Missouri Wild Turkey Harvest and Population Status Report 2021

Missouri Department of Conservation – Science Branch

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POPULATION STATUS

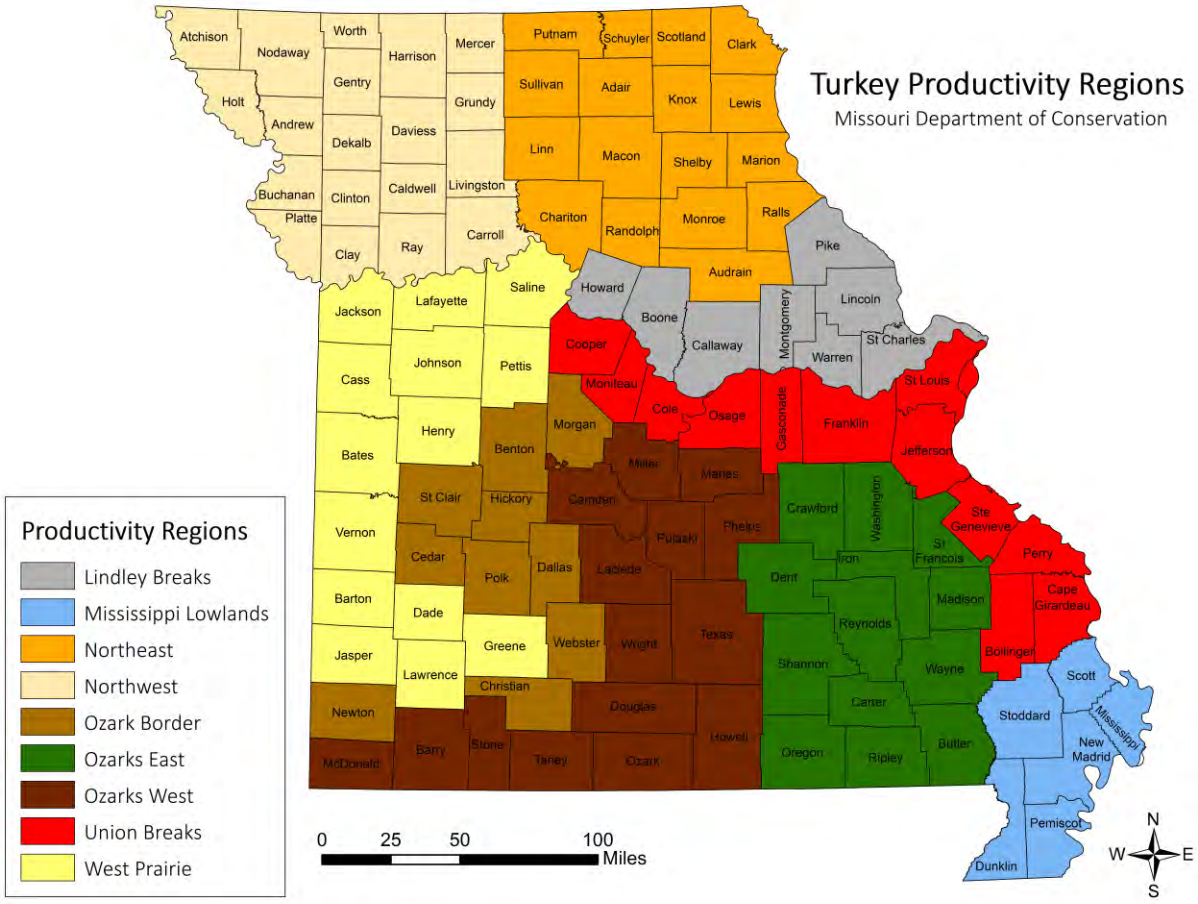
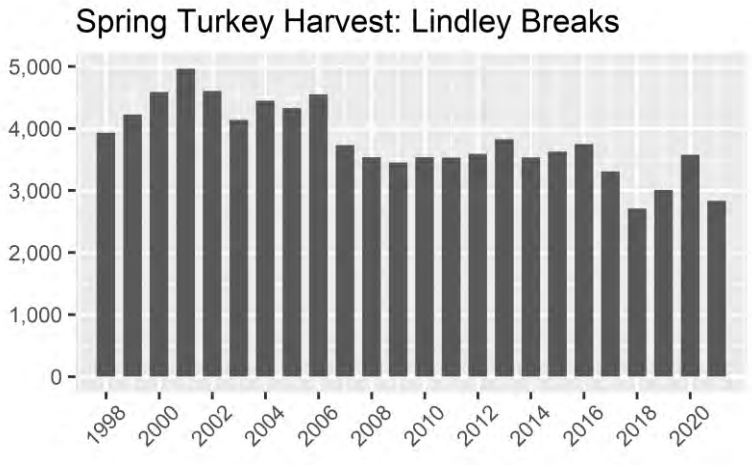
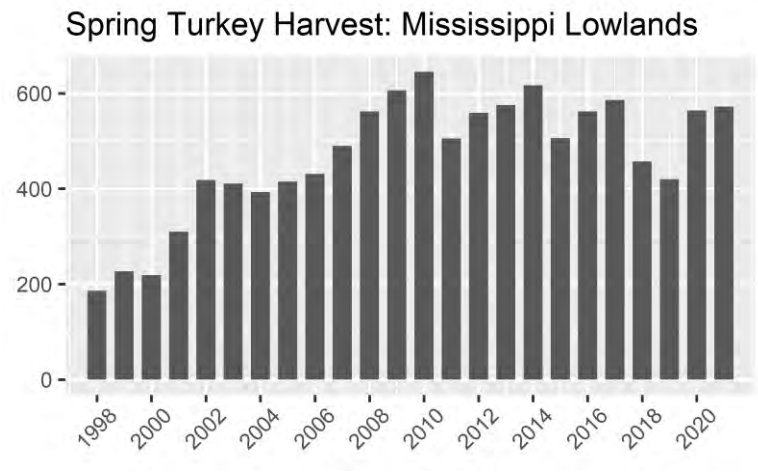


Figure 1. Turkey Productivity Regions in Missouri. Regions consist of counties grouped by similar land cover composition.

Lindley Breaks Region

Turkey abundance in the Lindley Breaks Region peaked in the early 2000s before declining about 30% from 2001-2009. Abundance stabilized from 2010-2016 before declining sharply from 2016-2018. Harvests increased in 2019 and 2020 but declined in 2021. The five-year spring turkey harvest trend in the Lindley Breaks Region indicates a stable population while the ten-year trend indicates a declining population.



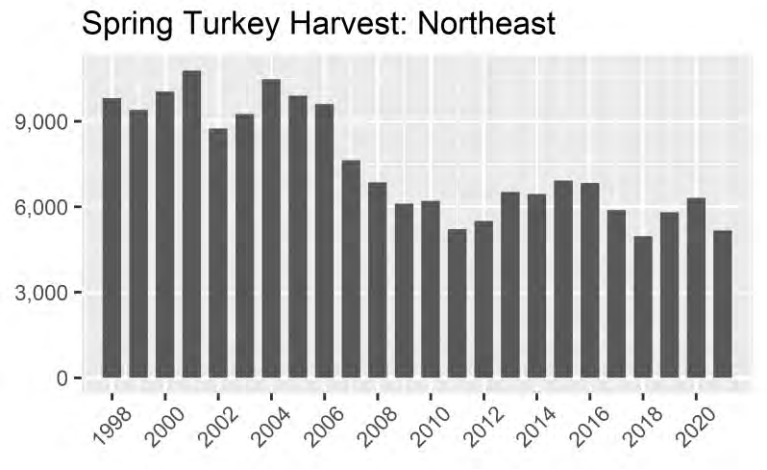


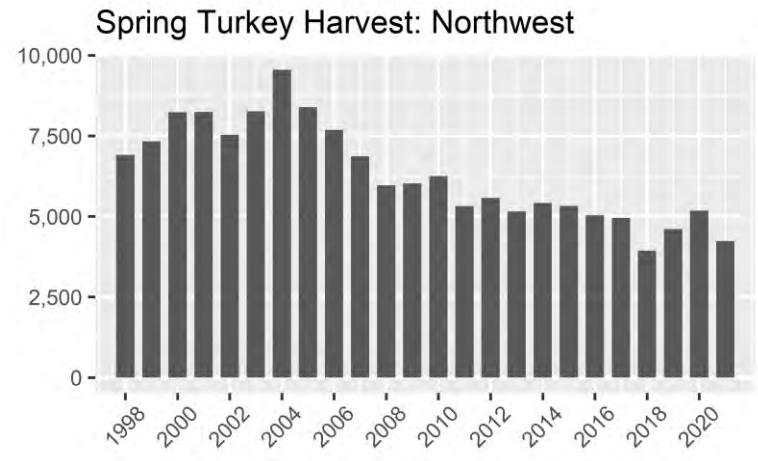
Mississippi Lowlands Region

The turkey population in the Mississippi Lowlands Region increased in during the 2000s. However, turkey abundance in this region has always been low compared to the other regions, and because of this, harvest tends to vary greatly on an annual basis. The five-year spring turkey harvest trend in the Mississippi Lowlands Region indicates a stable population while the ten-year trend indicates a declining population.

Northeast Region

The Northeast Region experienced six consecutive years of poor production, leading to a roughly 40% decline in abundance during the late 2000s. However, improved production in 2011 and 2014 caused abundance to increase and stabilize. Harvests increased in 2019 and 2020 but declined in 2021. The five-year spring turkey harvest trend in the Northeast Region indicates a stable population while the ten-year trend indicates a declining population.



