MANAGEMENT OF WILD TURKEYS IN SOUTH DAKOTA

SOUTH DAKOTA DEPARTMENT OF GAME, FISH AND PARKS
PIERRE, SOUTH DAKOTA

WILDLIFE DIVISION REPORT 2021–01

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This supportive document provides information for the "South Dakota Wild Turkey Action Plan" which provides management guidance for the SDGFP staff and Commission and can be found at https://gfp.sd.gov/management-plans/. Updates will occur when information is made available or as needed.

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LIST OF ACRONYMS

BA	Basal Area
BHNF	Black Hills National Forest
BLM	Bureau of Land Management
CHAP	Controlled Hunter Access Program
CGNF	Custer Gallatin National Forest
CNF	Custer National Forest
CRP	Conservation Reserve Program
CSP	Custer State Park
DBH	Diameter at Breast Height
DOW	Division of Wildlife
GIS	Geographic Information System
GPA	Game Production Area
Hapcap	Habitat Capability Model
HPAI	Highly Pathogenic Avian Influenza
HSI	Habitat Suitability Index
L-S	Lindzey-Suchy
MA	Management Area
MPB	Mountain Pine Beetle
NWP	Norbeck Wildlife Preserve
NWTF	National Wild Turkey Federation
SDGFP	South Dakota Department of Game, Fish and Parks
SDGFPC	South Dakota Department of Game, Fish and Parks Commission
SE	Standard Error
SPR	Statistical Population Reconstructions
SS	Structural Stage
USDA	United States Department of Agriculture
USFS	United States Forest Service

EXECUTIVE SUMMARY

The wild turkey (*Meleagris gallopavo*) is the largest native gamebird in North America. Wild turkeys were likely extirpated from the state by 1920 when market hunting and woodland destruction resulted in drastic declines in nation-wide wild turkey populations. Since the late 1940s, there has been an extensive effort to restore wild turkey populations across its range and due to many successful reintroductions, wild turkeys have returned to much of their historical range. Wild turkey restoration to native and expanded range is one of the greatest success stories in game management and wildlife conservation. Unfortunately, turkey populations from 2004 to 2014 have declined 5-8% in the United States, motivating resource agencies to direct research activities on determining which demographic parameters management should focus in order to have the greatest impact on population growth.

The South Dakota Department of Game, Fish, and Parks (SDGFP) manage wildlife and their associated habitats for their sustained and equitable use, and for the benefit, welfare, and enjoyment of the people of South Dakota and its visitors. This supportive document provides important historical background and significant biological information to aid in the management of wild turkeys in South Dakota. Current monitoring and management tools are presented, along with a discussion of the challenges and opportunities. This supportive document is intended to guide wildlife managers and biologists and aid the decision-making process of the Division of Wildlife and SDGFP Commission. It also serves to inform sportsmen and women, landowners, and all others interested in wild turkey management in South Dakota.

For the management of wild turkeys the following management priorities have been identified by SDGFP: 1) Annually determine status of wild turkey populations; 2) Biannually review and set wild turkey management unit population objectives; use harvest strategies to manage population within identified population objectives; 3) Cooperatively work with private landowners to resolve wild turkey depredation to stored-feed supplies and damage to other private property; 4) Maintain, manage, and protect existing wild turkey habitat throughout South Dakota; 5) Provide the public with hunting access to quality habitat on private and public land; 6) Continue to use science-based research, habitat inventories, and surveys to answer questions related to wild turkey ecology and public attitudes towards wild turkey management; and 7) Inform and educate the public on wild turkey ecology, management, and research.

INTRODUCTION AND HISTORICAL BACKGROUND

The wild turkey (*Meleagris gallopavo*) is the largest native gamebird in North America. The 5 subspecies of wild turkeys occurring in the wild are the eastern (*M. g. silvestris*), Florida (*M. g. osceola*), Merriam's (*M. g. merriami*), Rio Grande (*M. g. intermedia*), and the Gould's (*M. g. mexicana*). Eastern wild turkeys historically inhabited woodlands of southeastern South Dakota with their range stretching northwest to the mouth of the Cheyenne River (Smith 1953). Wild turkeys were likely extirpated from the state by 1920 when market hunting and woodland destruction resulted in drastic declines in nation-wide wild turkey populations (Over and Thoms 1920). Consequently, all populations of wild turkeys in South Dakota are the result of introductions or reintroductions. National wild turkey populations hit their low point in the 1930s which initiated modern day conservation and wildlife management efforts for population recovery (Kennamer et al. 1992).

The first successful introduction of wild turkeys was in the Black Hills in 1948 when 2 gobblers and 6 hens were released west of Spearfish in Lawrence County. The transplanted birds were wild-trapped Merriam's wild turkeys from New Mexico. Two subsequent introductions occurred in 1950 (14 from Colorado) and 1951 (5 from New Mexico) when another 19 wild turkeys were released. By fall 1952, an estimated 1,000 wild turkeys inhabited the Black Hills, and this flock formed the source for additional transplants along the Missouri River and its western tributaries which started in 1953 (Petersen and Richardson 1975). The Rio Grande subspecies was introduced into several areas of South Dakota in 1963, including the counties of Jones, Lyman, Bon Homme, Yankton, and Day. Subsequent transplants of Rio Grande wild turkeys were made in 1965, with some degree of initial success, to the Wessington Hills near Wessington Springs and to Little Moreau Refuge in Dewey County. In total, over 30 transplants of Merriam's, Rio Grande, or hybrid subspecies were transplanted onto the prairie of South Dakota (Appendix 1). Reintroduction of the eastern subspecies to South Dakota from wild flocks in Iowa, Missouri, Kentucky, and Pennsylvania began in 1990 and concluded in 2008 (Appendix 1). Today, wild turkeys are found in the Black Hills, riparian drainages with suitable woodland habitat, and in established woodland areas across the state (Figure 1). The mission of introducing and reintroducing wild turkeys in South Dakota is complete with most, if not all, suitable wild turkey habitat inhabited by wild turkeys.

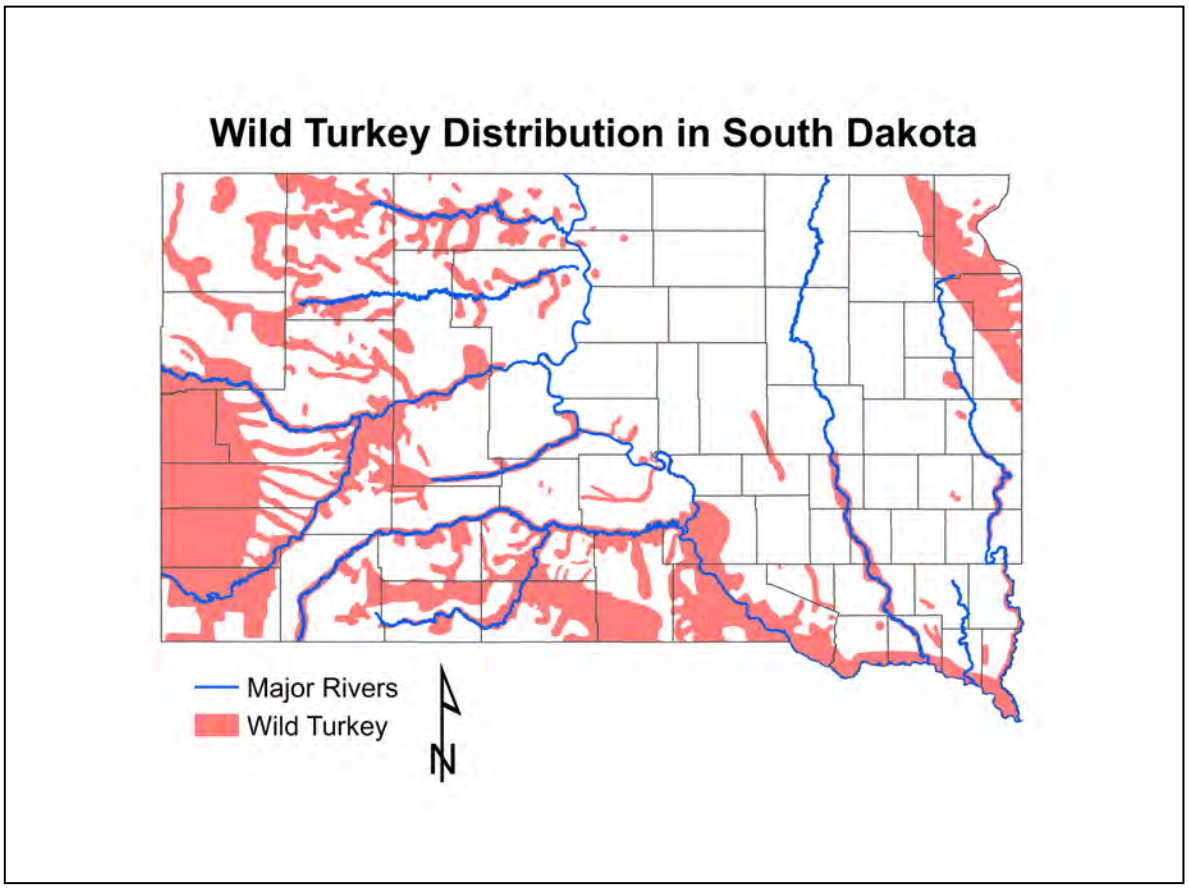

Figure 1. Wild turkey distribution in South Dakota, 2020. Some small, isolated, or not fully established populations may not be included.

Woodlands comprised of both trees and understory vegetation are the fundamental components of turkey habitat. Woodlands are essential to provide trees for wild turkey roosts, but they also provide wild turkeys with food and cover requirements. However, complexes of woodlands, grasslands and cropland can support higher wild turkey populations than woodlands alone. Throughout much of South Dakota, agricultural fields provide wild turkey foraging areas and are vital in sustaining wild turkey populations. On the South Dakota prairie, wild turkeys will utilize landscapes with minimal forested habitat as long as sufficient grasslands and foraging resources are available. Riparian areas in South Dakota and the entire Northern Great Plains region are a critical component of wild turkey habitat, as they provide roosting habitat, and these areas should be a high management priority in South Dakota for wild turkeys.

The varied nature of subspecies of wild turkeys and vegetative communities in South Dakota provides wild turkey managers with no standardized set of management strategies that will have statewide application. Because of this variability, wild turkey management in South Dakota must be innovative in the application of habitat, harvest and other management strategies in order to meet desired population objectives for each subspecies and each geographic region.

WILD TURKEY HUNTING

Historical harvest and licenses

Following successful introductions, South Dakota had its first hunting season in the fall of 1954 in the Black Hills (Podoll 1955) (Table 1). During the nine-day season, approximately 135 wild turkeys were harvested by 750 licensed hunters (Podoll 1955). The first prairie hunting season occurred in the fall of 1957 when 440 wild turkeys were harvested by 2,500 licensed hunters (Frary 1960). The 1957 season was limited to Butte, Lawrence, Pennington, Custer, Meade, Harding, and Fall River counties. The first spring gobbler hunting season was in the Black Hills in 1962 (Robbins 1962) and the first spring prairie gobbler season was in 1964 (Petersen and Robbins 1965). The first Black Hills spring season was held in 1962 with 540 licenses available. Although less than 50 gobblers were harvested by the 540 licensed hunters, the season was very popular among sportsmen. The first prairie gobbler season was very limited with only 13 licenses sold, but hunting opportunities quickly increased with over 1,000 licenses sold in 1981. By 1982, over 3,000 licenses were sold for the spring Black Hills season. In 1969, the first Custer State Park (CSP) hunting season was established with 50 fall licenses. The fall season has been suspended since 1994, but a spring season has occurred annually since 1978. Hunting opportunity was again expanded across the state in 1988 with the addition of a spring archery only license. While only 385 archery only licenses were sold during the first year, 3,467 licenses were sold in 2019. A special youth/mentored license was established in the fall of 2008 with licenses available for spring and fall seasons. In general, wild turkey populations and hunting opportunity have steadily increased and reached all-time highs from 2006–2010 when total harvest reached nearly 17,000 in 2010 (Figure 2). Historical statistics for all wild turkey seasons can be found at: http://www.gfp.sd.gov/hunting/harvest/default.aspx.

Table 1. Wild turkey licenses sold and wild turkey harvest for all spring (prairie, Black Hills [BH], archery, Custer State Park [CSP], and mentored/youth) and fall (prairie, Black Hills [BH], Custer State Park [CSP], archery, and mentored/youth) seasons in South Dakota.

	Licenses Sold										Turkey Harvest									
	Spring					Fall					Spring					Fall				
Year	Prairie	BH	Archery	CSP	Ment/Youth	Prairie	BH	CSP	Ment/Youth	Total	Prairie	BH	Archery	CSP	Ment/Youth	Prairie	BH	CSP	Ment/Youth	Total
1954							750			750							135			135
1955																				
1956																				
1957						100	2,095			2,195						50	390			440
1958							2,144			2,144							561			561
1959						188	2,569			2,757						32	408			440
1960						300	1,914			2,214						23	149			172
1961							2,270			2,270							468			468
1962		540				20	1,860			2,420		49				4	291			344
1963		621					2,079			2,700		95					410			505
1964	13	931					2,346			3,290	1	113					393			507
1965	100	965					3,549			4,614	20	176					589			785
1966	116	1,000					4,308			5,424	28	196					1,049			1,273
1967	161	1,197					3,433			4,791	33	198					291			522
1968	177	1,480					4,647			6,304	37	251					1,078			1,366
1969	231	1,858					4,681	50		6,820	78	253					674	26		1,031
1970	310	1,340						125		1,775	102	194						81		377
1971	296	1,418					932	150		2,796	121	283					401	12		817
1972	341	1,419					2,431	150		4,341	135	421					953	25		1,534
1973	380	2,068					2,923	150		5,521	177	497					997	35		1,706
1974	390	2,294					3,451	150		6,285	189	291					861	48		1,389
1975	432	2,266					4,123	150		6,971	132	596					1,635	41		2,404
1976	407	2,798					3,443	198		6,846	135	509					661	32		1,337
1977	260	2,119					1,622			4,001	130	367					428			925
1978	341	1,889		40			1,208			3,478	192	424		13			346			975
1979	559	1,916		60			1,848			4,383	192	550		28			594			1,364
1980	772	2,362		60			2,381	60		5,635	498	641		36			1,001	30		2,206
1981	1,123	2,973		60		784	2,638	60		7,638	706	829		25		511	1,041	28		3,140
1982	1,522	3,164		70		870	2,407	60		8,093	812	827		14		596	879	14		3,142
1983	1,350	3,098		70		1,306	3,226	40		9,090	692	907		20		706	1,092	37		3,454
1984	1,498	3,592		80		1,111	3,084	40		9,405	765	1,053		27		697	1,007	21		3,570
1985	1,730	3,803		80		1,532	2,993	40		10,178	912	1,090		24		897	796	11		3,730
1986	1,651	3,510		80		1,162	1,018	40		7,461	817	752		17		813	308	14		2,721
1987	1,624	2,410		80		1,147	1,184	40		6,485	938	732		18		957	598	25		3,268
1988	2,245	2,625	385	80		2,374	1,559	40		9,308	1,656		74	34		3,133	780	19		5,696
1989	2,794	2,825	490	100		2,872	1,405	40		10,526	2,284	1,107	105	36		2,761	632	18		6,943
1990	3,151	3,138	455	100		2,399	1,560	40		10,843	1,789	1,023	61	38		2,185	800	29		5,925
1991	2,931	3,288	471	100		2,401	1,627	40		10,858	1,608	1,097	49			1,884	734	21		5,393
1992	3,237	3,855	588	100		2,444	1,633	40		11,897	1,811	1,390	112	54		1,792	691	19		5,869
1993	2,844	4,020	506	100		2,122	1,086	40		10,718	1,370	1,266	54	43		1,370	336	16		4,455
1994	2,987	3,849	557	100		2,028	692	40		10,253	1,683	932	114	42		1,444	260	21		4,496
1995	3,318	3,362	677	100		2,297				9,754	1,758	960	135	50		1,508				4,411
1996	3,461	2,497	782	100		2,719				9,559	2,110	918	215	48		2,155				5,446
1997	3,704	2,574	754	100		3,212				10,344	2,064	937	127	52		2,618				5,798
1998	4,199	3,475	788	100		3,499				12,061	2,803	1,243	188	55		2,715				7,004
1999	4,208	3,552	700	100		3,233	675			12,468	2,931	1,304	174	39		3,387	394			8,229
2000	4,522	3,374	826	100		3,674	628			13,124	3,360	1,288	168	76		3,066	337			8,295
2001	4,963	3,998	915	100		3,524				13,500	3,620	1,379	214	52		3,116				8,381
2002	5,136	4,761	1,062	100		3,649	325			15,033	3,770	1,503	283	61		2,661	182			8,460
2003	5,143	5,053	1,219	100		3,572	432			15,519	3,744	1,456	347	81		2,882	279			8,789
2004	5,323	5,798	1,652	100		3,734	750			17,357	4,068	2,494	512	91		2,718	476			10,359
2005	5,663	6,397	2,179	100		4,105	1,395			19,839	4,285	2,689	591	90		3,176	720			11,551
2006	6,312	6,656	2,532	100		5,055	3,240			23,895	5,070	2,598	737	84		3,087	1,643			13,219
2007	6,585	6,378	2,479	125		5,614	3,779			24,960	5,119	2,430	679	87		4,194	2,169			14,678
2008	7,370	6,508	2,658	135		5,527	4,062		236	26,496	5,921	2,743	722	96		4,556	1,986		101	16,125
2009	7,479	5,474	2,567	135	422	5,876	3,646		353	25,952	6,369	2,346	844	97	171	4,337	1,369		110	15,643
2010	7,691	5,244	2,548	135	535	5,995	3,312		423	25,883	6,564	2,195	780	89	228	5,438	1,553		156	17,003
2011	8,064	4,808	2,721	135	601	5,649	3,098		442	25,518	5,536	1,693	686	88	210	4,335	1,050		116	13,714
2012	7,863	4,435	2,555	135	559	5,527	2,165		529	23,768	5,554	1,685	739	64	205	3,337	927		149	12,660
2013	7,874	4,512	2,830	135	642	5,066	1,627		520	23,206	5,213	1,517	641	83	192	1,901	373		92	10,012
2014	7,189	3,944	2,722	135	679	1,910	810		390	17,779	3,642	1,258	695	78	211	645	215		75	6,819
2015	6,387	3,877	2,919	135	654	1,936	433		370	16,711	3,566	1,258	790	50	205	649	127		98	6,743
2016	6,850	4,056	3,202	100	734	908	434		429	16,713	2,486	1,575	885	49	277	246	147		84	5,749
2017	6,577	4,401	3,298	100	799	898	433		453	16,959	3,328	1,701	912	58	310	250	139		83	6,781
2018	6,510	4,567	3,264	100	735	548	220		521	16,465	2,733	1,441	719	43	261	194	54		96	5,541
2019	6,375	4,545	3,467	100	1,024	548	216		412	16,687	2,727	1,365	915	48	295	182	53		60	5,645
2020	6,455	4,733	4,459	98	1,356					17,101	3,113	1,287	1,340	55	508					6,303

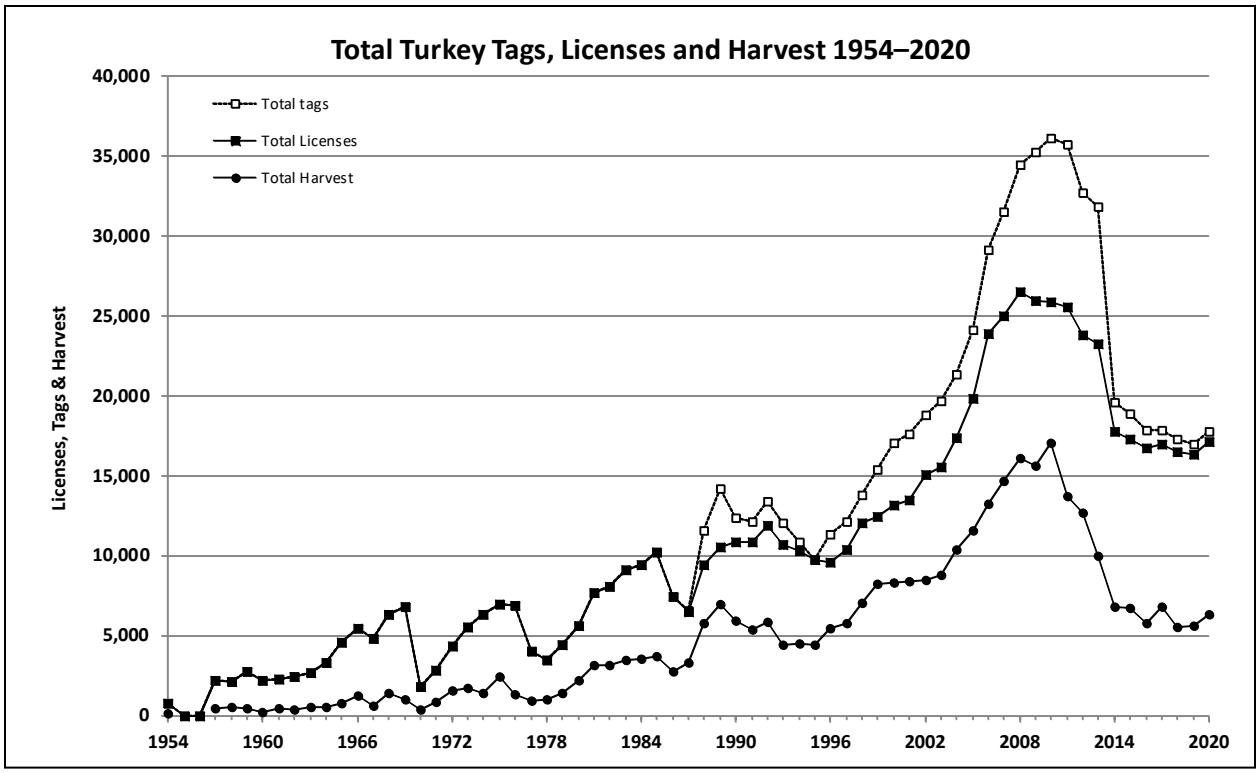

Figure 2. Total wild turkey tags, licenses, and harvest for all wild turkey seasons in South Dakota 1954–2020.

Hunter Access

There is a total of 2,259,125 acres (914,236 ha) of land open for public hunting within the wild turkey range in South Dakota during 2019-2020 (Table 2). Ownership of these lands is a variety of federal, state, and private. About half of the public hunting land is National Forest, owned and managed by the USFS. Most of the National Forest land is the Black Hills National Forest (BHNF), a destination for resident and non-resident hunters seeking Merriam's wild turkeys. Other federal lands include National Grasslands, Bureau of Land Management (BLM) lands, Bureau of Reclamation lands, Corp of Engineers lands, and U.S. Fish and Wildlife Service National Wildlife Refuge System lands. Nearly 70% of land open to public hunting in the wild turkey range is owned by the Federal Government. The remaining public hunting land includes 396,583 (160,492 ha) acres of state-owned land and 325,206 acres (131,606 ha) of private land leased for public hunting by the SDGFP. The state-owned land is composed of SDGFP-owned game production area (GPA), recreation areas, and State Parks, as well as lands owned by the Office of School and Public Lands. The SDGFP walk-in area program provides landowners with annual payments to open their land to public hunting. The controlled hunting access program (CHAP) is similar but each property is subject to specific rules and the hunter may have to reserve a time to use the property. Currently there are seven CHAP areas open to spring wild turkey hunting. The Conservation Reserve Enhancement Program is a partnership program with the U.S. Department of Agriculture (USDA) in which cropland is converted to perennial cover for 10–15 years in return for a rental payment to the owner/operator. The parcels are open to public hunting during the duration of the contract. Additional opportunities exist where hunters obtain access on private lands not enrolled in any programs.

Table 2. Acres (hectares) of land open to public hunting within South Dakota's wild turkey range, 2019-2020. Note, not all lands may be occupied by wild turkeys during all seasons. See big game regulations and hunting atlas for specific restrictions and closures on publicly owned land and private lands leased for public hunting.

Ownership	Acres (Hectares)
Federal	
Forest Service - National Forest	1,151,514 (466,001)
Forest Service - National Grassland	228,777 (92,583)
Bureau of Land Management	88,473, (35,804)
Bureau of Reclamation	3,335 (1,350)
Corp of Engineers	25,444 (10,297)
Fish and Wildlife Service	29,793 (16,104)
Federal Total	**1,537,336 (622,138)**
State	
Game, Fish and Parks - Game Production Area	106,822 (43,229)
Game, Fish and Parks - Recreation Area or State Park	93,734 (37,933)
School and Public Lands	196,028 (79,330)
State Total	**396,583 (160,492)**
Private	
Walk-in Area[1] and Controlled Hunting Access Area	**325,206 (131,606)**
Grand Total	**2,259,125 (914,236)**

[1] Includes Conservation Reserve Enhancement Program

POPULATION SURVEYS

Trend Surveys and Indices of Population Demographics

Winter Flock Composition—A statewide winter flock count is conducted annually from 1 January–31 March of each year in some administrative regions. The objective with this survey is to determine distribution of wild turkeys throughout the state by counting wild turkeys in key concentration areas, which can be traditional from year to year. This survey attempts to classify wild turkeys by gender and age which may allow for additional modeling of populations if sample sizes are acceptable. Winter flock counts providing juvenile hen:adult hen ratios occur late in the survival interval which is important to quantify and can provide a surrogate for annual survival if other data are unavailable. Data can provide indicators of both nest survival from the previous spring as well as annual survival and recruitment of female poults. Data is analyzed initially by administrative region, and if enough data are collected by hunting unit the analysis can be conducted at that level but sample size will most likely be limited by unit. Age and gender data are needed to conduct statistical population reconstructions (SPR) of wild turkey populations. General data can be compared year to year, but long-term data of 5 years or more are typically needed to generate SPR estimates and abundance estimates. Winter flock data can be auxiliary data used in conjunction with harvest data, brood data, and previous research data to generate abundance estimates.

Wild Turkey Brood Survey—A statewide summer brood survey is conducted annually from 1 July–30 September in some administrative regions. The objective with this survey is to determine population trends, annual production, and general distribution of wild turkeys observed during summer. The primary metric that gets compared from year to year is the ratio of young:hen. This survey is useful as it provides managers some information on brood size from year to year; however, information on nest survival, or a surrogate thereof, is difficult to determine with this survey because getting a sufficient count on the number of females without broods is difficult. Typically, hens without poults are utilizing non-meadow habitats, whereas hens with poults are easy to survey in open meadow habitats. Ratio data of young:hen can be used as auxiliary data to conduct SPR analysis of wild turkey populations if sample size is not limiting. General data can be compared year to year but long-term data of 5 years or more are needed to generate abundance estimates.

Matrix Modeling—Within the Black Hills a post-breeding matrix projection model is an important tool that is utilized by managers to help in making spring and fall harvest recommendations. This model is a 2-stage (yearling, adult), 2-sex, post-breeding matrix projection model with the following structure:

$$A = \begin{bmatrix} 0.5 \times F_y \times p_{yf} & 0.5 \times F_a \times p_{af} & 0 & 0 \\ p_{yf} & p_{ya} & 0 & 0 \\ 0.5 \times F_y \times p_{yf} & 0.5 \times F_a \times p_{af} & 0 & 0 \\ 0 & 0 & p_{ym} & p_{am} \end{bmatrix}$$

where F_y and F_a are fecundity or the average number of young produced by yearling and adults and p_{yf}, p_{af}, p_{ym}, and p_{am} are annual survival probabilities for yearling females, adult females, yearling males, and adult males, respectively. This model assumes poult counts are made 4 weeks post-hatching. This model incorporates research information from telemetry studies from the southern, central, and northern Black Hills. The model is vetted annually with precipitation data during winter, incubation period, and poult rearing which can influence demographics. Demographics may and can differ from the southern to the northern Black Hills annually (Yarnall et al. 2020a), and it is important to model those demographics appropriately (Figure 3 and 4).

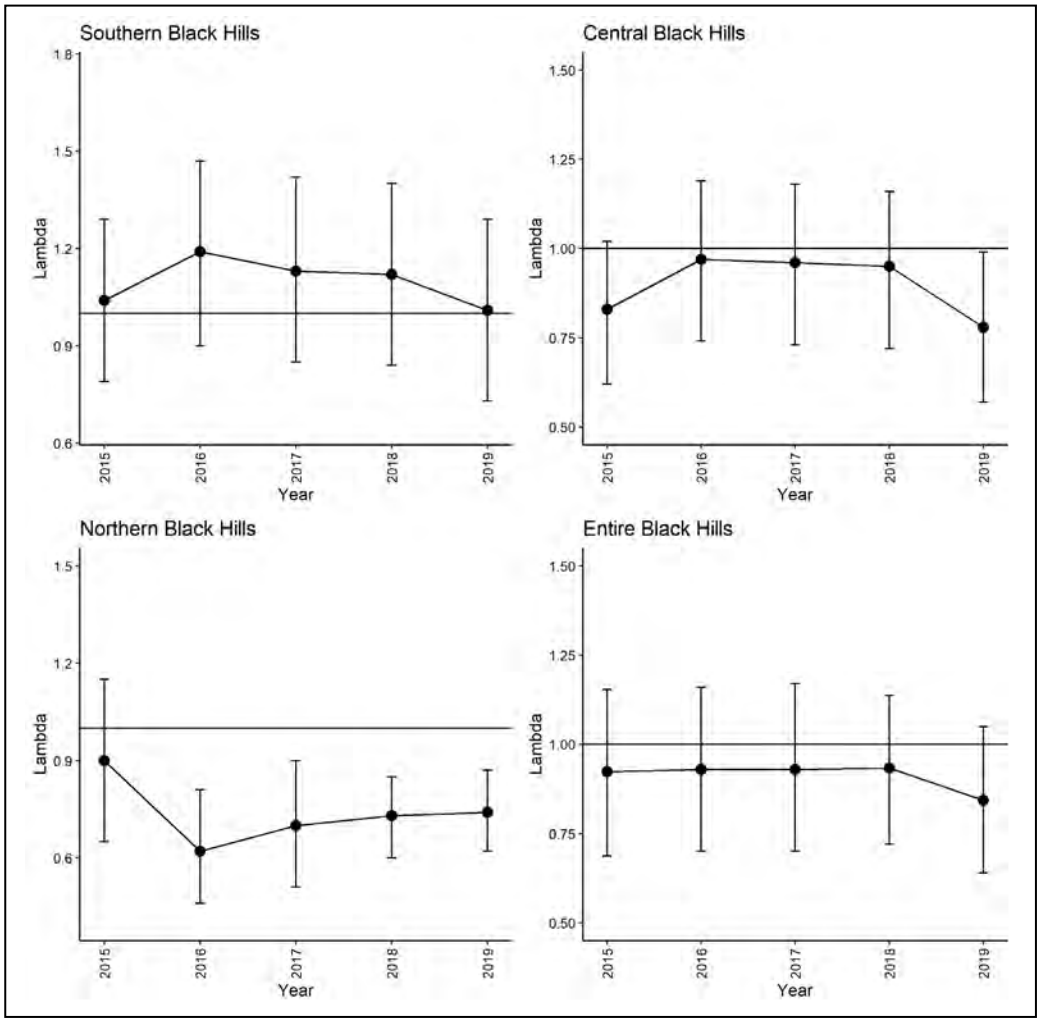

Figure 3. Matrix demographic projections with 95% confidence intervals of Merriam's wild turkeys by 3 areas and for the entire Black Hills, South Dakota, 2015–2019.

