 438 in 2014; during the same period there were 2,895 (11.4%) recoveries resulting from doves banded in Missouri. Of those recoveries, 2,697 (93.2%) were recovered in Missouri (Table 10). In addition to being recovered in Missouri, doves banded in Missouri were recovered in 14 other states plus Mexico. For doves recovered in Missouri, most (97.8%) were banded within the State; the remaining recoveries were banded in 10

other states (Table 11). Graphical representations of band recoveries through 2016 are provided (Figures 21, 22).

Starting in July 2017 the USGS Patuxent Bird Banding Laboratory will no longer support a call center to receive Federal bird band reports over its toll free line. Hunters that shoot and retrieve banded birds are now asked to report the band online at the mobile friendly web site (http://www.reportband.gov/). A report requires only around 5 minutes to complete online with hunters providing the band number, the location where the bird was killed, and the date when the bird was killed. After a report is submitted, the date and location where the bird was originally banded is provided a Certificate of Appreciation along with additional banding details (date, location of banding) will be sent via email. By reporting band numbers dove hunters will be helping to manage our dove resource for future generations.

Capturing and banding birds requires considerable effort, and documenting recovery or re-sighting of banded birds is essential to profit from that effort. Band recovery data are the basis for improving the conservation and knowledge of bird populations in North America. Please help the BBL, its many partners, and the birds of North America by continuing to report your band recoveries.

Wing Survey and Recruitment

The National Dove Plan recognizes the need for mourning dove recruitment information. Recruitment indices for other migratory game birds are obtained from wing collections conducted by national mail surveys conducted by the USFWS. A 3-year study, therefore, was initiated in 2007 to collect samples of wings using the 2 different collection methods, compare state-level and management unit-level estimates of age ratios derived from the 2 methods, and provide a cost comparison. The results of this project demonstrated the national mail survey provided an efficient and cost effective survey of dove wings. Other work has been accomplished at Iowa State University to correct for unknown aged wings. The national survey has now become operational and all of the wings (approx. 50,000) are processed and scored annually at the central location of the James A. Reed Memorial Wildlife Area, near Kansas City, MO.

Sampling wings from check stations at Missouri managed dove hunting areas will continue in an effort to obtain estimates of statewide recruitment. In combination with banding data, age ratios from dove wings can be used to estimate recruitment on a more realistic basis compared to the traditional fashion of using corrected age-ratios from wings and assuming that adult males and females are equally abundant in the population. Long-term datasets are necessary for the estimators to work properly; we currently have approximately 9-10 years of data. This preliminary work will eventually lead to a peer-reviewed manuscript and recruitment estimates that will be used in a balance-equation population model for a more informed harvest management strategy.

Table 1. Estimates of the number of doves harvested, number of hunters, and days afield by state in the Central Management Unit (CMU; Figure 2) from the Migratory Game Bird Harvest Information Program (HIP) survey for the 2016 hunting season.

	HARVEST		HUNTERS		DAYS		SEASONAL HARVEST (Harvest/Hunter)	
Arkansas	258,200	(±29)[1]	16,300	(±28)	36,200	(±27)	15.9	(±41)
Colorado	141,200	(±20)	13,100	(±18)	29,700	(±19)	10.8	(±27)
Iowa	128,100	(±19)	9,700	(±15)	25,300	(±17)	13.2	(±24)
Kansas	427,600	(±18)	28,600	(±12)	77,200	(±17)	14.9	(±22)
Minnesota	96,700	(±79)	6,500	(±58)	18,000	(±55)	15.0	(±98)
Missouri	321,600	(±20)	25,200	(±14)	65,100	(±21)	12.8	(±24)
Montana	16,000	(±53)	1,900	(±44)	3,500	(±43)	8.6	(±69)
Nebraska	132,000	(±22)	9,700	(±19)	24,500	(±18)	13.7	(±29)
New Mexico	47,900	(±26)	4,400	(±18)	12,800	(±33)	10.8	(±31)
North Dakota	76,900	(±30)	5,300	(±24)	15,800	(±35)	14.5	(±39)
Oklahoma	400,400	(±28)	23,800	(±14)	58,500	(±21)	16.8	(±32)
South Dakota	112,400	(±46)	5,600	(±22)	17,100	(±33)	20.1	(±51)
Texas	5,155,300	(±19)	278,700	(±13)	956,800	(±18)	18.5	(±23)
Wyoming	20,100	(±40)	1,700	(±27)	3,700	(±36)	11.5	(±48)
CMU Total	7,334,600	(±14)	430,400[2]		1,344,400	(±13)		

[1]This represents the 95% confidence interval expressed as percent of the point estimate.

[2]This total may be slightly exaggerated because some people may be counted more than once if they hunted in more than one state, and explains why there is no estimated confidence interval.

Table 2A. Percent change of the 2018 Roadside Mourning Dove Survey relative to 2017, 5-year (2013–17), and 10-year (2008–17) averages by Zoogeographic regions. Numbers in parentheses after the region names are the number of counties within that region turning in a completed and returned survey route. The Survey index is the number of doves observed per square mile.

Zoogeographic regions	2018 Index	2-year (2017-2018) % change	5-year (2013-2017) % change	10-year (2008-2017) % change
Northwest Prairie (11)	1.35	-23.60	-11.91	-10.00
Northern Riverbreaks (11)	1.19	-11.38	-13.20	-12.34
Northeast Riverbreaks (20)	1.64	16.50	30.45	26.66
Western Prairie (12)	1.73	-11.38	3.77	5.51
Western Ozark Border (13)	2.20	10.01	35.55	46.16
Ozark Plateau (24)	0.68	-18.80	-18.43	-9.25
Northern and Eastern Ozark Border (12)	0.99	36.04	2.89	-3.49
Mississippi Lowlands (7)	3.30	-9.45	-10.96	-13.38
STATEWIDE (110)	1.47	-3.05	4.00	5.85

Table 2B. Percent change of the 2018 Roadside Mourning Dove Survey relative to 2017, 5-year (2013–17), and 10-year (2008–17) averages by MDC Management Regions. Numbers in parentheses after the region names are the number of counties within that region turning in a completed and returned survey route. The Survey index is the number of doves observed per square mile.

MDC management regions	2018 Index[a]	2-year (2017-2018) % change	5-year (2013-2017) % change	10-year (2008-2017) % change
Northwest (19)	1.22	-22.05	-19.03	-16.74
Northeast (15)	1.67	25.95	34.36	34.77
Kansas City (10)	1.58	-11.58	-1.07	3.60
Central (15)	1.71	9.41	34.40	25.98
St. Louis (6)	0.77	6.07	9.17	0.91
Southwest (17)	1.89	-2.40	16.73	29.78
Ozark (12)	0.52	-5.47	-26.12	-22.17
Southeast (16)	1.79	-9.68	-13.11	-14.40
Statewide (110)	1.47	-3.05	4.00	5.85

Table 3. Critical mourning dove abundance thresholds (in millions) in the Eastern, Central, and Western Management Units based on the percentage of the population size expected when at maximum productivity (MSY; one half of carrying capacity). The harvest strategy states that 85% of the posterior probability distribution (confidence in the parameter estimate) must be above the critical abundance threshold to prescribe the regulatory alternative. Thus, if the lower 70% CI for the predicted abundance is below the critical abundance threshold value then the more restrictive regulatory alternative is prescribed.

Percentage MSY	Regulatory Prescription	EMU	CMU	WMU
50	**Restrictive**	**35.6**	**59.3**	**19.3**
30	**Closed**	**21.3**	**35.6**	**11.6**

Table 4. Mourning dove daily bag limit and days associated with each regulatory alternative in the Eastern, Central, and Western Management Units based on the proposed harvest strategy.

Management Unit	Regulatory alternative	Daily bag limit	Days
EMU	Standard	15	90
	Restrictive	10	70
	Closed	0	0
CMU	**Standard**	**15**	**90**
	Restrictive	**10**	**70**
	Closed	**0**	**0**
WMU	Standard	15	60
	Restrictive	10	60
	Closed	0	0

Table 5. Predicted abundance of mourning doves and respective credible intervals (in millions) for September 2016 for each Management Unit.

Management Unit	Population Predictions	L70% CI
EMU	71.85	58.30
CMU	149.08	130.60
WMU	45.22	37.38

Table 6. Dove harvest characteristics during September 2017 from conservation areas cooperating with an Adaptive Resource Management (ARM) program to evaluate the effects of different hunter and harvest management strategies on the goal of maximizing hunting opportunities[1].

Area	Number of Hunts	Doves Killed	Shots Fired	Hours Hunted	Doves Shot and Not Retrieved
A. A. Busch CA	294	50	640	784	32
Bois D'Arc CA	470	720	4,714	1,399	104
Columbia Bottom CA	408	109	778	1,375	17
Eagle Bluffs CA	192	488	2,460	583	90
Otter Slough CA	101	326	1,328	305	62
Pony Express CA	354	1,457	9,295	1,337	212
J. A. Reed Mem. WA	642	1,269	7,907	2,242	275
R. E. Talbot CA	640	2,779	18,565	2,153	609
Ten Mile Pond CA	515	3,632	14,822	1,493	330
Total for Participating Conservation Areas[1]	3,616	10,830	60,509	11,671	1,731

[1]It is important to note that these areas represent just a few dove hunting opportunities on public areas, and are part of a long-term management experiment. The Department provides managed mourning dove hunting opportunities on approximately 5,000 acres located on 150 fields located on >90 public conservation areas.

Table 7. Managed shooting field characteristics and relative distribution of the harvest characteristics by relative field size, during 2017.

Area Code	Area Name	2017 # Acres	2017 # Fields	Ave. Field Size	Doves Killed per Acre[1]	Hunters per Acre[2]	Shots per Acre[3]	Hours per Acre[4]
ABCA	August A Busch CA	94.3	17	5.5	0.53	3.12	6.79	8.31
BDCA	Bois D'Arc CA	187.0	55	3.4	3.85	2.51	25.21	7.48
CBCA	Columbia Bottoms CA	127.3	45	2.8	0.86	3.21	6.11	10.80
EBCA	Eagle Bluffs CA	36.0	3	12.0	13.56	5.33	68.33	16.19
MATC[5]	Marais Temps Clair CA							
OSCA	Otter Slough CA	54.0	6	9.0	6.04	1.87	24.59	5.65
PECA	Pony Express CA	113.4	17	6.7	12.85	3.12	81.97	11.79
RMWA[5]	James A Reed Mem. WA							
TACA	Talbot CA	124.7	32	3.9	22.29	5.13	148.88	17.27
TMCA[5]	Tem Mile Pond CA							
WHCA[5]	William & Erma White CA							
LOCA[5]	William Logan CA							
All Areas		736.7	175	4.21	8.05	3.34	51.28	10.77

[1]Represents doves killed per managed acre during the entire month of September.
[2]Represents the number of hunters per managed acre during the entire month of September.
[3]Represents shots per managed acre during the entire month of September.
[4]Represents the number of hours spent by hunters per managed acre during the entire month of September; all hours were rounded up the next whole number.
[5]Field information was not submitted for this area. Totals in this table do not include this area's harvest information

Table 8. Number of hunting trips made by hunters estimated by matching conservation numbers throughout the month of September, 2017; e.g., we assume 175 hunters made one dove hunting trip on ABCA and 21 hunters made two trips, etc. Multiple trips may be over-estimated because some areas have hunters fill out another card when hunting different fields. Not all hunters provided a usable conservation number therefore these are conservative estimates of the number of dove hunting trips during the month of September. See Table 9 for abbreviations of area names.