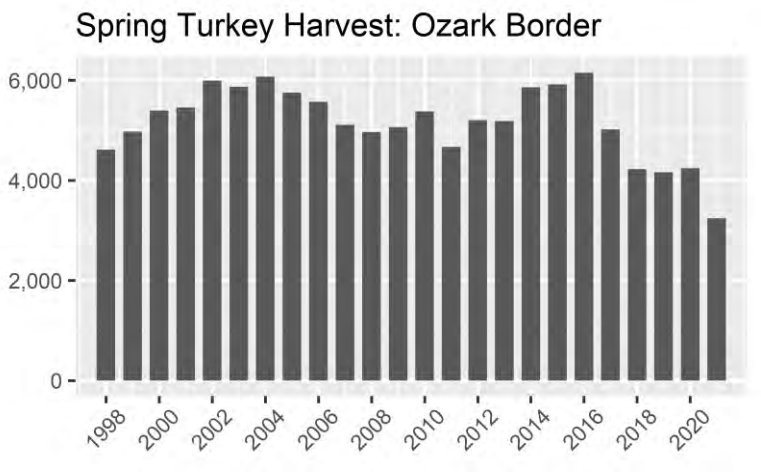


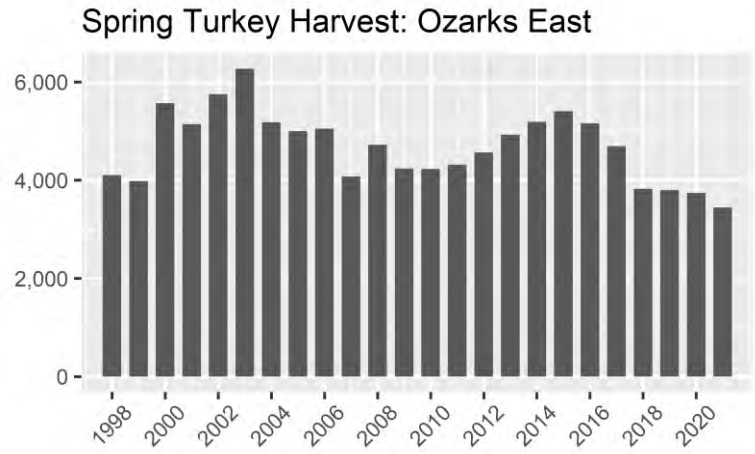
Northwest Region

The Northwest Region experienced a sharp decline in abundance in the late 2000s due to poor production. Abundance appeared to stabilize from 2011-2017. Harvests increased in 2019 and 2020 but declined in 2021. The five-year spring turkey harvest trend in the Northwest Region indicates a stable population, while the ten-year trend indicates a declining population.

Ozark Border Region

Turkey abundance in the Ozark Border Region peaked in the early 2000s before declining during the mid-to-late 2000s. Abundance increased from 2011-2016 before sharply dropping from 2016-2018. Harvests stabilized from 2018-2020 but declined in 2021. The five- and ten-year spring turkey harvest trends in the Ozark Border Region indicate a declining population.



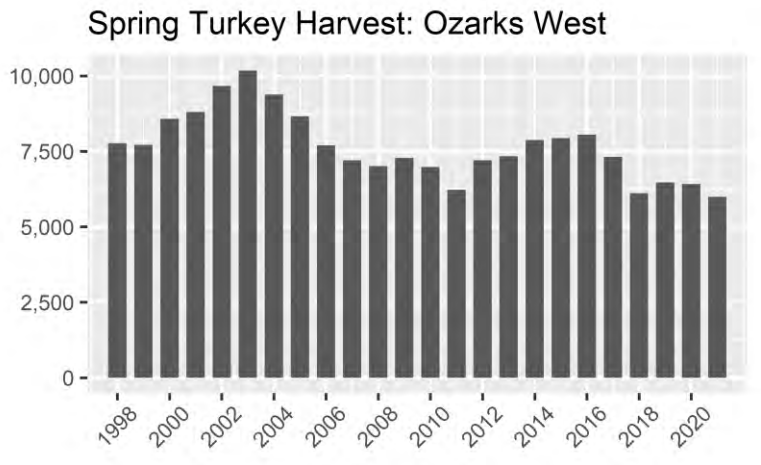


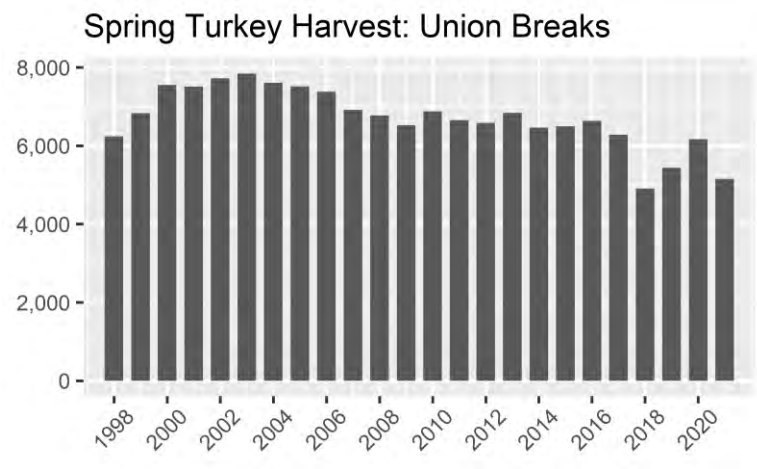
Ozarks East Region

The turkey population in the Ozarks East Region declined during the late 2000s, but after several years of improved production, abundance increased from 2011-2015. The harvest declined again from 2016-2018 but has leveled-off in recent years. The five- and ten-year spring turkey harvest trends in the Ozarks East Region indicate a declining population.

Ozarks West Region

Turkey abundance in the Ozarks West Region peaked in the early 2000s, followed by sharp declines during the mid-to-late 2000s. Improved production resulted in an increasing trend in spring harvest from 2011-2016. The harvest declined again from 2016-2018 but has leveled-off in recent years. The five- and ten-year spring turkey harvest trends in the Ozarks West Region indicate a declining population.



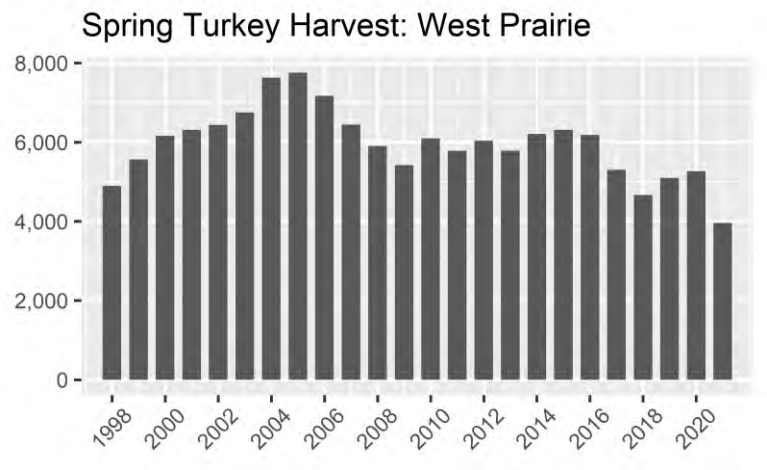


Union Breaks Region

Turkey abundance in the Union Breaks Region peaked in the early 2000s. Abundance gradually declined during the mid-to-late 2000s and was stable from 2009-2017. After a sharp decline in harvest during 2018, harvest increased during 2019 and 2020. However, harvest declined again in 2021. The five- and ten-year spring turkey harvest trends in the Union Breaks Region indicate a declining population.

West Prairie Region

The West Prairie Region turkey population peaked in the early-to-mid 2000s, and after declining from 2006-2009, abundance increased from 2010-2015. Harvest declined from 2016-2018, increased in 2019 and 2020, but declined again in 2021. The five- and ten-year spring turkey harvest trends in the West Prairie Region indicate declining abundance.



PRODUCTION – WILD TURKEY BROOD SURVEY

The Missouri Department of Conservation (MDC) has been conducting a Wild Turkey Brood Survey annually since 1959. During the survey, Department staff and citizen volunteers record observations of hens, poults, and gobblers during June, July, and August. Turkey sightings are recorded on observation cards, which the MDC mails to participants at the beginning of each survey month. By recording observations of hens and poults, survey participants provide information that serves as an index to turkey production. It is through this survey that the MDC determines the success of each year's turkey hatch. Turkey observations are collected at the county-level and analyzed by Turkey Productivity Region (Figure 1), which are counties grouped by similar land cover composition. Conservation Department staff determines the percentage of hens observed with and without poults, and the average number of poults per hen for those hens observed with a brood. Observations of hens and poults are used to determine the poult-to-hen ratio (PHR), which is the average number of poults per hen. The PHR includes observations of hens with a brood and those observed without a brood.

In 2021, MDC staff and citizen volunteers recorded observations of over 75,000 turkeys during the three-month survey. The 2021 statewide poult-to-hen ratio (PHR) was 1.0, which was the same as the 2020 PHR and 11% greater than the previous five-year average (Figure 1, Figure 2, Table 1). However, this year's PHR was 17% lower than the 10-year average and 23% lower than the 20-year average (Table 1). Regional PHRs in 2021 ranged from 0.7 in the West Prairie Region to 2.4 in the Mississippi Lowlands Region (Table 1). Compared to the five-year averages, production in 2021 was greater in the Lindley Breaks, Mississippi Lowlands, Northwest, Ozark Border, Ozarks East, Ozarks West, and Union Breaks Regions but lower in the Northeast Region (Table 1). Production in the West Prairie Region was equal to the five-year average for that region (Table 1).

At the statewide scale, 40% of hens were observed with a brood, which was up from 38% in 2020 and was 22% greater than the 5-year average (Table 2). The percentage of hens observed with a brood ranged from 31% in the West Prairie Region to 64% in the Mississippi Lowlands Region (Table 2). Statewide, the average number of poults per brood was 4.0, which was up from 3.8 in 2020 and 9% greater than the five-year average (Table 2). The average number of poults per brood ranged from 3.5 in the West Prairie Region to 5.1 in the Mississippi Lowlands Region (Table 2).

Table 1. Index (poult-to-hen ratio) of Missouri wild turkey production by Turkey Productivity Region (Figure 1). Data were obtained during the Conservation Department's Wild Turkey Brood Survey in 2021 and are compared to the previous year and the average for periodic intervals.

Productivity Region	2021 Index	1-Year (2020) Change	5-Year (2016-2020) Change	10-Year (2011-2020) Change	20-Year (2001-2020) Change
Lindley Breaks	1.2	9%	20%	-8%	-14%
MS Lowlands	2.4	118%	85%	71%	20%
Northeast	1.0	-29%	-9%	-29%	-23%
Northwest	1.3	-7%	8%	-7%	-7%
Ozark Border	1.0	43%	25%	-9%	-17%
Ozarks East	1.0	No Change	11%	-33%	-38%
Ozarks West	1.1	57%	38%	No Change	-15%
Union Breaks	1.1	-8%	10%	-8%	-21%
West Prairie	0.7	No Change	No Change	-30%	-36%
Statewide	**1.0**	**No Change**	**11%**	**-17%**	**-23%**

[a]Statewide totals include observations where Productivity Region was not recorded on the survey form.

Table 2. Data obtained during the Missouri Department of Conservation's Wild Turkey Brood Survey, listed by Turkey Productivity Region (Figure 1), 2021.