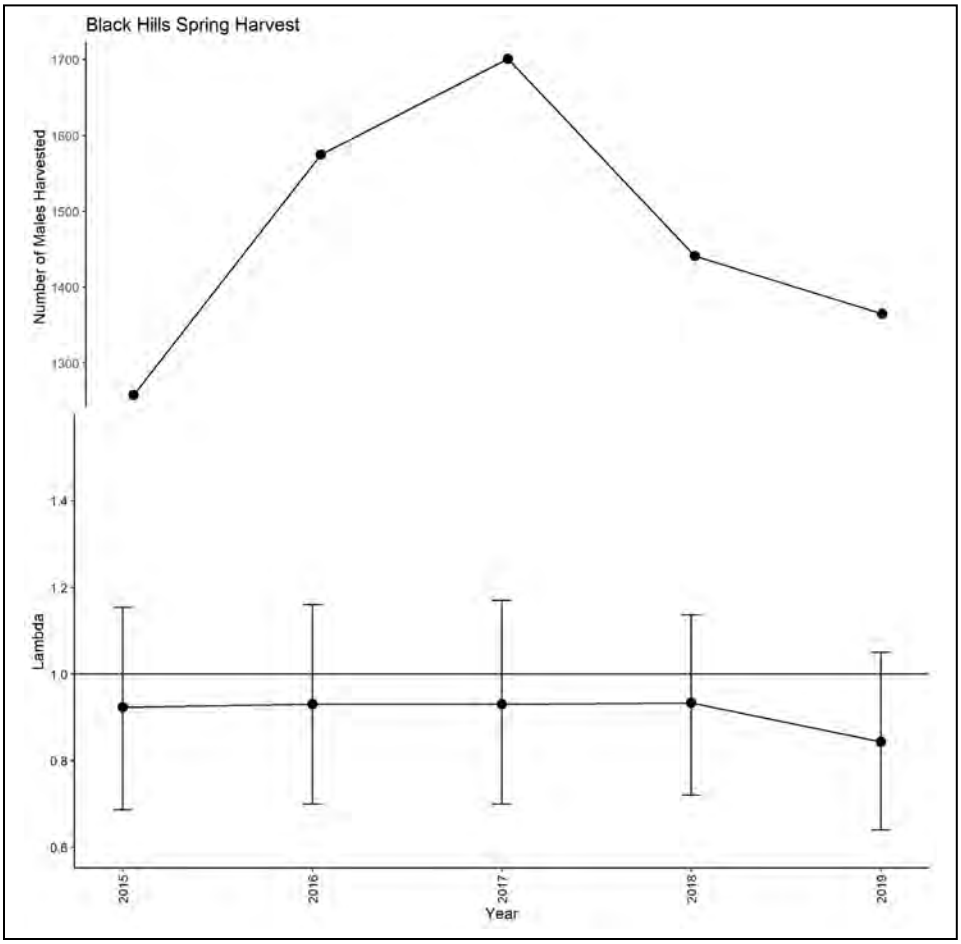

Figure 4. Matrix demographic projections with 95% confidence intervals of Merriam's wild turkeys and number of males harvested for the entire Black Hills, South Dakota, 2015–2019.

After running 100,000 simulations, asymptotic growth rates with mean lambda, standard deviation, and 95% confidence intervals are provided for the southern, central, and northern Black Hills. This method hinges upon updated demographic data and unfortunately the southern and central Black Hills are currently using outdated data (early 1990s for the central Black Hills and early 2000s for the southern Black Hills). Sensitivity analysis with elasticities can be conducted, and the proportion of variation in lambda can be explained by metrics such as hen nesting success, poult survival, and hen survival. This tool can be applied in any area where recent demographic data has been collected, but it is more effective with current information, and increased precision or smaller standard errors associated with the point estimates. For example, we provide the elasticities table below for data collected in the northern Black Hills during 2008-09 and 2017-18 (Table 3). Clearly population growth in the northern Black Hills is most sensitive to adult hen survival. Additionally, Life Stage Simulation Analysis (LSA) corroborated asymptotic growth rates were most sensitive to variation in adult female survival probabilities (R^2 = 0.614, Figure 5).

Table 3. Elasticity of asymptotic growth rates to proportional changes in vital rates of Merriam's wild turkeys in the northern Black Hills, South Dakota 2008-09 and 2017-2018.

Vital rate	Mean elasticity	95% CI
Adult female survival probability	0.500	[0.399, 0.611]
Yearling female survival probability	0.240	[0.187, 0.287]
Adult female reproduction	0.240	[0.187, 0.287]
Yearling female reproduction	0.012	[0.001, 0.042]
Adult male survival probability	0.000	[0.000, 0.000]
Yearling male survival probability	0.000	[0.000, 0.000]

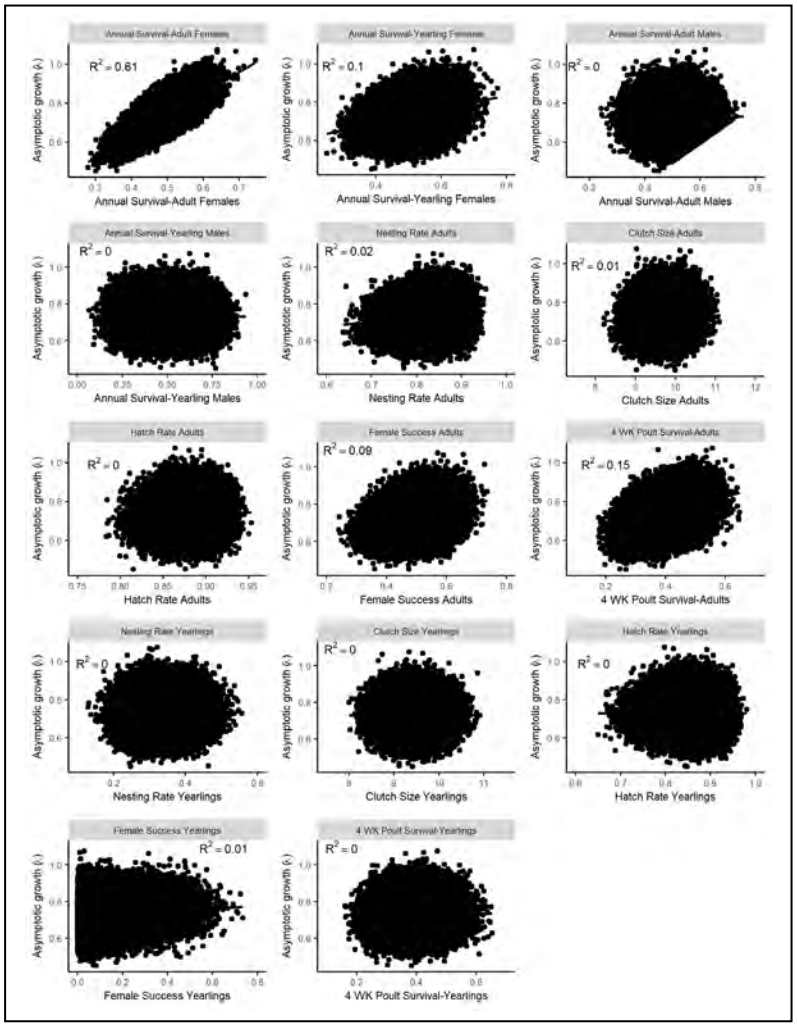

Figure 5. Realizations of estimated asymptotic population growth rates (λ) of Merriam's wild turkeys as a function of survival and reproductive rates of yearlings (0-1 years old) and adults (>1 year old) in the northern Black Hills, South Dakota, 2008-09 and 2017-18. Scatterplots are based on 100,000 random realizations of estimated survival and reproductive rates.

Harvest Surveys

Wild Turkey Harvest Survey—This survey is used to annually determine gender composition, age at harvest during spring, amount and distribution of spring and fall wild turkey harvest and recreational opportunity utilized by hunters. Hunter survey cards are used to estimate hunter success, wild turkey harvest and related information for each season. Sampling intensity is dependent on season, number of licenses sold, and license types available. The postage-paid survey cards are returned to the SDGFP office in Pierre, South Dakota where the data are compiled and analyzed. Hunters may also report harvest information through an internet response system, which records answers directly to the database.

WILD TURKEY RESEARCH IN SOUTH DAKOTA

It is evident how important the wild turkey resource is to the citizens of South Dakota based upon the amount of quality research that has been conducted in this state. Sound research is one of the primary pillars of the North American Model of Wildlife Conservation (Geist 2006). Without such a model, managing the wild turkey or other game species effectively would be difficult. Research on topics such as survival and reproduction, or fitness characteristics, can be utilized to determine habitat quality and for demographic projection modeling. Such knowledge can enhance our ability to better understand species dynamics and more appropriately manage their habitats or harvest management. At the time of this publication there have been at least 56 professional articles published on this game bird and its ecology in South Dakota. Products include 1 book, 3 game reports or bulletins, 12 theses or dissertations, and 40 peer-reviewed research articles.

Resource Selection

Research on wild turkey resource selection in South Dakota has been extensive and encompasses many aspects of wild turkey ecology. Research covers various aspects from ground and tree roost sites to seasonal resource selection which have been based on biologically meaningful intervals.

Tree Roost Sites—Merriam's wild turkeys in the Black Hills typically use larger diameter at breast height (DBH) ponderosa pine (*Pinus ponderosa*) trees (>11 in [30 cm] DBH) than found at random, and usually larger trees have more open branch spacing which is an important factor of roost-site selection (Rumble 1990, Rumble 1992, Thompson 2003, Thompson et al. 2009). Additionally, wild turkeys used roosting areas with lowered tree densities and less downed woody debris on the forest floor providing for easier access for roost entry and exit (Thompson 2003). Further, for roost sites in the Black Hills, Merriam's wild turkeys usually select a different roost site each night unless the roost site is near consistent agricultural food sources such as at ranches, and typically, roost sites have not had recent timber activity (Rumble 1990, Rumble 1992, Thompson 2003).

Along the Missouri River breaks in Gregory County, Merriam's wild turkeys selected mature plains cottonwood (*Populus deltoides*) and American basswood (*Tilia americana*) trees which had open branch spacing for roost sites (Flake et al. 1996). During the summer months within this prairie landscape, wild turkeys selected for larger DBH trees and for greater basal area (118 ft^2/acre [27.2 m^2/ha]) than at reference sites (64 ft^2/acre [14.6 m^2/ha]).

Ground Roost Sites—Concealment cover is important for ground-roosting hens and their poults immediately following hatch during the vulnerable, preflight stage. When resource selection at ground roosts was compared with nests and random points it was found that ground roosts were similar in structure to nest sites (Lehman et al. 2009). Ground roosts and nests were greater in visual obstruction than random sites. Further, ground roosts were closer to meadow–forest edges than either nests or random sites. Structure at ground roosts may provide visual protection from predators, and management for shrub vegetation or woody debris along meadow–pine forest ecotones will provide cover for females with poults during the vulnerable preflight stage (Lehman et al. 2009).

Winter Resource Selection—Previous research on Merriam's wild turkey resource selection during winter has been extensive and provided important information for resource managers in the Black Hills (Rumble and Anderson 1992, Rumble and Anderson 1993a, Rumble and Anderson 1996a, Rumble and Anderson 1996b, Rumble and Anderson 1996c, Lehman et al. 2007a, Lehman et al. 2015). Research has demonstrated nonrandom selection of habitats at multiple scales in the Black Hills (Rumble and Anderson 1992, Rumble and Anderson 1996c, Lehman et al. 2007a). During winter, Merriam's wild turkeys in northern ranges often forage on natural foods such as ponderosa pine seeds (Rumble and Anderson 1996a, Lehman et al. 2007a) or waste grains obtained from farmsteads (Hengel 1990, Hoffman et al. 1996, Lehman et al. 2007a). Logistic models indicated that pine seed availability was the most influential variable determining whether wild turkeys in the southern Black Hills based winter resource selection near farmstead areas providing grains, or within the ponderosa pine forest (Lehman 2005, Lehman et al. 2007a). At the macrohabitat scale (third-order habitats; Johnson 1980), female Merriam's wild turkeys in the southern Black Hills selected for a more open-canopy ponderosa pine habitat than reported for the central Black Hills (Rumble and Anderson 1993a). In the central Black Hills, the greatest pine seed abundance occurred in habitats with >70% ponderosa pine and >121 ft^2/acre (28 m^2/ha) basal area. In the southern Black Hills, the greatest pine seed abundance occurred at 96–121 ft^2/acre (22–28 m^2/ha) basal area (275–350 trees/ha) (Lehman et al. 2007a). Mountain pine beetle (MPB) (*Dendroctonus ponderosae* Hopkins) epidemics can reduce the amount of optimal winter habitat for Merriam's wild turkeys in the Black Hills, and silvicultural practices such as pre-commercial thinning and uneven-aged management can substantially reduce the amount of time to grow back optimal winter habitat following a mountain pine beetle epidemic (Lehman et al. 2015). At the microhabitat scale (fourth-order habitats; Johnson 1980) Merriam's wild turkeys selected foraging sites with less understory vegetation and visual obstruction (Rumble and Anderson 1996b, Lehman et al. 2007a). Observations indicated Merriam's wild turkeys foraged primarily on pine seeds directly beneath mast-producing trees, and presumably less understory vegetation provided easier detection of predators while allowing easy scratching for seeds in the pine needle debris (Lehman et al.

2007a). South-facing aspects were also selected in the Black Hills and allowed sunlight to melt snow more rapidly than on adjacent aspects and are the first areas to have bare ground, which facilitates scratching for pine seeds following snowfall events (Rumble and Anderson 1996b, Lehman et al. 2007a).

In northeastern South Dakota (Marshall and Roberts counties), eastern wild turkeys used agricultural fields and waste grains over large areas, whereas Rio Grande wild turkeys in the same area localized movements and used stored feed grains immediately adjacent to ranching or farming operations (Lehman 1998, Lehman et al. 2003). Just south in Grant County, eastern wild turkeys utilized forested communities more than available, and utilized croplands less than available (Shields 2001). Similar to Grant County, further south along the James River, home range analysis of resource selection indicated wild turkeys concentrated in forested habitats, and had smaller proportions of cropland, hayland, idled ground, and farmsteads in the core areas of their home ranges (Leif 2001). In the Wessington Springs area, eastern wild turkeys selected primarily for woodland habitats based upon compositional analysis for the entire year (Switzer and Tucker 2009).

Nesting Season Resource Selection—Gaining an understanding of resource selection across spatial scales during the nesting season is critical as nest survival can be closely tied to larger landscape characteristics or at the microhabitat level (Martin and Roper 1988, Badyaev and Faust 1996, Thogmartin 1999, Liebezeit and George 2002, Lehman et al. 2008a). Typically, we obtain knowledge of what resources are important by modeling daily nest survival or nest failure events using a set of candidate models with measured covariates (Dinsmore et al. 2002, Shaffer 2004, Heisey et al. 2008).

In the Black Hills, an analysis of macrohabitats (third-order habitats; Johnson 1980) indicated there were no patterns of nest site selection (Rumble and Hodorff 1993). However, research at the fine scale (fourth-order habitats; Johnson 1980) in the Black Hills suggested concealment cover or visual obstruction from common juniper (*Juniper communis*) shrubs and woody debris were important for concealing first nests, while deciduous shrubs such as snowberry (*Symphoricarpos occidentalis*) were used for renests (Petersen and Richardson 1975, Rumble and Hodorff 1993, Lehman et al. 2008a). Increased slope at nest sites may also be an important component for nest survival (Petersen and Richardson 1975, Rumble and Hodorff 1993, Lehman et al. 2008a). Hazard modeling indicated survival of renests in the southern Black Hills was most influenced by greater visual obstruction surrounding nests (Lehman et al. 2008a). For renests in the central Black Hills, visual obstruction was greater than for first nests, and in the 1.1 yard (1 m) to 2.2 yard (2 m) area surrounding the nest bowl visual obstruction averaged 9 inches tall (23 cm; Rumble and Hodorff 1993). In the northern Black Hills hens selected for greater visual obstruction when compared with paired random sites (Litt et al. 2020).

In northeastern South Dakota, eastern and Rio Grande wild turkeys did not differ in selection of vegetation type (*e.g.*, woodland, grassland, shrubland) for nesting habitat (Lehman et al. 2002). Compared to reference sites, nests sites were located directly underneath shrubs, had more trees within 1.1 yards (1 m) of the nest bowl, and greater cover above the nest bowl (Lehman et

al. 2002). Random sampling indicated shrub vegetation was least available in the study area, but shrubs, particularly snowberry, was used the most for nesting (Lehman et al. 2002). Female eastern wild turkeys in Grant County selected for idled grassland and shrubland vegetation types for nesting and avoided cropland and pastureland; for microhabitat data, wild turkeys also selected for more horizontal visual obstruction at the nest bowl and within 32.8 yards (30 m) of the nest bowl (Shields 2001). Along the James River corridor, eastern wild turkeys were more inclined to use more open grasslands with minimal woodland at the larger scale of selection, and nest site selection occurred equally between herbaceous and woody-herbaceous vegetation communities (Leif 2001). For Merriam's wild turkeys in south-central South Dakota nesting primarily occurred in woodlands for first nests before the first week in May and occurred in grasslands following the first week in May (Day et al. 1991a). Most nests had concealing vegetation above the nest bowl and shrubs were strongly selected in grassland communities; grassland nests had greater visual obstruction surrounding the nest bowl when compared to random sites and nest sites located in forests (Day et al. 1991a). Further, water did not appear to be an important factor in nest site selection (Day et al. 1991a). Undoubtedly, idled grasslands or Conservation Reserve Program (CRP) fields can provide important nesting habitat in the prairie landscape of South Dakota (Day et al. 1991a, Leif 2001, Shields 2001). In northeastern South Dakota nest survival probability was lowest in agricultural fields relative to all other cover types and positively related to horizontal visual obstruction (Tyl et al. 2020).

Brood-rearing Resource Selection—Once nests are hatched, it is imperative that females with poults find habitats that provide both concealment cover from predators and forage. Developing poults require insects for foraging to obtain the protein needed for fast growth; poults will consume a high proportion of arthropods in their diet during the summer months (Rumble and Anderson 1996a, Lehman 2005, Flake et al. 2006). Grasshoppers and beetles provided most of the insect biomass selected by poults for foraging (Rumble and Anderson 1996a, Lehman 2005).

In the Black Hills, females with poults select for meadow and open pine habitats at large scales (Rumble and Anderson 1993a, Rumble and Anderson 1993b, Lehman et al. 2012). As poults get larger and more developed later in the summer and early fall they use meadow habitat less and forests more (Rumble and Anderson 1993b). At the microhabitat scale females with poults in the central Black Hills selected sites with greater herbaceous biomass and less overstory canopy cover, and foraging sites were close to meadow-forest ecotones (Rumble and Anderson 1996b, Rumble and Anderson 1997). Similarly in the southern Black Hills, hens with poults selected for greater herbaceous biomass than found at random, and sites were closer to meadow-forest ecotones (Lehman et al. 2012). It is recommended that managers maintain 1,043–1,165 lbs/acre (1,170–1,306 kg/ha) herbaceous biomass through August in the Black Hills to provide poult-rearing habitat (Rumble and Anderson 1997, Lehman et al. 2012).

In Grant County, females with broods did not utilize pastureland but used cropland and hayland adjacent to woody habitat; hens without broods used predominantly woodlands (Shields 2001). The ecotone of woodlands and pasturelands were used by broods along the James River (Leif 2001). In Gregory County, Merriam's broods used areas along edges of grassland and woodland

habitat and foraged in areas that had more forb cover and less grass cover than found at random sites (Day et al. 1991b). Younger broods used habitats with greater visual obstruction than older broods (Day et al. 1991b).

Habitat Capability and Suitability Modeling—Habitat Capability and Suitability Models give resource managers a predictive tool when managing forests and habitats for species into the future. In the Black Hills, a Habitat Capability Model (Hapcap) was validated using observed telemetry data from the central Black Hills (Rumble and Anderson 1995). Most notably the authors appropriately revised the Hapcap Model for the winter habitat coefficients to better represent biologically meaningful values in ponderosa pine habitats (Rumble and Anderson 1995). Further, Habitat Suitability Index (HSI) models provide a quantitative indicator of habitat quality for species (Schamberger et al. 1982). HSI models represent the relative suitability of habitats (0 is unsuitable and 1 is optimal) (Schamberger et al. 1982) to support Merriam's wild turkeys; Rumble and Anderson (1996c) set out to validate a previously untested Merriam's L-S (Lindzey-Suchy) HSI model using telemetry data from the central Black Hills. The L-S HSI model did not accurately reflect the habitat suitability for Merriam's wild turkeys in the Black Hills. It overemphasized soft mast and shrubs and underemphasized ponderosa pine as winter habitats. The L-S HSI model overemphasized trees >12 in (31 cm) DBH for roosts and underestimated the herbaceous biomass requirements for poults during summer. This model also performed poorly for assessing the general suitability of the Black Hills as wild turkey habitat and the authors revised many of the coefficients to reflect the ecology of Merriam's wild turkeys in the Black Hills; a specific HSI model was adapted and is used for the Black Hills (Rumble and Anderson 1996c).

Prairie landscapes were quantified and evaluated for the potential of expanding wild turkey populations into new areas of South Dakota (Knupp 1990). This study suggested areas along the Big Sioux River and James River corridors had potential habitats for wild turkey expansion (Knupp 1990).

Home Range and Movements

Home Range Size—In the southern Black Hills, winter home range size for hens was pooled among years for 90% fixed kernel estimates. Home range sizes varied for both birds wintering in farmsteads (range: 959–12,087 acres [387.9–4,891.5 ha]) and birds wintering in forest (range: (2,321–15,547 acres [939.3–6,291.8 ha]); further analysis comparing mean size (Table 4) indicated home ranges were smaller for females associated with farmstead compared to females wintering in forest (Lehman 2005). For adult males in the southern Black Hills, there was considerable variability from 2005 to 2006, but over the 2 years of study mean home range size was 2,175 acres (880 ha; Steinke 2006). Mean home range size for Merriam's wild turkeys was considerably smaller in Gregory County (Table 4); however, fewer locations and a different method were used to estimate home range size (Laudenslager 1988).

In prairie habitats, mean home range size for female eastern wild turkeys during winter varied from a low of 672 acres (272 ha) along the James River drainage to a high of 2,651 acres (1,073

ha) in Grant County (Table 4). For female eastern wild turkeys, spring home range size varied from a low of 1,023 acres (414 ha) in Marshall and Roberts counties to a high of 4,999 acres (2023 ha) in Grant County. For female eastern wild turkeys, summer home range size varied from a low of 205 acres (83 ha) in Marshall and Roberts counties to a high of 1,517 acres (614 ha) in Grant County. In Grant County, home range sizes for gobblers were smaller than those for females in every season (Table 4). For Rio Grande wild turkeys in northeastern South Dakota, home range size was considerably smaller in winter and spring seasons compared to eastern wild turkeys (Table 4).

Table 4. Area and subspecies, gender, season, mean home range size (acres [hectares]), method of determining size, and citation of where to find more detail on home ranges for wild turkeys in South Dakota.

Area and Subspecies	Gender	Season	Mean Acres (Hectares)	Method	Citation
Southern Black Hills farmstead birds Merriam's	Female	Winter	2,523 (1,021)	90% fixed kernel	Lehman 2005
Southern Black Hills forest birds Merriam's	Female	Winter	3,941 (1,595)	90% fixed kernel	Lehman 2005
Southern Black Hills Merriam's	Male	Spring	2,175 (880)	90% fixed kernel	Steinke 2006
Grant County Eastern	Female	Winter	2,651 (1,073)	90% fixed kernel	Shields 2001
Grant County Eastern	Male	Winter	1,391 (563)	90% fixed kernel	Shields 2001
Grant County Eastern	Female	Spring	4,999 (2,023)	90% fixed kernel	Shields 2001
Grant County Eastern	Male	Spring	3,054 (1,236)	90% fixed kernel	Shields 2001
Grant County Eastern	Female	Summer	1,517 (614)	90% fixed kernel	Shields 2001
Grant County Eastern	Male	Summer	882 (357)	90% fixed kernel	Shields 2001
Marshall and Roberts counties Eastern	Female	Winter	736 (298)	90% adaptive kernel	Lehman et al. 2003
Marshall and Roberts counties Rio Grande	Female	Winter	84 (34)	90% adaptive kernel	Lehman et al. 2003
Marshall and Roberts counties Eastern	Female	Spring	1,023 (414)	90% adaptive kernel	Lehman et al. 2003

Table 4 continued.

Area and Subspecies	Gender	Season	Mean Acres (Hectares)	Method	Citation
Marshall and Roberts counties Rio Grande	Female	Spring	509 (206)	90% adaptive kernel	Lehman et al. 2003
Marshall and Roberts counties Eastern	Female	Summer	205 (83)	90% adaptive kernel	Lehman et al. 2003
Marshall and Roberts counties Rio Grande	Female	Summer	185 (75)	90% adaptive kernel	Lehman et al. 2003
James River Drainage Eastern	Female	Winter	672 (272)	90% adaptive kernel	Leif 2001
James River Drainage Eastern	Female	Spring	1,359 (550)	90% adaptive kernel	Leif 2001
James River Drainage Eastern	Female	Summer	524 (212)	90% adaptive kernel	Leif 2001
Gregory County Merriam's	Female	Winter	220 (89)	Minimum Area	Laudenslauger 1988
Gregory County Merriam's	Male	Winter	351 (142)	Minimum Area	Laudenslauger 1988
Gregory County Merriam's	Female	Summer	353 (143)	Minimum Area	Laudenslauger 1988
Gregory County Merriam's	Male	Summer	867 (351)	Minimum Area	Laudenslauger 1988
Wessington Hills Eastern	Female	Winter	1,030 (417)	95% fixed kernel	Switzer and Tucker 2009
Wessington Hills Eastern	Female	Spring	1,717 (695)	95% fixed kernel	Switzer and Tucker 2009
Wessington Hills Eastern	Female	Summer	680 (275)	95% fixed kernel	Switzer and Tucker 2009

Dispersal and Movements—Quantification of movement data such as spring dispersal distances and localized movements during nesting can provide useful spatial information for resource selection or be used in adjusting nest survival information (Lehman et al. 2005). Quantification of pre-incubation movements was conducted for 3 subspecies and used to provide an adjustment rate for nesting success (Lehman et al. 2005). The authors used telemetry data and a spider distance method (Hooge and Eichenlaub 1997) in a Geographic Information System (GIS) to compare pre-laying and laying period movements and were able to determine when a nest had been initiated at accuracy rates >75%. Analyses revealed groups of decreased distances (e.g., 3 successive relocations with spider distances less than model estimated points) indicating probable nest initiations. Using the 90% prediction probability, the authors estimated an additional 46 nests (eastern = 15, Rio Grande = 7, Merriam's = 24), and the percentage of false-positives (i.e., percentage of females predicted to be laying but were not) was <7.1% for all subspecies. Movement data for all 3 subspecies are provided and demonstrate localized behavior during the egg laying period (Figure 6; Lehman et al. 2005).

In Marshall and Roberts counties, during winter eastern females foraged (mean = 793 yards [725 m], SE = 31 [28]) and roosted (mean = 807 yards [738 m], SE =47 [43]) farther from farmsteads than Rio Grande females (forage mean = 188 yards [172 m], SE = 11 [10]; roost mean = 204 yards [187 m], SE = 19 [18]; Lehman et al. 2003). Additionally, eastern females dispersed further for nesting (mean = 4,333 m, SE = 290) when compared to Rio Grande females (mean = 3229 yards [2,953 m], SE = 519 [475]). In Grant County, eastern females dispersed a mean distance of 7,819 yards (7,150 m) (SE = 984 [900]) in spring for nesting (Shields 2001). Also, during winter eastern females foraged at approximately a mean distance of 569 yards (520 m) (SE = 22 [20]) from farmsteads in Grant County (Shields 2001). In Gregory County, Merriam's wild turkey female mean dispersal distance from winter core areas to nest sites was 2,843 yards (2,600 m) (SE = 915 [837]) (Flake and Day 1996).

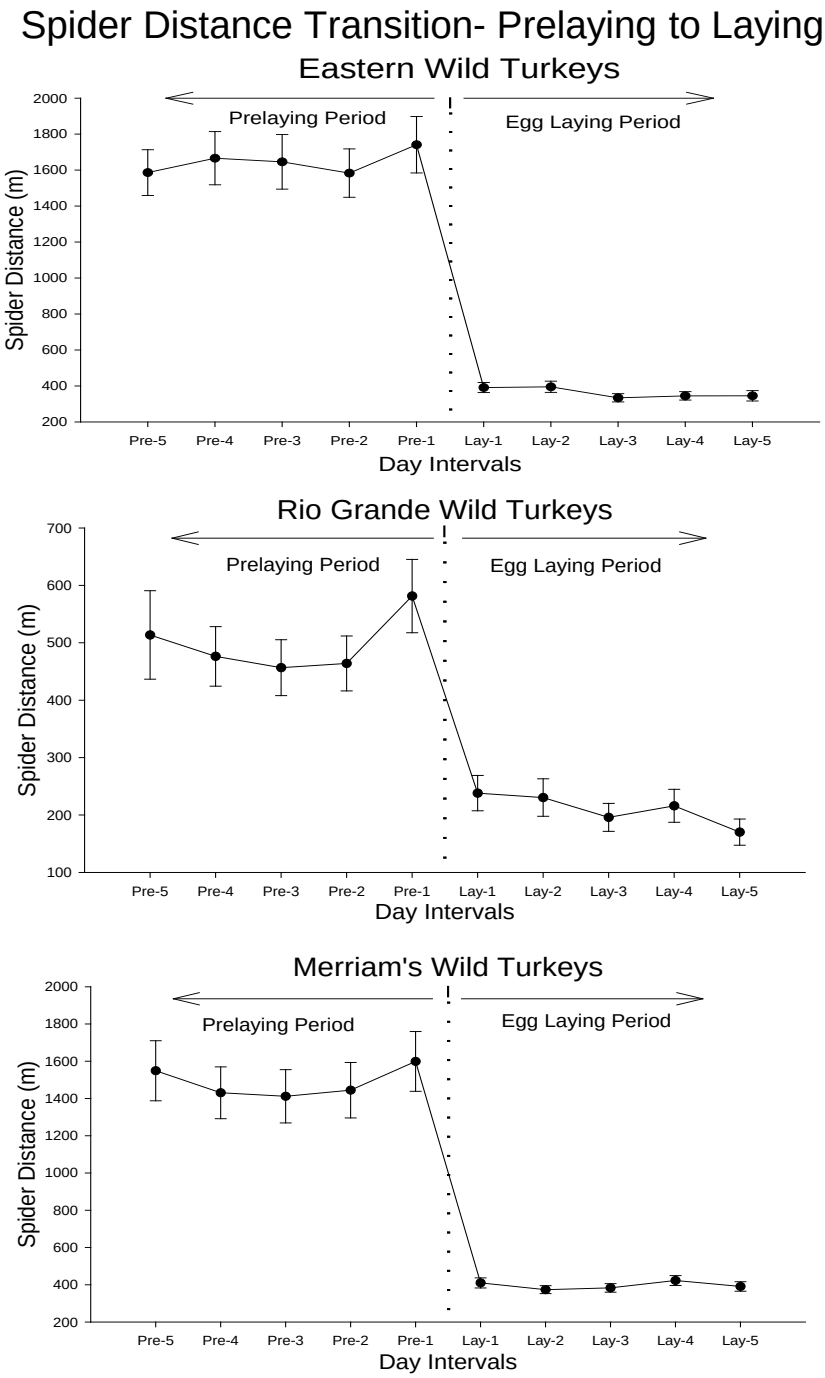

Figure 6. Transition of spider distances, or daily movements with 95% confidence intervals of wild turkeys from pre-laying to laying in South Dakota (Lehman et al. 2005).