# Days Hunted	ABCA	BDCA	CBCA	EBCA	OSCA	PECA	RMWA	TACA	TMCA	Total Hunters	% of Hunters
1	175	230	358	95	51	214	352	382	221	2,078	78.65
2	21	60	14	28	17	39	73	72	89	413	15.63
3	9	14	2	7	1	12	26	16	18	105	3.97
4	3	3	1	4		3	8	2	5	29	1.10
5	1	2	1		1		2	1	3	11	0.42
6					1			1		2	0.08
7	1							1		2	0.08
8											
9											
10		1								1	0.04
11											
12											
13									1	1	0.04
Total	**210**	**310**	**376**	**134**	**71**	**268**	**461**	**475**	**337**	**2,642**	**100**

Table 9. Estimated distance traveled in miles to hunt doves calculated from zip codes provided by hunters and zip code for conservation area, during September 2017.

Area Code	Area Name	N[1]	Mean	Min	Max	Q25	Median (Q50)	Q75
ABCA	August A Busch CA	288	22.3	0.0	214.0	9.9	18.6	27.5
BDCA	Bois D'Arc CA	464	41.1	0.0	652.6	22.2	26.9	39.8
CBCA	Columbia Bottoms CA	397	37.3	0.0	1,845.9	21.9	30.5	41.2
EBCA	Eagle Bluffs CA	191	41.7	0.0	543.0	0.0	14.3	57.7
OSCA	Otter Slough CA	99	47.2	0.0	593.5	9.9	25.1	41.2
PECA	Pony Express CA	347	52.5	9.3	565.4	22.6	37.2	62.2
RMWA	James A Reed Mem. WA	632	24.6	0.0	781.8	6.3	14.7	23.0
TACA	Talbot CA	629	48.8	0.0	698.4	30.4	38.3	53.6
TMCA	Ten Mile Pond CA	505	76.4	0.0	1,819.5	36.7	52.8	74.8

[1]Number of hunters providing a usable zip code.

[2]Q25, Q50, and Q75 represent the 1st, 2nd, and 3rd quartiles or percentiles of the data. For example, Q50 represents the middle value of distances traveled compared to the arithmetic mean that takes into account the far outside values.

Table 10. Recoveries of all mourning doves banded in Missouri and recovered in Missouri and elsewhere. For example, there were 4 doves banded in Missouri in 2013 that were recovered in Arkansas, and 410 doves banded in Missouri in 2014 that were recovered in Missouri. Note these data were last updated January 2018; data are continually added and revised by the USGS Bird Banding Lab.

State Recovered	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Grand Total**
Alabama		1			1					1	3
Arkansas		4	12	6	7	4	4		2		39
Florida	2		2		2	1			1		8
Illinois	5	8	4	2	3	7	5	1	1	1	37
Kansas	2	4		2	2		4				14
Kentucky	1	1	3		2	2					9
Louisiana	2	4	2	2	2	1	4	1			18
Mexico	2	1	1	1					1	1	7
Minnesota									1		1
Mississippi	2		1	1		2	2	1			9
Missouri	357	292	264	290	271	326	410	194	205	88	2,697
North Carolina							1				1
Oklahoma		1					2	1			4
South Carolina	1										1
Tennessee	2	2	4	2	2	1	2		1		16
Texas	3	4	3	6	3	6	4	1		1	31
Total Recoveries	**372**	**322**	**296**	**312**	**295**	**350**	**438**	**199**	**212**	**92**	**2,895**
Total Doves Banded in MO	**2,778**	**2,937**	**3,170**	**2,464**	**2,486**	**2,657**	**3,162**	**2,079**	**2,206**	**1,547**	**25,486**

Table 11. Recoveries of mourning doves from only Missouri, that were banded in Missouri and elsewhere; e.g., one dove banded in Illinois in 2013 was recovered in Missouri, and in 2014, 410 doves banded in Missouri were recovered in Missouri. Most recoveries in Missouri are birds banded in Missouri.

Banding State	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Grand Total**
Illinois	1	3	3	1		1	1	1	4		15
Iowa	2		1		1		2	1	3	1	11
Kansas	1	3	1	7	2	3	1			1	19
Kentucky	1			1			2	1			5
Louisiana							1				1
Missouri	357	292	264	290	271	326	410	194	205	88	2,697
Montana									1		1
Nebraska							1		1		2
Ohio	1										1
Oklahoma	1	2				1					4
Texas						1					1
Grand Total	**364**	**300**	**269**	**299**	**274**	**332**	**418**	**197**	**214**	**90**	**2,757**

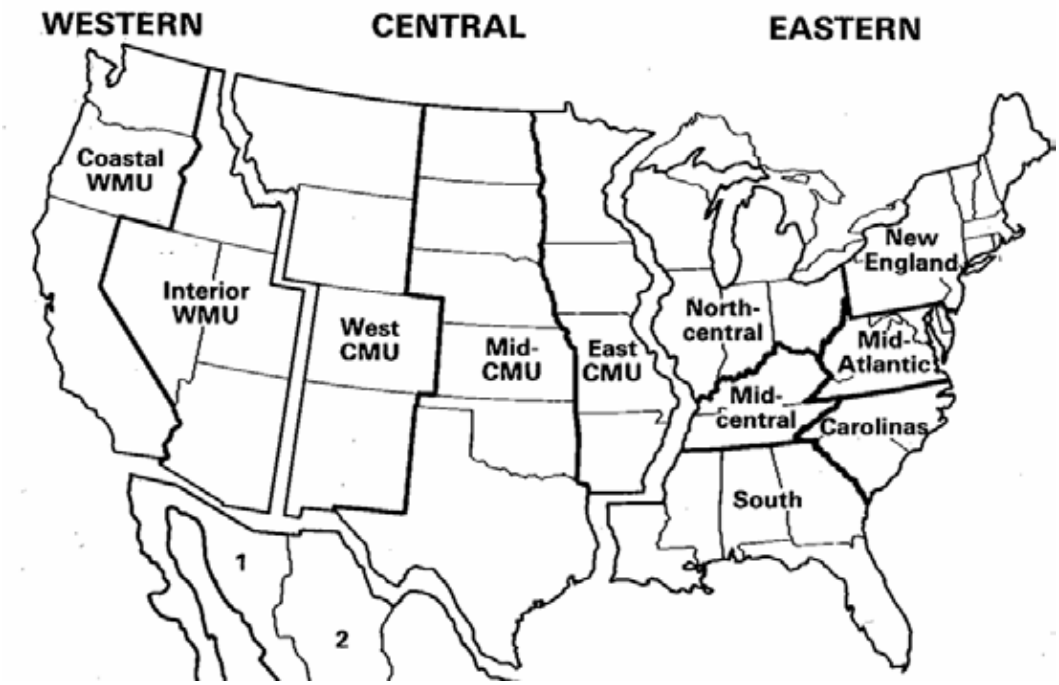

Figure 1. Within the United States, there are 3 zones, or management units, that contain mourning dove populations that are roughly independent of each other. These zones encompass the principle breeding, migration, and U.S. wintering areas for each population. Harvest management decisions are annually established by management unit. The Central Management Unit (CMU) consists of 14 states containing roughly 46% of the U.S. land area, and routinely has the highest Call-Count Survey (CCS) indices in the country.

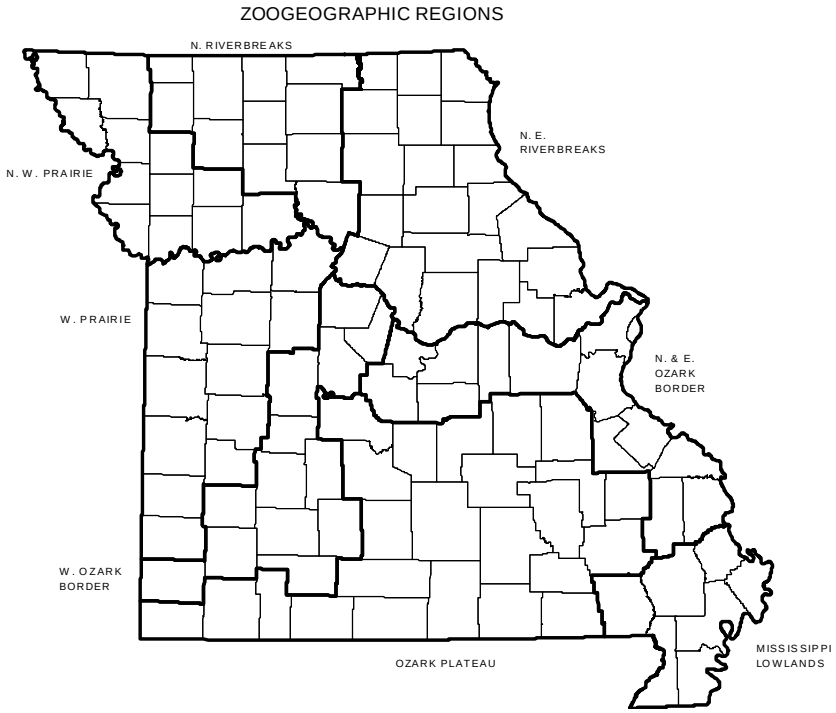

Figure 2A. Zoogeographic Regions in Missouri.