Productivity Region	% Hens w/ Brood	Average Brood Size	Poult-to-Hen Ratio	Gobbler-to-Hen Ratio
Lindley Breaks	48%	4.0	1.2	0.8
MS Lowlands	64%	5.1	2.4	1.3
Northeast	33%	4.0	1.0	0.6
Northwest	36%	4.6	1.3	0.8
Ozark Border	36%	3.9	1.0	0.8
Ozarks East	37%	3.8	1.0	0.5
Ozarks West	44%	4.1	1.1	0.6
Union Breaks	42%	3.9	1.1	0.5
West Prairie	31%	3.5	0.7	0.9
Statewide[a]	**40%**	**4.0**	**1.0**	**0.7**

[a]Statewide totals include observations where Productivity Region was not recorded on the survey form.

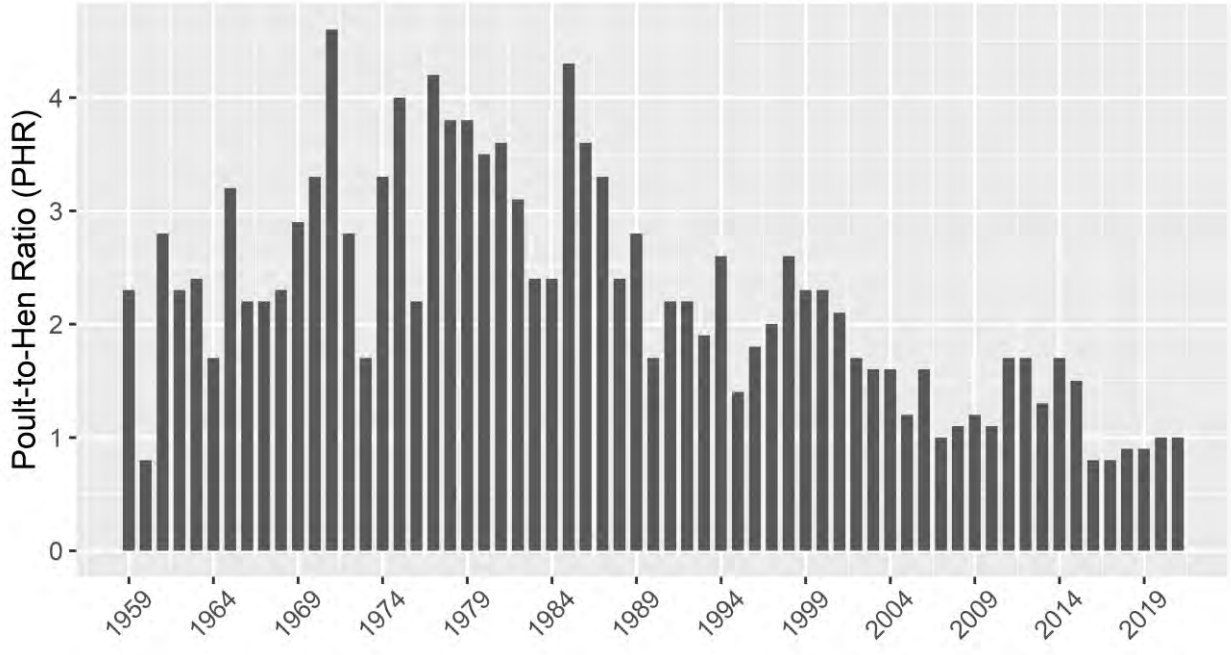


Figure 2. Missouri statewide poult-to-hen ratios derived from the Wild Turkey Brood Survey conducted in June, July, and August, 1959-2021.

HARVEST

2021 Spring Turkey Season

During the 2021 youth spring turkey season, which took place April 10-11, hunters harvested 2,795 turkeys. This harvest total represented a 3% increase from the 2020 youth season but was 8% lower than the previous five-year average youth season harvest total. In 2021, a total of 15,985 youth permits were sold which included 15,120 resident youth and 865 non-resident youth permits. The total number of youth permits sold in 2021 was 12% lower than the number sold in 2020.

During the 2021 regular spring turkey season, which took place April 19 - May 9, hunters harvested 31,800 turkeys. This harvest total represented an 18% decrease from the 2020 regular season. Juvenile male

turkeys represented 18% of the regular season harvest (Figure 3), which was 10% greater than the previous five-year average. The total 2021 spring turkey harvest, including both the youth and regular seasons was 34,595 (Figure 4). This harvest total was 17% lower than the 2020 harvest total and was 17% lower than the previous five-year average. Counties with the highest total spring harvest were Franklin, Texas, and Callaway, where 773, 737, and 707 turkeys were harvested, respectively (Figure 5).

Total permit sales for the 2021 spring turkey season (102,490; excluding no-cost landowner permits) were 10% lower than in 2020 and <1% lower than the previous five-year average (Figure 4). Spring turkey permit sales in 2021 included 93,723 (91%) resident permits and 8,767 (9%) nonresident permits. An additional 22,318 no-cost permits were distributed to landowners. The total number of unique spring turkey hunters in Missouri in 2021 was 122,182. The number of spring turkey hunters in 2021 was 8% less than in 2020 and 9% lower than the previous five-year average. Note that the total number of hunters does not equal the permit sales total because some hunters purchase a permit in addition to receiving a no-cost landowner permit.

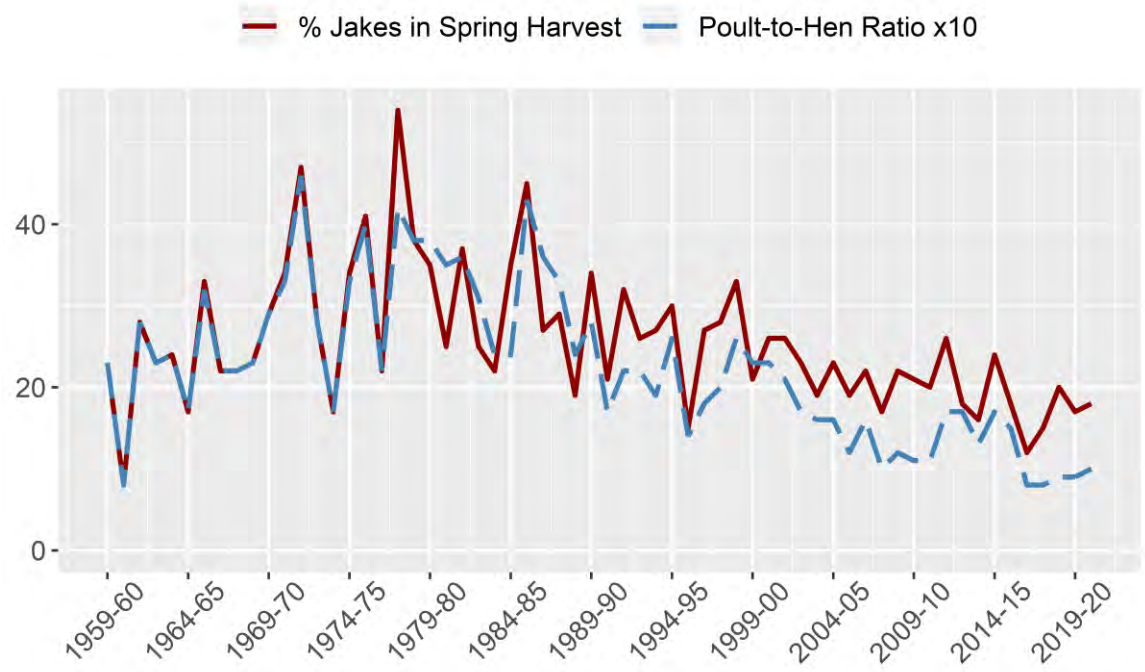


Figure 3. Missouri's statewide poult-to-hen ratio multiplied by 10, compared with the percentage of jakes in the following year's regular season spring harvest, 1959-2021.

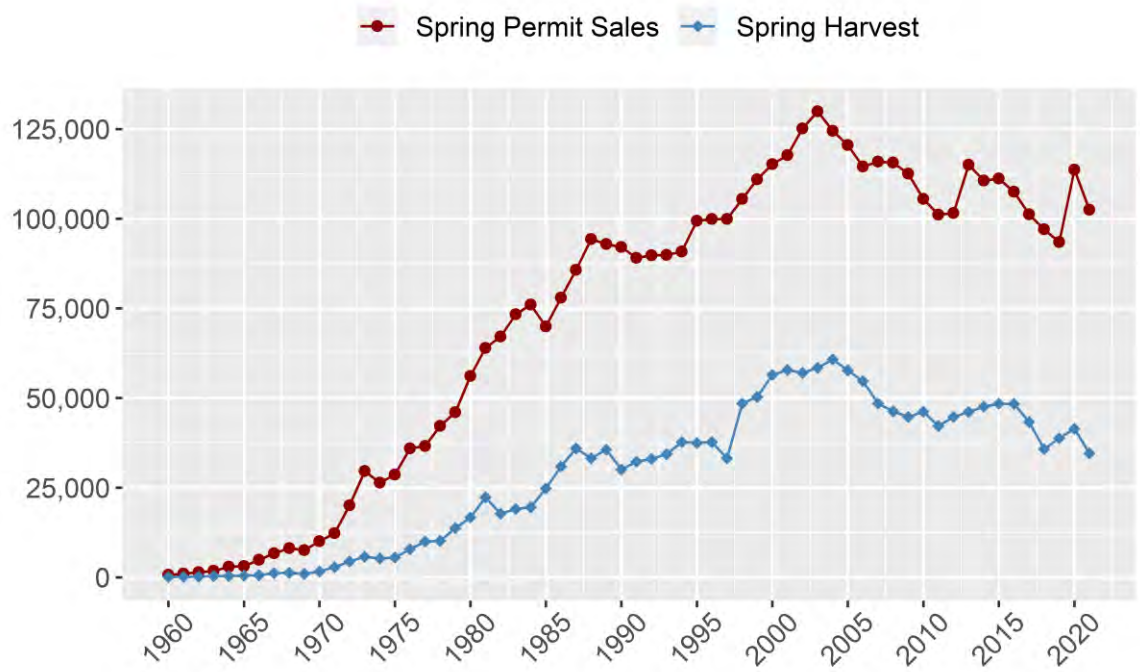


Figure 4. Number of wild turkeys harvested during the spring season (youth and regular season) in Missouri and the number of turkey hunting permits sold for the spring season, 1960-2021. Permit sales do not include no-cost landowner permits.