Survival

Understanding the variation surrounding vital rates among wild turkey populations give resource managers crucial insights into what changes in climate, harvest, and land management practices may have on fitness and changes in growth rates. Survival of adult females can be an important vital rate of wild turkey populations and a primary factor for population change based upon modeling and sensitivity analysis (Suchy et al. 1983, Wakeling 1991, Vangilder and Kurzejeski 1995, Rolley et al. 1998, Alpizar-Jara et al. 2001). Wild turkey populations may be especially susceptible to negative population growth if fall harvests decrease female survival at an additive level (Vangilder and Kurzejeski 1995, Alpizar-Jara et al. 2001).

Female Survival and Mortality—Annual survival of adult female Merriam's wild turkeys has varied from 0.49 to 0.68 (Table 5). Annual survival of adult Rio Grande females was 0.77. Annual survival of adult female eastern wild turkeys has varied from 0.51 to 0.78. Annual yearling female wild turkey survival rates have varied from 0.49 to 0.74 across subspecies and landscapes (Table 5).

When evaluating seasonal survival typically the spring season has the lowest survival rates for females (Rumble et al. 2003, Flake et al. 2006, Lehman et al. 2007b, Yarnall et al. 2020a). Most of the mortality occurs while hens are nesting or early during the brood-rearing period with young poults, and most of the mortality is typically from mammalian predators (Flake et al. 2006, Lehman et al. 2007b, Yarnall et al. 2020a). Coyotes (*Canis latrans*) have been the primary predator of hens during the nesting season, but other species such as red fox (*Vulpes vulpes*), bobcats (*Lynx rufus*), and great-horned owl (*Bubo virginianus*) can also predate wild turkeys (Lehman 1998, Rumble et al. 2003, Flake et al. 2006, Lehman et al. 2007b). Golden eagles (*Aquila chrysaetos*) were observed attacking adult wild turkeys during winter but were never witnessed as being successful (Lehman and Thompson 2004). Winter survival often has the highest seasonal survival for wild turkeys in South Dakota (Flake et al. 2006). In some cases, starvation can occur during winter when deep snow cover lasts for longer periods of time. In the southern Black Hills, 3 yearlings and 1 adult died of starvation shortly after deep snowfall covered food resources. During this period, snow cover >7.9 in (20 cm) lasted roughly 14 days. Emaciated birds had lost 40–41% of their original body weight (Lehman et al. 2007b). In northeastern South Dakota, severe winter weather caused 14% of mortality (Lehman et al. 2001). Starvation and poor body condition resulted in Merriam's female mortality in the northern Black Hills even into the spring and summer nesting season (Yarnall 2019). Fall harvest has not been documented as a major source of mortality for hens in South Dakota, and illegal hen kill during spring has been minimal (Leif 1997, Lehman et al. 2001, Rumble et al. 2003, Flake et al. 2006, Lehman et al. 2007b).

Male Survival and Mortality—Unfortunately, information on male wild turkey survival has been limited primarily by sample sizes. There have been two studies in the Black Hills where sample sizes were sufficient for survival estimation. Annual survival for adult males has varied from 0.42 to 0.80 across subspecies and landscapes (Table 5). Annual survival for yearling males has only been documented in the northern Black Hills at 0.49 (Table 5).

Due to sample size limitations, most of the seasonal survival and mortality information for males has come from these same 2 studies in the Black Hills. For seasonal survival in the northern Black Hills, survival was lowest in late winter or spring, and most mortality occurs from spring wild turkey harvest (34%), followed by late winter or early spring snow storms (12%), fall hunting (7%), and crippling loss (7%) (Berdan 2010). A large percentage of mortality was unknown (22%; Berdan 2010). In the southern Black Hills, spring survival was much lower than occurred in the other seasons (Steinke 2006). Clearly, spring harvest had the biggest impact on survival at 73% of mortality. Fall harvest accounted for 4% of mortality, and crippling loss accounted for 2%. Mammalian and avian predation each accounted for 2% of total mortality (Steinke 2006). Unfortunately, 17% of mortalities were classified as unknown (Steinke 2006).

Poult Survival and Mortality—Poult survival in combination with nest survival may be an important vital rate for wild turkey populations, and population growth may be sensitive to changes in poult survival (Pollentier et al. 2014). Most poult mortality occurs by 2 weeks of age and survival decreases slightly between 2 and 4 weeks of age (Table 6). Four-week poult survival has varied from a low of 0.11 for yearling-raised poults in the southern Black Hills to a high of 0.51 for poults raised by adult eastern females (Table 6).

Female wild turkeys with broods have been observed being attacked by golden eagles and goshawks (*Accipiter gentilis*) (Lehman 2003, Lehman and Thompson 2004). Golden eagles have successfully killed and consumed poults in the southern Black Hills (Lehman and Thompson 2004). Other predators have killed and consumed poults but identification of predators killing poults was difficult as poults were not radio-marked during any of the South Dakota research studies. Inclement weather can kill poults and 11 poults died of hypothermia in the southern Black Hills (Lehman et al. 2008b). Modeling indicated cold and wet events were negatively associated with poult survival and age was positively associated with poult survival (Lehman et al. 2008b). In the northern Black Hills, there was little evidence that minimum daily temperature, daily precipitation, or hen age were associated with poult survival (Yarnall et al. 2020b).

Table 5. Annual survival rates ($\hat{S}$ ± SE) by area, subspecies, gender, age, and citation of where to find more detail on survival rates for wild turkeys in South Dakota.

Area	Subspecies	Gender	Age	$\hat{S}$	SE	Citation
Southern Black Hills	Merriam's	Female	Adult	0.67	0.09	Lehman et al. 2007
Southern Black Hills	Merriam's	Female	Yearling	0.49	0.11	Lehman et al. 2007
Southern Black Hills	Merriam's	Male	Adult	0.42	0.06	Steinke 2006
Central Black Hills	Merriam's	Female	Adult	0.68	0.09	Rumble et al. 2003
Northern Black Hills	Merriam's	Female	Adult	0.49	0.04	Yarnall et al. 2020a
Northern Black Hills	Merriam's	Female	Yearling	0.51	0.04	Yarnall et al. 2020a
Northern Black Hills	Merriam's	Male	Adult	0.50	0.06	Berdan 2010
Northern Black Hills	Merriam's	Male	Yearling	0.49	0.06	Berdan 2010
Marshall and Roberts counties	Eastern	Female	Adult	0.72	0.06	Lehman et al. 2001
Marshall and Roberts counties	Rio Grande	Female	Adult	0.77	0.07	Lehman et al. 2001
Grant County	Eastern	Female	Adult	0.66	0.09	Shields and Flake 2006
Grant County	Eastern	Female	Yearling	0.74	0.12	Shields and Flake 2006
Grant County	Eastern	Male	Adult	0.80	0.41	Shields 2001
Grant County	Eastern	Female	Adult	0.63	0.07	Tyl 2019
Grant County	Eastern	Female	Yearling	0.62	0.07	Tyl 2019
James River Drainage	Eastern	Female	Adult	0.78	0.06	Leif 2001
James River Drainage	Eastern	Male	Adult	0.78	0.31	Leif 1997
Wessington Hills	Eastern	Females	Adults	0.51	0.11	Switzer and Tucker 2009

Table 6. Area, subspecies, age class of hen wild turkey raising poults (Age), poult survival rates (Ŝ at 2 weeks and 4 weeks ± SE), and citation of where to find more detail on poult ecology for wild turkeys in South Dakota.

Area	Subspecies	Age	Ŝ 2 weeks	Ŝ 4 weeks	Citation
Southern Black Hills	Merriam's	Adult	0.37 ± 0.06	0.33 ± 0.05	Lehman et al. 2008b
Southern Black Hills	Merriam's	Yearling	0.11 ± 0.10	0.11 ± 0.10	Lehman et al. 2008b
Northern Black Hills	Merriam's	Adult		0.39 ± 0.06	Yarnall et al. 2020b
Northern Black Hills	Merriam's	Yearling		0.39 ± 0.06	Yarnall et al. 2020b
Marshall and Roberts counties	Eastern	Adult	0.62 ± 0.06	0.51 ± 0.06	Lehman et al. 2003
Marshall and Roberts counties	Rio Grande	Adult	0.51 ± 0.07	0.40 ± 0.07	Lehman et al. 2003
Grant County	Eastern	Adult	0.39 ± 0.10	0.34 ± 0.09	Shields 2001
Grant County	Eastern	Yearling	0.54 ± 0.21	0.49 ± 0.24	Shields 2001
Grant County	Eastern	Adult		0.36 ± 0.02	Tyl 2019
Grant County	Eastern	Yearling		0.20 ± 0.02	Tyl 2019
Gregory County	Merriam's	Adult	0.43 ± 0.20	0.43 ± 0.20	Flake and Day 1996

Reproduction

Nest Chronology—Understanding the temporal nature of nesting is important both in terms of the ecology of the bird and in management of harvest and season setting. Timing of precipitation and cold events in relation to peak nesting can have negative consequences for wild turkey reproduction. Nest initiation, or laying behavior, has been documented to occur in early April. In Gregory County, nest initiation started on 9 April (Flake and Day 1996). Nest initiation in the southern Black Hills began on 11 April and on 21 April in the central Black Hills (Rumble and Hodorff 1993, Lehman et al. 2007c). Nest initiation occurred 14 April for both eastern and Rio Grande wild turkeys in northeastern South Dakota (Lehman et al. 2001). Further, eastern wild turkeys initiated laying around 12 April in Grant County (Shields and Flake 2006).

Onset of incubation typically occurs in late April or early May for first nests, and peak incubation, or the median date of incubation has ranged from 10 May–27 May (Table 7). Timing of peak incubation is an important metric to track as weather during this time can influence nest survival (Lehman et al. 2008a). Peak nest hatching for first nests typically occurs in early June (Shields 2001, Lehman et al. 2008a), and peak nest hatching for renests can occur in early to mid-July (Lehman et al. 2008a). Initiation of renests can occur very late in the summer. Lehman (2005) documented high renesting effort among some radio-marked females and a fourth nest (3rd renest) was initiated on 22 June. The latest observed nest initiation was on 2 July and that nest hatched in early August (C. P. Lehman, South Dakota State University unpublished data).

Clutch Size—Average clutch size can vary from 9.2 to 11.89 (Table 7). Typically, first nest clutch size is slightly larger than renest clutch size, and adult females may have slightly larger clutches than yearling females; however, clutch size differences are not statistically significant. Adult females averaged 11.89 eggs per clutch, whereas yearlings averaged 9.22 eggs per clutch in the southern Black Hills (Lehman 2005). Clutch size for renesting adult females averaged 10.22 in the southern Black Hills (Lehman 2005). Clutch sizes for eastern wild turkeys in Grant County were very similar among age classes and did not differ between first nests and renests (Shields 2001). Clutches ranged from 7 to 13 eggs in the central Black Hills and from 6 to 17 eggs in the southern Black Hills (Rumble and Hodorff 1993, Lehman 2005). Hatch rates for eggs within clutches are typically very high and are 80% or greater across the state (Rumble and Hodorff 1993, Flake and Day 1996, Leif 1997, Lehman 1998, Shields 2001, Lehman 2005, Switzer and Tucker 2009).

Table 7. Area, subspecies, age class of hen (Age), median nest incubation dates for first nests (Inc), mean clutch size (Clutch), nest rates (Nest_Rate), nest success (Nest_Succ), renest rate (Renest), and citation of where to find more detail on reproduction for wild turkeys in South Dakota.

Area	Subspecies	Age	Inc	Clutc	Nest_Rate	Nest_Succ	Renest	Citation
Southern Black Hills	Merriam's	Adult	10 May	11.89	0.98	0.50	0.75	Lehman et al. 2008
Southern Black Hills	Merriam's	Yearling	10 May	9.22	0.50	0.83	1.00	Lehman 2005
Central Black Hills	Merriam's	Adult	-----	9.20	0.97	0.36	-----	Rumble and Hodorff 1993
Central Black Hills	Merriam's	Yearling	-----	9.20	0.73	0.23	-----	Rumble and Hodorff 1993
Northern Black Hills	Merriam's	Adult	27 May	9.67	0.83	0.51	0.36	Yarnall 2019
Northern Black Hills	Merriam's	Yearling	27 May	9.43	0.33	0.39	0.00	Yarnall 2019
Marshall and Roberts counties	Eastern	Adult	20 May	10.45	0.86	0.70	0.59	Lehman et al. 2001
Marshall and Roberts counties	Rio Grande	Adult	20 May	10.62	0.90	0.59	0.77	Lehman et al. 2001
Grant County	Eastern	Adult	17 May	11.00	0.94	0.48	0.22	Shields 2001
Grant County	Eastern	Yearling	17 May	11.00	0.91	0.51	0.51	Shields 2001
Grant County	Eastern	Adult	-----	10.4	0.80	0.52	0.60	Tyl 2019
Grant County	Eastern	Yearling	-----	9.8	0.74	0.46	0.25	Tyl 2019
James River Drainage	Eastern	Adult	22 May	10.40	0.91	0.41	0.26	Leif 2001
Wessington Hills	Eastern	Adult	-----	10.20	0.78	0.22	0.26	Switzer and Tucker 2009
Gregory County	Merriam's	Adult	-----	11.20	0.70	0.44	0.29	Flake and Day 1996

Nest Survival and Factors Influencing Outcomes of Nests—Nest survival may be an important vital rate for wild turkey populations, and population growth may be sensitive to changes in nest survival (Roberts et al. 1995, Pollentier et al. 2014). Nest success, or a surrogate for nest survival, can vary considerably from 0.22 to 0.83 across the state (Table 7). Variables such as visual obstruction with vegetation or other habitat variables, timing of weather events, and predator communities can influence nest survival outcomes. The interaction of precipitation and concealment cover appears to influence mammalian nest predation in the southern Black Hills, and greater visual obstruction from shrub cover partially offsets the negative effects of precipitation during incubation (Figure 7; Lehman et al. 2008a). Shrub cover can be limited early during the first nest period because leaves of deciduous shrubs are not developed. Common juniper, an evergreen shrub, was the most selected shrub during the first nest period in the southern Black Hills and positively influenced nest survival (Lehman et al. 2008a). Pine slash was also selected as screening cover during the first nest period, but it was not a covariate that lowered hazard risk. Steeper slopes had a positive relationship with nest survival, and several successful nests were located on some extremely steep slopes (Lehman et al. 2008a). Renest success was higher than first nest success as has been observed in other studies, probably because of better nest concealment (Rumble and Hodorff 1993, Lehman et al. 2008a). Hazard modeling indicated survival of renests was most influenced by greater visual obstruction surrounding nests. Visual obstruction for renests was primarily from deciduous shrub cover, and western snowberry was the most common shrub used as nest cover for renests (Lehman et al. 2008a). Nest hazard, or probability of nest mortality, can be associated with weather variables, and for every 0.4 inch (1 cm) increase in daily precipitation, hazard of nest mortality increased by 139% in the southern Black Hills (Figure 7). Mammalian predators and primarily coyotes used olfaction following precipitation events and were predating wild turkey nests in the southern Black Hills (Lehman et al. 2008a).

In the central Black Hills, hens selected small sites (<5.5 yards [5 m] across) with obstructed view of the nest and vegetation averaging 9.1 inches (23 cm) tall; few microhabitat differences occurred between successful and unsuccessful nests, and those that did were related to higher survival of third nest attempts (Rumble and Hodorff 1993). Third nests had greater vegetation cover primarily from western snowberry which was similar to the results found in the southern Black Hills (Rumble and Hodorff 1993, Lehman et al. 2008a). Primary nest predators were mammals and American crows (*Corvus brachyrhynchos*) in the central Black Hills (Rumble and Hodorff 1993).

In the northern Black Hills, hens selected nest sites with greater visual obstruction and mammalian predation was the leading cause of nest failure (Yarnall et al. 2020b). Precipitation was associated with reduced nest survival (Figure 8) and greater values of visual obstruction were associated with increased nest survival (Yarnall et al. 2020b). Further, in contrast to studies in grassland and shrubland systems, Yarnall et al. (2019) found little evidence that the timing of vegetation sampling influenced conclusions regarding the association between visual obstruction and nest survival; model selection and estimates of nest survival were similar regardless of when vegetation data were collected (i.e., whether at nest failure or at nest hatch). The dominant hiding cover at most of the nests was provided by evergreen shrubs (e.g.,

common juniper); retention of leaves and slow growth of these plants likely prevent appreciable changes in visual obstruction during the incubation period (Yarnall et al. 2019).

Within prairie landscapes, wild turkeys had the highest nest success estimates in northeastern South Dakota within Marshall, Roberts, and Grant counties (Table 7). For eastern wild turkeys in northeastern South Dakota, females selected for shrub patches and primarily western snowberry to provide concealment cover (Shields 2001, Lehman et al. 2003). Most nests were lost to nest predation from coyotes, red fox, raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and crows; however, nest success was sufficient for population growth (Lehman 1998, Shields 2001, Tyl 2019). Additionally, successfully nesting females had larger home ranges and core areas than unsuccessfully nesting females (Shields 2001). Further south along the James River and Wessington Hills areas, eastern wild turkeys primarily selected for grasslands and western snowberry shrub patches for nesting, and nest success was noticeably lower in those landscapes when compared to northeastern South Dakota (Table 7). Further, the Wessington Hills population had the lowest documented nest success rate in the state and nearly half that found along the James River and in Gregory County (Table 7; Flake and Day 1996, Leif 2001, Switzer and Tucker 2009). Wild turkeys in Gregory County had similar nest survival in woodland habitats and grassland habitats (Flake and Day 1996). Perhaps the undulating topography or vegetation communities along the Prairie Coteau in northeastern South Dakota provides some unique landscape characteristics which allow for higher nest survival rates when compared to other prairie habitats.

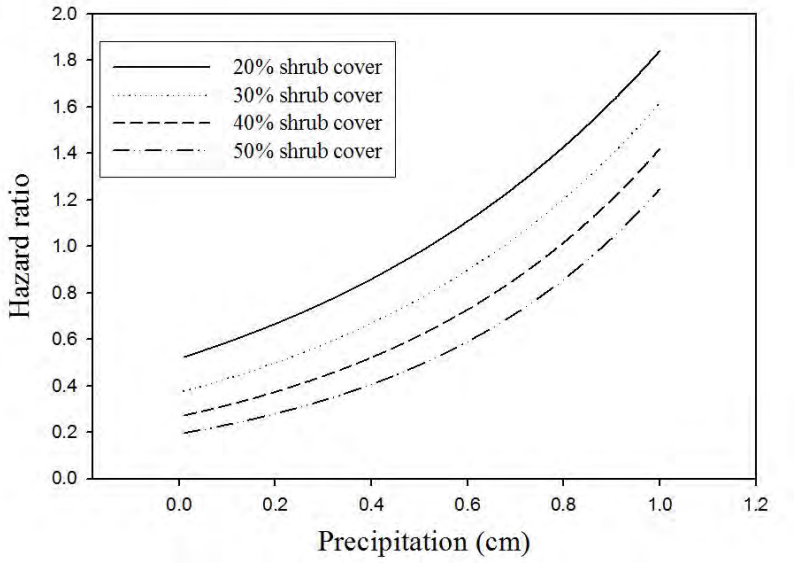

Figure 7. Hazard ratios in association with the interaction of shrub cover and precipitation for Merriam's wild turkey nests in the southern Black Hills, South Dakota, USA, 2001–2003. Nest hazard functions were lower when shrub cover was greater in magnitude. Graph includes 20%, 30%, 40%, and 50% levels of understory shrub cover and its effects on nest hazard under varying levels of daily precipitation (Lehman et al. 2008a).

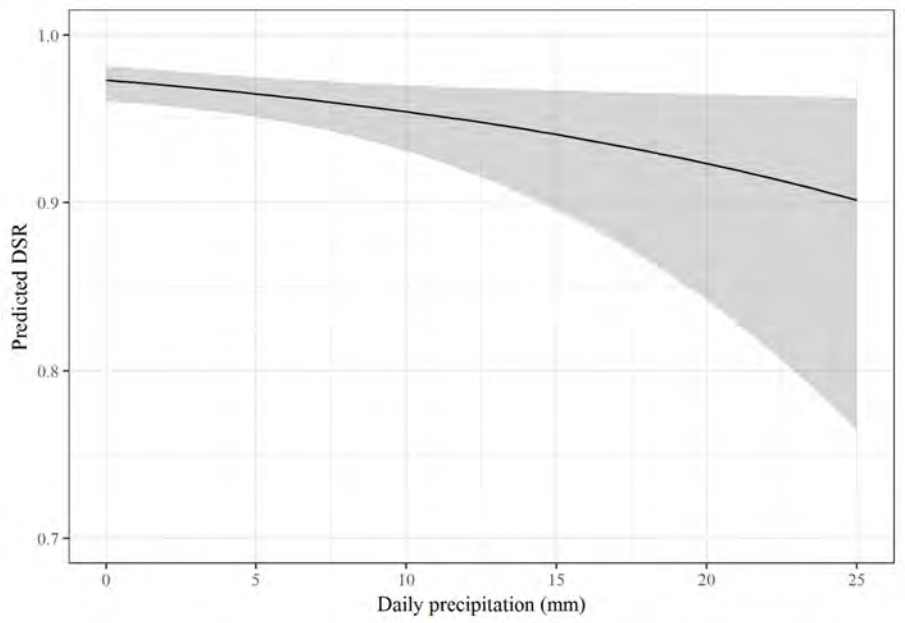

Figure 8. Predicted daily survival rates (DSR) and 95% confidence intervals for wild turkey nests in 2017 across a range of daily precipitation values when visual obstruction is held at the mean value, northern Black Hills, SD.

Diet

Wild turkeys, except for hens during the incubation period, are actively seeking out high-quality foods to build protein and fat reserves necessary for their survival and reproduction. Wild turkeys are omnivorous, highly selective feeders and consume various foods from seeds, leaves of grasses, fruits, flowers from forbs, and invertebrates depending upon availability (Hoffman et al. 1993, Flake et al. 2006). Wild turkeys will select habitats which provide optimal foraging resources throughout the year, and in South Dakota this selection is often associated with agricultural or ranching activities where cereal grains are provided in the landscape. In South Dakota, diet selection has been investigated in the Black Hills (Twedt 1961, Peterson and Richardson 1975, Rumble and Anderson 1996a, Lehman 2005), in Gregory County (Laudenslager and Flake 1987), and in eastern Pennington County (Twedt 1961). Feeding trials indicate wild turkeys select items which provide the greatest energy value (unpublished data, Rocky Mountain Research Station, Rapid City, SD, Flake et al. 2006).

In the central Black Hills, ponderosa pine seeds and bearberry (*Arctostaphylos uva-ursi*) were strongly selected in the diet during fall and winter (Rumble and Anderson 1996a). Bur oak (*Quercus macrocarpa*) acorns were found to be an important winter food source in the central Black Hills (Richardson and Peterson 1975). An earlier study where most of the diet data came from the Black Hills indicated fall diets were composed of 50% cereal grains (Twedt 1961).

In the southern Black Hills, females wintering in forested habitats were primarily feeding on ponderosa pine seeds (94.2%) in 2002, and grass stems (77.7%) and forbs (19.9%) in 2003

(Table 8). Females wintering in association with farmsteads were primarily feeding on items related to cattle or horse feeding operations for both 2002 and 2003 (Table 8). Corn, oats, and field peas were the primary foods in wild turkey crops from farmsteads. In 2002, ponderosa pine seed diets of forest wintering females were higher in crude protein, crude fat, crude fiber, and phosphorus than livestock feed diets of farmstead wintering females. In 2002, livestock feed diets of females wintering in farmsteads were higher in nitrogen free extract than diets of forest birds. In 2003, grass and forb diets of females wintering in forest were higher in crude fat, ash, crude fiber, and calcium than livestock feed diets of females wintering in farmsteads. In 2003, livestock feed diets of females wintering in farmsteads were higher in nitrogen free extract and phosphorus than diets of females wintering in forest (Lehman 2005). Farmstead dependence can vary from 50–91% in the southern Black Hills depending upon pine seed availability in the forest (Lehman et al. 2007a); when pine seed crops decrease in the forest, wild turkeys can utilize other food sources such as cereal grains, grass stems, or bearberry fruits (Rumble and Anderson 1996a, Lehman et al. 2007a).

Collection of wild turkey crops in the Missouri River breaks indicate Merriam's wild turkeys selected for bur oak acorns, cereal grains, and grasshoppers (Order Orthopterans) during the fall months (Laudenslager and Flake 1987).

During spring grass and forb foliage, grass seeds and forb seeds/flowers comprised large proportions of adult wild turkey diets from late winter through spring (Rumble and Anderson 1996a). During summer more invertebrates are available in meadow and open pine habitats in the Black Hills and sites where hens were feeding with poults had greater abundance of invertebrates than found at random sites (Rumble and Anderson 1996a, Lehman 2005). In the southern Black Hills, proportion of invertebrates consumed by poults varied among age classes (Table 9). In both the central and southern Black Hills older poults consumed more Orthopterans (e.g. grasshoppers) than younger poults, and younger poults consumed more Coleopterans (e.g. beetles) than older poults (Rumble and Anderson 1996a, Lehman 2005). As poults get older (50–84 days) they typically consume more grass and forb foliage than younger poults (Table 9; Rumble and Anderson 1996a, Lehman 2005). It is hypothesized that grasshoppers are primarily selected through the first 7 weeks of life because they provide the most protein for developing poults as mass/individual is among the highest available in meadows and other open habitats (Rumble and Anderson 1996a, Lehman 2005).

Table 8. Means in ml displacement (percentage of wild turkey crop by volume) and standard errors (SE) of food contents found in both females wintering in association with farmsteads and females wintering in forested habitats in the southern Black Hills, South Dakota, 2002–03 (Lehman 2005).

	2002				2003			
	Farmstead Birds		Forest Birds		Farmstead Birds		Forest Birds	
Crop Contents	ml (%)	SE	ml (%)	SE	ml (%)	SE	ml (%)	SE
Forbs	0.04 (0.10)	0.02	0.00 (0.00)	0	0.13 (0.18)	0.07	6.50 (19.9)	4.64
Grass Stems	1.75 (3.89)	0.74	0.73 (4.20)	0.27	3.78 (5.20)	1.08	25.4 (77.7)	10.9
Grass Seeds	0.00 (0.00)	0	0.00 (0.00)	0	0.10 (0.14)	0.1	0.09 (0.30)	0.07
Pine Seeds (*Pinus ponderosa*)	2.85 (6.30)	1.53	16.2 (94.2)	8.11	0.01 (0.02)	0.01	0.02 (0.05)	0.01
Currant Berries (*Ribes* spp.)	0.00 (0.00)	0	0.00 (0.00)	0	0.00 (0.00)	0	0.14 (0.40)	0.1
Bearberry (*Arctostaphylos uva-ursi*)	0.00 (0.00)	0	0.12 (0.66)	0.08	0.01(0.01)	0.01	0.00 (0.00)	0
Poison Ivy Drupes (*Toxicodendron Rydbergii*)	0.00 (0.00)	0	0.00 (0.00)	0	0.00 (0.00)	0	0.00 (0.00)	0
Rose Hips (*Rosa* spp.)	0.00 (0.00)	0	0.00 (0.00)	0	0.00 (0.00)	0	0.20 (0.60)	0.2
Invertebrates	0.06 (0.10)	0.02	0.17 (0.94)	0.17	0.00 (0.00)	0	0.36 (1.05)	0.2
Corn (*Zea mays*)	26.3 (58.0)	7.9	0.00 (0.00)	0	21.0 (29.0)	7.3	0.00 (0.00)	0
Oats (*Avena sativa*)	13.8 (30.5)	12.1	0.00 (0.00)	0	21.4 (29.5)	5.95	0.00 (0.00)	0
Horse Pellets (Commercial feeds)	0.55 (1.20)	0.55	0.00 (0.00)	0	0.00 (0.00)	0	0.00 (0.00)	0
Peas (*Pisum sativum*)	0.00 (0.00)	0	0.00 (0.00)	0	25.9 (35.7)	9.31	0.00 (0.00)	0
Sunflower (*Helianthus annuus*)	0.00 (0.00)	0	0.00 (0.00)	0	0.20 (0.25)	0.2	0.00 (0.00)	0
Total Farmstead Feeds	40.6 (89.7)	8.54	0.00 (0.00)	0	68.3 (94.4)	10.5	0.00 (0.00)	0

Table 9. Proportion of crop contents and standard errors (SE) found within samples of varying poult age classes (1–21 days, 22–49 days, and 50–84 days posthatch). Age class crop contents were compared using multiple-response permutation procedures. Crops of poults raised from unmarked females were collected in the southern Black Hills, South Dakota, 2001–2003 (Lehman 2005).