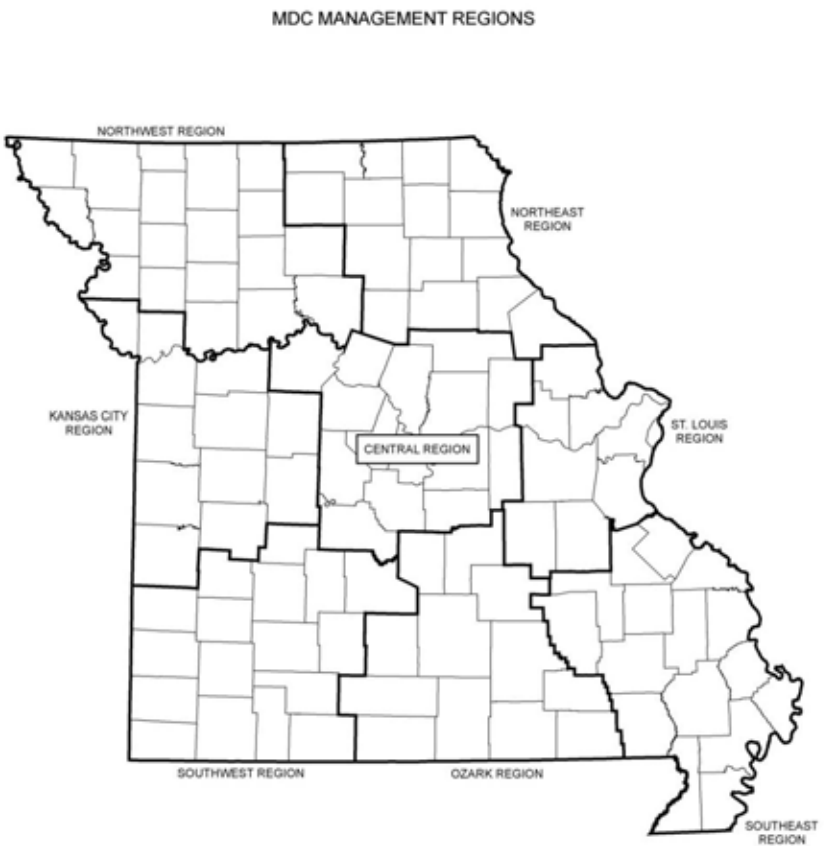

Figure 2B. MDC Management Regions in Missouri

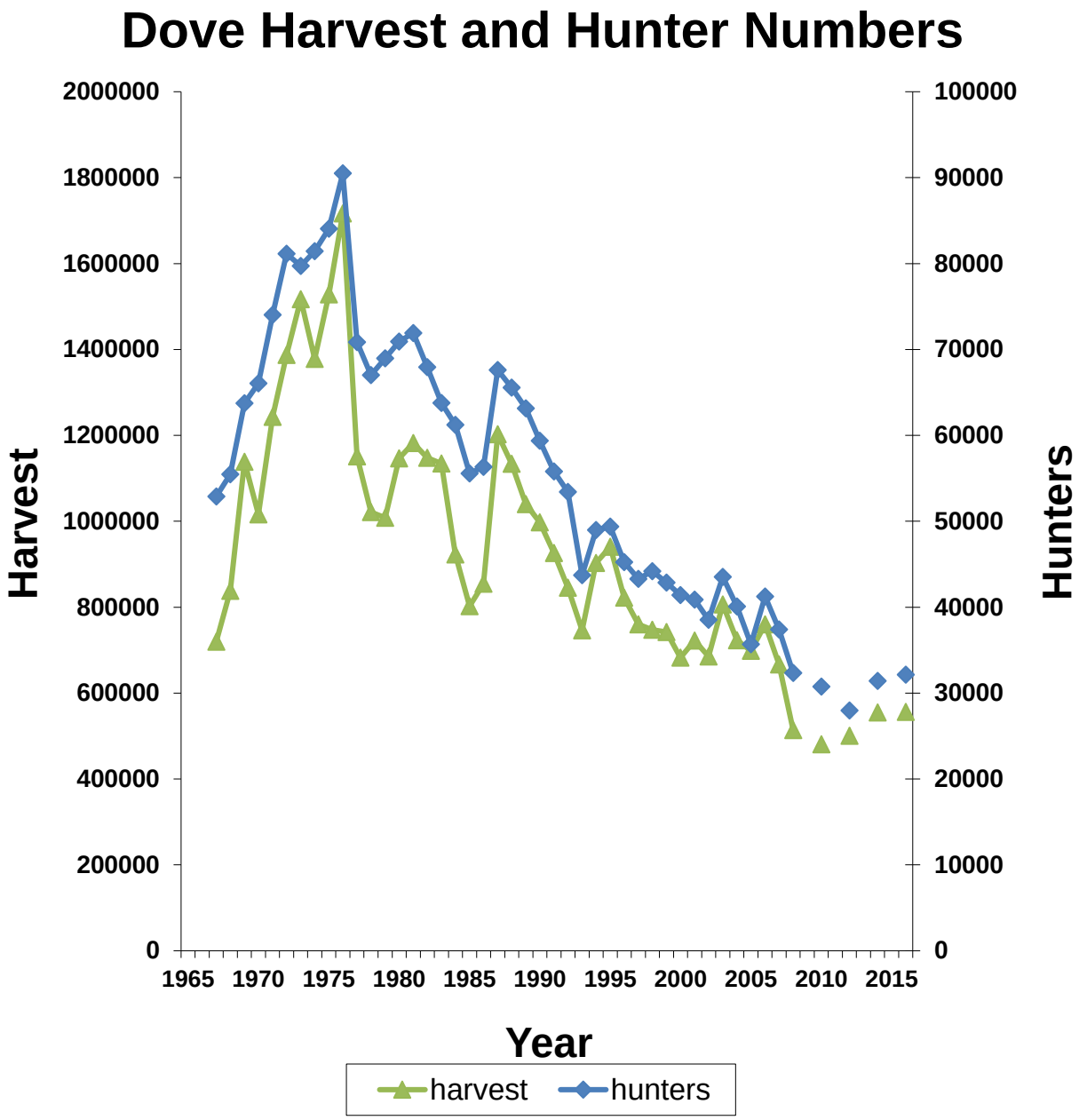

Figure 3. Long-term trends (1967– 2016) of mourning dove harvest and number of dove hunters in Missouri estimated annually by the small-game post-season harvest mail survey; note, starting in 2008 the small game hunter post-season harvest survey was conducted every-other year. Data through 2016 shown here, a survey was conducted in 2016.

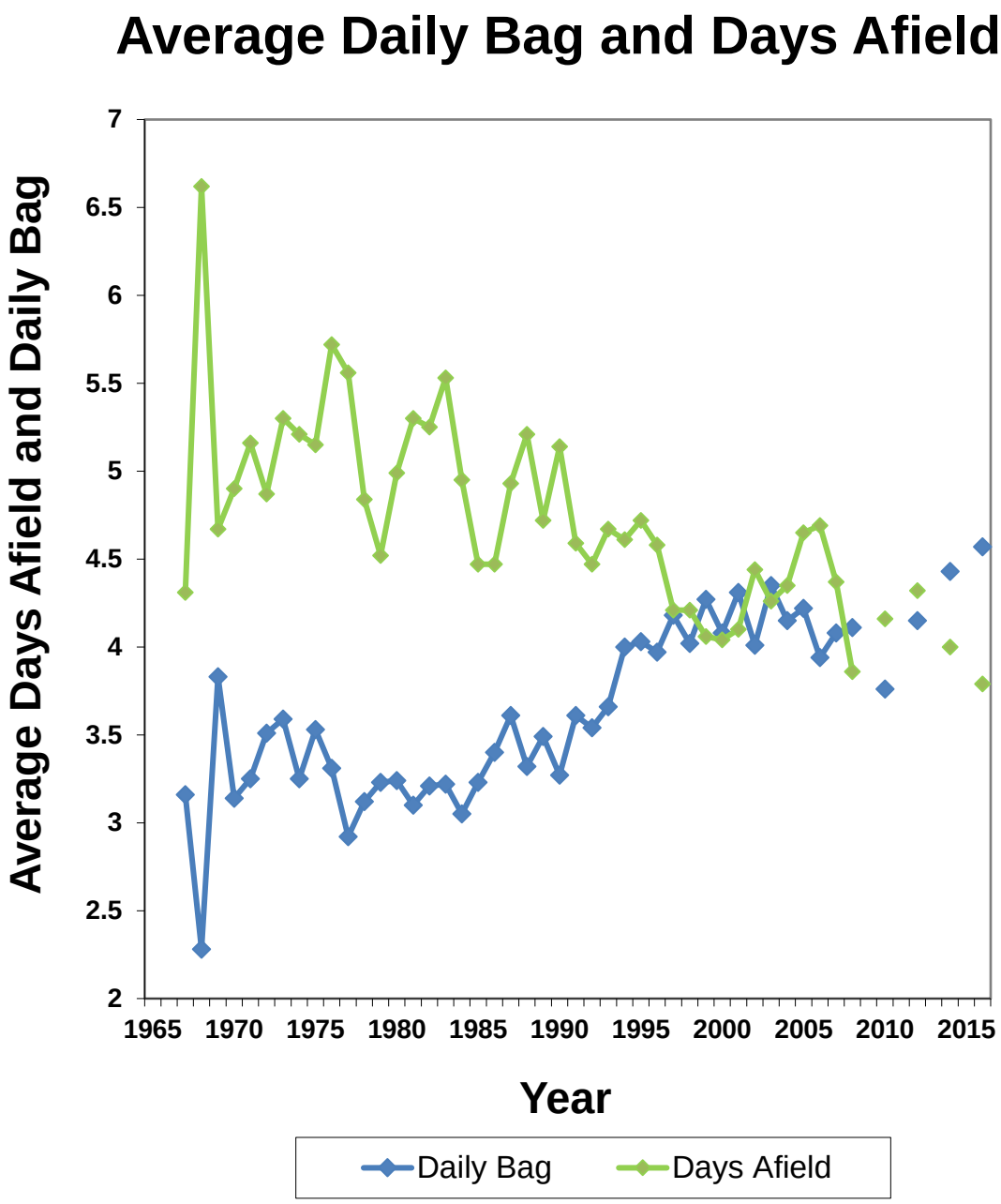

Figure 4. Long-term trends (1967–2016) of mourning dove average daily bag limit and average number of days afield for Missouri dove hunters estimated annually by the small-game post-season harvest mail survey; note, starting in 2008 the small game hunter post-season harvest survey was conducted every-other year. Data through 2016 shown here, a survey was conducted in 2016.

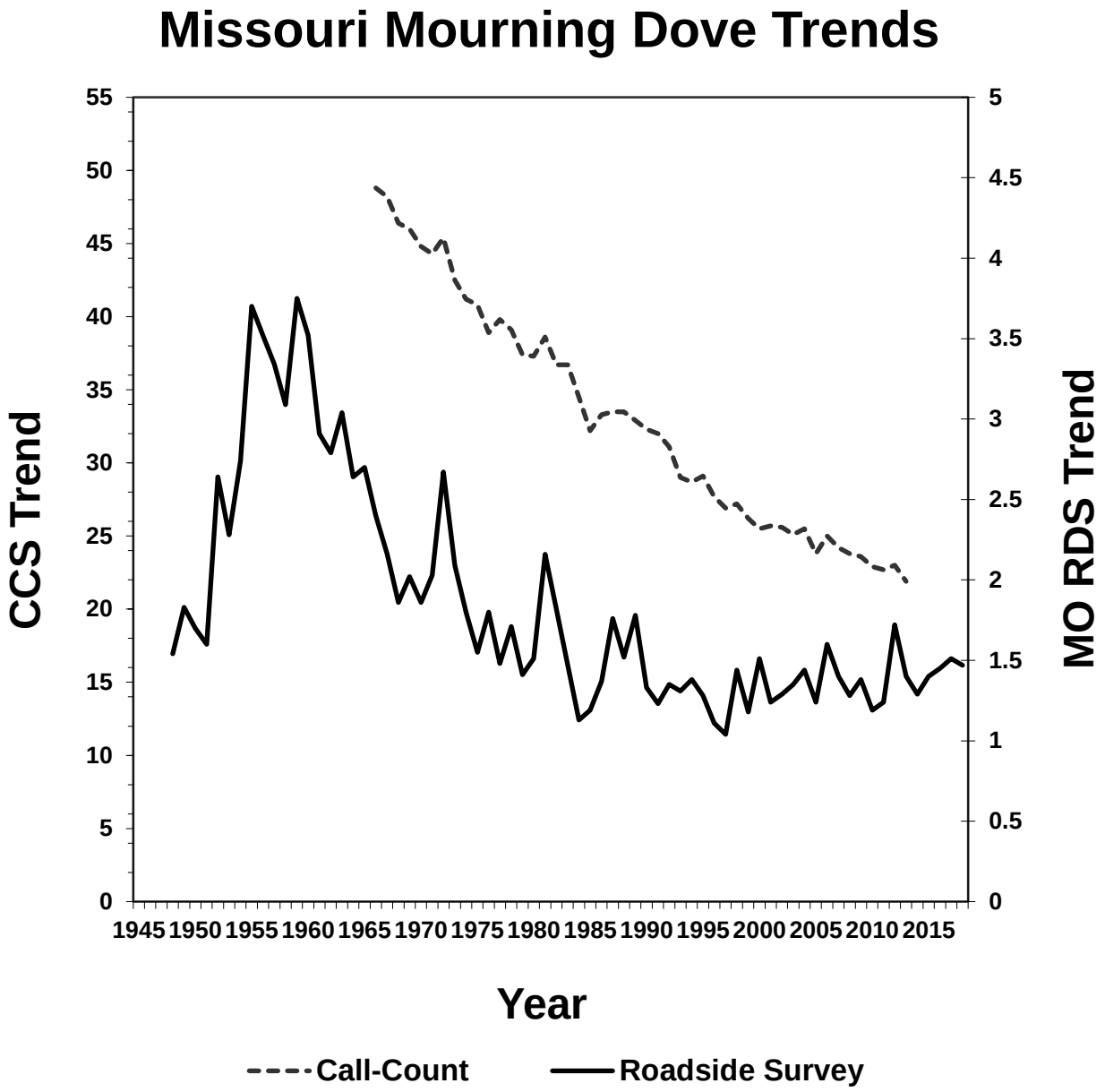

Figure 5. Missouri roadside mourning dove survey (RDS; doves observed along survey route) expressed as doves/mile (1947–2018) and U.S. Fish and Wildlife Service mourning dove call-count survey (CCS; doves heard calling) route regression trend analysis (1966–2012). Note the call-count survey was discontinued in 2012.