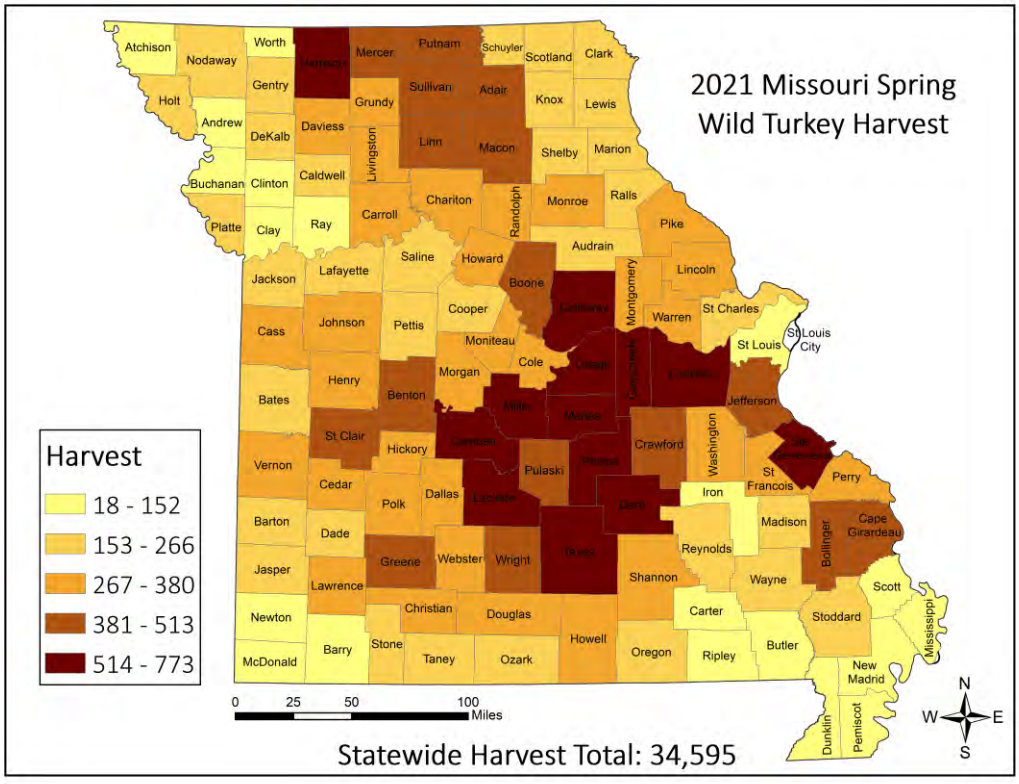


Figure 5. Total (youth and regular season) spring wild turkey harvest in Missouri, 2021.

2021 Fall Firearms Turkey Season

The 2021 fall firearms turkey harvest total of 1,836 was 14% lower than the 2020 harvest total but was 29% below the previous five-year average (Figure 6). The majority of the fall firearms harvest occurred south and east of central Missouri (Figure 7). The top harvest counties were Dent (72), Maries (58), and Texas (56).

The fall firearms turkey permit sales total in 2021 (11,962) was 3% lower than the 2020 permit sales total (12,329). However, compared to the average number of permits sold during the previous five fall firearms seasons (2016-2020), permits sales were up by 11% in 2021.

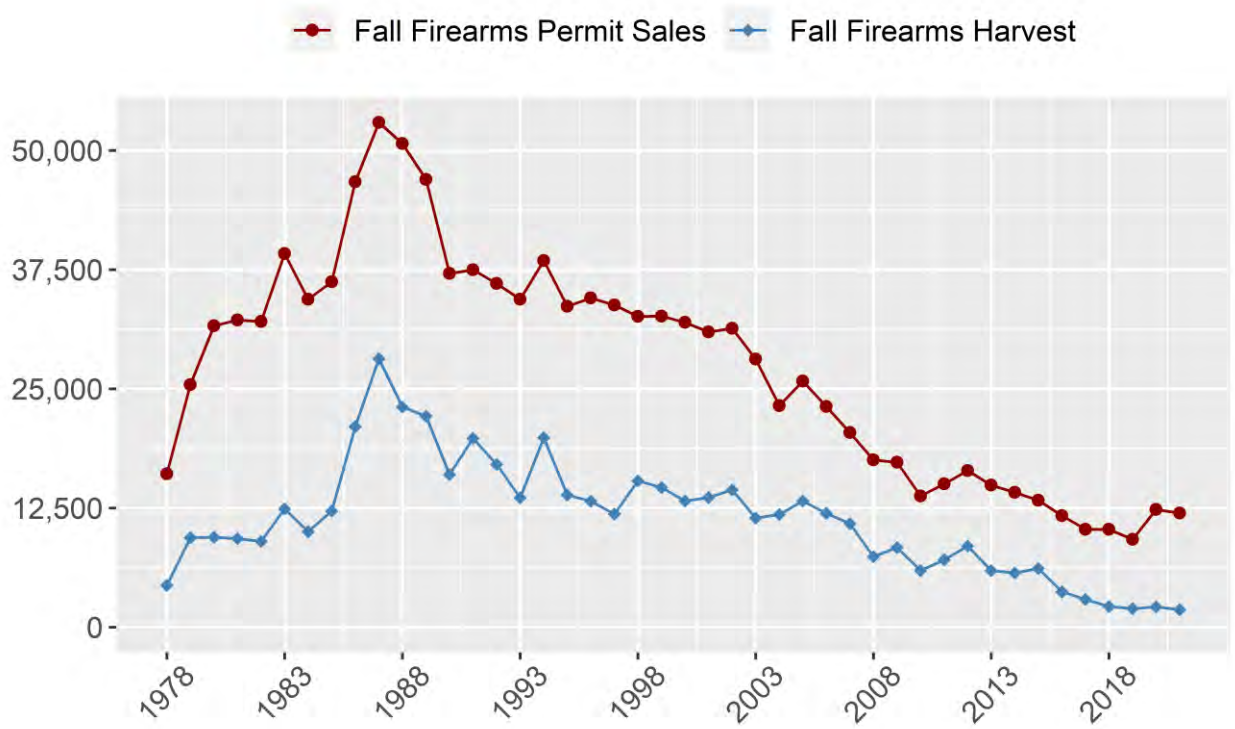


Figure 6. Number of wild turkeys harvested during the fall firearms turkey season in Missouri and the number of fall firearms permits sold, 1978-2021. Permit sales do not include no-cost landowner permits.

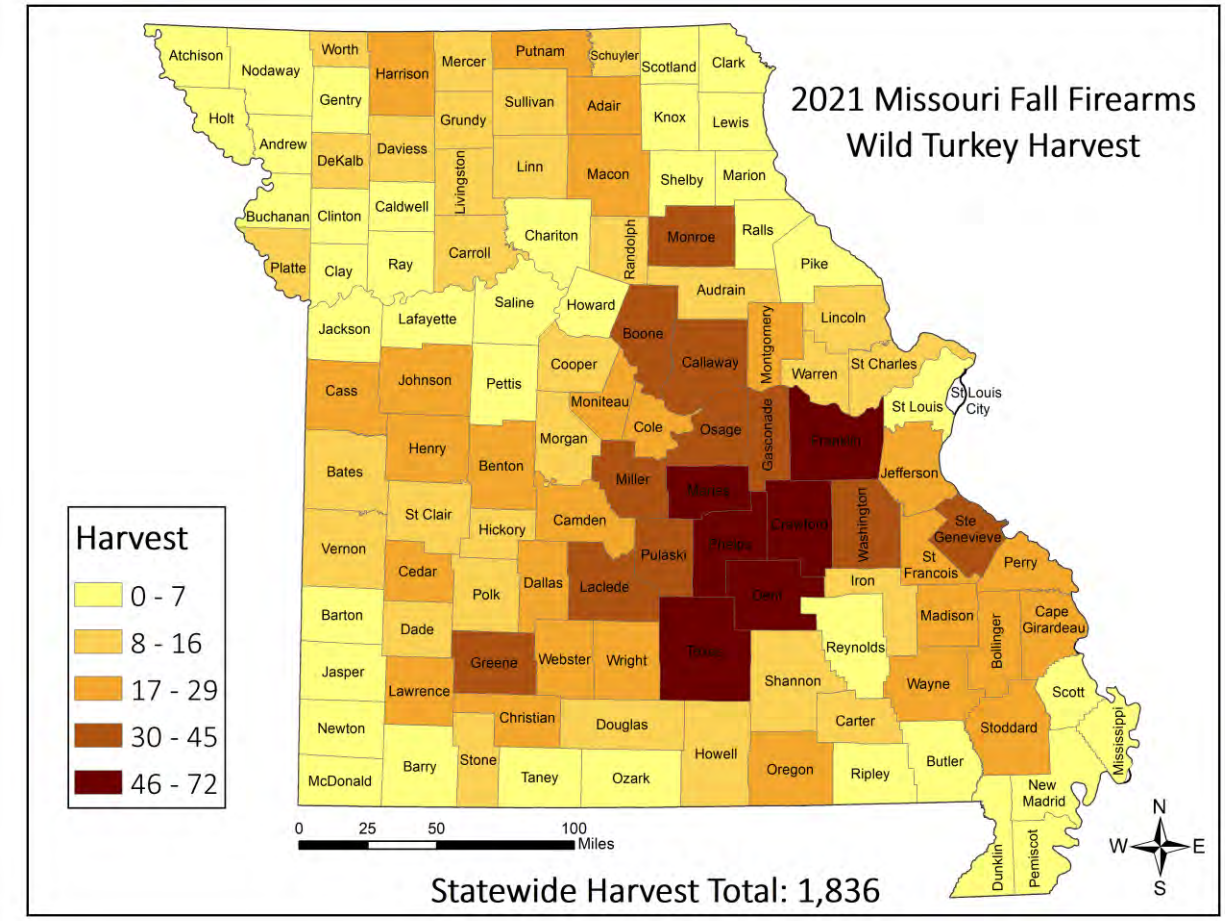


Figure 7. Missouri fall firearms wild turkey harvest, 2021.

2021 Fall Archery Turkey Season

Hunters harvested 2,516 turkeys during the 2021 fall archery deer and turkey season (Figure 8). The 2021 archery turkey harvest total was 13% lower than the 2020 harvest total but 36% greater than the previous five-year average (Figure 8). The top three harvest counties were Franklin (69), Jefferson (67), and Callaway (61) (Figure 9). Unlike the fall firearms turkey harvest, which has shown a declining trend since the late 1980s (Figure 6), the fall archery harvest increased until the mid-2000s. Since 2005, archery turkey harvests have fluctuated substantially (Figure 8).