	1–21 days (*n* = 28)		22–49 days (*n* = 15)		50–84 days (*n* = 9)		MRPP	
Forage Items	Mean	SE	Mean	SE	Mean	SE	T Statistic	*P*-Value
Orthoptera	43.60A	6.49	66.59B	8.37	71.46B	7.57	-2.26	0.04
Coleoptera	18.08A	4.37	3.26B	1.11	1.41B	0.83	-5.35	0.00
Homoptera	5.93	2.88	16.83	7.33	7.72	5.04	-0.02	0.38
Larvae	11.34A	3.07	3.88A	2.12	0.00B	0.00	-2.66	0.02
Other Arthropods	11.85	3.15	6.89	2.59	8.79	5.22	0.64	0.70
Total Arthropods	90.80	4.84	97.44	1.32	89.38	4.97	-0.71	0.20
Grass and Forb Foliage	0.01A	0.01	0.04A	0.03	0.59B	0.43	-8.74	0.00
Grass and Forb Seed	1.18	0.83	0.40	0.20	1.20	1.20	0.38	0.56
Soft Mast	1.00	1.00	1.90	1.33	8.50	5.08	-1.15	0.12
Hard Mast	0.79	0.79	0.08	0.08	0.00	0.00	0.68	0.72
Total Vegetation	2.97	1.45	2.42	1.29	10.29	4.87	-1.23	0.11

Behavioral Research

Information on wild turkey nesting chronology and gobbling activity is important in setting spring gobbler hunting season dates (Healy and Powell 1999). Gobbling is a vocalization used by males during the breeding season to attract females for breeding, and this behavior can vary based upon weather, hunting pressure, and chronology of nesting (Bevill 1975, Hoffman 1990, Miller et al. 1997a, Miller et al. 1997b, Lehman et al. 2007c). The relationship between gobbling activity, hunting pressure, weather variables, and nesting chronology was studied using hunted and non-hunted wild turkey populations in the southern Black Hills (Lehman et al. 2007c). During the hunting period, gobbling activity was lower in the hunted population on the BHNF when compared to the non-hunted Wind Cave National Park population. We observed 2 peaks in gobbling activity: one following winter break-up of flocks, and the other just before or during peak incubation (Figure 9). Gobbling activity was poorly predicted by measured weather and nesting chronology variables. South Dakota's spring hunting season encapsulates the second peak of gobbling activity, but most gobblers are harvested during the prelaying period (57%) or before the peak of incubation and second gobbling peak (Figure 9). Illegal harvest of females was minimal even though females were not generally nesting during peak harvest. Females can be susceptible to illegal harvest if the spring season starts before peak of incubation (Healy and Powell 1999). Gobbling activity was reduced during the hunting season presumably by the negative association between gobbling and subsequent disturbance by hunters (Lehman et al. 2007c).

Strutting behavior is typically displayed by male wild turkeys during the spring breeding season, but during a research study this behavior was witnessed by female wild turkeys during the brood-rearing period (Lehman 2002). The strut is defined as a short-range signal and highly coordinated movement typically directed towards a female during courtship during the spring breeding season (Healy 1992). During this behavior the retrices are fanned out and the outer primaries of the wings are outstretched and can be dragged across the ground. During this display a drumming sound is emitted; it has been described as a "hum" or "chump" sound (Williams 1984). While collecting a visual observation on a radio-marked female with poults, an unmarked female without any poults approached the marked female and both females started to strut. This atypical behavior for females was possibly related to dominance as both females were also witnessed fighting during the interaction (Lehman 2002).

Gallinaceous birds have rarely been observed caring for offspring other than their own. Rumble and Mills (1991) documented 4 cases of apparent adoption by Merriam's wild turkeys over a 3-year period while collecting data on brood-rearing habitat selection patterns in the central Black Hills of South Dakota. Poults hatched from one radio-marked female were being raised by a different radio-marked female, and this appears to be the only documented occurrence of adoption by Merriam's wild turkeys (Rumble and Mills 1991).

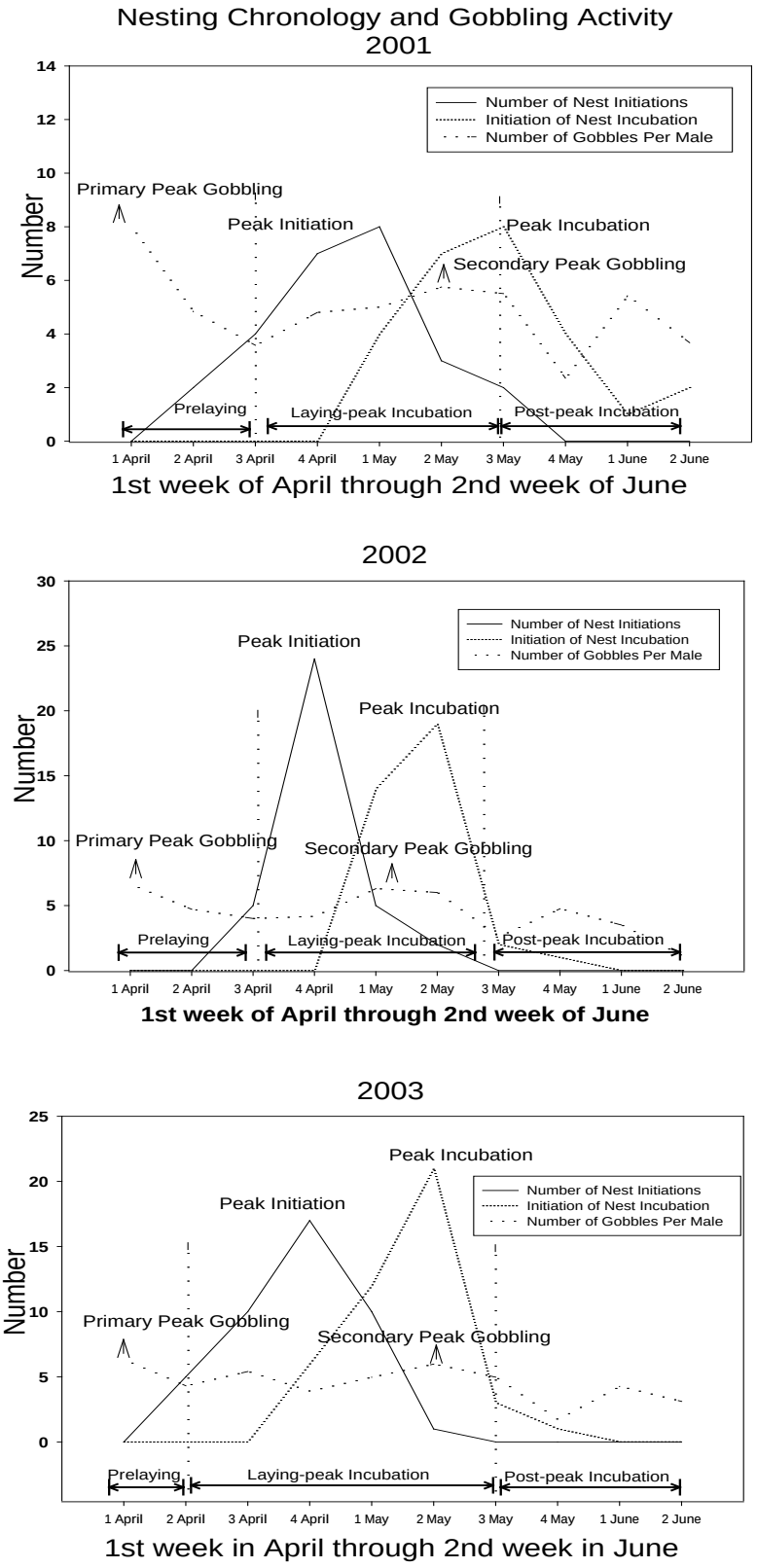

Figure 9. Relationship of female nesting chronology and gobbling activity for a hunted population of Merriam's wild turkeys in the southern Black Hills, South Dakota, 2001–2003.

Additional Research

Wild turkey gender and age information is needed to define population structure but it can be difficult to obtain. A study classified gender of Merriam's wild turkeys accurately based on measurements of two foot characteristics (Rumble et al. 1996). Measurements from the middle toenail to heel pad correctly classified gender 98% of the time; correct classification of age and gender of birds was 94% in the initial Black Hills study. An independent test of this technique on Merriam's wild turkeys from Colorado using measurements of the middle toe pads correctly classified the gender of Merriam's 99% of the time; however, when gender and age were combined they were only correctly classified at a rate of 50% (Rumble et al. 1996). This technique may be useful for determining gender, but when age is included study results suggest this technique may need more evaluation (Rumble et al. 1996).

Future Research Needs

The most important need is the collection of wild turkey vital rate information, and if possible, robust data should be collected from each administration region (Regions 1-4) of South Dakota. Data on adult survival, poult survival, and nest survival will provide demographic information which can be used to model population growth. Such information can then be used in making harvest and perhaps habitat management decisions which will aid in the management of the species. In conjunction with collection of vital rate information data, there is a need to collect winter severity and precipitation data and model the response of vital rates with these environmental covariates. Timing of precipitation and extreme weather events can highly influence vital rates and gaining an understanding of these relationships will aid in the management of wild turkeys.

PUBLIC AND PRIVATE LAND MANAGEMENT

Custer State Park

Custer State Forest became CSP after action by the state legislature in 1919. The park encompasses 70,750 acres (28,631 ha) of forests and grasslands in the Black Hills of South Dakota (Figure 10). Geography varies from steep granitic spires in the northwest part of the park, forested rolling topography in the main body, and grading eventually into grasslands on the eastern and southern boundaries. Elevation ranges from 3,760 feet (1,146 m) to 6,700 feet (2,042 m) above sea level. Vegetation is dominated by white spruce and ponderosa pine mix on north slopes at higher elevations, by pure ponderosa pine on most forestlands, and by mixed grass prairie on grasslands. Wild-trapped Merriam's wild turkeys from Colorado and New Mexico were released near the towns of Custer and Hot Springs in 1950 and 1951 (Peterson and Richardson 1975). Records indicate 49 Merriam's wild turkeys were stocked into CSP sometime following the initial releases near Custer and Hot Springs. Soon after, the Merriam's population grew rapidly and expanded. The park manages wildlife for species diversity, visitor view ability, and to provide a high-quality recreational hunting opportunity. The objective of wild turkey management in CSP is to provide optimal view ability of wild turkeys to the public and to provide a limited license high-quality hunting experience for South Dakota residents.

Wild turkey hunting in CSP began in 1969 with initial hunts occurring in winter where hens and gobblers were harvested in January. The first spring hunt was initiated in 1978 with 40 licenses. The last fall hunt occurred in 1994 where 60% of the harvest was hens, and the harvest of hens in the fall did not match the unit objectives. Since the early 2000s spring gobbler hunting opportunities have been limited to 100–135 licenses, and the focus has been to keep hunter numbers at a lower level to provide for a higher-quality hunting experience. Due to the lower number of hunters, the park can harvest a high proportion of older gobblers (50% ≥4+ years) providing some evidence that these birds receive less hunting pressure. A 200-yard (183 m) no hunting buffer around public roads was implemented in 2015 to help mitigate visitor and hunter interactions and to protect view ability of wild turkeys along public road systems. The park is included in the southern Black Hills region and demographic modeling and trend data are used to monitor growth of the population.

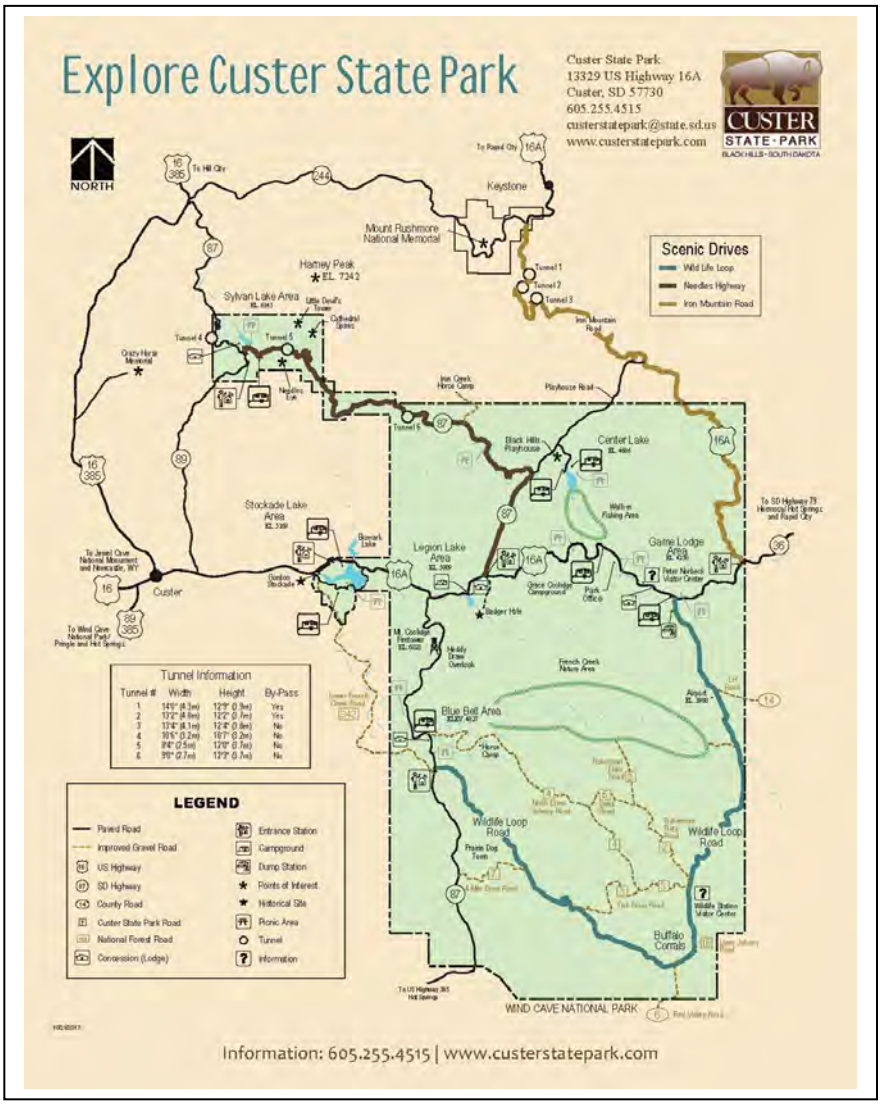

Figure 10. Location of Custer State Park in the southern Black Hills, South Dakota.

Other State Parks and Recreation Areas

Excluding CSP, the SDGFP owns and manages 132 State Parks, Recreation Areas, Nature Areas, and Lakeside Use Areas encompassing 31,717 acres (12,835 ha). These areas are primarily managed for outdoor recreation (camping, hiking, water access), but many contain high quality wild turkey habitat and most are open to wild turkey hunting with specific restrictions. The DOW and Division of Parks and Recreation have collaborated on habitat management projects on SDGFP lands. There is likely opportunity to increase collaboration to further improve wildlife habitat management within specific State Parks, Recreation Areas, Nature Areas, and Lakeside Use Areas.

Black Hills National Forest

Area and Vegetation—The BHNF encompasses western South Dakota (Lawrence, Meade, Pennington, Custer, and Fall River counties) and northeastern Wyoming (Figure 11). These unglaciated mountains span from 3,200 (975 m) to 7,242 feet (2,207 m). Average annual precipitation ranges from approximately 16 inches (40.6 cm) in the southern Black Hills to 29 inches (73.7 cm) in the northern hills and highest elevations. Most of the moisture falls April through September as high-intensity thunderstorms. The BHNF fire protection district within South Dakota is approximately 1.9 million acres (768,902 ha) of which 1.1 million acres (445,154 ha) are administered and managed by BHNF (USDA 2006). The remaining acreages are in private ownership (~790,000 acres [319,702 ha]) with a scattering of other federal and state lands (USDI Bureau of Land Management, National Park Service, SDGFP, South Dakota School and Public Lands).

Eighty-nine percent of land managed by BHNF is forested (USDA 2005a). The most common forest type is ponderosa pine at 92%. Ponderosa pine (hereafter referred to as pine) occurs in 13 plant associations from high elevation, mesic coniferous forests/woodlands with greater than 60% canopy cover to low elevation, dry coniferous forests/woodland types with less than 50% canopy cover. The dry coniferous forests/woodlands are the most dominant ecological group within the entire Black Hills (Marriott and Faber-Langendoen 2000, USDA 2005a). BHNF classifies vegetation communities by dominant species and structural stage (SS) category which encompass DBH and overstory canopy cover (Table 10).

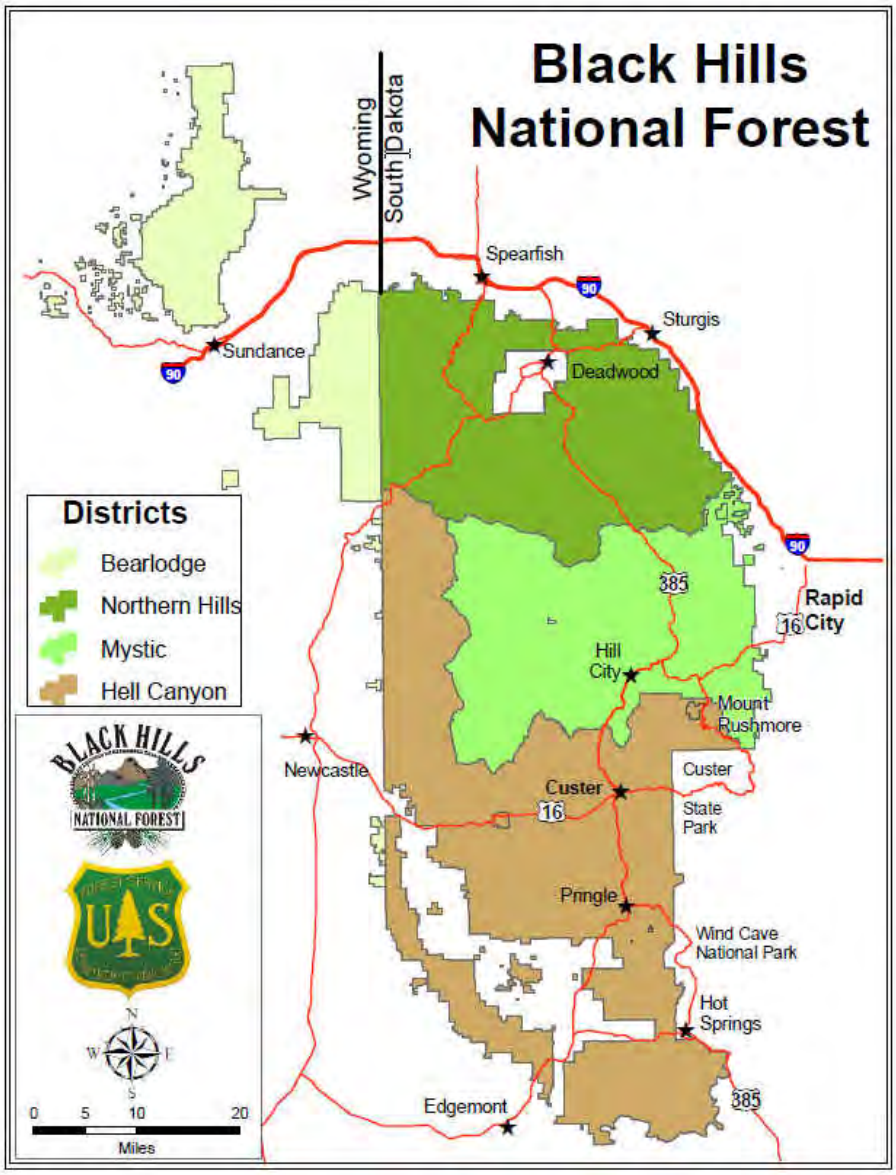

Figure 11. Black Hills National Forest located in western South Dakota and eastern Wyoming. (Map provided by Black Hills National Forest)

Table 10. Classification of vegetation community based on structural stage (SS), diameter at breast height (DBH), and percent canopy cover (Buttery and Gillam 1983, USDA 2005a).

Vegetation community categories			
Structural Stage	DBH	Overstory canopy	SS Code
Grass-forb	–	0–10%	1
Shrub-seedling	< 1" (2.5 cm)	11–100%	2
Sapling-pole	1–9" (2.5–22.9 cm)	0–40%	3A
Sapling-pole	1–9" (2.5–22.9 cm)	41–70%	3B
Sapling-pole	1–9" (2.5–22.9 cm)	71–100%	3C
Mature	> 9" (22.9 cm)	0–40%	4A
Mature	> 9" (22.9 cm)	41–70%	4B
Mature	> 9" (22.9 cm)	71–100%	4C
Late successional	> 16" (40.6 cm)	0–100%	5

Ponderosa pine, primarily mature pine SS's (4A, B and C), are important ecological plant communities for Black Hills Merriam's wild turkeys during winter (Rumble and Anderson 1993a, Lehman et al. 2007a). Ponderosa pine is extremely successful in regenerating. Vigorous, healthy seed is produced almost every year with abundant crops every 2–5 years (Boldt and Van Deusen 1974) throughout most geographic areas within the Black Hills. Sheppard and Battaglia (2002) attributed pine's prolific growth and establishment to growing season precipitation and climatic influences. Because of pine's prosperous growth in concert with a timber industry, BHNF is a very active, intensively managed public forest. It is the most viable timber producing forest within its USFS region that extends into Colorado.

BHNF has an objective to manage 1,037,100 acres (419,699 ha), or 84% of the suitable timber base in certain percentages of pine SS's (Table 11) for a diverse pine ecosystem (USDA 1997, USDA 2005b). The remaining forested lands on BHNF are comprised of 6% aspen (*Populus tremuloides*), bur oak, and paper birch (*Betula papyrifera*); 2% Black Hills white spruce (*Picea glauca*); and less than 1% juniper woodlands (*Juniperus spp*.) (USDA 2005a). Hardwoods are frequently mixed with encroaching conifers. At lower elevations in the northern and eastern foothills, bur oak often forms stands with ironwood (*Ostrya virginiana)*. There are scattered inclusions of less than 100 acres (40 ha) each of lodgepole pine (*Pinus contorta*) in the northern Black Hills and non-native Douglas fir (*Pseudotsuga menziesii*) in Norbeck Wildlife Preserve (NWP) (USDA 2013).

On BHNF, there are 77,606 acres (31,406 ha) of riparian areas and wetlands (montane and low-elevation) which includes 3,470 miles (5,584 km) of perennial and intermittent streams (USDA 2005a). Floodplains and low elevation drainages have mixed hardwood trees and deciduous shrubs such as cottonwood (*Populus spp*.), bur oak, green ash (*Fraxinus pennsylvanica*), boxelder (*Acer negundo*), American elm (*Ulmus americana*), willows (*Salix spp.*), and northern hawthorn (*Crataegus chrysocarpa*).

The remaining vegetative cover types are non-forested. Shrublands (dominated by greater than 40% crown canopy of shrubs and less than 10% tree canopy cover) encompass 4,400 acres (1780 ha) (USDA 2005a, USDA 2013) and are dominated by upland shrubs: big sagebrush (*Artemisia tridentata*), silver sagebrush (*Artemisia cana*), mountain mahogany (*Cercocarpus montanus*), creeping juniper (*Juniperus horizontalis*), three-leaved sumac or skunkbrush (*Rhus aromatic var. trilobata*) and chokecherry (*Prunus virginiana*) (Marriott et al. 1999). Prairie and interior grasslands cover 105,805 acres (42,817 ha) with less than 10% tree crown cover and include species such as blue grama (*Bouteloua gracillis*), buffalograss (*Buchloe dactyloides*), oatgrass (*Danthonia spp.*) green needlegrass (*Stipa viridula*), western wheatgrass (*Pascophyrum smithii, Elytrigia spp.*) and non-native graminoids such as smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*) and Timothy (*Phleum pretense*) (USDA 2005a, USDA 2013).

Managing for diverse and dynamic Black Hills ecosystems presents many challenges, including providing a variety of pine densities, ages, structural sizes and other tree species, shrubs and understory. Understory production increases as the overstory stocking level (basal area or BA) and crown cover decrease (Pase and Hurd 1957). Plant diversity demonstrates a similar pattern (Uresk and Severson 1989, Uresk and Severson 1998).

Wild Turkeys and Black Hills National Forest Planning—Wild turkeys have been classified by South Dakota Codified Law 41-1-1(4) as a big game species. Consequently, habitat management recommendations on Forest Service lands usually include wild turkeys with ungulate big game species. In the BHNF Forest Planning process, wild turkeys have been labeled as a *demand species* because of public demand and interest in the species (USDA 2005a). Wild turkeys have a different set of habitat management considerations within the NWP discussed below. The BHNF can implement site-specific habitat considerations for wild turkeys if abundance, availability and habitat condition have been proposed by the public (including SDGFP) and identified by the BHNF as important, substantial land management issues. However, the BHNF is not required to do so. The BHNF has jurisdiction of land management on its lands, but coordination for wildlife management with SDGFP is accomplished through a Memorandum of Agreement (USDA and SDGFP 1985).

Land and resource management emphasis on the BHNF is categorized by geographic areas, known as management areas (MAs). Each MA has a concentrated emphasis on land management prescriptions for certain multiple uses. The BHNF employs six general MA categories which range from little human use to extensive use. Regardless of the BHNF MA designation, a mosaic of pine SS's and densities with a mix of meadows and openings will provide year-round habitat for wild turkeys.

Norbeck Wildlife Preserve—A separate and very unique MA (MA 5.4A) on the BHNF is the NWP. A separate set of directives guide management on 35,000 acres (14,163 ha) and includes a working relationship with SDGFP (USDA and SDGFP 2009). Within the NWP, wild turkeys are labeled as a *focus species*, defined as selected game animals and birds that breed in or spend a significant portion of their life requirements within the NWP (Griebel et al. 2007). The NWP is important for wild turkeys, sportsmen and the viewing public for several reasons:

- Effects of proposed management in the NWP *must* consider impacts to wild turkeys and other focus species (USDA 2010a). Wild turkeys are afforded site-specific considerations in management over and above general BHNF planning.
- Recently, SDGFP and BHNF cooperated in a long-term habitat management project on 26,727 acres (10,816 ha) to improve or maintain certain habitat features for focus species, including wild turkeys (USDA 2010a, 2010b). The level of detail in vegetation treatments and partnership is precedent setting and could be a template for wild turkey habitat treatments outside the NWP boundary.
- NWP shares a 20 mile (32 km) southern boundary with CSP, and wild turkeys can move between the two land units. Habitat projects adjacent to this boundary are planned in a cooperative effort between CSP and BHNF.
- NWP provides a fairly remote and quiet experience for humans, including hunters, looking for solitude and a "walk-in" area unburdened from distractions found elsewhere.
- The last active livestock allotment within the northern-most parcel of NWP was recently phased out by BHNF due to several administrative challenges and impacts to some focus species (USDA 2010c).

Custer Gallatin National Forest

Area and Vegetation—The northern Great Plains in Harding County, South Dakota, has ponderosa pine habitats across private, SDSPL, BLM, and Custer Gallatin National Forest (CGNF). The preponderance of these pine highlands (>78,000 acres [31,565 ha]) are managed by CGNF's Sioux Ranger District. Eight non-contiguous highlands or buttes are scattered within approximately a 90-mile (144 km) radius. Within South Dakota, the Sioux Ranger District manages 5 buttes surrounded by native grasslands mostly in private ownership (Figure 12, Table 11). Three additional buttes of the Sioux Ranger District occur just across the South Dakota border in Carter County, Montana (Figure 12).

Custer National Forest (CNF) and Gallatin National Forest recently combined and references herein prior to that merger are listed as CNF. These pine-clad buttes are caps of resistant sandstone atop erodible silt, clay and sand which rise 328 (100 m) to 984 feet (300 m) above the surrounding plains within the unglaciated Missouri Plateau (Hansen and Hoffman 1988). The ecosystems are highly irregular topography consisting of buttes, slopes, and steep rimrock breaks, and rolling and tabletop grasslands with interspersed hardwood draws (Hansen and Hoffman 1988, USDA 1986a). Precipitation averages 14 inches (35.6 cm), with most of it falling from March through July as spring snowstorms and high-intensity thunderstorms.

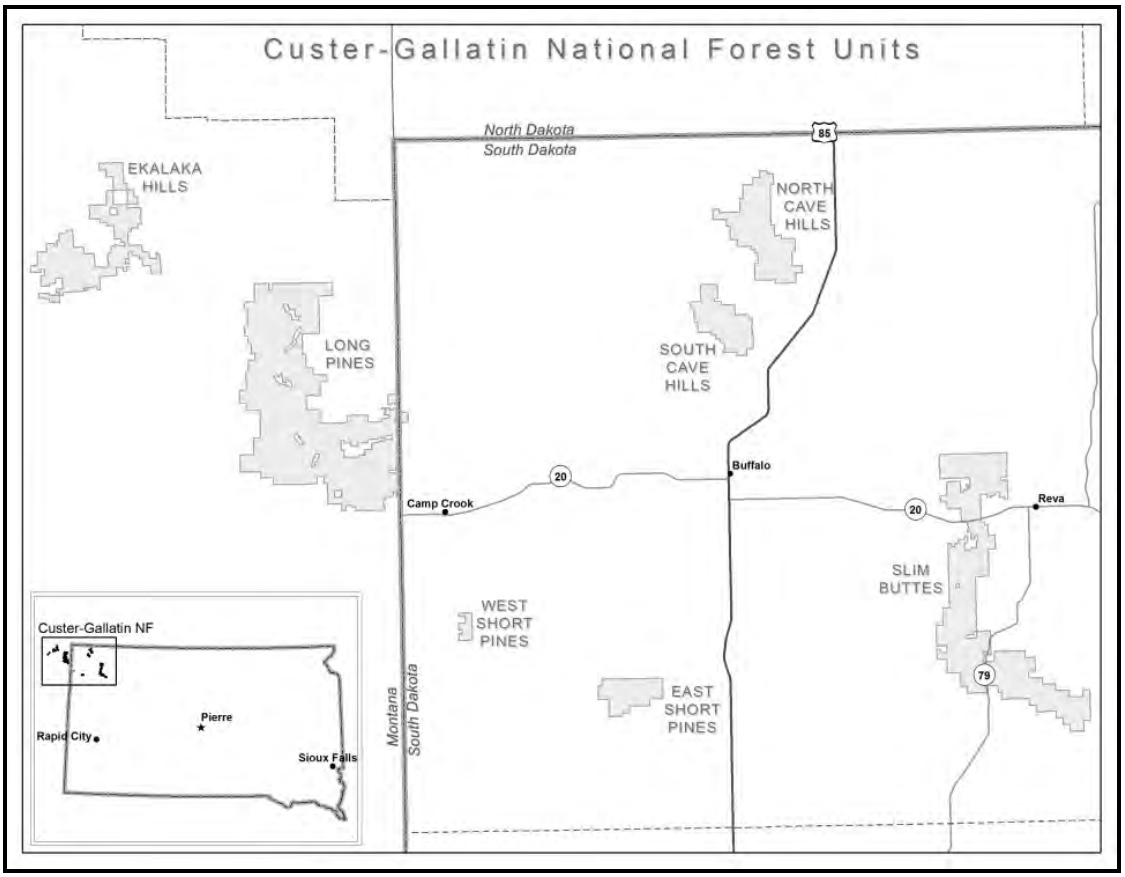

Figure 12. Location of Custer Gallatin National Forest highlands in Harding County, South Dakota and southeastern Montana. (Map by S. Nichols)

Table 11. Acres (hectares) of Custer Gallatin National Forest Lands within the Sioux Ranger District of South Dakota (USDA 2009, USDA Sioux Ranger District Pers. Comm. 2015).