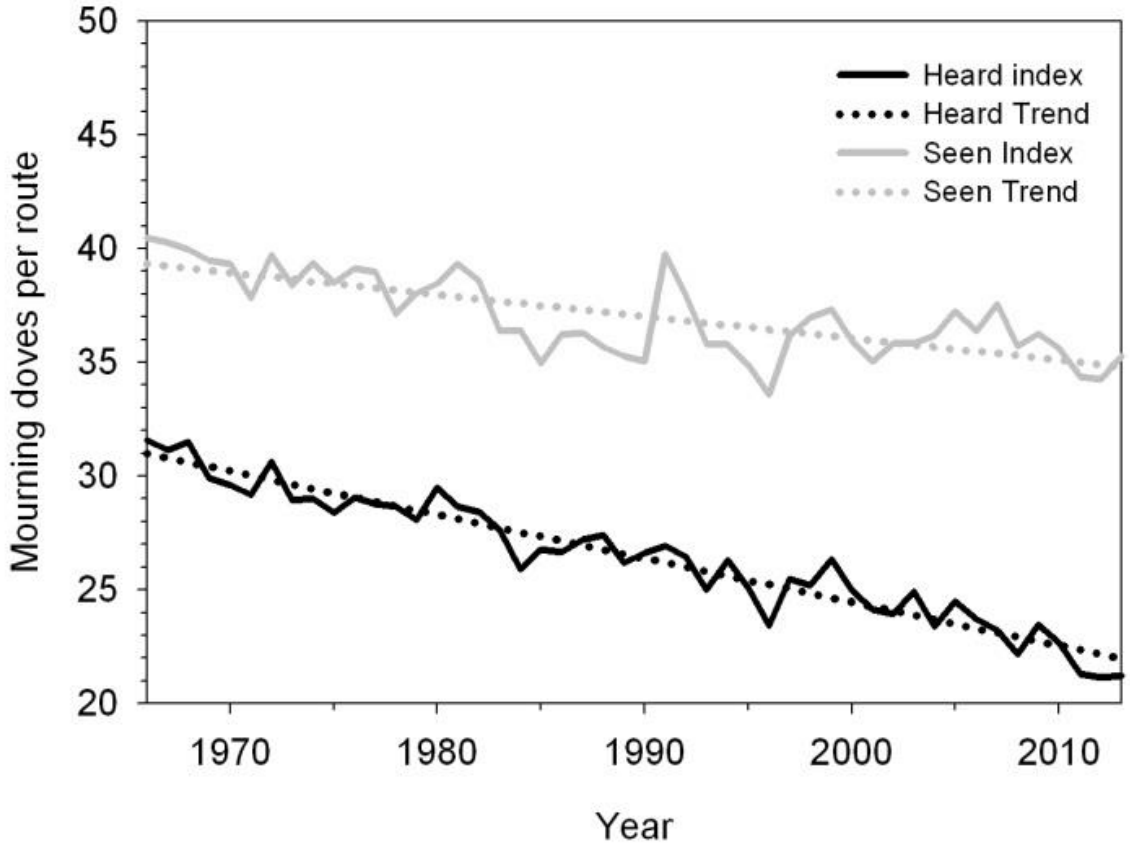

Figure 6. Call-Count Survey (CCS) trends in the Central Management Unit (CMU) of doves heard calling (heavy solid line) and doves observed (light solid line) for the Central Management Unit (CMU); from the USFWS 2013 Mourning Dove Status Report). Note that as of 2014 Morning Dove Status Report, Call Count Survey results were not reported any more because the CCS was discontinued in 2012.

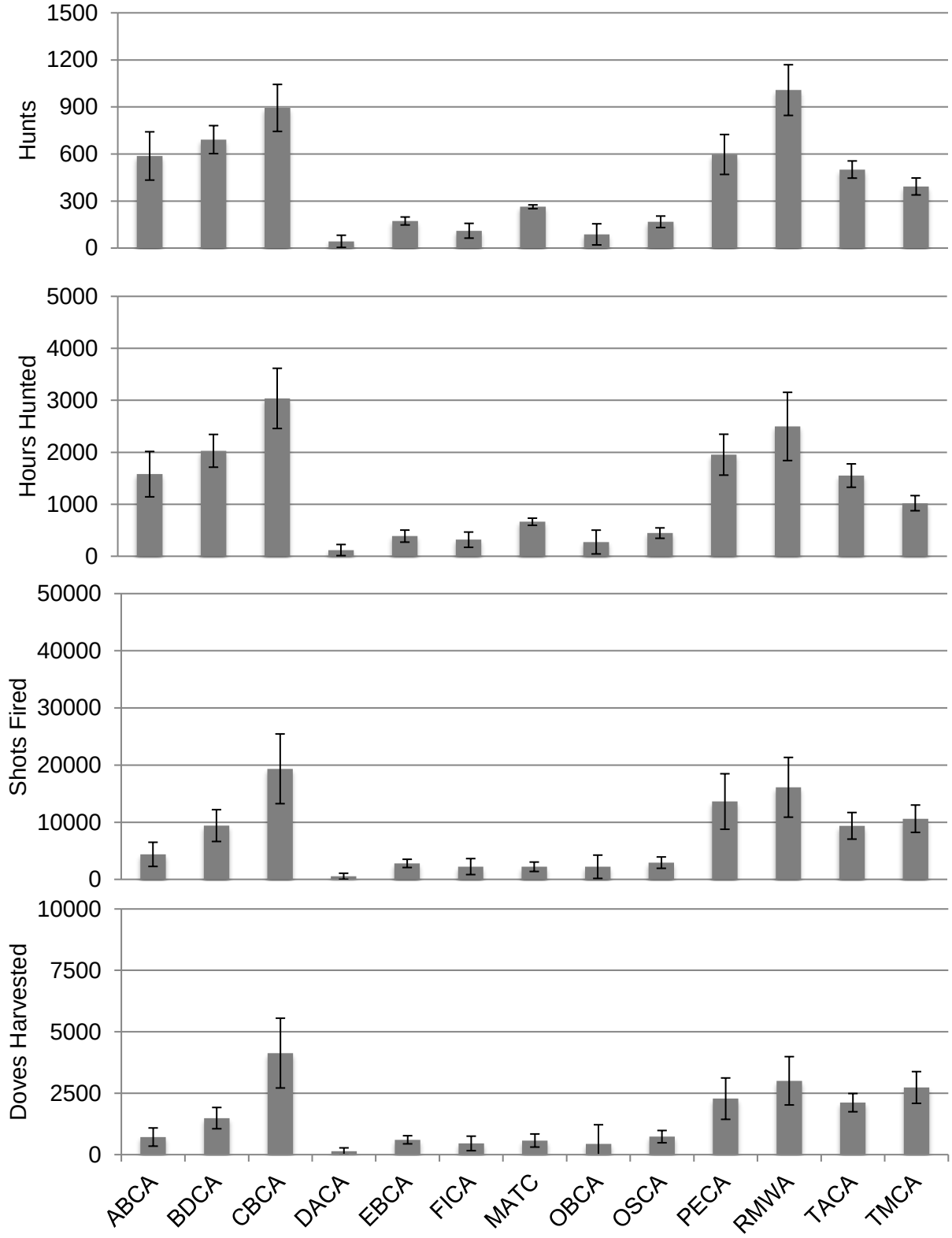

Figure 7. Average yearly total of hunts (or hunters), hours hunted, shots fired, and doves harvested (with 95% CIs shown with black lines) during September on MDC areas, 1998–2017 (see Table 9 for acronym details).

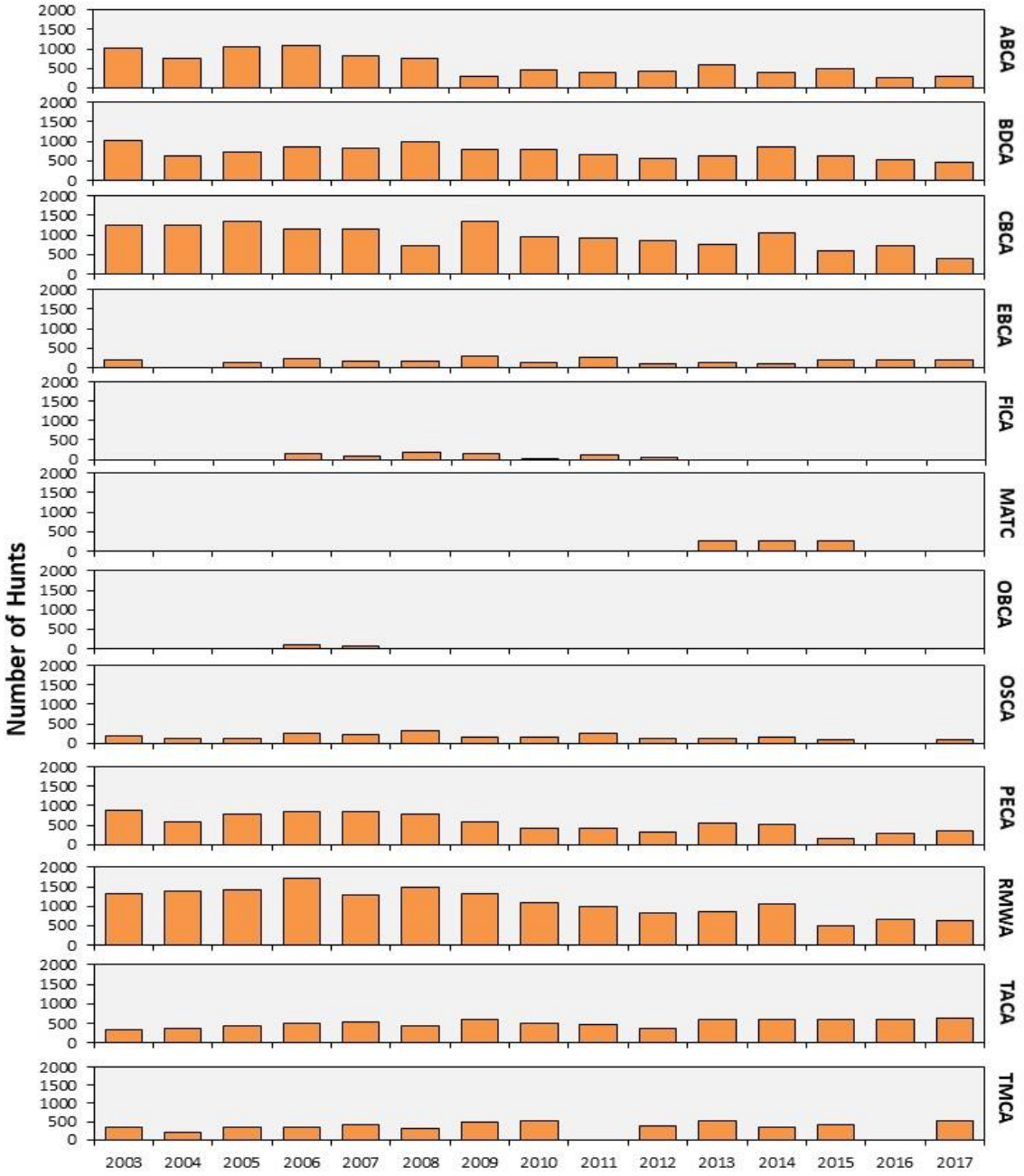

Figure 8. Yearly totals (through September) of the number of hunts (or hunters) on MDC areas from 2002–2016 (see Table 9 for acronym details); we assumed that each card was a different hunter although some areas require a new card each time a hunter changes fields.