Although archery permit sales were relatively stable from the mid-1990s through the mid-2000s, sales have since shown an increasing trend. In 2021, 152,833 fall archery hunting permits were sold. The 2021 permit sales total was down 2% from the record-high total in 2020 (156,342) but was still 14% greater than the previous 5-year permit sales average (2016-2020) (Figure 8).

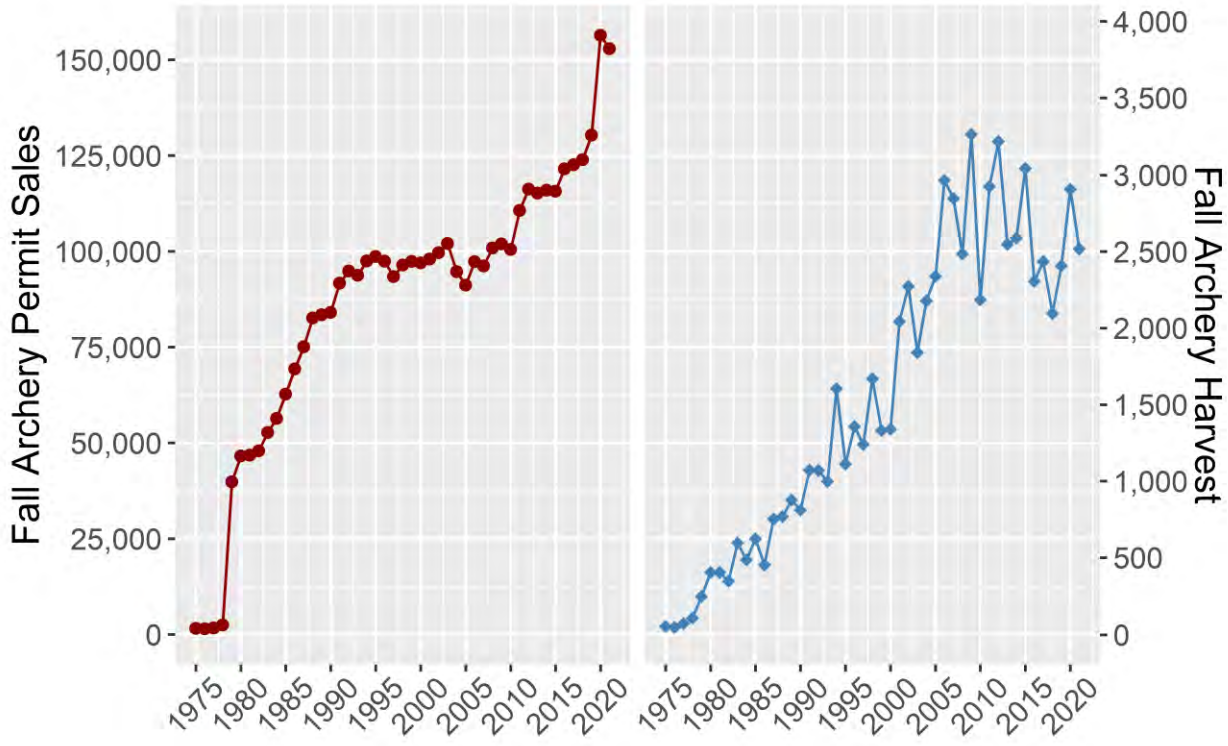


Figure 8. Missouri fall archery permit sales compared to fall archery turkey harvest, 1975-2021. Permit sales do not include no-cost landowner permits. In 1979, the archery deer and archery turkey permits were combined into one permit.

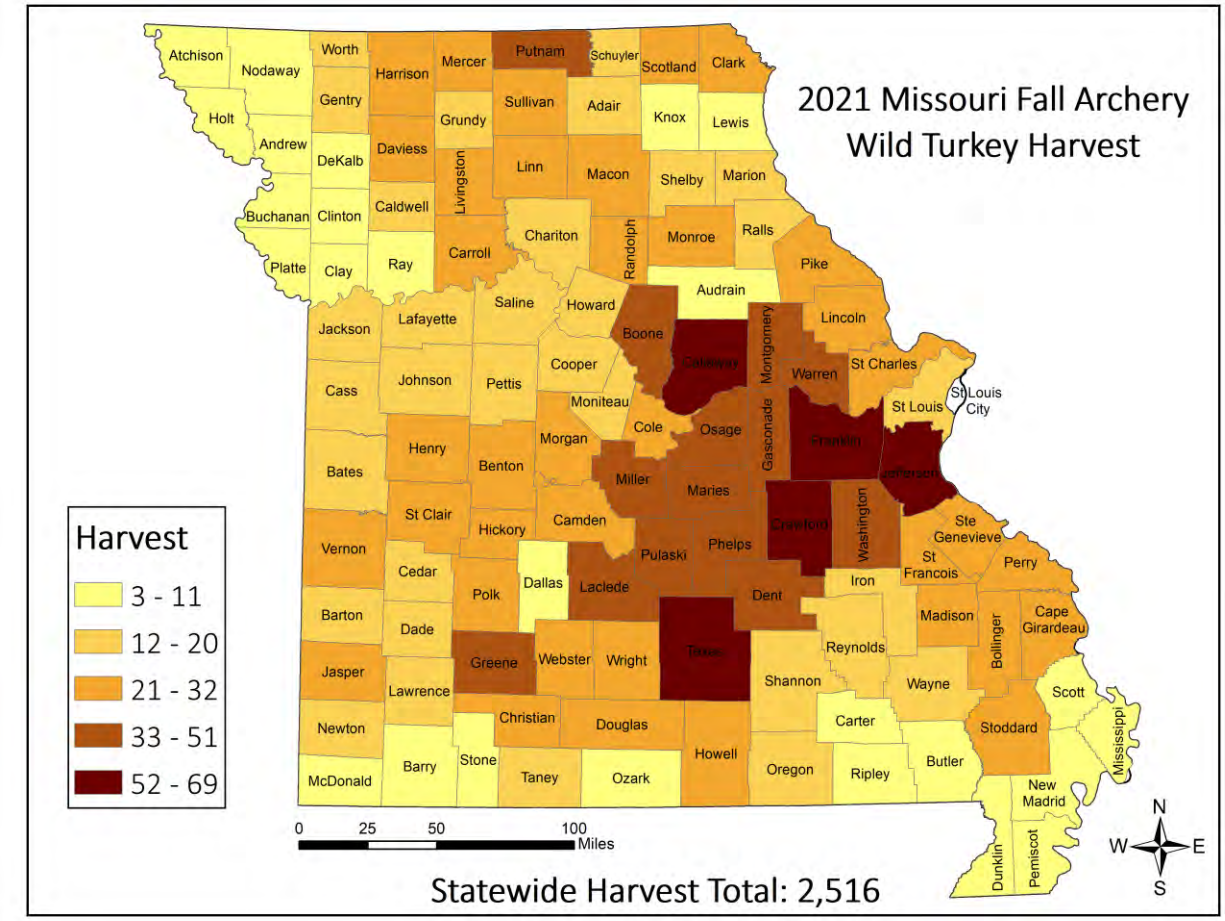


Figure 9. Missouri fall archery turkey harvest, 2021.

HUNTING INCIDENTS

There was one hunting incident during the 2021 spring turkey season. The number of spring turkey hunting incidents in Missouri has declined considerably over the course of the last three decades. During the late 1980s, more than 30 incidents occurred annually for every 100,000 permits sold. During the last five hunting seasons, the average number of incidents per 100,000 permits sold is 1.2 (Figure 10).

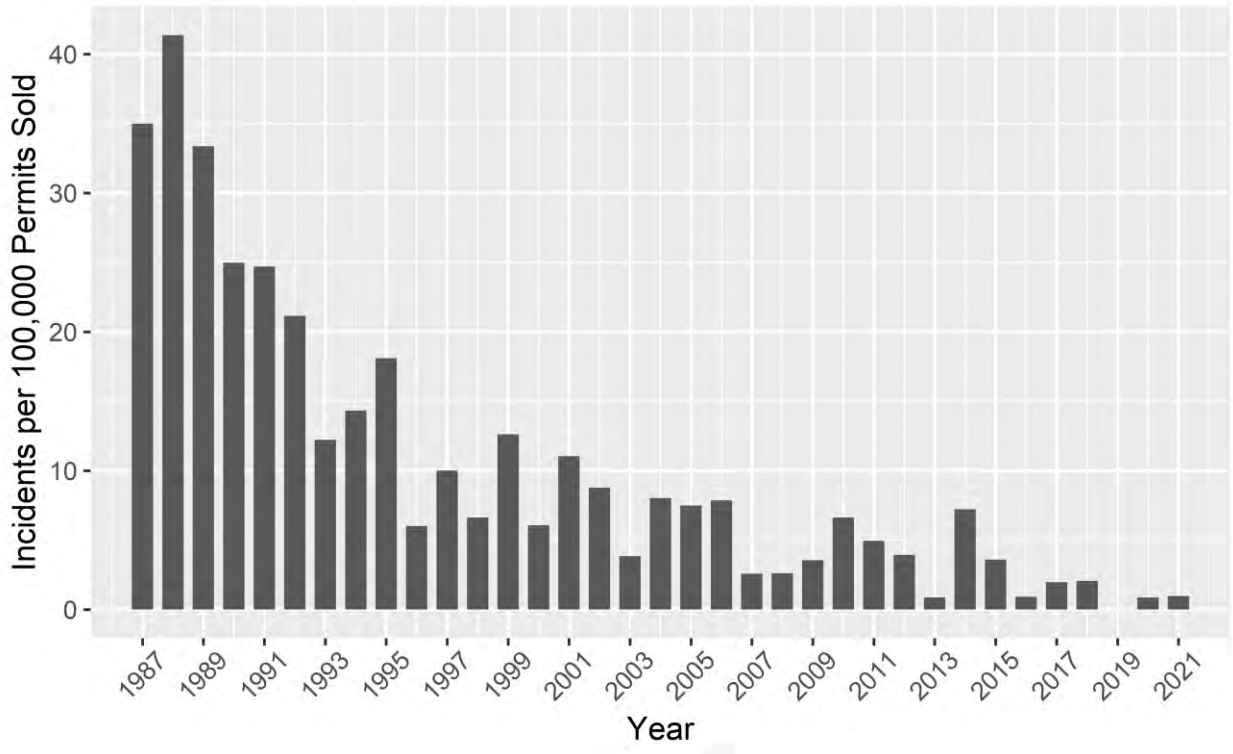


Figure 10. Hunting incidents during the spring turkey season in Missouri per 100,000 permits sold, 1987-2021.