Land Unit Name	Acres (Hectares) in South Dakota
Slim Buttes	47,139 (19,077)
North Cave Hills	14,557 (5,891)
South Cave Hills	8,865 (3,588)
East Short Pines	6,135 (2,483)
West Short Pines	1,269 (514)
Long Pines	320 (130)
TOTAL	**78,285 (31,681)**

Similar to the Black Hills approximately 80–100 miles (128–161 km) to the south, the Sioux Ranger District ecosystems are disturbance based and formed through fire (primarily lightning strikes), insects, storms, disease, and wild ungulate grazing. CGNF regards these disturbances as critical components to sustain biological diversity and strives to achieve or maintain diversity and public values through timber, prescribed fire, and domestic grazing management (USDA 1986b, USDA 1986c) as budgets allow.

In the mid-1880s, prior to these buttes becoming federal forest reserves, privately-owned sawmills provided lumber to territorial settlers. In the West Short Pines, "*practically all the merchantable timber was cut."* (Odell 1983). Early logging which high-graded large pine trees may explain, in part, the absence of large pine today.

In the 1970s, timber production was not sought for commercial value and was treated as an aesthetic value. There was a small private mill in Camp Crook which produced rough lumber for locals (USDA 1972). On the South Dakota side of the Sioux Ranger District, timber treatments prior to the 1980s were mostly individual tree selection and understory thinning (USDA 1972).

In 1981–1984, sampled plots across the Sioux (Montana and South Dakota) and Ashland Ranger Districts (Montana) indicated that pine SS's were heavily dominated by seedling- to sapling-sized trees (86% 0– 4 inches [0–10.2 cm] DBH) followed by even abundance of pole-sized (7% $\geq$ 4–8 inches [10.2–20.3 cm] DBH) and mature-sized (6% $\geq$ 8–16 inches [20.3–40.6 cm] DBH) pine with few very large (<0.5% $\geq$ 16 inches [40.6 cm] DBH) trees (Hansen and Hoffman 1988). Dense basal area ranged from 146 ft^2/acre (33.5 m^2/ha) to over 200 ft^2/acre (45.9 m^2/ha).

In 1997, different random plots were inventoried across the Sioux and Ashland Districts (DeBlander 2001). The inventory mirrored the size class distribution of the 1980s plots with the largest proportion of pine in seedling- to sapling-sized trees (59%) followed by a similar abundance of pole- (15%) and mature-sized (20%) trees. Again, there was a near absence of very large trees (3%). Basal areas were not reported.

It can be inferred from these two inventories, in the most recent 18 years, that over two-thirds of pine on the landscape within the Ashland and Sioux Ranger Districts were in the seedling to sapling growth stage. This indicates heavy pine reproduction and likely pine encroachment into woody draws (narrow gulches dominated by hardwood trees and shrubs), meadows, and other areas historically kept in check by fire (USDA 1992). The remaining one-third were mature trees ($\geq$ 9 inches [22.7 cm] DBH) with a paucity of very large pine trees (> 16 in [40.6 cm] DBH). Since these inventories, there have been 4 substantially large fires on the Montana side of the Sioux Ranger District. Structural stages across the Sioux District have likely changed due to these fires but more recent timber stand inventories are not available.

Since the 1980s, timber management has been focused on salvage, sanitation, and safety removals as budgets allow. In 2014, a commercial timber management project was proposed for the East Short Pines to remove some of the dense saw timber, understory pine, and to reduce fuel loads (USDA 2014). CNF Plan (USDA 1986c) does not have SS objectives for pine.

Today, the dominant overstory habitat type remains ponderosa pine. Juniper is a second conifer species which occurs mostly on north-facing slopes (Hansen and Hoffman 1988) (Figure 13). Understory includes mixed grass prairie species (see list below), sun sedge (*Carex inops* subsp. *Heliophila*), and chokecherry.

Quaking aspen, green ash, plains cottonwood (*Populus deltoids* subsp. *monifera*), and chokecherry make up the dominant hardwood component found in woody draws, ravines, and riparian areas (Rumble et al. 1998) (Figure 14). Green ash and chokecherry vegetation make~~s~~ up a less than 1% of total land area in western South Dakota (Boldt et al. 1978) but is critical to the overall Great Plains grasslands diversity (Uresk et al. 2015; In Press).

Figure 13. Pine dominated highlands characterizes the overstory vegetation of the Harding County highlands, South Dakota. (Photo by M. Deisch).

Figure 14. Hardwoods such as green ash and chokecherry provide habitat for wild turkeys in lower elevations such as woody draws, ravines, and riparian areas. (Photo by M. Deisch)

Hardwood draws that have lacked fire disturbance in the past century now have considerable pine encroachment. Non-native sod-forming Kentucky bluegrass and native western snowberry have become dominant understory components (USDA 2003). Snowberry can increase with over grazing and browsing by both domestic and wild ungulates.

Grassland vegetation across the buttes and lowlands is comprised of northern mixed grass prairie species, predominantly western wheatgrass, threadleaf sedge (*Carex filifolia*), little bluestem *(Schizachtrium scoparium*), big bluestem (*Andropogon gerardii*) , green needlegrass, needle-and-thread (*Stipa comata*), sideoats grama (*Bouteloua curtipendula*), blue grama, fringed sagewort (*Artemisia frigida*), cudweed sagewort (*Artemisia ludoviciana*), purple coneflower (*Echinacea angustifolia*), silverleaf scurfpea (*Pediomelum argophyllum*), gooseberry (*Ribes spp*.), Missouri goldenrod (*Solidago missouriensis*), and soft goldenrod (*Solidago mollis*) (USDA 2003, USDA 2014).

Vegetative foods available to wild turkeys on the pine buttes of Sioux Ranger District include grass seeds (wild turkeys tend to select Kentucky bluegrass, smooth brome, and others) and fruits (gooseberry, snowberry and chokecherry). The dominant winter foods for wild turkeys in the Black Hills include pine and bearberry seeds (Flake et al. 2006). All these food sources are available in the pine buttes.

Other than livestock grazing and some fuel thinning (USDA 1992), there have been few opportunities for mechanical and prescription fire vegetation management on the Sioux Ranger District in South Dakota. Suitable lands for timber production include pine forests with a shrub understory (USDA 1992), but lack of funding and no proximity to commercial timber mills greatly restrict viable options to best manage pine.

Wild Turkeys and Custer Gallatin National Forest Planning—Merriam's wild turkeys were released in 1953 (33 birds among West Short Pines, South and North Slim Buttes, and North Cave Hills) and 1959 (8 birds in East Short Pine) on the Sioux Ranger District in South Dakota. The first hunting seasons in Harding County were in 1957, 1959, and 1960 (Bever 1961). By 1972, it was reported that the wild turkeys were well established (USDA 1972), but SDGFP in-house file notes stated that wild turkey habitat in the 1970s appeared to be abundant but wild turkey numbers were not. File notes also indicated that wild turkeys only occupied habitats within the North Cave Hills and the north end of the Slim Buttes.

Similar to BHNF, CGNF Management Plan designated MAs with specific management emphasis. Of the 9 MAs within South Dakota, 7 are likely to have some seasonal or annual habitat for wild turkeys (Table 12). Wild turkeys and white-tailed and mule deer are labeled as a *selected species* within MA "D" and habitat for these species govern specific management direction (USDA 1986c). Timber, livestock, and vegetation treatments will be aimed at mitigating adverse impacts to vegetation although short-term impacts may be necessary to achieve long-term goals. Analysis of wildlife habitat prior to a treatment will include, but is not limited to, forage, cover, winter range, and roost areas. All wildlife, not just *selected species*, across CGNF will be given some level of effects consideration.

CGNF can implement site-specific habitat considerations for wild turkeys on most MAs if abundance, availability, and condition of wild turkey habitat have been proposed by the public (including SDGFP) and identified by CGNF as important and substantial land management issues. However, CGNF is not required to do so. CGNF has jurisdiction of land management on its lands, but coordination (with State agencies and other critical stakeholders) is the highest priority of wildlife and fish management on the CNF (USDA 1986b). For South Dakota wildlife and fisheries trust resources, this is accomplished through a Memorandum of Agreement (USDA and SDGFP 1985, USDA 1986c).

Table 12. Management Areas with wildlife considerations by land unit and acreage (hectares) on the Sioux Ranger District in South Dakota. Wildlife, including wild turkeys, could occur on the listed management areas, although management emphasis will include other public land uses (USDA 1986c).

Management Area (Management Emphasis)	Land Unit Name	Acres (Hectares) in South Dakota	Total Acres (Hectares) in South Dakota
B (Livestock grazing, minerals, and energy)	Slim Buttes North Cave Hills Long Pines	44,735 (18,104) 8,857 (3,584) 324 (131)	53,916 (21,819)
C (Elk, raptors, and grouse)	All Units especially rimrock formations	10,013 (4,052)	10,013 (4,052)
D (Wild turkey, White-tailed and mule deer)	Slim Buttes East Short Pines West Short Pine	1,129 (456) 6,135 (2,483) 1,269 (514)	8,533 (3,453)
E (Minerals and energy)	All Units	14, 525 (5,878)	14,525 (5,878)
L (Candidate Research Natural Areas)	Slim Buttes – Deer Draw Hardwoods and Riparian	131 (53)	131 (53)
N (Woody Draws)	All Units	Unknown	Unknown
O (National Natural Landmark)	Slim Buttes – The Castles	977 (395)	977 (395)

BUREAU OF LAND MANAGEMENT

The Bureau of Land Management (BLM) manages 274,239 acres (110,981 ha) in western South Dakota (Figure 15). The BLM's multiple-use mission, set forth in the Federal Land Policy and Management Act of 1976 (U.S. Department of the Interior and Bureau of Land Management 2001), ensures that the BLM manages public land resources for a variety of uses, including: 1) energy development, 2) livestock grazing, 3) recreation, and 4) timber harvesting. Where riparian vegetation occurs on BLM land, such areas can be utilized for nesting, brood-rearing, and roosting by Merriam's wild turkeys. Also, these areas can provide recreational opportunities for wild turkey hunting. The BLM's Resource Management Plan (RMP 2015) includes the following management decisions pertaining to wild turkeys in chapter 3 of the document: Forest treatments will retain or improve turkey roost sites. Such treatments will retain 10 inch or larger diameter at breast height trees in groups of 3 to 6 that have roost tree characteristics on slopes and ridges to provide roost sites for turkeys within ponderosa pine habitat. The RMP also directs that special consideration be given for unique habitats, such as riparian areas and woody draws, important for wildlife. These and other BLM management decisions support management of habitats for wild turkey populations.

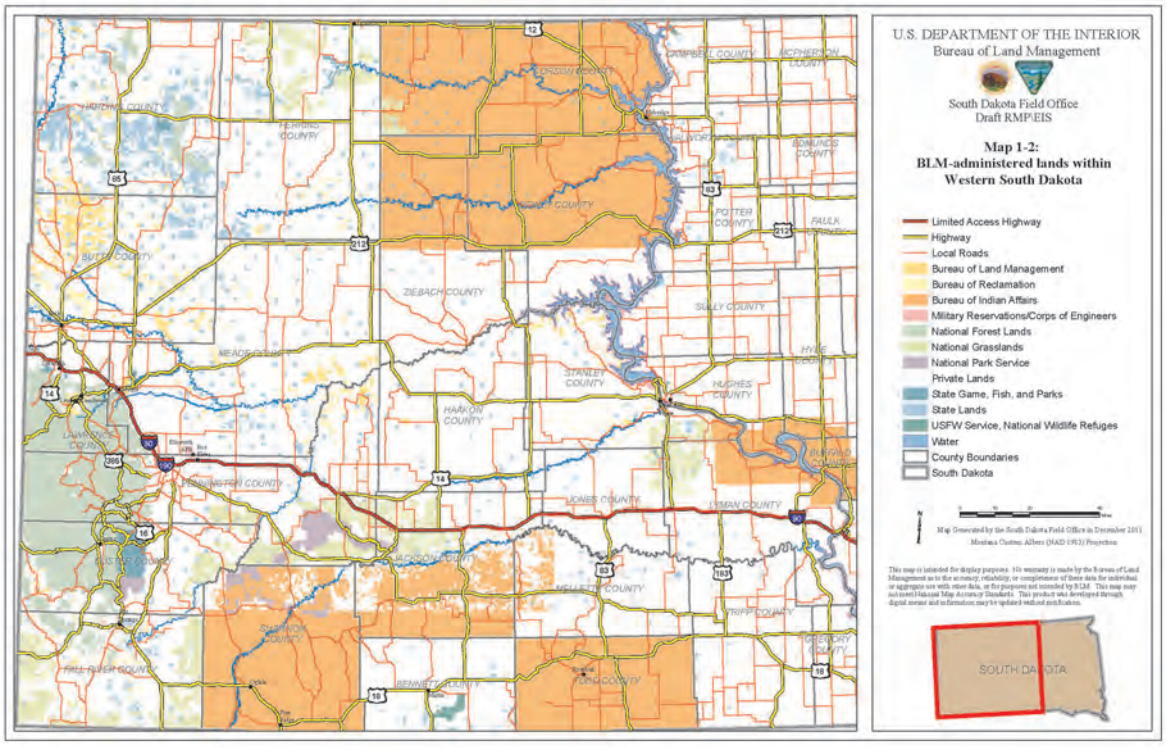

Figure 15. Location of Bureau of Land Management lands in western South Dakota. (Map provided by the Bureau of Land Management).

Game Production Areas

The SDGFP owns and manages 720 Game Production Areas (GPAs) encompassing 285,623 acres (115,588 ha). Wild turkeys may occur on many of these GPAs, particularly those located along major riverine systems, along the Missouri River reservoirs, and in the Black Hills. General habitat management objectives on GPAs are designed to benefit a wide array of wildlife species and public uses. Woody cover development and enhancement practices such as establishing and encouraging tree and shrub habitat benefit wild turkeys throughout the year. Additionally, thinning and timber harvest on selected areas are used to promote hardwood and mast producing species. Food plots of unharvested grain crops are utilized by wintering wild turkeys on some GPAs. Grassland habitats are periodically managed by haying and/or grazing to maintain diverse and desirable plant communities which provide nesting and brood rearing habitat for wild turkeys. Wild turkey hunting opportunities are also considered in habitat management planning and public use facility developments.

The SDGFP's land acquisition efforts across the state focus on securing habitat types that support resident and migratory wildlife species while providing various wildlife-related recreational opportunities. This approach has resulted in a widely distributed land inventory of high quality habitat types that is both biologically sound and publicly accessible. Land acquisition priorities include parcels that provide a connection or corridor between other public lands, additions to existing GPAs, parcels that enhance or facilitate public access to GPAs and other public lands, in-holding and round-out parcels that consolidate or connect existing GPAs, and parcels that provide buffers or are necessary for maintaining or enhancing the integrity of existing GPAs and other public lands.

Private Lands

Outside of the Black Hills and Custer Gallatin National Forest lands and other parcels of various types of public lands across the state described above, the remaining high-quality wild turkey habitat occurs on private or tribal controlled lands. West of the Missouri River, its large tributaries, including the White, Bad, Cheyenne, Belle Fourche, Moreau, and Grand Rivers, and their respective larger tributary streams, are characterized by narrow wooded corridors and associated shrub and grassland habitats capable of sustaining excellent populations of wild turkeys. Land use in these areas is predominantly cattle grazing on native rangelands with associated hay production and cultivation of small grain and row crops. Grazing management strongly influences habitat conditions in these woodland, shrubland, and grassland environments. Season-long over-grazing and traditional livestock wintering/feeding areas in wooded riparian areas can significantly limit local available habitats, whereas more carefully managed rangelands are capable of providing quality year around habitat for desired populations of turkeys. Post-settlement stream/river channel incision, lack of full functioning floodplains, stream flow regulation by large upstream dams, excessive browse by cattle and deer, cropping, and competition from introduced invasive woody species such as Russian olive all contribute to the profound lack of natural regeneration of native woodland and shrubs species along many reaches of these western river/stream corridors.

East of the Missouri River, land use along the lower wooded reaches of the Missouri's tributaries and the woody draws along the eastern edges of the Prairie Coteau and Missouri Coteau is a mix of livestock grazing and cropland agriculture as dictated by topography and soil types. Conversion of remaining native grasslands or expired CRP acres is a significant threat to landscapes adjacent to these woodland corridors and woody draw habitats. As noted above for western river/stream corridors, grazing management and other factors can strongly influence potential for natural regeneration of these important native woodland habitats.

Currently, SDGFP private lands habitat programs and staff prioritize working on grazing management projects with cooperating grass-based agricultural producers on ranches and farms located in landscapes with high proportions of intact grassland. The SDGFP technical and financial assistance is available for conservation practices such as cross fences, water developments, pond/wetland projects, riparian area fencing, pasture or range seedings, and grazing planning. Other practices such as winter food plots, woody cover plantings, riparian tree and shrub plantings, and habitat fencing are other practices delivered to assist with meeting the goals of cooperating landowners while benefitting a host of wildlife, including turkeys. Some of the most promising projects recently completed that directly benefit important turkey habitats have included fencing of relatively large, dense stands of young cottonwoods and other native hardwood saplings that were naturally established on exposed floodplain substrates during 2011 flood events. We are hopeful that protection of such areas from livestock grazing will allow such stands to persist even with continued, but perhaps less intense, deer browsing disturbance.

The SDGFP private lands staff have also cooperated with local conservation districts to provide financial and technical assistance to complement SD Department of Ag Conservation Commission grant funding aimed at demonstrating planting and protection techniques to establish native riparian tree and shrub plantings. Additionally, other riparian fencing, grazing management, woody cover establishment practices, etc. can be implemented on private working lands with attractive incentives available through USDA's CRP, EQIP, and CSP programs. Despite the high forage production potential and important habitat values of riparian areas in working landscapes, landowner interest and participation rates in the various programs has been relatively low. Additional outreach with the landowner community is needed to better understand this trend and educate potential cooperators on the scope of practice and cost share opportunities available for working ranch and farmlands. Evaluation of existing projects is also needed to better inform future approaches delivered by SDGFP and other conservation partners.

CITIZEN INVOLVEMENT AND OUTREACH

Effective decision-making by wildlife agencies necessitates the need to consider public perceptions and opinions, along with potential responses to management policies. Along with hunter harvest and biological data collection, public involvement is an important component in revising and implementing a wild turkey management plan in South Dakota. Public participation helps ensure decisions are made in consideration of public needs and preferences. It can help resolve conflicts, build trust, and inform the public about wild turkey management in

South Dakota. Successful public participation is a continuous process consisting of a series of activities and actions to inform the public and stakeholders, as well as obtaining input regarding decisions which affect them. Public involvement strategies provide more value when they are open, relevant, timely, and appropriate to the intended goal of the process. It is important to provide a balanced approach that represents all stakeholders as a combination of informal and formal techniques reaches a broader segment of the public. When possible, combining different techniques is preferred over a single public involvement approach since no single citizen or group of citizens can represent the views of all citizens. Multiple avenues for public involvement and outreach, therefore, were used in the revision of the Wild Turkey Management Plan including commission meetings, social media, written public comment, stakeholder group, and other venues. These approaches are designed to involve the public at various stages of plan development and to ensure opportunities for participation are accessible to all citizens.

Wild Turkey Stakeholder Group

A stakeholder for this purpose is defined as a person, group, or organization with an interest in the management of wild turkeys. Because wild turkeys are greatly prized by many South Dakota residents, SDGFP felt it was important to have a diverse representation of stakeholders to provide input for future management of wild turkeys in South Dakota. The formation and input from this stakeholder group, however, did not inhibit SDGFP from obtaining and incorporating additional input or opinions on wild turkey management in South Dakota.

The South Dakota Wild Turkey Stakeholder Group included representation from the following: general public, wild turkey hunters, private landowners, agricultural interests, and conservation organizations. Those who served on the South Dakota Wild Turkey Stakeholder Group during this planning process can be found on page ii. A Wild Turkey Stakeholder Group Charter (Appendix 2) was shared with all stakeholders and described the purpose, objectives, authority, roles, and responsibilities of this group.

Key topics and issues discussed by the stakeholder group included the following: status of wild turkeys, SDGFP wild turkey depredation program, overview of current management plan, current challenges and opportunities, unit-specific population objectives, habitat and access programs, outreach and education, urban wild turkey management, rifles during the spring season, harvest strategies matrix table, unit boundaries, and review of draft revisions of planning documents.

Individual views and opinions varied amongst the broad representation of this stakeholder group. While many topics were discussed at length, a great deal of time was devoted to how SDGFP determines unit-specific population objectives, landowner tolerance, hunter desires, and depredation tools. Careful considerations of these opinions were included in identifying the management objectives and strategies necessary to successfully manage wild turkeys within the varying social carrying capacities.

Public Meetings

The term *public meeting* is used as an umbrella term for all types of meetings, including but not limited to public hearings, open houses, or workshops. SDGFP uses a variety of public meeting formats designed to be accessible by all members of the public and to provide meaningful opportunities for public involvement. An important involvement opportunity exists through the SDGFP Commission. As part of the rule setting process, the SDGFP Commission formally holds a public hearing at each meeting where it takes public testimony regarding pending matters under the commission's purview, including but not limited to wild turkey management. In addition to the public hearing process, the Commission also reviews department management plan drafts and related public comments, and they formally approve final plans.

In addition to these formal involvement opportunities, SDGFP provides informal opportunities for public participation. To ensure accessibility to all interested individuals, multiple regional open houses are held each year in different locations and at various times to provide for maximum participation. These open houses are advertised to the public through a variety of outlets and are designed to both inform the public about specific topics (i.e., unit-specific wild turkey population objectives, season dates, units, etc.) and to gather input and feedback from the public. Wild turkey planning meetings and working groups are also used to inform and collect input from targeted stakeholders and groups regarding wild turkey populations and season recommendations. Each given situation is different, and each approach to a specific challenge will be unique; therefore, public involvement strategies will use a variety of techniques to encourage all citizens to actively participate.

Social Media

The South Dakota Wild Turkey Action Plan 2020-2026, along with other wildlife management plans, is located on the South Dakota Game, Fish and Parks website at http://gfp.sd.gov/wildlife/management/plans/default.aspx. Information on wild turkey hunting in South Dakota, along with season dates and other surveys and reports, can be found at http://gfp.sd.gov/hunting/big-game/turkey/default.aspx. As the plan was being developed, information such as members of the stakeholder group, meeting agendas and notes, and other information items was shared with the public at http://gfp.sd.gov/hunting/big-game/turkey/wild-turkey-management-plan.aspx.

Feedback on the plan was solicited through several different platforms by way of a stakeholder workgroup, as well as through public meetings, open house events, and the standard commission meeting process. Plan updates and other information were provided through digital platforms by using Facebook, Twitter, and targeted email messaging. Scheduled Facebook and Twitter posts were also made after the release date of the plan as reminders to let followers know that this information is available online. However, when users made comments via social networking, they were directed to provide those comments in writing to wildinfo@state.sd.us or mail them to 523 E. Capitol Ave., Pierre, SD 57501, and include a full name and city of residence in order for them to be a part of the official public record.

Media was also informed of the plan through the standard press release distribution process. Press releases were sent via email to a group of over 8,500 people (media and customers alike) who have opted in to receive all SDGFP News (or press releases). Press release information was also shared internally with over 550 SDGFP employees and was posted to all SDGFP digital platforms mentioned above as well as online at: http://gfp.sd.gov/news/default.aspx and http://news.sd.gov/.

Public Opinion Surveys

A sample of 1,250 firearm hunters and 1,250 archery hunters was drawn from the 2018 SDGFP license database for a total sample size of 2,500 to survey turkey hunter opinions related to turkey management issues (Longmire 2018). Just under half (47%) of spring turkey hunters supported restricting firearms to shotgun only during all spring firearm turkey seasons. One-third (34%) of hunters were opposed to this restriction, and 19 percent neither opposed nor supported this restriction. There were statistically significant but minimal differences between license categories and hunters' level of support/opposition to restricting firearms to shotgun only during all spring turkey seasons (Longmire 2018). Nearly half of spring turkey hunters (49%) support restricting firearms to shotgun only during the Black Hills firearm spring turkey season. Over one-quarter (29%) oppose this restriction and 22 percent neither oppose nor support it. There were statistically significant but minimal differences between license categories in their level of support/opposition for restricting firearms to shotgun during the Black Hills firearm spring turkey season (Longmire 2018).

Gigliotti (2000a and 2000b) conducted a public opinion mail survey of 2,790 resident and non-resident spring wild turkey hunters with an 86% return response rate. The survey focused on management issues related to spring wild turkey hunting, particularly the issue on whether to eliminate the use of rifles and handguns for spring wild turkey hunting. Most spring wild turkey hunters used shotguns (89% for spring prairie season and 89% for spring Black Hills season). About 21% used a rifle for spring prairie wild turkey hunting, and about 16% used a rifle for spring Black Hills wild turkey hunting (total exceeds 100% because multiple weapons can be used by a single hunter). Very few hunters used a handgun for spring wild turkey hunting. Spring wild turkey hunters were a satisfied group with 89% indicating they were satisfied with the current turkey hunting opportunities in South Dakota with only 4% dissatisfied. Most (83%) were satisfied with the current regulations related to wild turkey hunting, with only 5% dissatisfied. About 50% of spring wild turkey hunters would support eliminating the use of rifles and handguns for spring wild turkey hunting while 37% would oppose eliminating this use. Non-residents were more in favor of eliminating the use of rifles and handguns than residents (66.1% vs. 43.3%). Gigliotti (2009) found no difference in spring wild turkey hunter attitude toward this issue in a more recent mixed mode survey (e-mail and regular mail) with a response rate of 44% for email and 75% for regular mail. Both surveys found excitement, nature enjoyment, social interaction, and challenge were the primary motivations for spring wild turkey hunting.

Non-Governmental Organizations

The National Wild Turkey Federation (NWTF) is the principal non-profit organization dedicated to the conservation of wild turkeys and the preservation of hunting heritage. Founded in 1973, the Edgefield, South Carolina based organization has local chapters in every state. The NWTF was instrumental in the wild turkey recovery by facilitating introductions and reintroductions throughout the country. As wild turkeys have been introduced or reintroduced into most suitable habitat, their current priority is habitat improvement, hunter recruitment, and hunter access. Their current initiative, *"Save the Habitat. Save the Hunt."*, strives to raise $1.2 billion to conserve or enhance more than 4 million acres (1,618,743 ha) of essential upland wildlife habitat, create 1.5 million hunters, and open access to 500,000 acres (202,342 ha) for hunting, shooting and outdoor enjoyment. South Dakota has 21 local chapters and a state chapter with 3,000 members. Since 1985, approximately $900,000 has been raised and spent on projects within the state through the Hunting Heritage Super Fund. Projects include habitat enhancement, conservation education, youth and women's outdoor events, disabled hunter events, hunting heritage outreach, hunter safety, wild turkey restoration, rewards, wild turkey management, land purchase and protection, access projects, and research. Two SDGFP biologists serve on the Hunting Heritage Super Fund committee and state chapter board, as well as the national technical committee. The NWTF biologist manages the Hunting Heritage Super Fund, assists partners with habitat and management projects, and carries out the NWTF mission in the region. Several other non-governmental conservation organizations are active within South Dakota, and their efforts also likely benefit wild turkey habitat, hunter access, and the hunting heritage. These organizations often work together to achieve common goals, especially large projects such as land purchases.

CHALLENGES AND OPPORTUNITIES

Habitat

Montane Ponderosa Pine Habitats of the Black Hills and Western Prairie—Great opportunities exist for wild turkey hunters and bird enthusiasts to enjoy Merriam's wild turkeys in montane ponderosa pine habitat in western South Dakota because much of this habitat is on public land (Figures 16 and 17). The Black Hills is mostly comprised of USFS land and administered by the BHNF. The scattered ponderosa pine highlands of the North Cave Hills, South Cave Hills, East Short Pines, West Short Pines, and Slim Buttes are USFS land administered by CGNF. Access to public lands is typically very reasonable, but travel management policies can vary by Federal and State jurisdiction.

Primary challenges facing the management of Merriam's wild turkeys in the Black Hills involve changing landscape conditions. The mountain pine beetle (MPB) is an endemic insect and a substantial mortality agent in unmanaged ponderosa pine stands (Furniss and Carolin 1977). Beetle outbreaks have killed millions of trees in the Black Hills since the early 1900s (Blackman 1931, Thompson 1975). During the most recent epidemic, beginning in the mid-1990s, considerable tree mortality occurred throughout the Black Hills (Schmid et al. 2007). From 1996–2013 an estimated 414,000 acres (167,540 ha), or roughly a third of the Black Hills,

incurred substantial tree mortality (Howell et al. 2014). Characteristics of trees within stands that are highly susceptible to MPB during epidemics include trees ≥6 inches (15 cm) in diameter at DBH and basal area exceeding 70–80 ft^2/acre (16.1–18.4 m^2/ha) (Fettig et al. 2007, Schmid et al. 2007). Stands that are susceptible to MPB can also provide optimal winter habitat conditions for wild turkeys (Lehman et al. 2015). Tree basal areas >100 ft^2/ac (23 m^2/ha) have been recommended for Merriam's wild turkey winter habitat in the northern part of their range (Hoffman et al. 1993, Rumble and Anderson 1996a, Lehman et al. 2007a). Understanding the dynamics of ponderosa pine regeneration and growth patterns as it relates to natural disturbance and silviculture is intrinsically connected to winter resources needed by Merriam's wild turkeys.

Figure 16. Ponderosa pine habitat utilized by Merriam's wild turkeys in the Black Hills of South Dakota. (Photo by C. Lehman)

Figure 17. Ponderosa pine habitat utilized by Merriam's wild turkeys in the Slim Buttes of western South Dakota. (Photo by L. Flake)

A recent evaluation of the effects of MPB on winter habitat for wild turkeys indicated the MPB epidemic reduced high-quality winter habitat conditions by reducing the large tree (>9 inches [22.9 cm] DBH) component and reducing stand BA and associated canopy cover (Lehman et al. 2015). Pre-commercial thinning and uneven-aged management practices can reduce the recovery time of these forests but managing the forest structure to reduce the likelihood of a large MPB epidemic or stand replacing wildfire would be preferred over mitigation post-event.

Management for a mosaic of ponderosa pine structural stages with varying ages and stocking densities will not optimize winter habitat for wild turkeys but will reduce loss of dense and mature forests to MPB or catastrophic wildfire, thus providing winter habitat conditions needed by Merriam's wild turkeys in the future (Lehman et al. 2015).