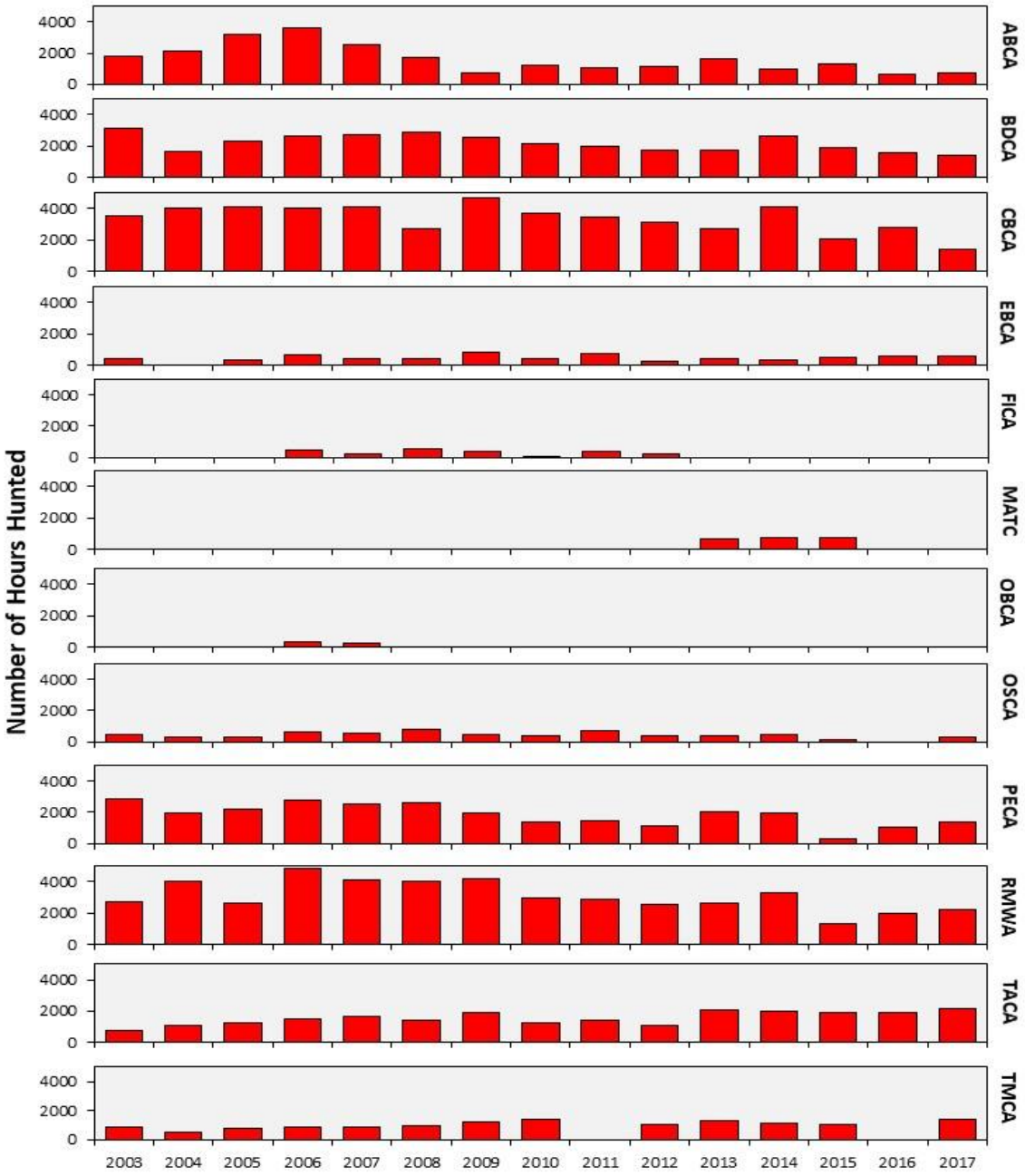

Figure 9. Yearly totals (through September) of the number of hours hunted on MDC areas from 2002–2016 (see Table 9 for acronym details).

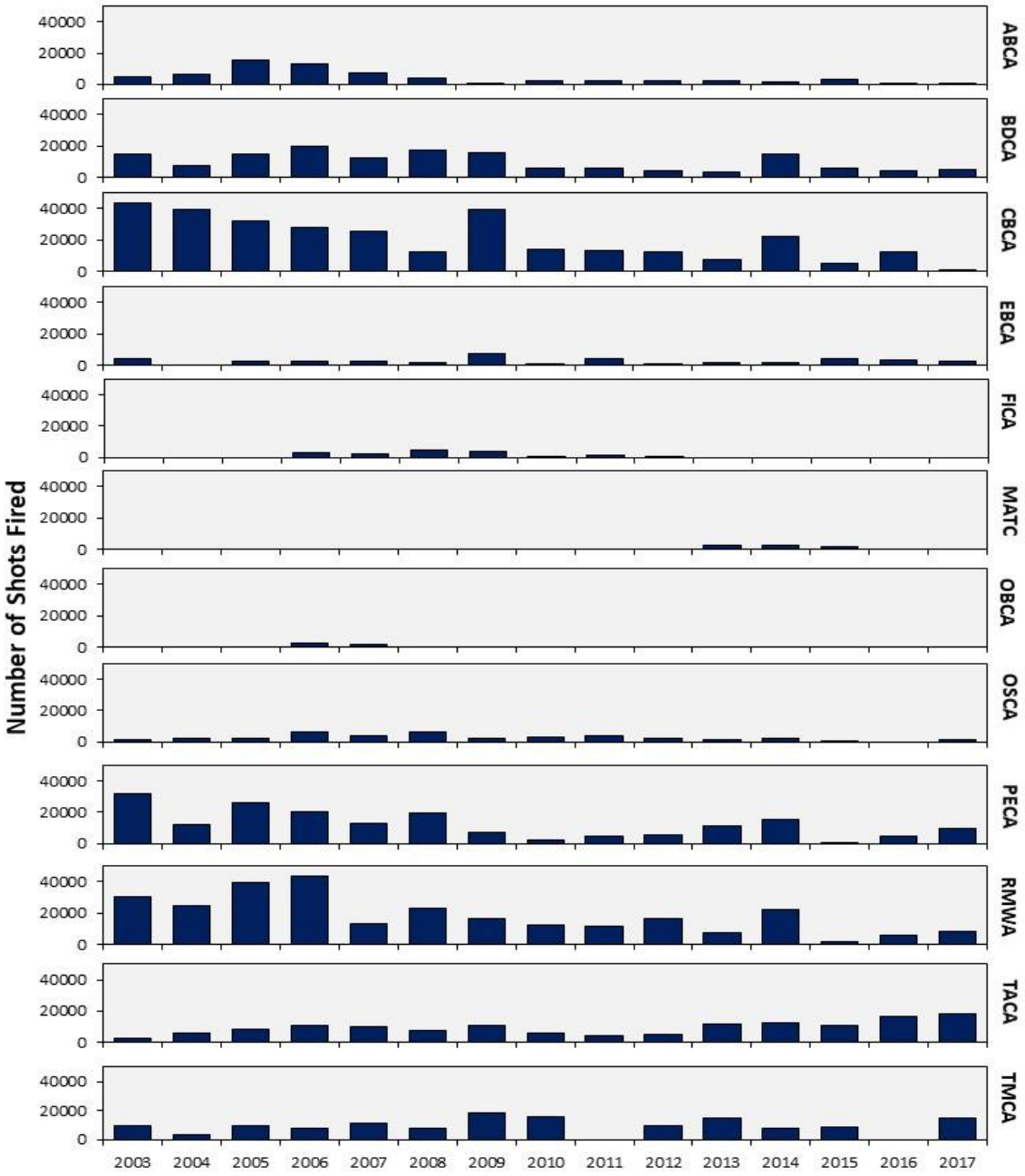

Figure 10. Yearly totals (through September) of the number of shots fired on MDC areas from 2002–2016 (see Table 9 for acronym details).

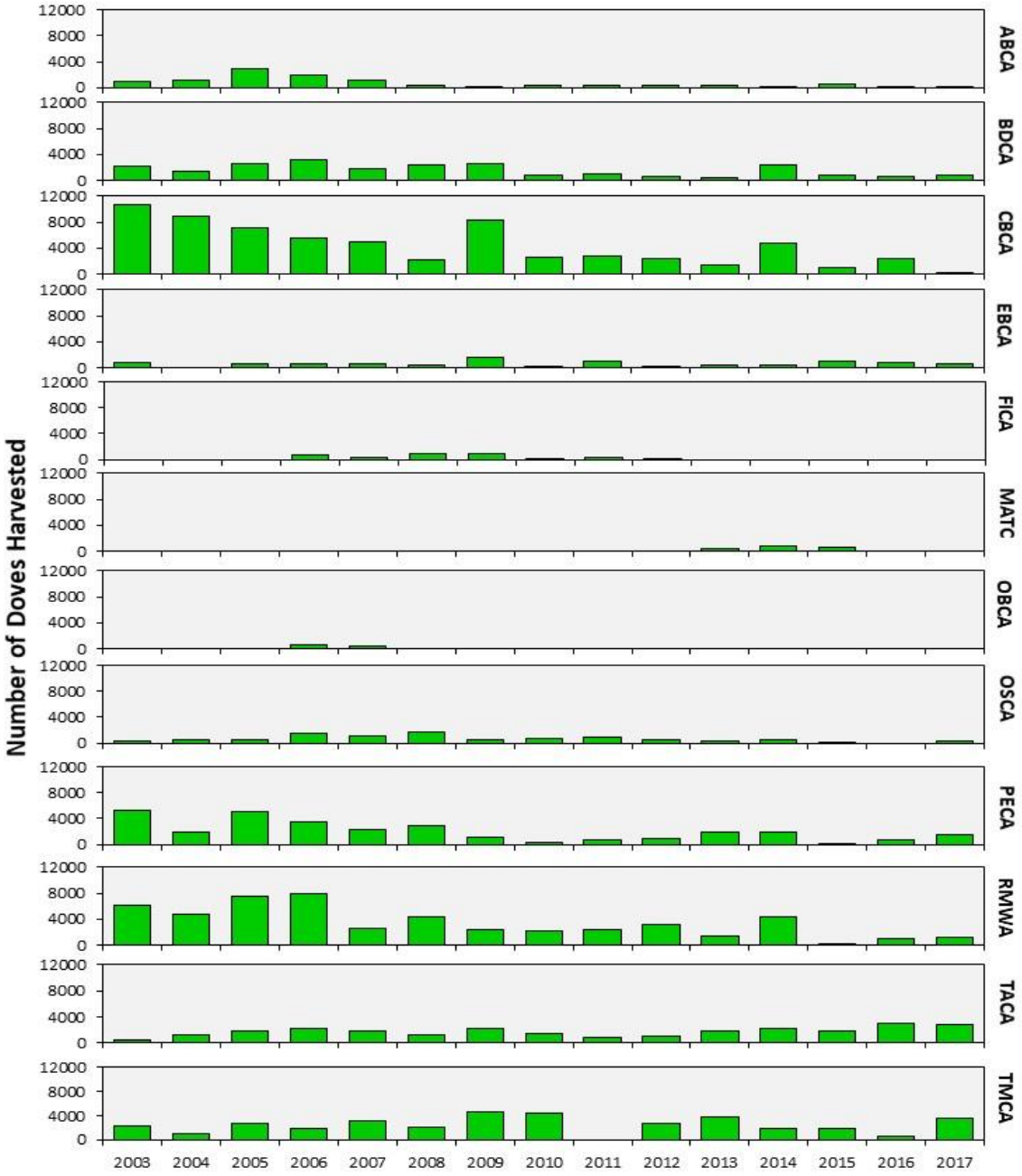

Figure 11. Yearly totals (through September) of the number of doves harvested on MDC areas from 2002–2016 (see Table 9 for acronym details).