RECENT REGULATION CHANGES

Other than changes to some Conservation Area regulations and managed spring turkey hunts, no turkey hunting regulation changes occurred in 2021.

Factors Influencing Wild Turkey Nest Success and Poult Survival in North Missouri research project

Overview

Wild turkey production has exhibited a long-term declining trend, with recent hatches being especially poor. Nest success and poult survival rates from the previous north Missouri study were lower than many previously reported estimates from the literature, and the poult-to-hen ratios calculated from the summer brood survey during the past 4 years are some of the lowest in the state's history. Because of low recruitment, turkey abundance in Missouri could be at its lowest level in decades, generating concern about long-term population viability. Density dependence, large-scale landscape change, changing weather patterns, decreasing insect abundance, and increasing populations of some mesocarnivores (nest & poult predators) could be adversely affecting turkey production. Since these factors have traditionally been studied in isolation, there is an incomplete understanding of how these factors are affecting turkey populations. Improving our understanding of factors affecting turkey nest success and poult survival would provide important information when communicating about declining turkey production and abundance with concerned stakeholders. This information would also inform habitat management efforts on public and private lands in Missouri to increase turkey recruitment and ultimately abundance.

Objectives of this five- and one-half-year cooperative research project with the University of Missouri include:

1. Determine the most effective method of attaching radio-transmitters to turkey poults.
2. Determine how weather (temperature and precipitation), landscape characteristics, predator densities, and their interactions affect turkey nest success.
3. Determine how weather (temperature and precipitation), landscape characteristics, predator densities, and invertebrate abundance affect poult survival, and identify the main causes of poult mortality.
4. Assess turkey brood-rearing habitat selection and determine habitats where turkeys and predators are most likely to interact.

Field work for this project will cover 4 nesting and brood-rearing seasons (to capture annual variability in covariates), and work will be conducted in Putnam County, Missouri. During the winter, we will capture and mark wild turkey hens with Global Positioning System-Acceleration-Ultra High Frequency (GPS-ACC-UHF) transmitters. These hens will be monitored for reproductive attempts throughout the spring and summer. Once a hen begins to incubate a nest, we will monitor the nest more frequently to determine if and how the nest failed or when the nest hatches. If nests successfully hatch, we will capture and mark the poults with Very High Frequency (VHF) radio transmitters and monitor their survival daily. In addition to monitoring nest attempts and survival of poults, we will:

- Deploy weather stations throughout the study area to gather detailed temperature and precipitation data.
- Conduct mark-and-recapture studies of nest predators (i.e., raccoon, skunk, opossum) at several sites throughout the study area to estimate their densities.
- Conduct vegetation surveys at the nest bowl (following a nest failure or successful hatch) to determine if vegetative cover plays a role in nesting success. Additionally, we will conduct vegetation surveys at several randomly selected sites near each nest that were not selected for to see if there is any pattern as far as which nesting sites hens are choosing to lay their eggs.
- Deploy trail cameras and scent lures to estimate larger predator (coyote, bobcat, fox) occupancy in different land cover types and to see if predator occupancy varies across the study area.
- Conduct vegetation surveys and collect arthropod samples at static sampling points throughout the study area as well as at sites used by hens with broods. These surveys will allow us to determine what sort of habitat hens with broods are selecting for versus what is available in the area and how those decisions impact poult survival. Additionally, we will be able to determine which habitats provide the most (and best) food for poults.

Project Update

The first field season wrapped up in August 2021 and a research update with preliminary results was published in December 2021. This research update can be found in the next section of this report.

Since publishing the 2021 research update, the second field season began. In January 2022, the research team began locating the hens marked during the first field season and locating additional flocks of hens. The team began setting bait sites to lure flocks into suitable capture locations. This winter trapping season was challenging due to an unusually warm winter with no snow cover in Putnam County. Despite the difficulties, the team was able to capture and mark an additional twenty-three hens (17 adult; 6 subadult) before the end of the winter. Between the hens marked during the first field season that were still alive, and the newly marked hens from the second field season, over 50 hens were being monitored for nesting attempts at the start of spring.

We are currently in the middle of the second field season. We will continue to summarize and share preliminary results from this work as those results become available. We will also continue to provide an update on this project in our annual Wild Turkey Population Status Report for the duration of this effort.

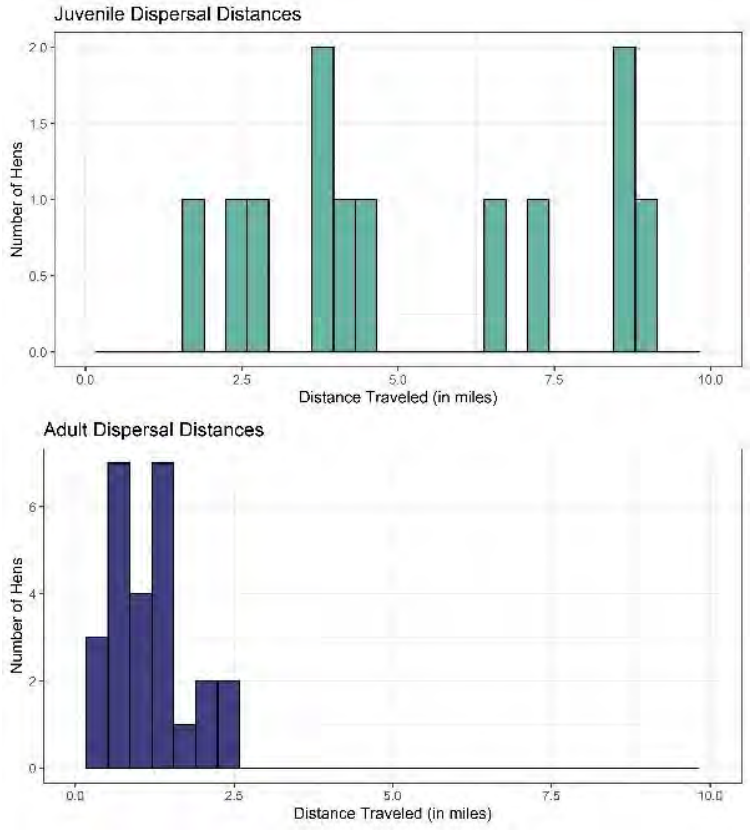
2021 Putnam County Wild Turkey Research Update

Field work for the 2021 field season concluded on August 15th. We would like to thank the 86 landowners who granted us permission to access 40,448 acres of private property in Putnam County. Without their assistance, this work would not be possible! We have welcomed an additional PhD student to the project: Cara (CJ) Yocom-Russell. The second of four field seasons will begin in January 2022.

Above: Missouri Department of Conservation Wild Turkey and Ruffed Grouse Biologist, Reina Tyl, and University of Missouri PhD student, Alisha Mosloff, tagging a wild turkey hen.

Wild Turkey Capture and Tracking

We captured wild turkeys throughout Putnam County during the month of February 2021. We targeted our capture efforts toward flocks of hens. We captured 108 wild turkeys: 54 adult hens, 44 subadult hens, and 10 subadult males (jakes). All captured birds were banded. Fifty-one hens (30 adults, 21 subadult) were fitted with GPS backpack transmitters. The backpacks collect GPS locations at regular intervals and emit a UHF radio signal which allows researchers to locate hens and download GPS data remotely. The distance at which data can be downloaded is dependent upon factors such as terrain and tree cover, but on average we found that we needed to be within 300-m of the hen. We downloaded GPS data from each hen weekly. We have collected > 1.5 million GPS locations so far.



Hen Survival and Dispersal

Of the 51 hens captured and tagged, 46 survived the 2021 field season. Three mortalities were due to predation and two had an unknown cause of death. Subadult hens dispersed an average of 5.24 miles from the location where they were captured to their first nest site while adult hens dispersed an average of 1.17 miles (see figure to the left). Three hens dispersed into Iowa in the spring and remained there for the duration of the field season.

Left: Post-winter dispersal distances traveled by juvenile and adult wild turkey hens marked in Putnam County, Missouri during February 2021.

Nest Survival and Site Selection

Fifty of the 51 GPS tagged hens were alive at the beginning of the nesting season. Of those 50 hens, 39 reached nest incubation. Eight of the 39 initial nest attempts hatched. Four hens whose initial nest failed initiated a second nest (renest) attempt, of which 1 hatched. Note that because wild turkeys do not start continuously incubating nests until the entire clutch is laid, it can be difficult to identify nest attempts that fail prior to incubation. Thus, it is possible that some nest attempts may have gone undetected if the nest failed during the laying stage. Regarding nest habitat, 17 nests were in forest cover while 26 nests were in open fields.

2021 Tagged Hen Nesting At a Glance

- 79.6 % of tagged hens incubated a nest
- 15.4% Renested following nest failure
- 20.9% of nests hatched:
  - 20.5% of initial nests hatched
  - 25% of 2nd nest attempts hatched
- Median Nest Incubation Date: 5/15/2021

Left: A successful turkey nest in Putnam County. This nest was in a field, approximately 10 meters from a forest edge. Of the 15 eggs, 11 hatched.

Brood Survival

An important objective of this study is to measure brood success and if possible, identify causes of poult mortality. To achieve this objective, we attempted to capture recently hatched poults belonging to GPS tagged hens and attach small (< 2-g) radio transmitters to them. This would allow us to monitor individual poults and identify causes of mortality. We attempted brood captures on 4 of the successful nests. We successfully captured 1 poult from 1 brood but were unable to capture the remaining broods within 3 days of hatching. A hen with another brood was depredated 3 days post-hatch, and therefore, the brood was assumed to be lost as well. The remaining broods have unknown fates because we were unable to access the property being utilized by the broods to determine brood fate. We are currently re-assessing our approach to quantifying brood survival based on lessons learned from this field season.

Brood Predator Camera Trapping

Predation risk can play an important role in survival and habitat use of wild turkey broods. We surveyed the distribution and habitat use of known brood predators (bobcat, coyote, and fox) from May-August using 62 camera traps distributed throughout Putnam County. Camera trap data is currently being processed.

Right: A poult captured on June 18, 2021, in Putnam County, Missouri. The poult was fitted with a VHF transmitter and then released.

Nest Predator Captures

To understand the potential influence of turkey nest predators (raccoons, opossums, and skunks) on nest success, we live trapped and tagged nest predators in April. We can estimate population sizes of nest predators using a technique known as capture-mark-recapture which relies on recapture rates of tagged and released animals. We will relate predator population estimates to nest success and identify possible relationships between the amount of potential nest predators in Putnam County and nest success. We live-trapped 3 areas in Putnam County for 10 days each, using 39-43 wire cage traps per area. Each captured mammal was ear tagged and microchipped the first time they were captured. These tags were then used to identify individuals if they were recaptured. Initial estimates of raccoon and opossum population sizes per acre in the three trap areas are below. While we were also targeting skunks, we were unsuccessful at capturing them.