In addition to the winter habitat loss associated with the MPB epidemic, there has been an increase in land development on private in-holdings adjacent to BHNF. A proportion of agricultural and ranching land has been converted to housing developments or smaller acreage residences which are sometimes referred to as "ranchettes". In Pennington and Custer counties, acres classified as agriculture has decreased an average of 4% from 2002–2012 and size of farms has decreased an average of 8% (USDA, Census of Agriculture 2002, 2012). Further, housing units per land area in both counties increased an average of 10% from 2000–2010 (2010 Census of Population and Housing, USDA 2010). Subdivisions and smaller acreage residences provide bird feeders and foraging sources for wild turkeys. Merriam's wild turkeys will readily use cereal grains when ponderosa pine seeds are limited in availability (Lehman et al. 2007a). With loss of ponderosa pine habitat to the MPB epidemic, such sources of forage are attractive for wild turkeys. To compound matters, many of these smaller acreages, or ranchettes, do not provide access for hunting and act as refuges where wild turkeys can avoid hunter harvest. This provides challenges for managers to control harvest and creates additional human-wildlife conflicts in developed areas.

In the pine highlands administered by CGNF, pine habitats can be at risk from catastrophic wildfire, especially during years of drought. In the Long Pines of southeastern Montana, a catastrophic wildfire removed 74% of the ponderosa pine habitat, and Merriam's wild turkeys were displaced by loss of entire pine stands and avoided the burned habitat for winter resource selection (Thompson 1993). Due to extremely dry spring conditions, a 4,000-acre (1,619 ha) fire in April 2015 burned with variable severity and intensity in the northern Slim Buttes. The long-term effects of that fire will determine both the benefits and potential detriments to wild turkey habitat. Low severity fires are not a concern and can enhance nesting and brood-rearing habitats for wild turkeys in some cases; however, the loss of winter forage sources and roosting habitats frequently results from severe fires that completely consume large stands.

Understory vegetation management can impact resources needed by wild turkeys, and livestock grazing typically occurs in meadows and open habitats which overlaps with resource selection of hens with poults during the summer months. If meadows or other open-canopied habitats are overgrazed, it can present a challenge for managers interested in wild turkey poult survival. If overgrazing removes nearly all the herbaceous vegetation, the needed concealment cover and foraging resources for poults is eliminated (Flake et al. 2006). Herbaceous biomass

provides cover to avoid predation, and the invertebrates needed for foraging is correlated with grass and forb biomass. It is recommended that managers maintain 1,041–1,162 lbs/acre (1,170–1,306 kg/ha) herbaceous biomass through August in ponderosa pine habitats to provide poult-rearing habitat (Rumble and Anderson 1997, Lehman et al. 2012). For monitoring of vegetation, we recommend using Robel pole measurements and estimation of herbaceous biomass using previous techniques (Robel et al. 1970, Rumble and Anderson 1997, Benkobi et al. 2000, Lehman et al. 2012); however, if ocular methods are used then 1,070 lbs/acre (1,200 kg/ha) roughly equates to vegetation at least 8 inches (20.3 cm) tall, and that will provide the resource needs for poults. This recommendation would apply to other regions in South Dakota where poults require brood-rearing habitat during summer.

Riparian and Floodplain Forest of the Western Prairie and Missouri River Valley—Riparian and floodplain woodlands associated with the Missouri River and smaller river systems west of the Missouri River can support substantial wild turkey populations when environmental conditions support robust vital rates (Figure 18). The river floodplains provide roughly 8% woodlands as cover for wild turkeys in this system (Knupp 1990). Primary tree species in these systems include plains cottonwood, green ash, boxelder, and chokecherry (Figure 19; Hanson and Hoffman 1988, Knupp-Moore and Flake 1994, Dixon et al. 2010). The remainder of vegetation is primarily rangelands/grasslands with shrubland inclusions, and the condition of these vegetation communities may be an important driver in wild turkey nest survival and poult production. Precipitation patterns can highly influence both vegetation growth and wild turkey demographics. In the southern Great Plains, reproduction of Rio Grande wild turkeys was negatively influenced by drought (Hohensee and Wallace 2001, Collier et al. 2012). Understanding how vital rates vary with precipitation and habitat conditions in this prairie landscape are unknown, and this provides a challenge for wild turkey management.

Figure 18. Riparian zone providing cottonwood forest habitat for Merriam's wild turkeys in western South Dakota. (Photo by C. Lehman)

Large cottonwood trees are important roost trees for wild turkeys in prairie landscapes in South Dakota (Flake and Ashton 1992). Based on GIS analyses of historic maps and aerial photography, historic floodplain cottonwood forests, woodlands, and shrublands have declined

47% from 1892 to 2006 along the Missouri River with study sites ranging from Montana to Missouri (Dixon et al. 2010). Much of the floodplain forest loss was linked to clearing for human land uses (e.g., primarily agricultural cropland) or flooding by reservoirs. Perhaps more of a concern is related to the regeneration of stands. Analysis reveals current cottonwood stands are >50 years old (62%), with only 14% of stands being established in the last 25 years (Dixon et al. 2010). The authors of this research indicate that cottonwood forest regeneration is not keeping pace with loss of habitat, and lack of regeneration is related to a reduction in sandbar formation which severely limits opportunities for new cottonwood seedling establishment (Dixon et al. 2010). Lack of cottonwood regeneration was also documented in a separate study along the Missouri River (Volke et al. 2015). An additional concern is that riparian woodlands will not regenerate when there is excessive livestock grazing or trampling along riparian corridors (Uresk and Boldt 1986). The future of this forest community appears to be uncertain, and future wild turkey populations and distribution will certainly be closely tied to this important plant community.

Another concern is damage or depredation by wild turkeys to silage, millet or oat bales, and other stored grains at ranches and farms during the winter months. One of the main reasons for increased depredation on the western prairie is the lack of harvested crop fields or food plots along riparian corridors, as much of this region is primarily rangelands (Flake et al. 2006). With the lack of high energy nutritious foods being available, wild turkeys readily utilize stored agricultural feeds immediately adjacent to farming and ranching operations. This behavior is more pronounced during winters with colder temperatures and greater snow depths. In some cases, producers could potentially plant food plots or agricultural fields to provide more high energy foods during winter. Providing alternative winter feeds may reduce depredation to stored sources (Flake et al. 2006).

Figure 19. Hardwoods such as green ash and chokecherry provide habitat for wild turkeys in lower elevations such as woody draws, ravines, and riparian areas. (Photo by M. Deisch)

In most cases, implementing practices, such as putting protective netting over bales and covering stored grains, will reduce or minimize wild turkey depredation on stored feeds prior to producers feeding cattle. Typically, producers have more tolerance for wild turkeys foraging on the waste grain present on cattle feed grounds after the cattle have been fed, versus direct depredation of feed stores.

Glacial Escarpments—Two major landforms rise hundreds of feet above the adjacent lowland areas of eastern South Dakota and portions of these landforms provide wild turkey habitat. The glaciated landforms are the Prairie Coteau in northeastern South Dakota and the Missouri Coteau of east-central South Dakota (Johnson et al. 1995). The eastern flanks of these landforms provide favorable microclimate conditions and fire protection for woodland habitat in an otherwise grass and cropland dominated portion of the state.

Where the Prairie Coteau drops off to the Minnesota-Red River lowlands in Marshall, Roberts, Grant, and Deuel counties, the topography is characterized by a series of large ravines (often called "coulees") with sometimes steep slopes (Figure 20). The cool and moist east and north exposures support deciduous woodlands while the adjacent, somewhat drier slopes support intermixed grassland and shrublands with intermixed woodlands. These areas support a rich mix of deciduous trees including bur oak, American basswood, plains cottonwood, boxelder, quaking aspen, and sugar maple (*Acer saccharum*) (Knupp-Moore and Flake 1994). Wild turkeys utilize the mixture of grassland, shrubland, and woodland for foraging, roosting, nesting, and brood-rearing.

Figure 20. Deciduous forests of the Prairie Coteau transition into the cropland areas of the Minnesota-Red River lowlands of northeastern South Dakota. (Photo by C. Lehman)

During fall and winter, cropland and ranch headquarters become increasingly important for food and protection, particularly during harsh winters. This unique region of diverse habitat availability provides suitable habitat for all wild turkey life cycle needs.

The eastern slope of the Missouri Coteau exhibits similar characteristics as the Prairie Coteau, but the woodlands are less extensive due to the drier climate and comparably subtle terrain. The most pronounced escarpment with extensive timber occurs in central Jerauld County. The combination of grassland, shrubland, forest, and adjacent agricultural fields fulfill the year-round needs of wild turkeys. Along the Missouri Coteau, wild turkeys occupy approximately a 35-mile (56 km) long, 5-mile (8 km) wide corridor from east-central Hand County through central Jerauld County.

Wild turkeys within these escarpment habitats will benefit from the retention of the existing habitat. Conversion of grassland to cropland has occurred throughout South Dakota in recent years which could result in loss of suitable wild turkey habitat (Lark et. al 2015, Reitsma et al. 2014, Wright and Wimberly 2013). However, much of the grassland associated with the glacial escarpments would be marginal or unsuitable to farm. Some of the grasslands in these areas are enrolled in the CRP and are used by wild turkeys for nesting (Switzer and Tucker 2009). Most of the glacial escarpments are working lands used for livestock grazing. Management should focus on providing technical and financial assistance related to grazing management to assure producers have the tools they need to implement sound grazing plans. Well managed uplands are a sustainable source of forage for livestock producers, but also represent important foraging, nesting, and brood-rearing habitat for wild turkeys. In areas where hardwood regeneration may be lacking, planting trees may improve or sustain deciduous forest habitat which is crucial for wild turkeys.

Eastern Rivers and Tributaries—The lower reaches of the James, Vermillion, and Big Sioux rivers were likely within the native range of eastern wild turkeys. The floodplains, tributaries, and draws associated with these eastern rivers support diverse deciduous woodlands and untilled upland corridors necessary to support wild turkeys (Figure 21).

The woodland habitat along the lower Big Sioux includes a variety of species including plains cottonwood, green ash, boxelder, American elm, silver maple (*Acer saccharinum*), peachleaf willow, and hackberry (*Celtis occidentalis*). Some of the most extensive and diverse woodlands in eastern South Dakota occur in areas along the Big Sioux River south of Sioux Falls in or near Newton Hills State Park. The extent and diversity of woodland generally decline north of Sioux Falls, but wild turkey populations still extend into Brookings County. Farther to the north, the Big Sioux does not have sufficient woodlands to support wild turkey populations.

The James River stretches 450 miles (724 km) in South Dakota from its confluence with Missouri River near Yankton all the way to the North Dakota border. The lower James River woodlands are comprised of green ash, boxelder, plains cottonwood, and American elm. Sufficient habitat exists to support wild turkeys from just south of Huron to its confluence with the Missouri River. Wild turkey habitat along the James River improves as the riverine system flows south. North of Huron, pockets of marginal habitat with the potential to support wild turkeys exists.

However, most of the woodland habitat is associated with the floodplain with limited woodland habitat associated with tributaries or river breaks which would likely limit the success of future wild turkey introductions.

Figure 21. Deciduous forests along the James River in eastern South Dakota provide habitat for eastern wild turkeys. (Photo by A. Leif)

The lower Vermillion River and two of its tributaries, Clay and Turkey creeks, in Clay, Turner, and Yankton counties have ample woodland habitat to support wild turkeys. Portions of the upper reaches of Clay and Turkey creeks have extensive woodland habitat and represent some of the largest and unique tracts of woodland in eastern South Dakota.

Most of the habitat associated with eastern rivers and tributaries are narrow corridors. For wild turkeys to persist, it is imperative that woodland and additional untilled uplands remain. Ironically, the portion of the native wild turkey range in eastern South Dakota is probably at most risk for habitat loss. In eastern South Dakota, cropland expansion onto previously uncropped land with much of the converted land classified as marginal or unsuitable as cropland has increased (Lark et. al 2015, Reitsma et al. 2014, Wright and Wimberly 2013). The narrow corridor of wooded and herbaceous uplands along major rivers and tributaries are vulnerable to cropland conversion. Wild turkey populations have recently fallen below desirable levels in eastern South Dakota likely in response to unfavorable weather, but habitat loss could be playing a substantial role in the decline. Future management should target grassland and hardwood tree establishment along the river corridors and advocacy for retention of existing habitat.

Disease

Wild turkeys can contract and die from various diseases, but serious losses from disease outbreaks have not been reported in the published literature nor are we aware of any such outbreaks in South Dakota. Most of the diseases that can affect wild turkeys also occur in domestic turkeys and chickens. Disease transmission among captive flocks cannot predict how a disease would impact wild turkey populations due to the relative lower density of birds. However, wild turkeys can become concentrated under certain circumstances during winter which could increase the chance of a larger disease outbreak. But again, large disease outbreaks have not been documented in wild turkeys in South Dakota.

Avian pox (also known as fowlpox virus [FWPV]), a viral disease, is one of the most common wild turkey diseases in the eastern U.S., sometimes killing or making the birds more vulnerable to predation. This disease often results in prominent wart-like growths on unfeathered areas of the body, particularly the head. Biting insects such as mosquitoes can transmit avian pox. A juvenile male Merriam's wild turkey was harvested by a hunter in Bon Homme County, South Dakota, on January 10, 2015. The turkey presented multiple skin lesions covering the non-feathered areas of the head and was confirmed having FWPV (Joshi et al. 2019). While it is possible that these wild turkeys were infected through contact with domestic poultry, the possibility that FWPV is endemic in this wild bird population cannot be formally excluded.

Wild turkeys can be susceptible to several diseases caused by parasites. One of the most common is histomoniasis or "blackhead" disease. Chickens and other Old World birds can survive blackhead and serve as a reservoir for the protozoan parasite (*Histomonas meleagridis*) that causes the disease. It is a complex infection that involves an intermediate host. The eggs of the worm and the protozoan parasite can be found in earthworms. A 10-week old poult found dead in the southern Black Hills tested positive for the protozoan parasite *Histomonas meleagridis* and was the cause of death (SDGFP, unpublished data 2019). This bird was part of large brood that was adjacent to a domestic flock of chickens and started developing severe symptoms around 9 weeks of age. This infection resulted in death very quickly at around 10 weeks of age and is the first confirmed case of this disease in South Dakota.

West Nile virus is a mosquito borne Flavivirus which was first identified in the western hemisphere in New York City in 1999. Birds are the most infected animal and serve as the prime reservoir host of the virus. Fortunately, wild turkeys are not vulnerable to infection by West Nile virus nor do they act as significant amplifying agents in infecting mosquitos (Swayne et al. 2000).

Mycoplasmosis is a bacterial disease caused by a suite of *Mycoplasma* bacteria species. The disease is most common among captive flocks of chickens and turkeys, but antibodies for the disease have been found in wild turkeys on rare occasions. The disease can suppress reproductive success in birds, but this not been documented in wild turkeys. Mycoplasmosis does not appear to be a problem in wild turkey populations in South Dakota or other states at this time.

Salmonellosis in wild turkeys through infection with Salmonella typhimurioum has caused isolated deaths, but the infection rate appears to be low. One death of a nesting female from salmonellosis was confirmed in the central Black Hills (Reviewed in Flake et al. 2006).

Swelling incapacitation in the foot or leg area, called bumblefoot, can be caused by infection from bacteria such as Bacillus and Staphylococcus. Several Rio Grande gobblers with bumblefoot that could not walk due to swelling and infection were observed in northeastern South Dakota, and these birds died within a short time (Reviewed in Flake et al. 2006).

Highly pathogenic avian influenza (HPAI), often referred to as bird flu, was first confirmed in wild birds in the United States on 15 December 2014. As of 4 August 2015, 85 cases of HPAI had been detected in wild birds, primarily in the western and central U.S. Among wild birds, the virus has only been found in live waterfowl, along with a few fatal cases in raptors. Waterfowl are considered carriers of the disease as they do not typically exhibit clinical signs of sickness when infected with the virus. Gallinaceous birds such as wild turkeys as well as raptors are highly susceptible to the virus and often die when infected. The virus is easily transmitted among individuals through contact with saliva, nasal secretions, feces, or surfaces contaminated with these excrements. The virus has been found to spread rapidly through domestic flocks because of the confined and high density nature of the flock. The virus infected 10 commercial poultry sites in April, May, and June 2015 in South Dakota. The last reported detection in the state was on 1 June 2015. HPAI has not been detected in wild turkeys. It is thought wild turkeys could be susceptible to the disease since captive turkeys often die when infected. However, it is unknown how quickly the virus could spread through wild turkey populations. The potential for a large scale outbreak is likely highest during winter when wild turkeys congregate in large flocks which would facilitate disease transmission.

Depredation

Wild turkey management in South Dakota is a complex and adaptive process that must include careful consideration of the biological, social, and political impacts. Wildlife managers must make careful decisions that recognize these considerations because wildlife is a public-trust resource yet utilizes private lands throughout the year. Private landowners who experience high intensities of wildlife damage tend to have a lack of tolerance for the species responsible for the damage (Conover 1998). While other wildlife species such as elk, deer, and Canada geese have experienced greater controversy and more complex management issues, wild turkeys have experienced social tolerance conflicts in South Dakota. Further, in many hunting units hunter opportunity is reliant upon access to private lands. Successful wildlife management programs must target private landowners and work cooperatively with farmers and ranchers to be effective (Ramsey and Shult 1981 and Bookhout 1996). SDGFP diligently works to maintain a balance between viable wild turkey populations, social tolerances, and the needs of a variety of stakeholders. SDGFP understands that cooperative partnerships with private landowners are an essential component to wildlife management and that private lands serve an important role regarding wild turkey management. Without this cooperative partnership, it would not be possible to meet the agency's responsibility of successfully managing South Dakota's wild turkey population. The public also supports management of

wildlife that is causing damage to personal property, especially when non-lethal techniques are employed (Reiter et al. 1999). It is because of these important considerations that SDGFP operates such an active and comprehensive wildlife damage management program regarding wild turkey depredation.

As several wildlife populations increased in South Dakota in the 1990s, SDGFP worked with the South Dakota Legislature to establish a funding mechanism to provide wildlife damage abatement services. In 1998, a $5 surcharge was established on most types of hunting licenses. Fifty percent of these funds are allocated to SDGFP's wildlife damage management program and the other 50% go to hunter access programs. The establishment of this funding was the financial foundation for which SDGFP's wild turkey depredation abatement program was initiated. From the 2000–2019, SDGFP has invested over $700,000 to address wild turkey depredation on private lands. Annual expenditures range from approximately $1,000 to $61,000 (Figure 22) and impact between 5–30 landowners. Because these programs are funded 100% by sportsmen and women, SDGFP requires that all landowners receiving wild turkey depredation assistance sign an agreement that states, *"the producer agrees to allow reasonable, free public hunting access to non-family members who obtain proper permission"* and *"the producer agrees NOT to charge any person or entity* a *fee or payment for wild turkey hunting access".* To achieve successful wild turkey management, it is imperative that sportsmen and women have access to private lands when revenues from hunting licenses are used to operate these programs and wild turkey populations are largely managed through regulated hunting.

The demand for wild turkey damage abatement services fluctuates annually, primarily due to weather events (i.e., harsh winters) and seasonal variations as well as local wild turkey populations. In 2006, 11% of landowners who were surveyed by SDGFP indicated that they had experienced wild turkey depredation within the past 2 years (Gigliotti 2006). Longmire (2014) found that 24% of landowners that were surveyed indicated that wild turkeys had caused a depredation problem on their property. Large concentrations of birds during the winter can cause substantial damage to stored-feed supplies intended for livestock if left unprotected. Most requests for wild turkey depredation assistance involve damage to stored-feed supplies (i.e. hay, straw, silage, or stored-grains), damage to buildings or vehicles due to the roost site location and associated defecation, and public safety concerns.

SDGFP has designed its wild turkey damage abatement services to address most of these types of requests for assistance. The most widely used service to address damage to stored-feed supplies is the use of protective netting. The netting is stretched over the stored-feed which creates a barrier and prohibits the birds from utilizing the stored-feed. In certain situations, SDGFP also provides and places corn or other grains at alternate feeding locations (i.e., short-stop feeding) away from problem areas. This technique is used in combination with hazing efforts, which help move the birds away from the problem area and then keep the birds at the new feeding location. Short-stop feeding can be an effective technique for keeping wild turkeys away from stored-feed supplies, but other wildlife species (i.e., deer) can quickly move into the short-stop feeding location and consume the grain quickly. Due to these circumstances, short-stop feeding is used only in specific situations and when deer numbers are low in the immediate area.

Trap and relocation is another management technique that SDGFP utilizes when large numbers of birds are present at specific locations and the overall wild turkey population is high in the local area. Baiting locations are identified nearby and after a few days of wild turkeys utilizing the bait, drop-nets, or rocket-nets are employed to capture the birds. The birds are then placed in boxes or trailers designed to accommodate wild turkeys and are relocated to more desirable locations. Trap and relocation does not work in areas with low wild turkey numbers or isolated wild turkey populations, as the removal would effectively eliminate most of the birds in that area. Release sites are carefully selected with consideration given to the amount of public land in the area and possible social tolerance issues, as releasing wild turkeys in some areas may create new conflicts near the release site. Most trap and relocation efforts occur in the Black Hills area where abundant wild turkey populations exist as well as vast amounts of public land. SDGFP has also utilized trap and relocation efforts into areas where wild turkey die-offs have occurred or where new populations are desired and contain suitable habitat. In these cases, in-depth discussions with area landowners prior to the relocation are a critical step to the success of this management technique.

Another management technique utilized in the wild turkey damage abatement program is different forms of hazing. SDGFP routinely works with landowners to employ different hazing practices to scare birds away from problem areas and roost locations. These techniques include pyrotechnics, propane cannons, coyote decoys, hazing with ATV's or snowmobiles, and lethal removal. SDGFP utilizes the fall wild turkey season whenever possible to send hunters to problem areas as the utilization of hunters accomplishes two important roles: the hunting pressure hazes the birds away from the immediate location, and a small number of birds are removed. Many times, this increase in human presence is enough to keep wild turkeys away from the immediate location if the hunting pressure is consistent. SDGFP also implements depredation pool hunts where randomly selected hunters are enlisted to harvest wild turkeys in strategic locations to reduce negative impacts to private property after traditional hunting seasons are closed. These types of hunts begin after the fall hunting season and conclude by late-March as the spring season opens in early-April and the large concentrations of birds begin to disperse. The most recent depredation hunt authorized by SDGFP was in 2020, where a handful of birds were killed before the remaining flock moved away from the impacted farmyard.

Several municipalities in South Dakota have experienced conflicts with wild turkeys and have requested SDGFP's assistance. In most situations, SDGFP does not provide direct wildlife damage assistance within city limits; however, SDGFP does provide technical assistance regarding management techniques that may address these issues. Where necessary, SDGFP works cooperatively with municipalities to authorize the use of kill permits to address these conflicts or public safety conflicts if other management techniques have proven unsuccessful. SDGFP works cooperatively with municipalities to develop management plans that identify processes and procedures for the utilization of lethal removal via SDGFP authorized kill permits. All wild turkeys removed by kill permits are salvaged for human consumption if the carcass is in suitable condition.

While these management techniques have proven successful in most cases over the last 20 years, depredation problems continue to occur and can be complex. SDGFP continues to

research innovative solutions to address wild turkey damage concerns. Wild turkey conflicts not only involve the management of wild turkeys but also include socio-economic dynamics as well. To help reduce or alleviate many of these conflicts, SDGFP must ensure that wild turkey populations are managed effectively and that all management goals are being met, as defined wildlife population levels and management goals are critical to effectively manage wildlife populations.

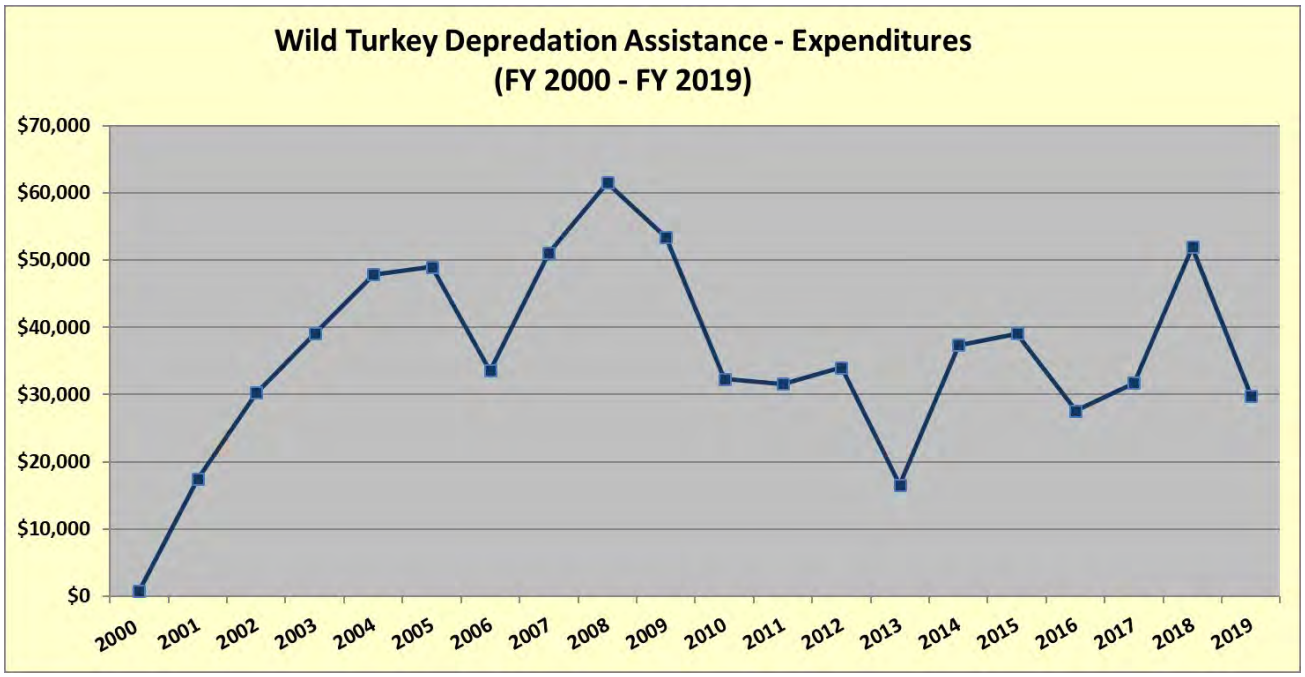

Figure 22. Annual expenditures (fiscal year 2000–2019) for South Dakota Department of Game, Fish and Parks wild turkey depredation abatement program and services.

Economic Analysis of Spring Turkey Hunting

Using data from a national project evaluating hunting expenses (Southwick 2003) as well as license sales information collected by SDGFP, an analysis of the economic value of spring turkey hunting was conducted (Western States Wild Turkey Workshop 2017). Spring turkey hunting occurs when other hunting opportunities are almost non-existent and provides hunters an opportunity to spend more days in the field. While enjoying their time outdoors, hunters spend significant amounts of money on equipment and travel. Turkey hunters spend money primarily in rural or less populated areas, and their contributions can be especially important to local economies. Using spring license data from 2019 and an estimate of $1,331.55 spent by each spring turkey hunter (adjusted for inflation), a grand total of $21,455,265 was projected for all spring turkey hunting expenditures annually in South Dakota (Western States Wild Turkey Workshop 2017). Monies spent by spring turkey hunters are significant for local economies in South Dakota.

In addition to local businesses benefiting from spring wild turkey hunting, taxes on ammunition and firearms are put into a fund established through the Federal Aid in Wildlife Restoration Act

(Pittmann-Robertson or P-R funds). P-R funds are used for habitat projects and scientific research projects in the state of South Dakota, which benefits both game and non-game wildlife species. Using current data this analysis will be updated (see Objective 6 and Strategy 6D).

Domestic and Game-Farm Turkeys

Domestication—Domestic turkeys have become an important part of our economic industry, and their origin was from wild birds captured in Mexico sometime after 1350 (Kennamer et al. 1992). Spanish explorers transported the newly domesticated birds from southern Mexico to Spain, where domesticated turkeys were allowed to colonize Europe. Later generations of the European birds were brought to Colonial America in the early 1600s and were the beginning of the domestic turkey industry (Schorger 1966, Kennamer et al. 1992). By the beginning of the 1700s, domestic turkeys were being raised in large numbers and a certain amount of crossing was occurring between domestic and wild birds (Aldrich 1967). Selective breeding provided many genetic variants and by World War II domestic turkeys were a major industry in America (Kennamer et al. 1992). Unfortunately, some private citizens have released dark-colored domestic turkeys in South Dakota, perhaps attempting to create new populations or supplement wild populations (Flake et al. 2006). This is discouraged by SDGFP and releasing domestic or game-farm sources of turkeys impede wild population management by potentially crossing and degrading the genetics and untamed traits of wild populations.

Demise of Wild Populations and Game-Farm Trial and Error—Early settlers devastated forests in the eastern United States, and the relentless pressure from market hunters to feed a growing nation lead to the demise of wild turkey populations (Kennamer et al. 1992). By the late 1790s and early 1800s, eastern wild turkey populations were becoming rare in the eastern United States. In South Dakota, the native eastern wild turkey occupied woodlands at least as far west as the Missouri River, but by 1920 those populations were extirpated (Over and Thoms 1920). Just over 160 wild turkeys of unknown origin were released by SDGFP in the Black Hills and central South Dakota in 1930 (Flake et al. 2006). Most wild turkeys used to restore populations during this time frame were genetically wild birds raised on game-farms, and these introductions usually failed (Kennamer et al. 1992). Game-farm, or pen-reared turkeys, are those hatched from eggs taken from wild turkey nests but raised by humans, and without imprinting on a wild hen, these birds lack the necessary survival traits. Another early attempt at releasing game-farm birds occurred in 1953 near Sioux Falls but this attempt also failed (Flake et al. 2006). Unfortunately, from the period of 1930–1950 many state agencies across the United States attempted to release game-farm raised turkeys instead of trapping and transplanting wild turkeys; this set back the wild turkey restoration process for almost 2 decades (Kennamer et al. 1992). Once trap-and-transplant programs of wild turkeys were initiated in 1948 in South Dakota and elsewhere across the United States, populations began to flourish and the wild bird made a successful comeback.

Hunting Season Structure

South Dakota Codified Law 41-11-5 grants authority to the South Dakota Game, Fish, and Parks Commission (SDGFPC) to establish hunting seasons for wild turkeys. South Dakota Administrative Rules 41:06:13:02, 41:06:14:02, 41:06:14:02.01, and 41:06:15:02 are under the authority of the SDGFPC and specifies open units, season dates, and license allocations. Administrative Rule changes to set wild turkey seasons are currently implemented on a 2-year cycle. The SDGFP provides recommended changes to Administrative Rule in the form of an action sheet for consideration by the commission. Fall wild turkey seasons, including license allocation and open units, are proposed in April and finalized in July. Spring wild turkey hunting seasons are proposed in July and finalized in September. Members of the public can provide comments to the commission or SDGFP at any time during the process. Comments received by the commission and SDGFP are shared with each other and entered as part of the public record.