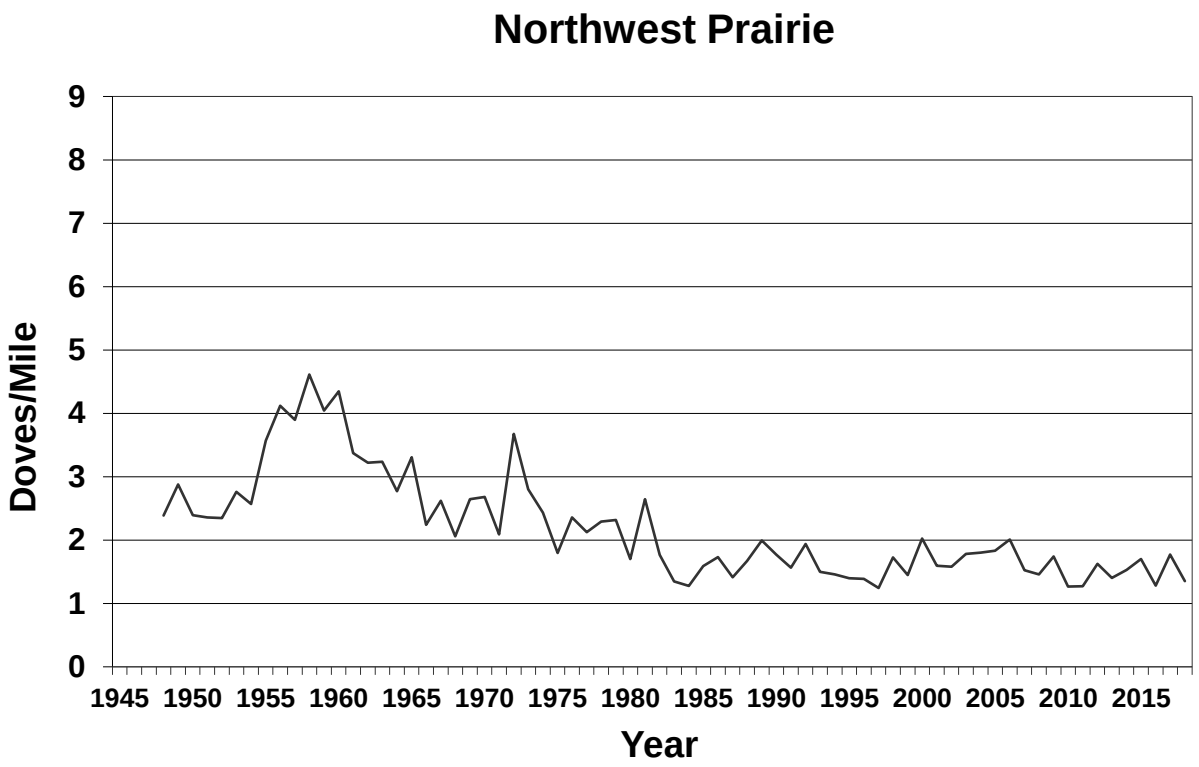

Figure 12. Missouri roadside dove survey index for the Northwest Prairie Zoogeographic Region (1948-2018).

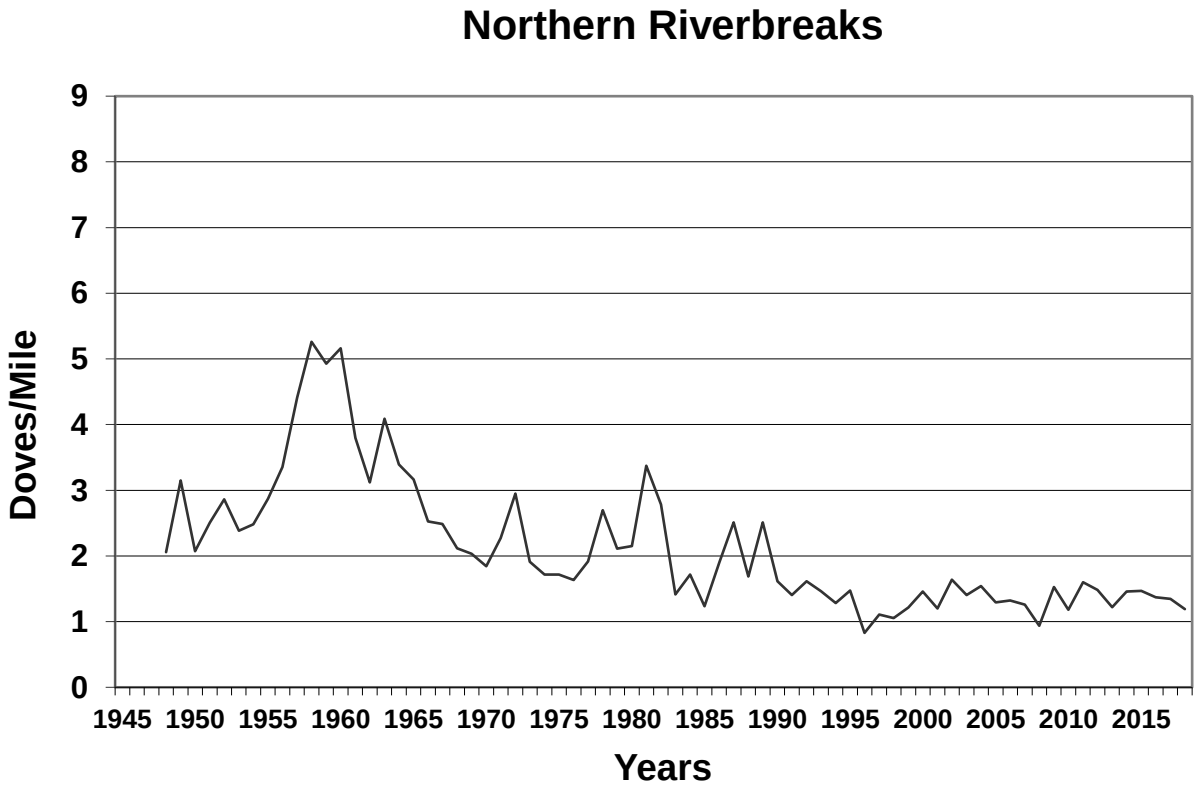

Figure 13. Missouri roadside dove survey index for the Northern Riverbreaks Zoogeographic Region (1948-2018).

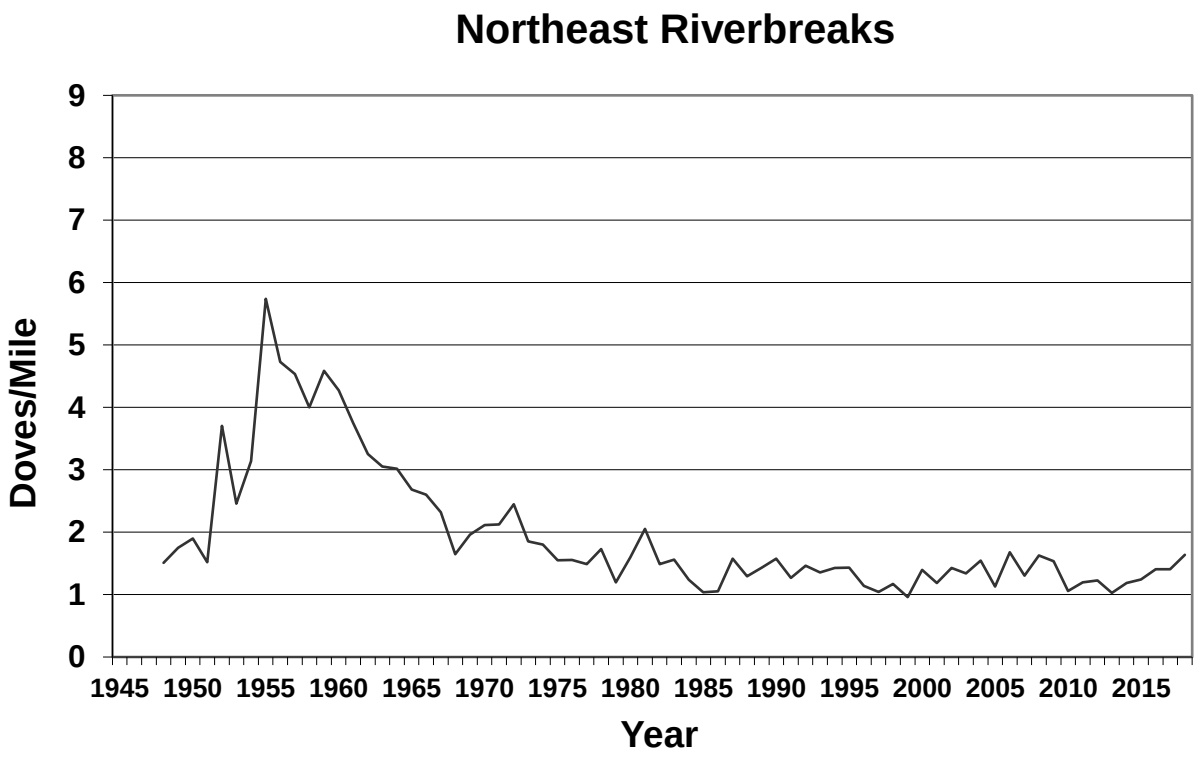

Figure 14. Missouri roadside dove survey index for the Northeast Riverbreaks Zoogeographic Region (1948-2018).

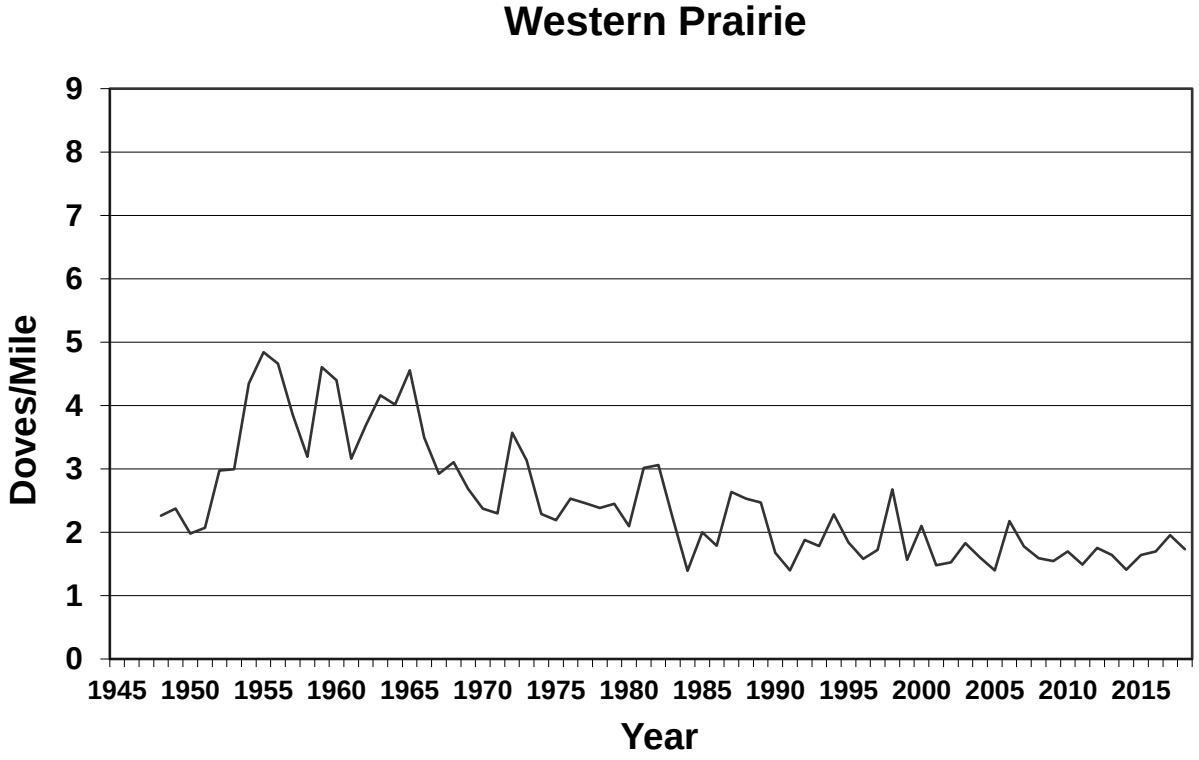

Figure 15. Missouri roadside dove survey index for the Western Prairie Zoogeographic Region (1948-2018).