Trap Site	Estimated Raccoons per acre	Estimated Opossums per acre
1	1.57	0.65
2	2.02	1.11
3	3.34	0.93

Weather Stations

Ten weather stations were deployed throughout Putnam County during the months of May-August. These stations recorded the air temperature every 30 minutes and the amount of rainfall at 0.2mm intervals. These data will be used to examine the relationships between weather and nest and brood survival.

Left: One of the 10 weather stations placed in Putnam County, Missouri. The weather stations are attached to a t-post with the rain gauge pictured on the left side and the temperature logger on the right.

Vegetation and Arthropod Surveys

Vegetation influences hen survival, nest success, and brood survival while arthropods are a vital food source for young poults. Arthropod availability may vary across habitat types such as forests, grasslands, and agricultural fields. Broods which have access to areas with greater arthropod availability may grow faster and have a greater chance of survival. We established 25 sites throughout Putnam County at which vegetation and arthropod biomass and diversity were sampled bi-weekly during May-August (brood rearing season). Arthropods were actively sampled using a modified leaf blower.

Right: An example of arthropods collected during a single survey. The insects are stored and will be identified to order in the lab.

Male Wild Turkey Harvest Rate Estimation Project

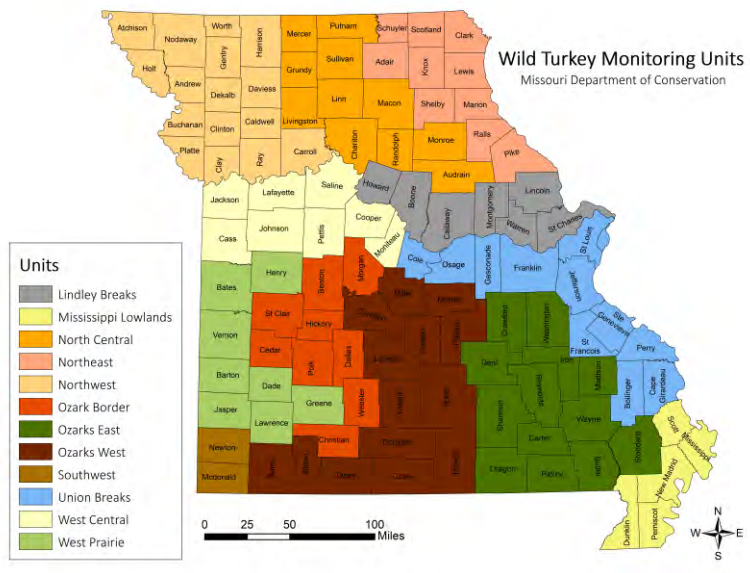
Overview

Above: A juvenile male wild turkey is released after being banded in Polk County, Missouri.

We recently embarked on a new research project aimed at estimating male turkey harvest rates—or the proportion of males removed through harvest —during the spring and fall hunting seasons. We are currently in the process of developing new population models for each Wild Turkey Monitoring Unit (TMU) that will allow us to estimate turkey abundance, harvest rates, and other population dynamics across the state. The models are being developed using available data from wild turkey field studies conducted in the Ozarks East, Northeast and North Central TMUs. During the development of these models, it became apparent that the existing data was not a good fit for some of the transitional areas between the Ozarks and the more open areas of north and west Missouri. We determined that updated harvest rate information for male turkeys in two TMUs—Ozark Border and Union Breaks—was needed to improve model performance.

Project Update

The Ozark Border and Union Breaks TMUs (red and blue regions in the figure below, respectively) are very linear and cover a broad geographic area. We decided to concentrate our turkey banding efforts during the winter of 2021-2022 in Cedar, Polk, St. Clair, and Benton counties in the Ozark Border TMU and Ste. Genevieve, Perry, and Bollinger counties in the Union Breaks TMU. Ultimately, we were looking to band turkeys by capturing them with rocket nets, but the first step involved finding flocks of turkeys and baiting them into suitable capture sites. Two technicians assigned to each TMU, along with the help of the Turkey Program Assistant and Turkey Program Leader, employed a mix of scouting for turkey flocks from public roadways, reaching out to local MDC staff and the private landowners they work with to see where they normally find wintering flocks of turkeys, and contacting landowner cooperatives and local NWTF Chapters to see if their members were willing to let us trap turkeys on their properties. We also scouted for flocks of turkeys on public lands within the study areas.



Left: Wild Turkey Monitoring Units (TMUs) are county aggregates grouped by similar land cover composition and turkey population trends.

Over 30 bait sites were established across each TMU to lure groups of turkeys into suitable capture locations. When at least one group of male turkeys began visiting a bait site regularly, we deployed rocket net equipment at that site. These nets were then used to capture the flocks of males, allowing the technicians to band each individual turkey. The banded birds were released on site immediately after banding.

Left: A bait site with rocket net equipment set up and ready for capture in Perry County, Missouri.

From January through March, our team orchestrated 21 capture events where a total of 86 turkeys were banded. Seventy-six of those turkeys were the target males and 10 females were captured as well. Of those 76 males, 38 were adults and 38 were juveniles. Each captured male turkey received an individual leg band to be used to contact MDC in the event of a successful harvest. A total of 12 banded male turkeys were reported harvested during the 2022 spring turkey season, two of which were harvested during the youth weekend. We will continue monitoring harvest of these banded turkeys through the 2022 fall firearms and archery turkey seasons.

Table: The number of turkeys banded in each county during the 2021-2022 winter season and the number of turkeys recovered in each county during the 2022 spring turkey hunting season.

County	Adult Males Banded	Subadult Males Banded	**Total Males Banded**	Females Banded	Adult Males Recovered	Subadult Males Recovered	**Total Recovered**
Benton	2	0	**2**	0	0	0	**0**
Bollinger	2	0	**2**	0	1	0	**1**
Cedar	5	7	**12**	5	1	1	**2**
Dallas	0	0	**0**	0	1	0	**1**
Perry	0	2	**2**	0	0	0	**0**
Polk	21	19	**40**	0	6	0	**6**
St. Clair	3	0	**3**	0	0	0	**0**
Ste. Genevieve	5	10	**15**	5	2	0	**2**
Total	38	38	**76**	10	11	1	**12**

Moving Forward

This winter's banding effort was the first of 3 winter trapping seasons. As with many first-year field seasons, there were several challenges that led to lower-than-expected capture success. The primary factor being the unpredictability of the weather. Weekly winter storms that brought snow, freezing rain, or both make it difficult to pattern flocks of turkeys and access some of the bait sites. Additionally, there were several capture events where the equipment malfunctioned which led to only a fraction of the turkeys on bait ending up entangled in the rocket net. We are spending the off season testing out equipment and strategizing additional ways to improve capture success in future years.

Acknowledgements

I, Turkey Program Leader Reina Tyl, would like to thank Turkey Program Assistant, Trevor Lindsay, and Turkey Banding Technicians—Arthur Ludwig, Ryan Steffens, Adam Cupito, and Nicholas Peterson—for their efforts to locate turkeys, communicate with landowners, and conduct turkey capture events this past winter. Additionally, I would like to thank our local MDC staff who assisted with landowner contacts, monitoring of bait sites, and banding of turkeys and who answered the call whenever we asked for their assistance. Perhaps most importantly, I would like to thank the nearly 50 private landowners who allowed us access to their properties and the hunters who called in to report their harvest of a banded turkey. Without their cooperation and help this project would not be possible.

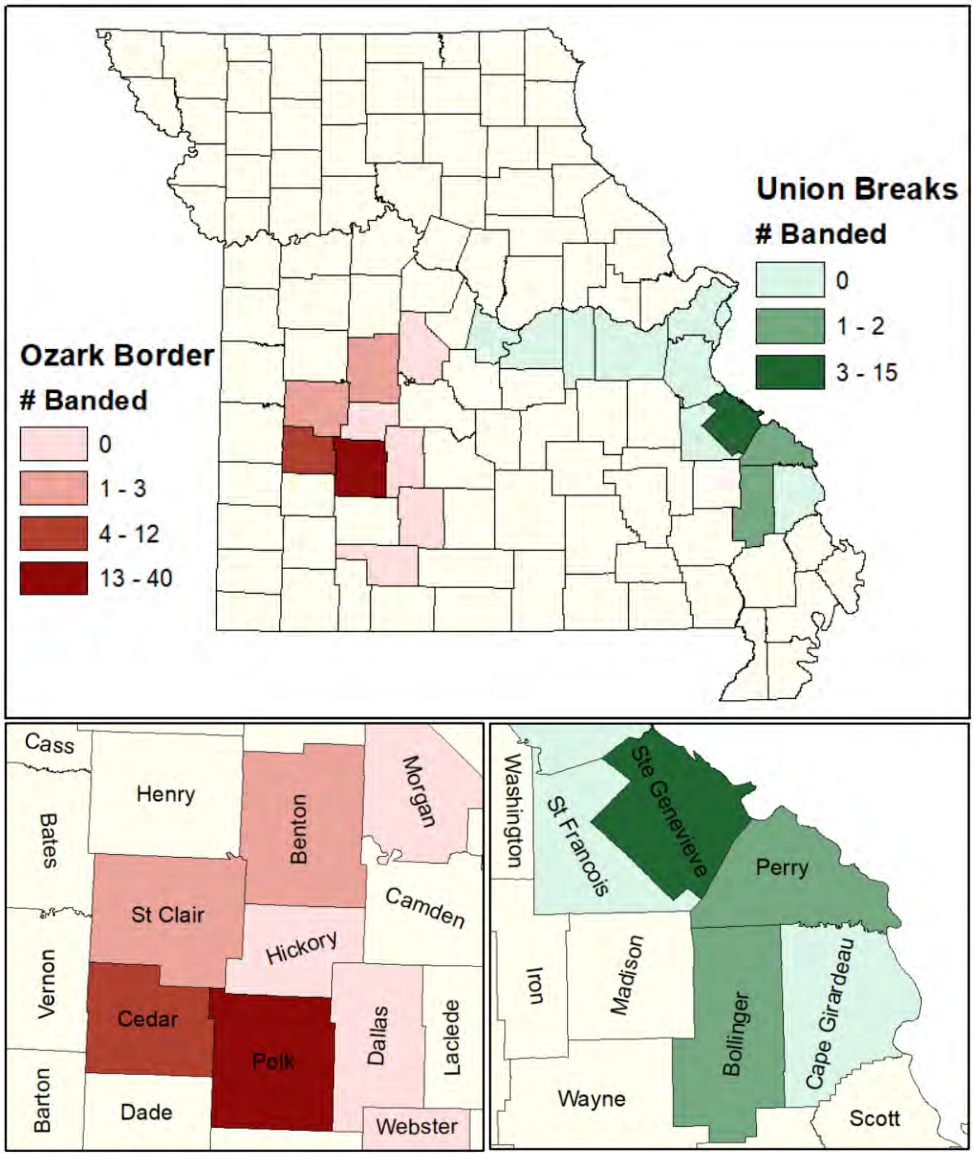


Figure: A map of the number of wild turkeys banded within each county in the Ozark Border and Union Breaks Turkey Monitoring Units during the 2021-2022 winter turkey capture season.