Seasons and Management Units

At the time of this document's publication, there were 5 spring wild turkey hunting seasons: Prairie, Black Hills, CSP, Mentored Youth, and Archery. There are also 3 fall wild turkey hunting seasons: Prairie, Black Hills, and Mentored Youth. Each season has established unit(s) with specific license allocations, weapon restrictions, season dates, and eligibility constraints (Table 13 and 14; Figure 23 and 24). Spring archery and mentored youth licenses are valid statewide except within CSP and in Lake County south of highway 34. There is alignment of spring and fall wild turkey units so unit-level harvest strategies can be applied appropriately. There is a biannual review of wild turkey hunting units to develop 2-year recommendations to modify, remove, or add units based on available biological data, public input, and staff recommendations. Future boundary adjustment recommendations will retain alignment of spring and fall units.

Table 13. Resident and nonresident license allocation by unit for 2020 fall wild turkey seasons.

Unit #	Unit Name	License Type	Resident Licenses	Nonresident Licenses
BH1	Black Hills	1 Any	100	8
ST1	Statewide Fall Mentor	1 Any	Unlimited, 1 per hunter	0
07A	Yankton	1 Any	150	0
12A	Bon Homme	1 Any	150	0
39A	Jackson	1 Any	35	3
48A	Marshall/Roberts	1 Any	100	0
Total for Limited Allocation Units			535	11

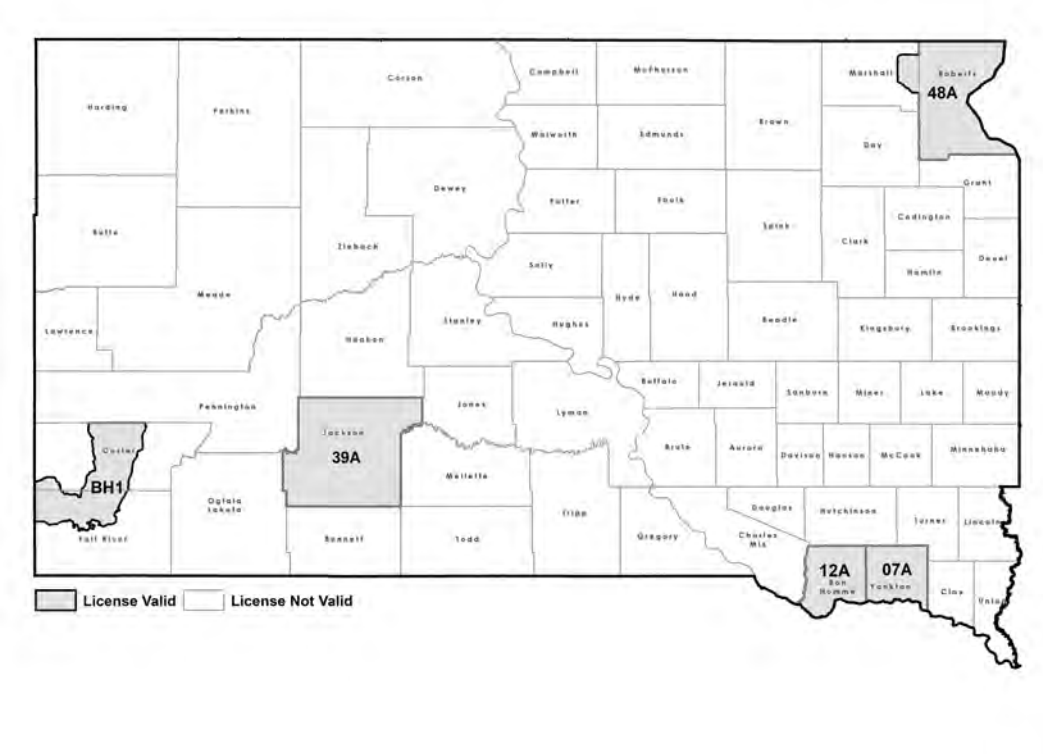

Figure 23. 2020 South Dakota fall wild turkey hunting units.

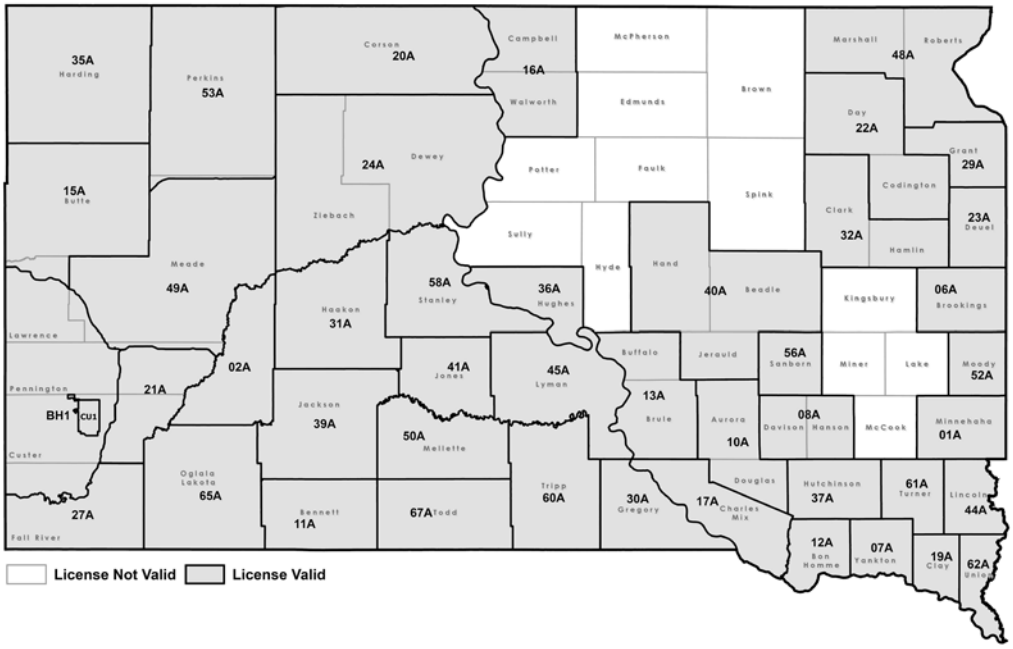

Figure 24. 2021 South Dakota spring wild turkey hunting units.

Table 14. Resident and nonresident license allocation by unit for 2021 spring wild turkey seasons.

Unit #	Unit Name	License Type	Resident Licenses	Nonresident Licenses
BH1	Black Hills	1 Male	Unlimited, 1 per hunter	Unlimited, 1 per hunter
BH2	Black Hills	1 Male	Unlimited, 1 per hunter	0
ST1	Statewide Spring Archery. Excludes Custer State Park	1 Male	Unlimited, 1 per hunter	Unlimited, 1 per hunter
CU1	Custer State Park	1 Male	100	0
ST1	Statewide Spring Mentor	1 Male	Unlimited, 1 per hunter	0
01A	Minnehaha	1 Male	80	0
02A	Pennington	1 Male	200	16
06A	Brookings	1 Male	20	0
07A	Yankton	1 Male	260	0
08A	Davison/Hanson	1 Male	80	0
08B	Davison/Hanson	1 Male	80	0
11A	Bennett	1 Male	30	3
12A	Bon Homme	1 Male	250	0
13A	Brule	1 Male	150	0
15A	Butte/Lawrence	1 Male	350	28
16A	Campbell/Walworth	1 Male	10	0
17A	Charles Mix/Douglas	1 Male	350	0
19A	Clay	1 Male	120	0
20A	Corson	1 Male	50	4
21A	Custer/Pennington	1 Male	150	12
22A	Day/Codington	1 Male	90	0
23A	Deuel	1 Male	110	0
24A	Dewey/Ziebach	1 Male	150	12
27A	Fall River	1 Male	75	6
29A	Grant	1 Male	260	0
30A	Gregory	1 Male	700	56
31A	Haakon	2 Male	200	16
32A	Hamlin/Clark	1 Male	20	0
35A	Harding	1 Male	100	8
36A	Hughes	1 Male	30	0
37A	Hutchinson	1 Male	60	0
39A	Jackson	1 Male	150	12
40A	Jerauld/Beadle/Hand	1 Male	20	0
41A	Jones	1 Male	75	6
44A	Lincoln	1 Male	50	0
44B	Lincoln	1 Male	50	0
45A	Lyman	1 Male	100	8
48A	Marshall/Roberts	1 Male	440	0
49A	Meade	2 Male	300	24
50A	Mellette	1 Male	350	28
52A	Moody	1 Male	60	0
53A	Perkins	2 Male	100	8
56A	Sanborn	1 Male	10	0
58A	Stanley	1 Male	40	4
58B	Stanley	1 Male	2	1
60A	Tripp	1 Male	400	32
61A	Turner	1 Male	20	0
62A	Union	1 Male	120	0
65A	Ogalala Lakota	1 Male	40	4
67A	Todd	1 Male	75	6
Total for Limited Allocated Units			**6477**	**294**

License Allocation System

For seasons with a limited license allocation, a lottery draw system is utilized to distribute available licenses. Applicants may apply for up to 2 units for each draw of each season. Nonresidents are allocated 8% of the number of resident licenses for spring prairie units west of the Missouri River and 8% of the resident licenses for the fall Black Hills season. Nonresidents are also eligible for fall west river prairie licenses. Half of resident permits are allocated to resident landowners who qualify for landowner preference. The initial phase of the first drawing for a season is limited to applicants with preference points. A preference point is gained when an applicant is unsuccessful for their first draw, first choice during a previous year's application and choose to purchase a preference point. Applicants also have the option of purchasing just preference points in any given year. If licenses are available after all applicants with preference points are drawn, applications from all applicants are added to the pool. Up to three rounds of drawings are conducted if all licenses are not allocated. After the third draw, licenses are distributed on a first come first served basis. See wild turkey hunting applications for full details on eligibility and season specific requirements.

For the spring prairie firearm season, applicants may have 1 license from the first or second drawing, up to 5 licenses during the third drawing, and an unlimited number of licenses after the third draw. Archery, mentored youth, and CSP applicants are limited to 1 license. Nonresidents may have 1 Black Hills license while residents may have 2 under most circumstances. For fall seasons, applicants may have 1 license from the first or second draw, and a total of 2 licenses maximum per season in the third drawing and thereafter. Fall mentored youth applicants are limited to a single license. Periodic review, including demand for unit-specific licenses of both spring and fall turkey units, will be conducted to ensure harvest levels and hunter opportunity are being met within desired management goals.

Harvest Strategies

The goal for wild turkey management in South Dakota is to maximize user opportunity during the spring while maintaining populations consistent with ecological, social, aesthetic, and economic values of the people of South Dakota and our visitors. One direct way to maximize opportunity and manage wild turkey populations is by implementing a harvest strategy that provides the population the potential to reach the objective. Unit-level wild turkey populations will be managed with an emphasis on providing spring hunting opportunity. Fall hunting seasons will be used for additional hunting opportunity and population control. Input from SDGFP staff, the wild turkey management stakeholder group, and the public have been incorporated into harvest management strategies for the Black Hills and prairie units. The intent is to develop a harvest strategy with a consistent management philosophy across units, but also allow for flexibility in unit-level recommendations based on data and field staff input. This plan does not recommend any changes to the mentored youth season structure. The CSP season will be evaluated periodically in cooperation with the Division of Parks and Recreation.

Prairie Harvest Strategy—Wild turkey units will be assigned a population objective of *increase, maintain, or decrease* on a biannual basis in alignment with the season setting schedule. A

unique harvest strategy will be utilized for each population objective (Figure 25). The unit objective will be based on available biological data, hunter survey comments, landowner comments, public comments, and field staff observations. Hunter success and harvest success can be used interchangeably when we discuss success rates for management. A minimum threshold based on spring hunter success and licenses issued will need to be met for a unit to be considered at or above population objective (maintain or decrease population objective). The minimum threshold is based on the upper 95% confidence interval (UCI) of hunter success. If the UCI is ≥ 40% spring hunter success and licenses issued is ≥ minimum license target for the previous 2 years, the population will be considered at or above population objective. Regional wildlife managers will collaborate with field staff to initially develop the minimum spring license targets based on field staff experience and past harvest data. If the UCI falls below 40% spring hunter success or tags fall below the minimum license target for 2 consecutive years, the fall season will be closed. If spring license allocation is ≤ 80 licenses caution should be used in opening a fall season (even if in the maintain or decrease population objective) as there could be concerns with potential additive mortality from any fall hen harvest. The *Unit Objectives* table (Table 15) will be used to: 1) view past spring hunting season statistics; 2) define minimum license target; and 3) track hunting statistics through the life of the management plan.

This framework is flexible in that even if a threshold to close the fall season is not met, the fall season could still be closed. Similarly, if a unit is below objective, but a fall closure threshold is not met, a fall season could still be utilized with a conservative number of tags to address depredation. Also, the population objective could still be *increase* even if the minimum threshold is met based on other factors (e.g. field staff input). See Appendix 3 to view unit-level spring harvest success and fall harvest statistics.

Population Objective	Increase	Maintain	Decrease
Justification	Turkey population below objective based on available biological data, hunter survey comments, public comments, and field staff observations. Turkey depredation on stored livestock forage is expected to be nonexistent or limited to isolated cases and should be adequately addressed through the wildlife damage management program. After all other tools have been exhausted, unique situations may be addressed using depredation pool hunts, kill permits, or trap and transfer to areas with low turkey abundance when fall season is closed.	Turkey population at objective based on available biological data, hunter survey comments, public comments, and field staff observations. Manageable turkey depredation on stored livestock forage is expected, but should be adequately addressed through wildlife damage management program, fall hunting (if open), trap and transfer, or depredation pool hunts. After all other tools have been exhausted, unique situations may be addressed using kill permits when fall season is open or closed.	Turkey population above objective based on available biological data, hunter survey comments, public comments, and field staff observations. Turkey depredation on stored livestock forage is expected to be above desired levels, but can usually be addressed through wildlife damage management program, fall hunting, trap and transfer, or depredation pool hunts. After all other tools have been exhausted, unique situations may be addressed using kill permits when fall season is open. Indicators for this category would be moderate to overabundant populations causing moderate to major depredation among landowners in the unit.
Hunting Season Structure Options	Spring: single bearded turkey licenses or close spring season Fall: Limited number of single or double any turkey licenses which allows for population growth and/or reduce size of unit to limit harvest to specific area, or close fall season.	Spring: Single or double bearded turkey licenses with option of split spring seasons Fall: Single or double any turkey licenses issued at a level expected to keep population within population objective Close fall season in units where population is expected to decline with fall harvest. Fall unit boundaries may be reduced in size.	Spring: Single or double bearded turkey licenses with option of split spring seasons Fall: Single or double any turkey licenses issued at a level expected to decrease population
Minimum Categorical Thresholds to Meet Objective or Close Fall Season	The 95% Upper Confidence Interval (UCI) of spring hunter success falls below the 40% threshold in one of two consecutive seasons; or spring license allocation is below minimum taget for one of two consecutive seasons (See unit objectives table). Under this scenario, fall turkey season could be closed. _____ **Threshold to close fall season** The 95% Upper Confidence Interval (UCI) of spring hunter success falls below the 40% threshold for 2 consecutive seasons; or license allocation is below minimum target for 2 consecutive seasons (See unit objectives table).	The 95% Upper Confidence Interval (UCI) of spring hunter success is ≥ 40% and minimum spring license target is met for 2 consecutive seasons (See unit objectives table). *Note: If this threshold is met, population objective could be shifted to increase based on other justifications.*	The 95% Upper Confidence Interval (UCI) of spring hunter success is ≥ 40% and minimum spring license target is met for 2 consecutive seasons (See unit objectives table). *Note: If this threshold is met, population objective could be shifted to maintain based on other justifications.*

Figure 25. Prairie units harvest strategies, 2021–2026.

Table 15. Prairie wild turkey unit objectives and hunting statistics, 2014–2020. For a unit to be in the maintain or decrease unit objective category, the upper 95% confidence interval (UCI) of hunter success must be ≥ 40% and licenses issued is ≥ minimum license target for the previous 2 years (2nd column). Cells shaded red indicate the UCI for spring hunter success is below 40%.

				2003 - 2015 Average			2014			2015			2016			2017			2018			2019			2020		
Unit	Minimum License Target	Current Population Objective	Threshold met to close fall season	Hunter Success %	Licenses sold	Tags sold	Hunter Success (95% C.I.)	Licenses sold	Tags sold	Hunter Success (95% C.I.)	Licenses sold	Tags sold	Hunter Success (95% C.I.)	Licenses sold	Tags sold	Hunter Success (95% C.I.)	Licenses sold	Tags sold	Hunter Success (95% C.I.)	Licenses sold	Tags sold	Hunter Success (95% C.I.)	Licenses sold	Tags sold	Hunter Success (95% C.I.)	Licenses sold	Tags sold
Bennett	50	Increase	No	71	62	112	45 (37-52)	76	152	51 (43-59)	76	76	44 (38-51)	54	54	45 (39-52)	33	33	58 (49-67)	33	33	35 (27-44)	33	33	43 (29-56)	33	33
Bon Homme	250	Increase	No	52	252	252	34 (29-39)	300	300	48 (43-54)	250	250	37 (32-43)	300	300	43 (38-48)	251	251	40 (35-44)	251	251	46 (41-51)	250	250	55 (50-60)	250	250
Brookings	10	Increase	No	39	32	32	33 (30-40)	20	20	24 (20-32)	20	20	10 (10-10)	20	20	44 (40-50)	20	20	39 (35-45)	20	20	28 (25-35)	20	20	43 (30-58)	20	20
Brule	100	Increase	No	53	82	82	44 (38-51)	108*	108	46 (40-52)	123*	123	33 (27-40)	129*	129	45 (39-51)	150	150	41 (35-47)	150	150	39 (33-45)	150	150	58 (52-64)	150	150
Butte/Lawrence	400	Increase	No	57	415	830	44 (40-49)	387*	774	36 (32-41)	368*	736	45 (40-50)	375	375	48 (43-53)	379	379	44 (38-49)	379	379	48 (43-54)	378	378	45 (40-51)	376	376
Campbell/Walworth	10	Maintain	No	NA	0	0	NA	0	0	NA	0	0	40(40-40)	10	10	56 (50-60)	10	10	25 (20-40)	10	10	50 (40-60)	10	10	71 (50-80)	10	10
Charles Mix/Douglas	300	Increase	No	51	318	445	32 (27-36)	400	400	38 (34-43)	400	400	28 (23-32)	400	400	41 (36-46)	350	350	32 (27-36)	350	350	43 (38-47)	350	350	47 (42-52)	351	351
Clay	75	Increase	No	48	119	119	32 (28-36)	160	160	27 (23-30)	120	120	32 (28-36)	120	120	52 (47-58)	120	120	32 (28-36)	120	120	32 (26-38)	120	120	41 (35-46)	120	120
Corson	100	Increase	No	53	126	232	51 (44-58)	92*	92	45 (39-51)	109	109	25 (18-31)	108*	108	58 (52-65)	108	108	34 (27-41)	108	108	33 (25-41)	54	54	37 (31-44)	54	54
Custer/ Penn-Mid	125	Increase	No	54	146	293	46 (40-52)	148*	296	47 (42-51)	159*	318	27 (22-32)	150*	300	52 (45-58)	162	162	42 (36-49)	162	162	37 (30-43)	162	162	40 (34-46)	162	162
Davison/Hanson	150	Increase	No	50	108	108	31 (27-36)	160	160	42 (37-46)	156*	156	26 (21-31)	161	161	32 (27-37)	158	158	24 (20-28)	158	158	32 (28-37)	160	160	35 (30-40)	159	159
Day/Codington	50	Increase	No	40	60	60	44 (37-51)	60	60	54 (48-60)	60	60	29 (25-35)	61	61	55 (49-60)	80	80	36 (29-43)	80	80	39 (35-43)	80	80	57 (50-64)	80	80
Deuel	75	Maintain	No	56	60	60	54 (50-57)	90	90	52 (48-56)	90	90	45 (40-51)	90	90	56 (50-61)	90	90	47 (43-52)	90	90	34 (29-39)	100	100	53 (48-58)	100	100
Dewey/Ziebach	100	Increase	Yes	56	199	359	48 (42-54)	138*	138	55 (48-61)	131*	131	34 (28-40)	160	160	48 (42-53)	160	160	45 (40-50)	160	160	34 (28-40)	158	158	19 (14-24)	123	123
Fall River	150	Maintain	No	56	209	418	48 (44-53)	149*	298	52 (47-57)	133*	266	39 (35-44)	161	322	48 (44-53)	162	324	42 (38-47)	162	324	32 (27-37)	81	81	51 (44-58)	81	81
Grant	185	Increase	No	57	176	176	54 (51-58)	220	220	56 (52-60)	220	220	36 (32-41)	220	220	50 (46-54)	220	220	46 (41-50)	220	220	48 (44-52)	220	220	61 (56-66)	217	217
Gregory	700	Increase	No	57	898	1351	41 (36-46)	1027	1027	47 (42-51)	919	919	28 (23-32)	865	865	45 (40-50)	756	756	41 (36-46)	756	756	36 (31-41)	755	755	41 (36-46)	747	747
Haakon	200	Maintain	No	63	226	403	55 (51-60)	222*	444	58 (53-63)	248*	496	43 (38-47)	214*	428	51 (46-55)	216	432	40 (35-45)	216	432	43 (38-49)	216	432	46 (40-52)	217	434
Hamlin	10	Increase	No	46	20	20	NA	0	0	NA	0	0	NA	0	0	56 (50-60)	10	10	0 (0-0)	10	10	44 (40-50)	10	10	25 (20-40)	10	10
Harding	150	Increase	Yes	46	190	306	25 (20-30)	116*	116	41 (35-48)	98*	98	30 (25-35)	153*	153	44 (38-51)	108	108	42 (37-47)	108	108	20 (15-26)	108	108	27 (22-32)	108	108
Hughes	30	Increase	No	50	36	55	22 (17-29)	40	40	34 (28-42)	40	40	26 (23-31)	40	40	54 (47-60)	30	30	43 (40-47)	30	30	50 (43-57)	30	30	54 (50-57)	30	30
Hutchinson	60	Increase	No	41	64	64	46 (41-51)	80	80	40 (34-46)	80	80	21 (18-24)	80	80	40 (34-46)	60	60	26 (20-32)	60	60	42 (37-47)	60	60	38 (32-44)	60	60
Jackson	150	Maintain	No	64	173	308	57 (53-62)	216	432	61 (56-66)	217	217	34 (29-40)	214	214	70 (65-75)	162	162	47 (42-53)	162	162	47 (40-54)	162	162	34 (28-40)	143	143
Jerauld	10	Increase	No	24	10	10	0	10	10	25 (20-40)	10	10	13 (10-25)	10	10	22 (20-30)	10	10	67 (60-70)	10	10	33 (30-40)	10	10	43 (30-60)	10	10
Jones	75	Increase	No	60	62	69	48 (38-59)	81*	81	43 (32-53)	75*	75	37 (26-48)	71*	71	43 (33-53)	77	77	27 (19-36)	77	77	30 (20-39)	81	81	56 (45-68)	80	80
Lincoln	80	Increase	No	40	98	98	35 (30-40)	100	100	34 (30-39)	99*	99	19 (15-22)	100	100	27 (24-31)	100	100	32 (27-36)	100	100	29 (24-34)	100	100	39 (34-44)	99	99
Lyman	100	Increase	No	57	129	206	40 (35-44)	162	162	50 (45-55)	162	162	28 (23-32)	162	162	36 (31-41)	108	108	35 (30-41)	108	108	27 (23-32)	108	108	43 (39-48)	107	107
Marshall/Roberts	330	Increase	No	50	404	508	43 (38-48)	500	500	45 (40-49)	500	500	40 (35-44)	400	400	47 (43-52)	400	400	43 (38-47)	400	400	46 (41-51)	400	400	54 (49-60)	400	400
Meade/Penngtn	300	Increase	No	66	352	704	45 (40-50)	349*	698	54 (49-59)	374*	748	38 (33-43)	306*	612	52 (47-57)	322	644	45 (40-50)	322	644	51 (46-57)	316	632	50 (45-56)	323	646
Mellette	350	Increase	No	63	527	1001	36 (31-41)	350*	350	47 (41-52)	332*	332	34 (29-39)	363*	363	46 (41-52)	376	376	29 (24-34)	376	376	41 (36-47)	349	349	46 (40-52)	378	378
Minnehaha	60	Increase	No	36	92	92	24 (21-27)	100	100	38 (34-43)	80	80	18 (15-22)	79	79	64 (57-71)	80	80	33 (29-38)	80	80	34 (28-40)	80	80	38 (32-44)	80	80
Moody	30	Increase	No	50	31	31	62 (57-65)	40	40	35 (29-41)	60	60	36 (30-43)	60	60	44 (38-50)	60	60	39 (32-46)	60	60	30 (24-36)	60	60	63 (57-69)	60	60
Oahe Downstream	0	Maintain	No	100	1	1	NA	5	5	100	1*	1	50 (50-50)	2*	2	100 (100-100	2	2	100 (100-100	2	2	0 (0-0)	2	2	NA	1	1
Pennington-East	150	Increase	No	65	179	358	57 (52-62)	132*	264	51 (47-56)	165*	330	40 (35-45)	145*	290	51 (46-57)	166	166	48 (41-55)	166	166	55 (49-61)	146	146	55 (48-62)	216	216
Perkins	75	Increase	Yes	58	108	212	44 (36-53)	52*	104	60 (52-68)	62*	124	29 (23-35)	81*	162	44 (37-52)	94	188	39 (30-48)	94	188	35 (28-42)	70	140	33 (27-39)	108	216
Sanborn	20	Increase	No	41	43	47	25 (20-33)	40	40	8 (5-19)	20	20	15 (15-15)	20	20	50 (40-60)	20	20	12 (10-18)	20	20	17 (10-39)	10	10	75 (60-80)	10	10
Oglala Lakota	50	Increase	Yes	74	42	73	76 (64-85)	42*	84	49 (38-59)	61*	61	50 (40-60)	43*	43	70 (60-80)	44	44	32 (23-42)	44	44	27 (18-37)	38	38	19 (13-29)	30	30
Stanley	40	Increase	No	42	53	53	36 (31-41)	54	54	37 (31-43)	54	54	32 (24-39)	55	55	34 (27-42)	44	44	28 (25-33)	44	44	33 (30-39)	44	44	59 (51-67)	44	44
Todd	75	Increase	No	63	68	68	44 (34-53)	71*	71	43 (33-53)	69*	69	35 (25-46)	66*	66	49 (41-57)	78	78	29 (18-40)	78	78	40 (29-51)	62	62	43 (30-55)	80	80
Tripp	350	Increase	No	63	434	500	61 (56-66)	432	432	57 (52-62)	451	451	34 (30-39)	432	432	57 (52-62)	432	432	42 (37-47)	432	432	40 (34-45)	432	432	47 (41-53)	428	428
Turner	20	Increase	No	38	44	44	50 (40-60)	20	20	26 (25-30)	20	20	33 (25-46)	20	20	62 (45-75)	20	20	26 (25-30)	20	20	35 (30-45)	20	20	80 (61-90)	20	20
Union	120	Increase	No	47	123	123	38 (34-43)	160	160	47 (43-51)	119*	119	27 (23-31)	120	120	37 (32-42)	120	120	40 (36-44)	120	120	31 (28-35)	120	120	47 (43-51)	120	120
Yankton	200	Increase	No	49	217	217	36 (32-41)	280	280	46 (42-51)	230	230	33 (29-37)	230	230	47 (42-52)	229	229	51 (46-56)	229	229	45 (40-50)	260	260	53 (48-58)	260	260

Black Hills Harvest Strategy—Unlike the limited spring tag allocation of the prairie units, the Black Hills unit is unique in that it provides an unlimited tag allocation for spring wild turkey hunting. Such a system allows SDGFP to sample the Black Hills male population which provides an index, or surrogate abundance estimate. Our estimate of surrogate abundance is based on a 2-year mean of previous spring harvest which categorizes population status by levels of *low*, *moderate*, or *high* (Table 16, Figure 26). Once population status is estimated and our objective is obtained, we have several categories where specific harvest strategies are designated for each objective. Within each objective of *increase*, *maintain*, or *decrease*, we have "A", "B", and "C" harvest strategy categories that can be implemented.

Hunter success and harvest success can be used interchangeably when we discuss success rates for management. The "A" category is triggered for each population status level when spring harvest is at or below 30% (including 95% confidence intervals) for 2 consecutive years. The "B" category is triggered for each population status level when spring harvest is at or below 30% (including 95% confidence intervals) for 1 year and is above for 1 year. The "C" category is triggered for each population status level when spring harvest is above 30% (including 95% confidence intervals) for 2 consecutive years. This adaptive process of utilizing a 2-year mean for obtaining population status, as well as limiting fall harvest by categories *A*-*C*, should limit potentially large population swings related to fall harvest and ensure more stability as it relates to harvest management. This strategy outlines a range of potential fall tag allocations and tag types which can be implemented by category (Figure 26). Spring tag allocation is assumed to be unlimited each year as this provides a basis for obtaining our population status. It should be noted that both fall and spring seasons can be closed when major disease or weather events cause severe population declines regardless of current population status, through the emergency rule-making authority of the SDGFP Commission.

A map of unit objectives for prairie, Black Hills, and Custer State Park seasons is available in Figure 27. See Appendix 3 to view spring harvest success and fall harvest statistics.

Population Status or Surrogate Abundance	**Low** **≤1400 mean harvest from previous 2 spring hunting seasons**	**Moderate** **1401-1899 mean harvest from previous 2 spring hunting seasons**	**High** **≥1900 mean harvest from previous 2 spring hunting seasons**
Population Objective	**Increase**	**Maintain**	**Decrease**
Justification	Turkey population objective based on surrogate abundance estimate given above. Turkey depredation on stored livestock forage is expected to be nonexistent or limited to isolated cases and should be adequately addressed through the wildlife damage management program. After all other tools have been exhausted, unique situations may be addressed using pool hunts, kill permits, or trap and transfer to areas with low turkey abundance when fall season is closed.	Turkey population objective based on surrogate abundance estimate given above. Manageable turkey depredation on stored livestock forage is expected, but should be adequately addressed through wildlife damage management program, fall hunting (if open), trap and transfer, or depredation pool hunts. After all other tools have been exhausted, unique situations may be addressed using kill permits when fall season is open or closed.	Turkey population objective based on surrogate abundance estimate given above. Turkey depredation on stored livestock forage is expected to be above desired levels, but can usually be addressed through wildlife damage management program, fall hunting, trap and transfer, or depredation pool hunts. After all other tools have been exhausted, unique situations may be addressed using kill permits when fall season is open. Indicators for this category would be moderate to overabundant populations causing moderate to major depredation among landowners in the unit.
A: **Spring success 95% CI below or overlapping 30% previous 2 seasons**	Spring: Single bearded turkey licenses and 1 license per person. Fall: Single any turkey licenses but limit to 200 or less. Fall unit boundaries may be reduced in size.	Spring: Single bearded turkey licenses and up to 1 license for non-residents and 2 licenses for residents. Fall: Single any turkey licenses but limit to 400 or less. Fall unit boundaries may be reduced in size.	Spring: Single bearded turkey licenses and up to 1 license for non-residents and 2 licenses for residents. Fall: Single or double any turkey licenses but limit to 1500 or less. Fall unit boundaries may be reduced in size.
B: **Spring success 95% CI below or overlapping 30% 1 of previous 2 seasons**	Spring: Single bearded turkey licenses and up to 1 license for non-residents and 2 licenses for residents. Fall: Single any turkey licenses but limit to 300 or less. Fall unit boundaries may be reduced in size.	Spring: Single bearded turkey licenses and up to 1 license for non-residents and 2 licenses for residents. Fall: Single any turkey licenses but limit to 500 or less. Fall unit boundaries may be reduced in size.	Spring: Single bearded turkey licenses and up to 1 license for non-residents and 2 licenses for residents. Fall: Single or double any turkey licenses but limit to 2000 or less. Fall unit boundaries may be reduced in size.
C: **Spring success 95% CI above 30% previous 2 seasons**	Spring: Single bearded turkey licenses and up to 1 license for non-residents and 2 licenses for residents. Fall: Single any turkey licenses but limit to 400 or less. Fall unit boundaries may be reduced in size.	Spring: Single bearded turkey licenses and up to 1 license for non-residents and 2 licenses for residents. Fall: Single any turkey licenses but limit to 600 or less. Fall unit boundaries may be reduced in size.	Spring: Single bearded turkey licenses and up to 1 license for non-residents and 2 licenses for residents. Fall:Single or double any turkey licenses but limit to 2500 or less. Fall unit boundaries may be reduced in size.