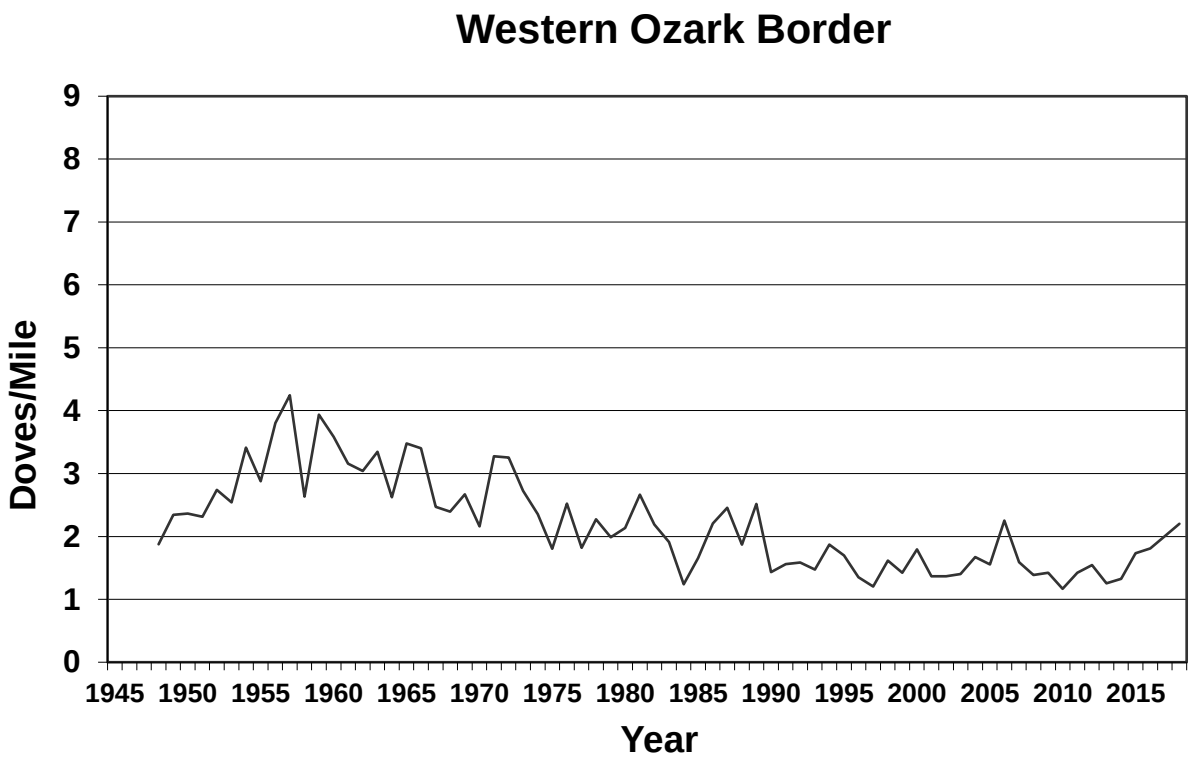

Figure 16. Missouri roadside dove survey index for the Western Ozark Border Zoogeographic Region (1948-2018).

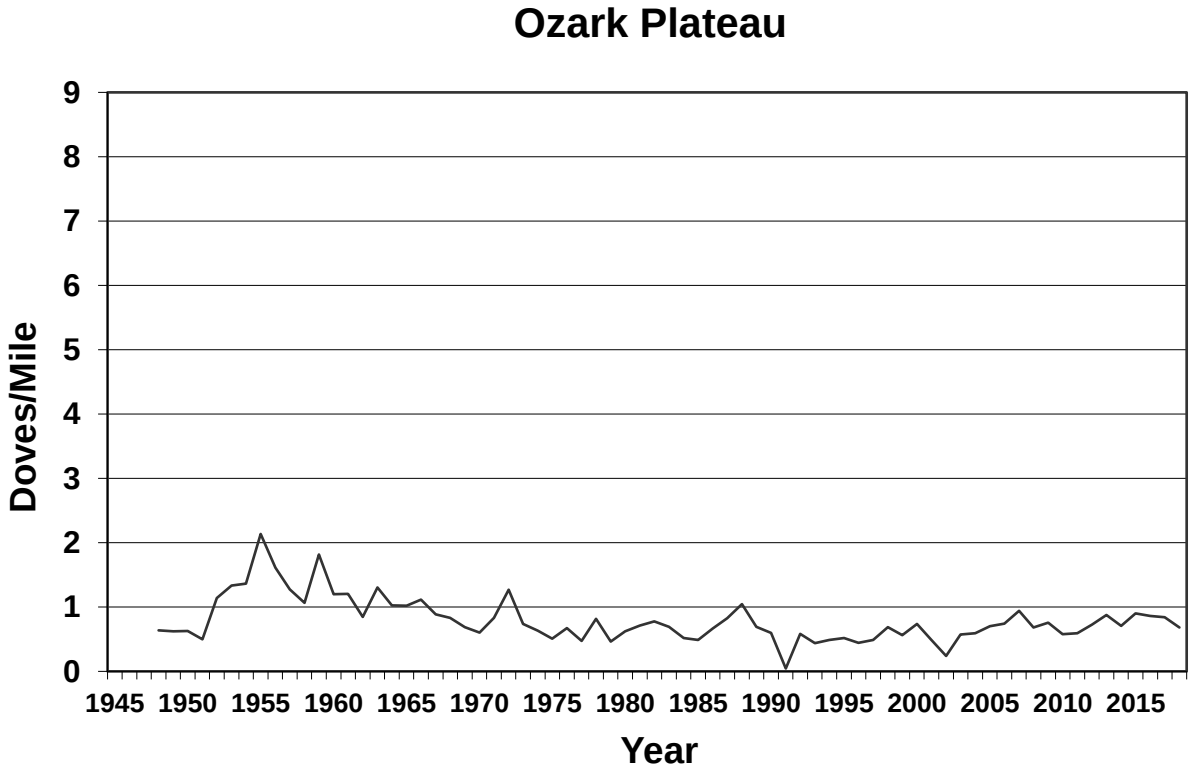

Figure 17. Missouri roadside dove survey index for the Ozark Plateau Zoogeographic Region (1948-2018).

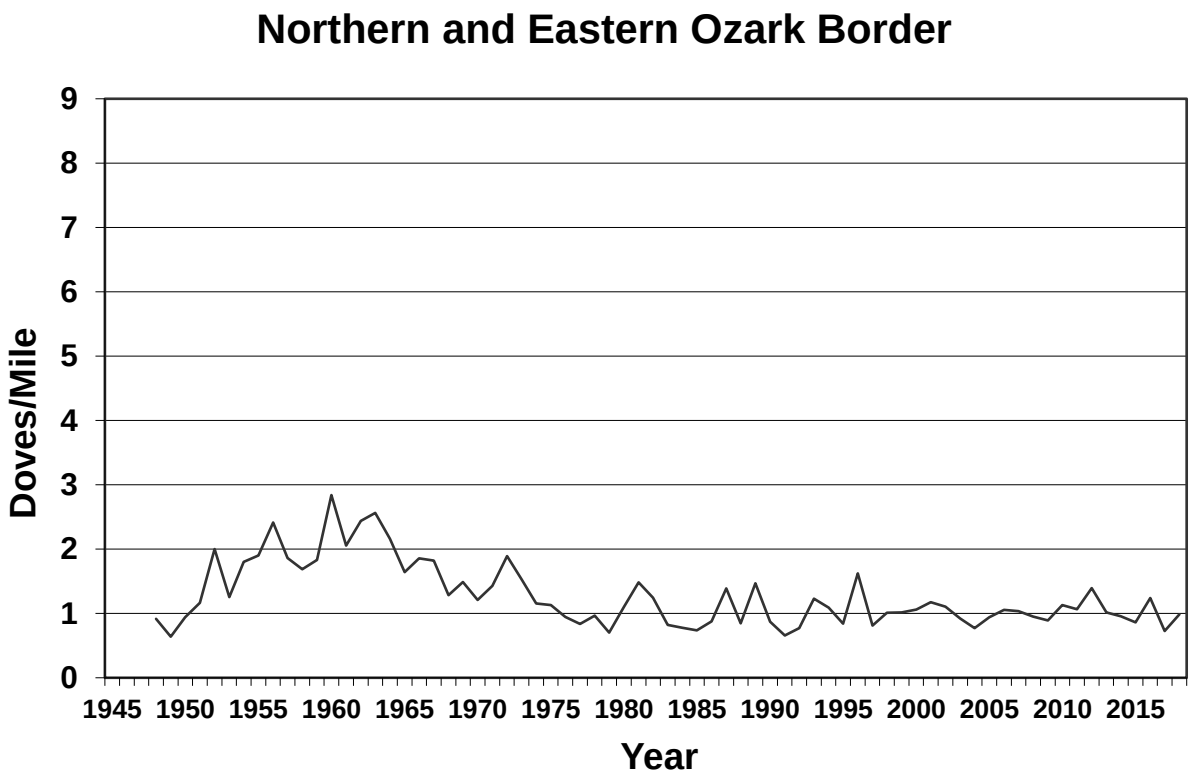

Figure 18. Missouri roadside dove survey index for the Northern and Eastern Ozark Border Zoogeographic Region (1948-2018).

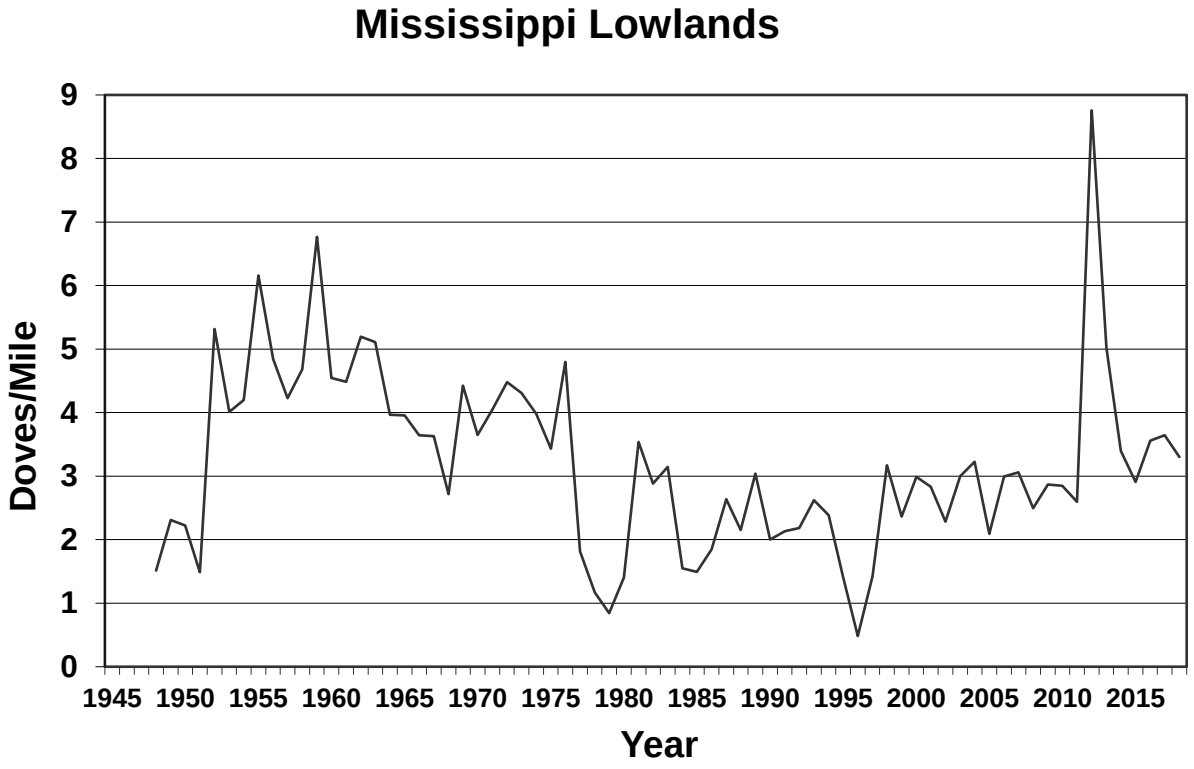

Figure 19. Missouri roadside dove survey index for the Mississippi Lowlands Zoogeographic Region (1948-2018).