APPENDIX A.

2021 Missouri spring turkey harvest (youth and regular seasons combined).

County	Adult Males	Subadult Males	Bearded Females	Total	Rank[a]
Adair	312	70	5	387	29
Andrew	93	20	2	115	105
Atchison	111	11	1	123	100
Audrain	126	35	3	164	93
Barry	91	26	0	117	104
Barton	148	46	5	199	82
Bates	184	77	5	266	62
Benton	329	71	1	401	26
Bollinger	342	80	5	427	23
Boone	358	87	7	452	20
Buchanan	66	25	0	91	107
Butler	72	18	0	90	109
Caldwell	163	49	0	212	78
Callaway	540	156	11	707	3
Camden	461	76	10	547	11
Cape Girardeau	340	85	4	429	22
Carroll	226	50	3	279	60
Carter	106	30	4	140	98
Cass	250	92	3	345	39
Cedar	272	58	3	333	41
Chariton	260	61	2	323	45
Christian	253	55	6	314	50
Clark	200	54	2	256	64
Clay	80	36	2	118	102
Clinton	92	27	0	119	101
Cole	237	70	5	312	51
Cooper	186	53	2	241	68
Crawford	427	69	3	499	16
Dade	185	44	0	229	69
Dallas	279	60	7	346	38
Daviess	307	71	2	380	30
Dekalb	133	35	0	168	92
Dent	531	44	7	582	8
Douglas	277	72	4	353	36
Dunklin	15	3	0	18	114
Franklin	598	157	18	773	1
Gasconade	480	132	6	618	6
Gentry	157	32	5	194	86
Greene	365	87	6	458	17
Grundy	263	53	3	319	47
Harrison	475	93	5	573	10

County	Adult Males	Subadult Males	Bearded Females	Total	Rank[a]
Henry	251	75	4	330	42
Hickory	238	65	3	306	53
Holt	156	29	3	188	87
Howard	262	56	3	321	46
Howell	248	48	5	301	54
Iron	113	22	2	137	99
Jackson	116	39	3	158	94
Jasper	168	44	4	216	76
Jefferson	363	72	2	437	21
Johnson	263	85	4	352	37
Knox	188	36	2	226	71
Laclede	497	67	10	574	9
Lafayette	163	51	4	218	75
Lawrence	255	55	9	319	48
Lewis	142	52	2	196	83
Lincoln	210	63	4	277	61
Linn	344	69	4	417	24
Livingston	263	63	4	330	43
Macon	402	100	1	503	15
Madison	175	38	1	214	77
Maries	448	87	8	543	12
Marion	125	57	1	183	89
McDonald	46	13	0	59	111
Mercer	339	44	5	388	28
Miller	488	113	6	607	7
Mississippi	79	10	2	91	108
Moniteau	221	70	3	294	58
Monroe	284	86	3	373	32
Montgomery	235	55	7	297	56
Morgan	261	65	3	329	44
New Madrid	36	12	0	48	112
Newton	69	29	1	99	106
Nodaway	169	32	0	201	81
Oregon	177	44	0	221	73
Osage	501	123	6	630	5
Ozark	167	25	3	195	84
Pemiscot	36	6	0	42	113
Perry	283	86	5	374	31
Pettis	181	68	1	250	66
Phelps	575	77	7	659	4
Pike	237	55	5	297	57
Platte	126	43	0	169	91
Polk	307	61	2	370	33
Pulaski	404	48	5	457	18

County	Adult Males	Subadult Males	Bearded Females	Total	Rank[a]
Putnam	388	65	3	456	19
Ralls	144	43	1	188	88
Randolph	233	66	1	300	55
Ray	98	52	0	150	96
Reynolds	144	28	3	175	90
Ripley	112	33	0	145	97
Saint Charles	151	42	2	195	85
Saint Clair	309	86	6	401	27
Saint Francois	253	51	4	308	52
Saint Louis	67	8	2	77	110
Sainte Genevieve	438	100	3	541	13
Saline	200	57	5	262	63
Schuyler	182	40	2	224	72
Scotland	189	61	4	254	65
Scott	127	23	2	152	95
Shannon	295	22	1	318	49
Shelby	153	47	4	204	79
Stoddard	155	66	0	221	74
Stone	166	35	3	204	80
Sullivan	455	49	9	513	14
Taney	192	33	3	228	70
Texas	654	80	3	737	2
Vernon	266	80	8	354	35
Warren	235	48	4	287	59
Washington	316	50	4	370	34
Wayne	177	66	1	244	67
Webster	283	58	3	344	40
Worth	98	18	2	118	103
Wright	350	50	12	412	25

[a]Rank based on total harvest in Missouri's 114 counties.

APPENDIX B.

2021 Missouri fall turkey harvest (firearms and archery seasons combined).

County	Adult Males	Adult Females	Subadult Males	Subadult Females	Total	Rank[a]
Adair	6	17	2	17	42	36
Andrew	0	5	1	2	8	106
Atchison	2	4	3	2	11	101
Audrain	5	3	0	7	15	89
Barry	1	2	0	1	4	111
Barton	8	4	2	2	16	87
Bates	8	4	4	7	23	74
Benton	10	15	4	12	41	39
Bollinger	12	18	7	12	49	25
Boone	17	31	14	16	78	15
Buchanan	2	5	1	2	10	102
Butler	4	0	1	1	6	109
Caldwell	6	7	1	0	14	92
Callaway	22	34	8	38	102	6
Camden	22	20	6	13	61	20
Cape Girardeau	20	13	0	12	45	31
Carroll	14	12	3	10	39	46
Carter	0	5	9	4	18	83
Cass	9	11	4	11	35	57
Cedar	5	16	4	16	41	40
Chariton	8	4	4	3	19	81
Christian	14	19	5	8	46	29
Clark	8	7	4	4	23	75
Clay	2	6	1	3	12	98
Clinton	6	3	3	2	14	93
Cole	14	19	11	7	51	24
Cooper	8	13	0	6	27	65
Crawford	25	38	10	30	103	5
Dade	5	10	7	8	30	62
Dallas	9	9	2	9	29	64
Daviess	12	12	4	8	36	54
Dekalb	4	7	2	5	18	84
Dent	20	39	17	46	122	1
Douglas	9	13	7	11	40	44
Dunklin	0	2	1	0	3	113
Franklin	29	41	17	35	122	2
Gasconade	21	28	12	21	82	10
Gentry	7	7	0	3	17	85
Greene	37	35	8	14	94	7
Grundy	9	5	1	11	26	67

County	Adult Males	Adult Females	Subadult Males	Subadult Females	Total	Rank[a]
Harrison	17	17	10	12	56	21
Henry	10	19	2	16	47	27
Hickory	11	16	7	5	39	47
Holt	6	3	1	5	15	90
Howard	7	4	5	7	23	76
Howell	11	11	2	12	36	55
Iron	9	10	2	4	25	69
Jackson	9	8	6	3	26	68
Jasper	7	15	1	1	24	73
Jefferson	26	38	13	14	91	9
Johnson	7	13	7	10	37	52
Knox	5	3	3	1	12	99
Laclede	26	24	7	25	82	11
Lafayette	7	8	3	1	19	82
Lawrence	14	10	5	8	37	53
Lewis	2	3	1	4	10	103
Lincoln	13	18	4	10	45	32
Linn	10	13	4	12	39	48
Livingston	10	9	4	15	38	49
Macon	16	14	4	14	48	26
Madison	8	18	4	11	41	41
Maries	29	25	16	34	104	4
Marion	6	5	2	1	14	94
McDonald	1	6	0	1	8	107
Mercer	9	14	11	6	40	45
Miller	18	19	9	34	80	14
Mississippi	3	3	0	3	9	105
Moniteau	11	8	5	12	36	56
Monroe	19	25	3	7	54	23
Montgomery	14	19	12	19	64	19
Morgan	14	12	3	12	41	42
New Madrid	2	1	0	1	4	112
Newton	6	3	3	1	13	96
Nodaway	2	1	1	2	6	110
Oregon	12	8	4	8	32	59
Osage	23	27	8	23	81	13
Ozark	2	5	1	4	12	100
Pemiscot	1	2	0	0	3	114
Perry	9	13	6	15	43	33
Pettis	8	8	0	6	22	78
Phelps	13	44	10	25	92	8
Pike	8	10	2	10	30	63
Platte	4	6	0	4	14	95

County	Adult Males	Adult Females	Subadult Males	Subadult Females	Total	Rank[a]
Polk	6	14	3	9	32	60
Pulaski	16	28	11	27	82	12
Putnam	23	26	6	10	65	18
Ralls	5	8	0	4	17	86
Randolph	14	13	2	6	35	58
Ray	5	5	2	4	16	88
Reynolds	2	6	2	5	15	91
Ripley	4	1	1	2	8	108
Saint Charles	8	20	4	6	38	50
Saint Clair	19	15	7	2	43	34
Saint Francois	5	20	6	24	55	22
Saint Louis	3	18	1	3	25	70
Sainte Genevieve	11	29	8	22	70	17
Saline	5	5	3	7	20	79
Schuyler	10	11	4	7	32	61
Scotland	10	7	2	6	25	71
Scott	3	3	1	3	10	104
Shannon	2	9	3	13	27	66
Shelby	5	7	0	1	13	97
Stoddard	6	17	12	11	46	30
Stone	4	5	1	10	20	80
Sullivan	11	17	5	9	42	37
Taney	2	11	3	7	23	77
Texas	26	46	19	25	116	3
Vernon	11	14	6	7	38	51
Warren	9	14	8	16	47	28
Washington	19	31	6	21	77	16
Wayne	7	18	3	13	41	43
Webster	7	13	8	14	42	38
Worth	5	14	2	4	25	72

[a]Rank based on total harvest in Missouri's 114 counties.