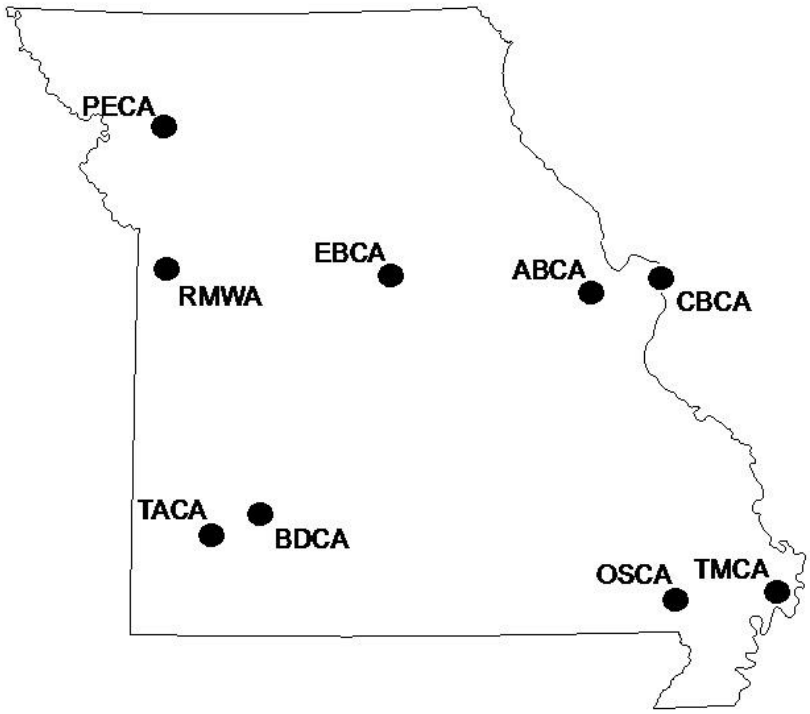

Figure 20. Locations of 9 public areas originally participating in mourning dove harvest management, 2005–2011; August A. Busch Conservation Area (ABCA), Bois D'Arc Conservation Area (BDCA), Columbia Bottom Conservation Area (CBCA), Eagle Bluffs Conservation Area (EBCA), Otter Slough Conservation Area (OSCA), Pony Express Conservation Area (PECA), James A. Reed Memorial Wildlife Area (RMWA), Robert E. Talbot Conservation Area (TACA), and Ten Mile Pond Conservation Area (TMCA). Since the beginning of this study, several other Conservation Areas have started collecting data for this analysis.

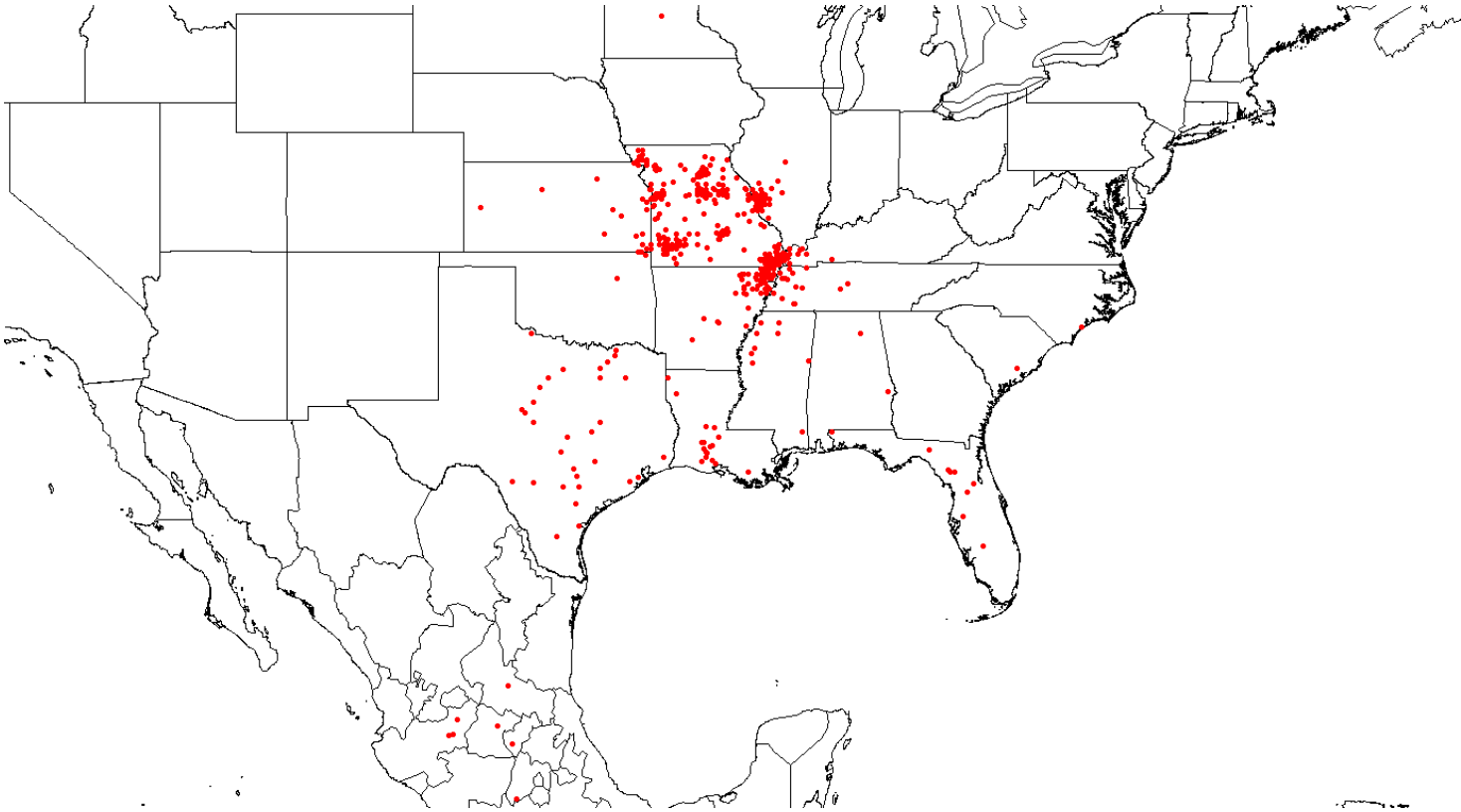

Figure 21. All recoveries for mourning doves banded in Missouri during the period 2008–2017. Red dots for recovery locations and blue dots for banding locations; some blue banding locations are covered with red recovery dots. Note the recoveries in the Baja Peninsula, Mexico City area, coastal South and North Carolina and Minnesota.

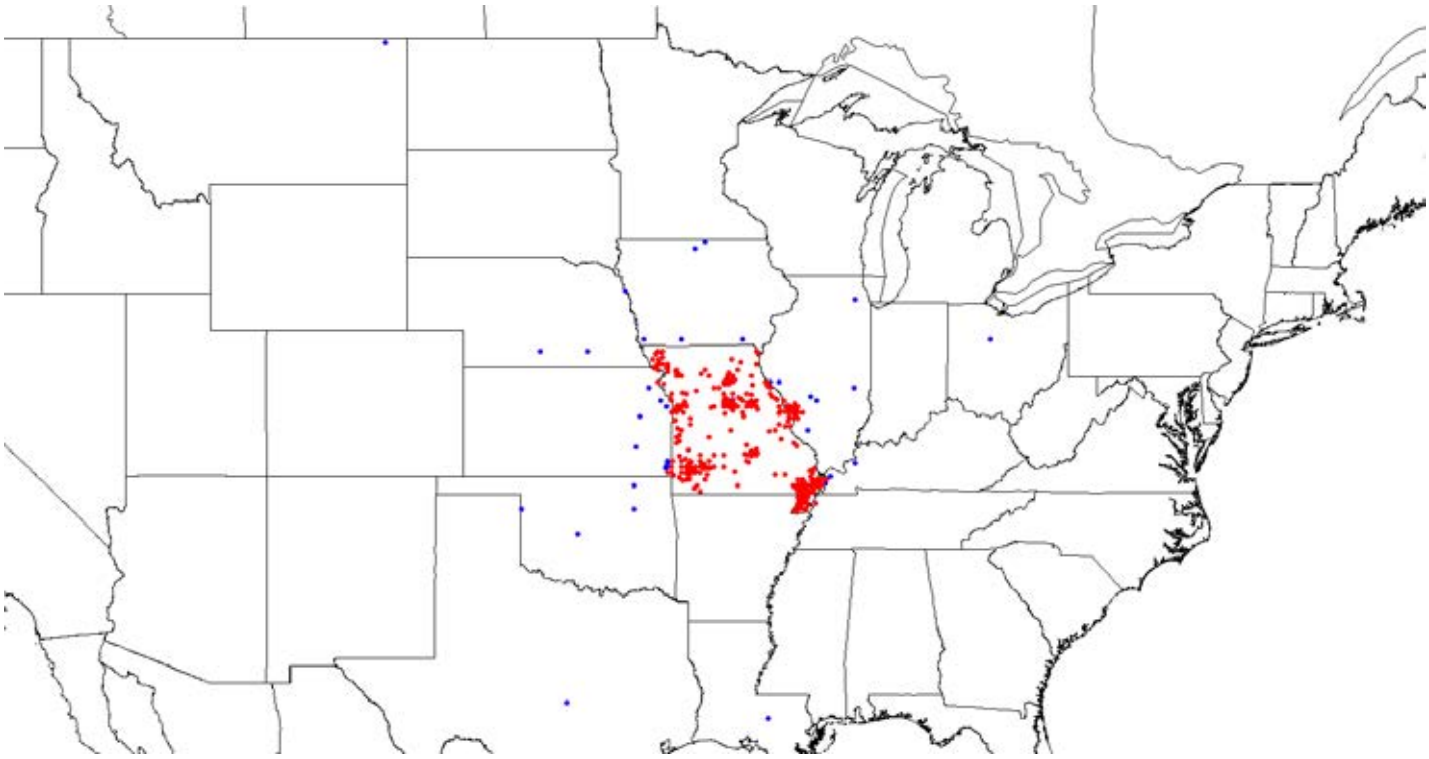

Figure 22. Recoveries only in Missouri of mourning doves banded in Missouri and elsewhere during 2008-2017. Red dots for recovery locations and blue dots for banding locations; some blue banding locations are covered with red recovery dots. Note the blue banding stations in southern Louisiana, central Texas, northern Ohio and northeastern Montana.