Figure 26. Black Hills unit harvest strategy, 2021–2026. In all cases above, it should be noted that this assumes spring harvest continues to be unlimited, which provides an estimate of population status. Further, if an uncontrollable event such as catastrophic disease or weather causes a severe population decline, both fall and spring seasons can be closed regardless of current population status.

Table 16. Black Hills wild turkey unit objectives and hunting statistics, 2014–2020. First, a surrogate abundance estimate is obtained using a 2-year mean of previous spring harvest which categorizes population status by levels of low (≤1,400), moderate (1,401-1,899), or high (≥1,900). Population objectives are based on the surrogate abundance estimates and include increase, maintain, or decrease.

Year	Hunter Success (95% C.I.)	Licenses sold	Spring Tags sold	Spring Harvest	Surrogate Abundance	Objective	Strategy[a]	Fall Tags Sold	Fall Harvest
2014	32 (29-35)	3944	3944	1258	1601 (Moderate)	Maintain	NA	810	100 males, 114 hens
2015	32 (28-36)	3877	3877	1258	1388 (Low)	Increase	NA	433	66 males, 62 hens
2016	39 (37-44)	4056	4056	1575	1258 (Low)	Increase	B	434	91 males, 55 hens
2017	39 (36-43)	4401	4401	1701	1417 (Moderate)	Maintain	C	433	87 males, 52 hens
2018	34 (29-36)	4567	4567	1441	1638 (Moderate)	Maintain	B	220	27 males, 26 hens
2019	32 (29-35)	4545	4545	1365	1403 (Moderate)	Maintain	A	216	34 males, 18 hens
2020	27 (23-30)	4733	4733	1287	1326 (Low)	Increase	A		

[a]Implementation of harvest strategies did not occur until 2016. The harvest strategy is determined using the previous 2 years of harvest success. The “A” category is triggered for each population status level when spring harvest is at or below 30% (including 95% confidence intervals) for 2 consecutive years. The “B” category is triggered for each population status level when spring harvest is at or below 30% (including 95% confidence intervals) for 1 year and is above for 1 year. The “C” category is triggered for each population status level when spring harvest is above 30% (including 95% confidence intervals) for 2 consecutive years. See specific strategies described in detail in Figure 26.

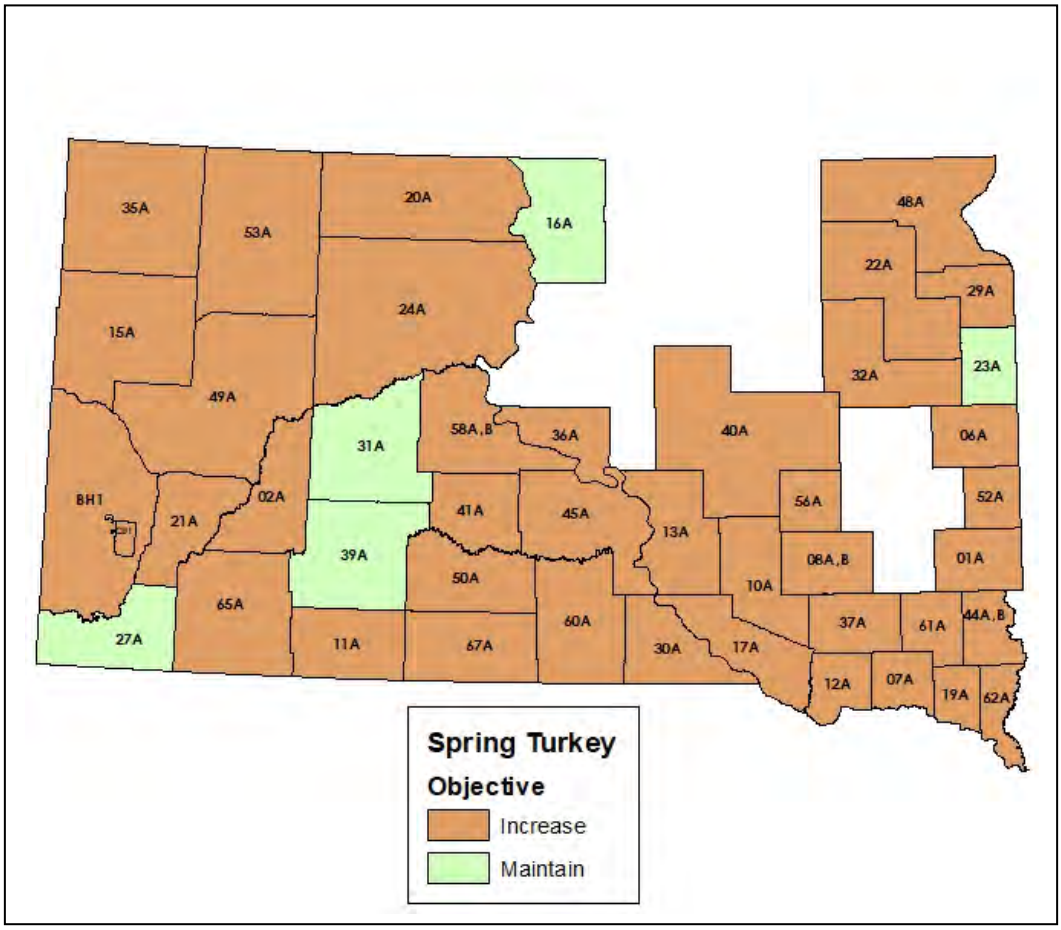

Figure 27. Unit-level population objectives for prairie, Black Hills, and Custer State Park spring hunting units, 2021.

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Appendix 1. Wild turkey transplants in South Dakota, 1948–2020.

Year	Release Site	Subspecies	No. Released	Origin
1948	Lawrence Co. West of Spearfish	Merriam's	8	New Mexico
1950	Black Hills, Hell Canyon	Merriam's	14	Colorado
1951	Black Hills West of Hot Springs	Merriam's	5	New Mexico
	Lawrence Co.	Merriam's	3	Near Spearfish
	Pennington Co.	Merriam's	21	Near Spearfish
1952	Black Hills Butte Co.	Merriam's	8	Black Hills
	Lawrence Co.	Merriam's	9	Black Hills
	Meade Co.	Merriam's	7	Black Hills
	Pennington Co.	Merriam's	1	Black Hills
1953	Black Hills	Merriam's	16	Black Hills
	Haakon Co.	Merriam's	3	Black Hills
	Harding Co.	Merriam's	33	Black Hills
	Jackson Co.	Merriam's	11	Black Hills
	Black Hills	Merriam's	24	Black Hills
	Black Hills	Merriam's	5	Black Hills
	Minnehaha Co.	Hybrid	5	Unknown
	Pennington Co.	Merriam's	41	Black Hills
	Perkins Co.	Merriam's	9	Black Hills
1954	Black Hills	Merriam's	2	Black Hills
1955	Black Hills	Merriam's	5	Black Hills
	Perkins Co.	Merriam's	8	Black Hills
1956	Black Hills	Merriam's	7	Black Hills
	Perkins Co.	Merriam's	8	Black Hills
1958	Gregory Co.	Merriam's	6	Black Hills
	Black Hills	Merriam's	10	Black Hills
	Meade Co	Merriam's	10	Black Hills
	Todd Co.	Hybrid	3	Farm Island

Appendix 1 (continued)

Year	Release Site	Subspecies	No. Released	Origin
1959	Dewey Co.	Merriam's	Unknown	Black Hills
	Gregory Co.	Merriam's	28	Black Hills
	Haakon Co.	Merriam's	10	Black Hills
	Harding Co.	Merriam's	8	Black Hills
	Jackson Co.	Merriam's	10	Black Hills
	Pennington Co.	Merriam's	10	Black Hills
	Perkins Co.	Merriam's	7	Black Hills
1960	Dewey Co.	Merriam's	5	Black Hills
1963	Bon Homme Co.	Rio's	31	Texas
	Day Co.	Rio's	25	Texas
	Jackson Co.	Merriam's	16	Perkins Co.
	Jones Co.	Rio's	25	Texas
	Lyman Co.	Rio's	21	Texas
	Mellette Co.	Merriam's	21	Perkins & Jackson Co.
	Yankton Co.	Rio's	14	Texas
1964	Dewey Co.	Rio's	14	Oklahoma
	Jerauld Co.	Rio's	11	Oklahoma
	Perkins Co.	Rio's	Unknown	Oklahoma
	Tripp Co.	Rio's	16	Oklahoma
1968	Jerauld Co.	Rio's	6	Jerauld Co.
	Lincoln Co.	Rio's	24	Jerauld Co.
	Yankton Co.	Rio's	12	Jerauld Co.
1970	Union Co.	Hybrid	15	Unknown
1972	Charles Mix Co.	Merriam's	27	Gregory Co.
	Gregory Co.	Merriam's	21	Gregory Co.
	Marshall Co.	Merriam's	20	Gregory Co.
	Marshall Co.	Rio's	19	Jerauld Co.
1975	Lyman Co.	Rio's	Unknown	Unknown
1979	Corson Co.	Rio's	35	Lyman Co.
	Dewey Co.	Rio's	14	Lyman Co.
	Dewey Co.	Rio's	6	Sica Hollow
	Marshall Co.	Rio's	5	Sica Hollow

Appendix 1 (continued)

Year	Release Site	Subspecies	No. Released	Origin
1981	Hughes Co.	Rios's	67	Dewey Co.
1982	Dewey Co.	Rio's	13	Lyman Co.
1983	Corson Co.	Merriam's	14	Black Hills
	Yankton Co.	Rio's	11	Turner Co.
	Corson Co.	Merriam's	13	Black Hills
	Dewey Co.	Merriam's	11	Black Hills
1985	Corson Co.	Merriam's	72	Black Hills
	Custer Co.	Merriam's	18	Black Hills
	Lincoln Co.	Merriam's	52	Black Hills
	Union Co.	Merriam's	19	Black Hills
1986	Corson Co.	Merriam's	24	Black Hills
	Lyman Co.	Merriam's	32	Black Hills
	Meade Co.	Merriam's	67	Haakon Co.
	Yankton Co.	Merriam's	109	Black Hills
1987	Corson Co.	Merriam's	14	Black Hills
	Corson Co.	Hybrid	26	Brown Co.
	Custer Co.	Merriam's	33	Black Hills
	Dewey Co.	Merriam's	39	Black Hills
	Dewey Co.	Hybrid	5	Potter Co.
	Jones Co.	Merriam's	74	Black Hills
1988	Bennett Co.	Merriam's	84	Jackson Co.
	Charles Mix Co.	Merriam's	23	Gregory Co.
	Corson Co.	Merriam's	90	Brown & Potter Co.
	Black Hills	Hybrid	149	Mellette Co.
	Stanley Co.	Merriam's	31	Gregory Co.
	Todd Co.	Merriam's	86	Jackson Co.
1989	Butte Co.	Merriam's	16	Perkins Co.
	Custer Co.	Merriam's	70	Fall River Co.
	Harding Co.	Merriam's	12	Perkins Co.
	Lawrence Co.	Merriam's	72	Perkins & Meade Co.
	Meade Co.	Merriam's	25	Meade Co.
	Black Hills	Merriam's	65	Meade Co.

Appendix 1 (continued)

Year	Release Site	Subspecies	No. Released	Origin
	Perkins Co.	Merriam's	126	Meade & Union Co.
		Hybrid	13	Turner Co.
1990	Union Co.	Eastern	13	Iowa
1991	Charles Mix	Merriam's	26	Charles Mix Co.
	Black Hills	Merriam's	140	Fall River Co.
	Black Hills	Merriam's	88	Fall River Co.
	Meade Co.	Merriam's	13	Fall River Co.
	Black Hills	Merriam's	54	Pennington Co.
1992	Brookings Co.	Merriam's	20	Jackson Co.
	Yankton Co.	Merriam's	21	Jackson Co.
	Bennett co.	Merriam's	4	Jackson Co.
	Haakon Co.	Merriam's	33	Jackson Co.
	Black Hills	Merriam's	162	Meade Co.
1993	Jones Co.	Hybrid	51	Mellette Co.
	Sanborn Co.	Eastern	20	Iowa
1994	Hanson Co.	Eastern	19	Missouri
	Spink Co.	Eastern	17	Missouri
	Custer Co.	Hybrid	47	Jackson Co.
	Meade Co.	Hybrid	31	Mellette Co.
	Pennington Co.	Hybrid	24	Mellette Co.
	Bennett Co.	Hybrid	16	Mellette Co.
	Jones Co.	Hybrid	25	Mellette Co.
	Stanley Co.	Hybrid	22	Mellette Co.
1995	Hanson Co.	Eastern	21	Missouri
	Hutchinson Co.	Eastern	62	Missouri
	Spink Co.	Eastern	16	Missouri
	Black Hills	Merriam's	115	Meade Co.
	Lyman Co.	Hybrid	53	Mellette Co.
	Jones Co.	Hybrid	46	Mellette Co.
1996	Marshall Co.	Eastern	58	Missouri
	Lincoln Co.	Hybrid	15	Union Co.
	Yankton Co.	Hybrid	38	Union Co.
	Black Hills	Hybrid	62	Mellette Co.

Appendix 1 (continued)

Year	Release Site	Subspecies	No. Released	Origin
	Black Hills	Hybrid	85	Corson Co.
	Black Hills	Hybrid	64	Mellette Co.
1997	Black Hills	Merriam's	116	Meade Co.
	Haakon Co.	Merriam's	14	Haakon Co.
	Butte Co.	Merriam's	11	Butte Co.
1998	Lincoln Co.	Hybrid	8	Union Co.
	Union Co.	Hybrid	6	Union Co.
	Butte Co.	Merriam's	32	Butte Co.
	Black Hills	Merriam's	44	Butte Co.
1999	Grant Co.	Eastern	99	Iowa & Kentucky
2000	Grant Co.	Eastern	36	Iowa
	Marshall Co.	Eastern	5	Kentucky
	Turner Co.	Eastern	24	Iowa
	Yankton Co.	Eastern	41	Missouri & Kentucky
2001	Brookings Co.	Eastern	23	Missouri & Kentucky
	Brown Co.	Eastern	14	Missouri & Kentucky
	Black Hills	Merriam's	96	Butte & Meade Co.
	Bennett Co.	Rio's	28	Jerauld Co.
2002	Brooking Co.	Eastern	2	Kentucky
	Brown Co.	Eastern	19	Missouri & Kentucky
	Jerauld Co.	Eastern	30	Missouri & Kentucky
	Codington Co.	Rio's	31	Jerauld & Roberts Co.
	Black Hills	Merriam's	101	Butte Co.
	Black Hills	Merriam's	46	Meade Co.
2003	Moody Co.	Eastern	34	Kentucky
	Black Hills	Merriam's	52	Butte Co.
	Black Hills	Merriam's	157	Fall River Co.
2006	Hamlin Co.	Eastern	44	Pennsylvania
	Hamlin Co.	Eastern	4	Grant Co.
	Hand Co.	Eastern	26	Grant Co.
	Brookings Co.	Eastern	9	Pennsylvania

Appendix 1 (continued)

Year	Release Site	Subspecies	No. Released	Origin
2007	Hamlin Co.	Eastern	21	Grant Co.
	Hand Co.	Eastern	19	Grant Co.
2008	Hand Co.	Eastern	17	Pennsylvania
	Deuel Co.	Eastern	42	Grant Co.
	Moody Co.	Eastern	24	Pennsylvania
2009	Clark Co.	Eastern	55	Grant Co.
2019	Lake Co.	Eastern	7	Iowa
2020	Lake Co.	Eastern	45	Iowa

Appendix 2. South Dakota Wild Turkey Management Plan 2021–2026 stakeholder group charter.

Wild Turkey Management Stakeholder Group

Purpose—The SDGFP "Wild Turkey Management Stakeholder Group" is a diverse group of citizen stakeholders who have been asked to assist SDGFP Staff and the SDGFP Commission in conducting a review of the broad range of issues affecting wild turkey management in South Dakota. The Wild Turkey Management Stakeholder Group will assist SDGFP Staff and the SDGFP Commission by offering insight, ideas, and alternatives that could be considered regarding the Department and Commission's positions on various wild turkey management goals, strategies, challenges and related recreational opportunities.

Objectives—The basic objectives of the Wild Turkey Management Stakeholder Group are to:

- Provide an additional link between the SDGFP Staff and the SDGFP Commission and the citizens we serve;
- Identify challenges and opportunities and develop ideas and suggestions regarding the range of issues affecting the management of wild turkey and associated recreation in South Dakota; and
- Promote communication, increased awareness, and mutual understanding between and among the Stakeholder Group members regarding the diversity of wild turkey management challenges.

Scope of Authority—The Stakeholder Group will function in an advisory capacity only and will provide a discussion forum for members to share their personal perspective and the perspective of the group or organization they may represent on a diversity of issues related to wild turkey management. Members who serve on the Stakeholder Group do so solely in a volunteer capacity. The Stakeholder Group is granted no authority over rule-making or rule enforcement on public or private land, has no budgetary authority or authority over personnel management, nor is it granted any authority over any state or federal agency or non-governmental organization. The Stakeholder Group was assembled as an additional citizen participation opportunity but is not designed to supplant or curtail any other type of citizen participation or public involvement opportunities that may be further utilized by SDGFP.

Organizational Structure and Stakeholder Group Membership—The Stakeholder Group is comprised of a diverse group of citizen stakeholders who may represent a broad range of public interests in the management of wild turkey in South Dakota. Participants will attend 2 to 4 structured meetings to hear SDGFP Staff presentations and offer their ideas and perspectives on wild turkey management. The Stakeholder Group meetings will be facilitated by SDGFP staff or a third party facilitator hired by SDGFP.

Stakeholder Group Member Roles and Responsibilities—Working Group members will:

- Make a commitment to attend the scheduled Stakeholder Group meetings;
- Offer their thoughts and ideas and communicate with others in a respectful manner while maintaining an open mind regarding the views and perspectives of other Working Group members, and;
- Serve as a sounding board and provide feedback and ideas to SDGFP Staff and the SDGFP Commission.

GFP Staff Roles and Responsibilities—SDGFP Staff will:

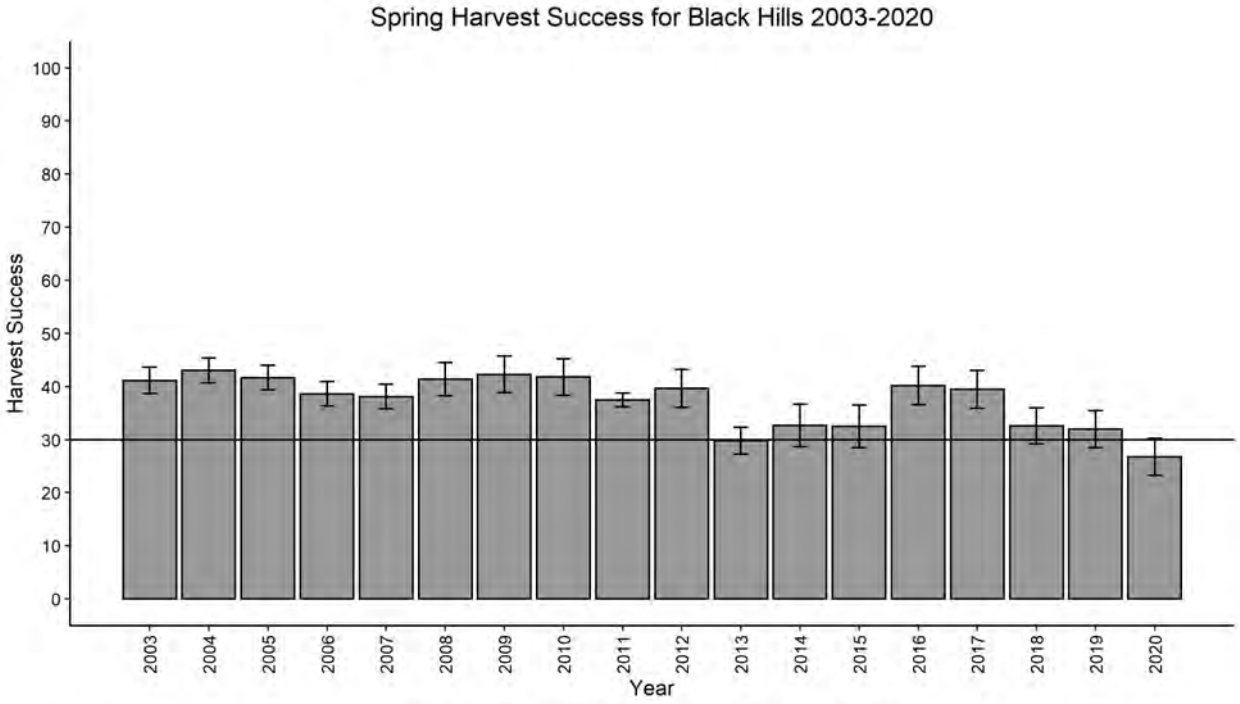
- Provide a diversity of information regarding wild turkey management to the Stakeholder Group;
- Serve the role of facilitator for the meetings, including keeping order, achieving the meeting agenda, and providing a comfortable working atmosphere for Working Group members to share ideas and opinions;
- Schedule and arrange meeting room facilities, including providing all necessary communication related to the meetings;
- Listen attentively and respectfully to all viewpoints; and
- Gather meeting notes and make them available to the public via the SDGFP website.

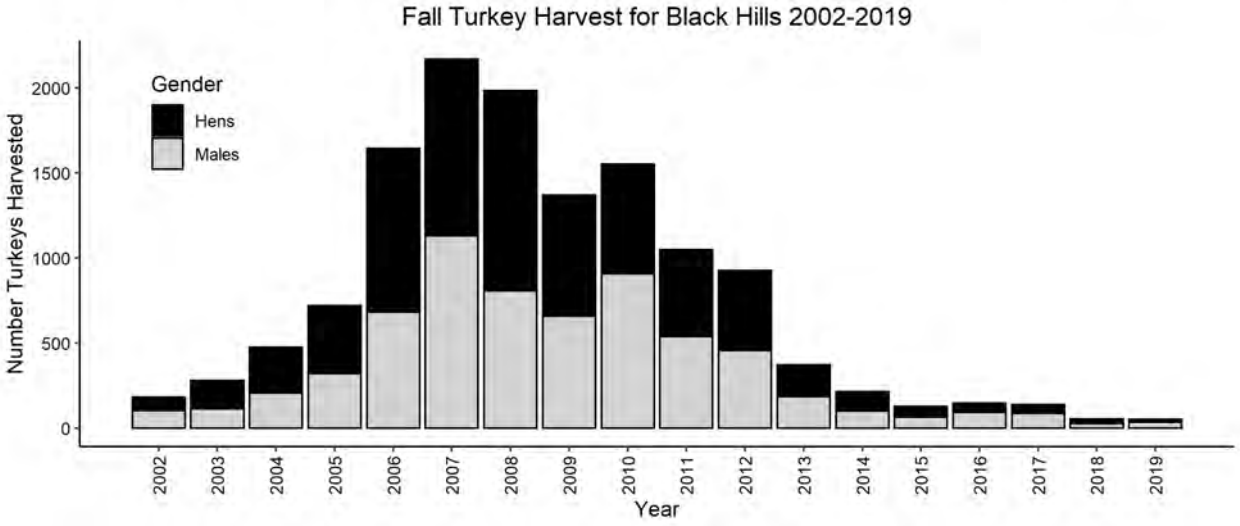
Meeting Guidelines and Communication—The purpose of the Wild Turkey Management Stakeholder Group is to provide a forum to promote understanding of wild turkey management issues and challenges from diverse perspectives; therefore, voting or other similar methods will not be used to formulate final group consensus on issues discussed.

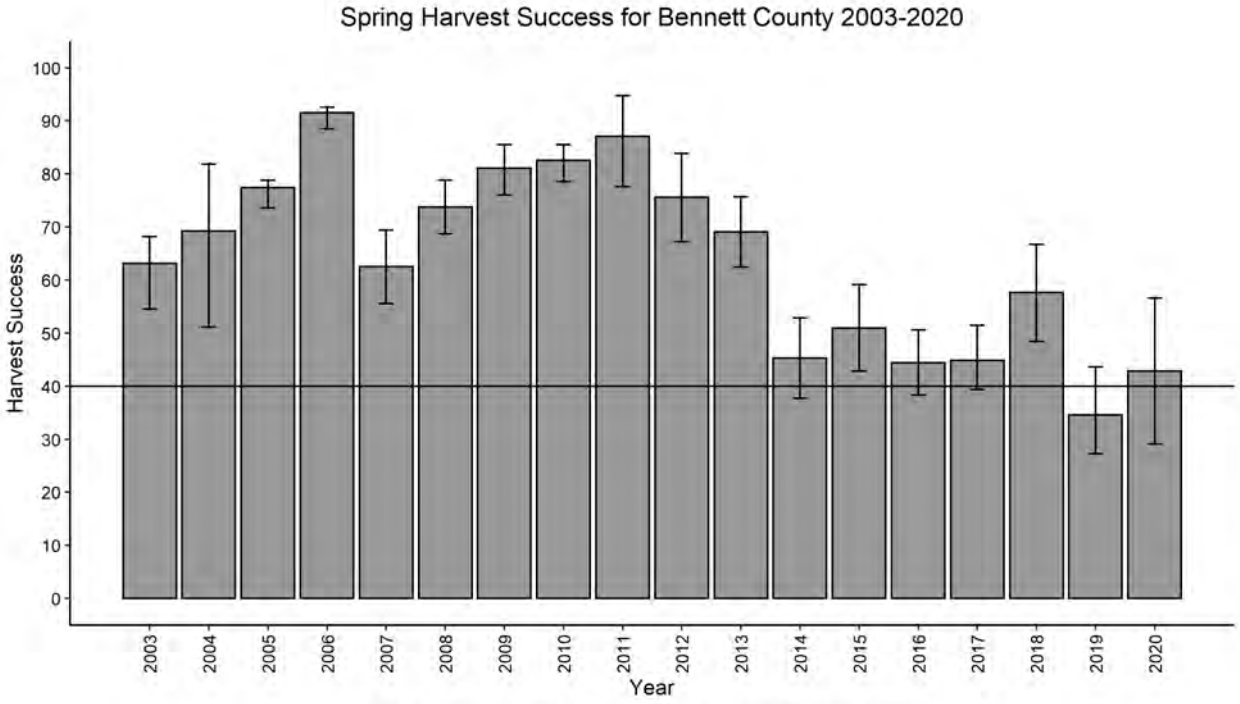
- Additional Open House meetings, citizen surveys or other public involvement techniques may be used to share information and gather additional public input on any proposed changes in wild turkey management.
- Stakeholder Group members are encouraged to discuss and communicate with others about specific wild turkey management issues discussed at the Stakeholder Group meetings.

Travel Expenditures—Travel expenses (lodging, per diem and vehicle mileage) for Stakeholder Group members will be reimbursed in accordance with State Reimbursement Rules for those members who are not reimbursed by another organization or agency.

Appendix 3. Unit-level spring harvest success with 95% confidence intervals 2003–2020 and fall wild turkey harvest 2002–2019. Spring harvest success is defined as the percent of hunters who harvested at least one wild turkey.






Spring Harvest Success for Bennett County 2003-2020
Harvest Success
100
90
80
70
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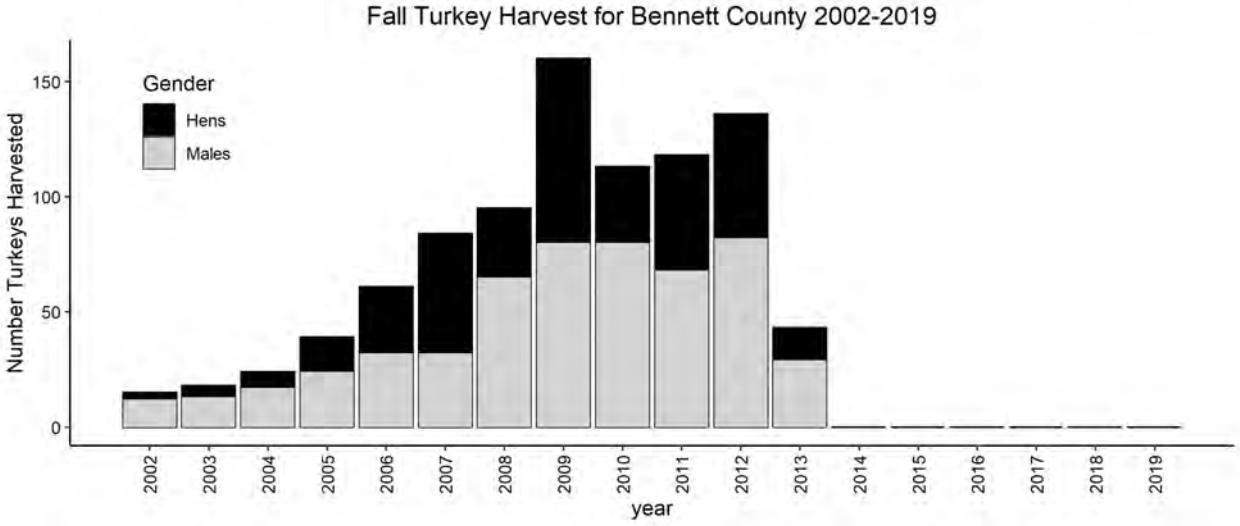
2019
2020
Year


Fall Turkey Harvest for Bennett County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
150
100
50
0
2002
2003
2004
2005
2006
2007
2008
2009
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2011
2012
2013
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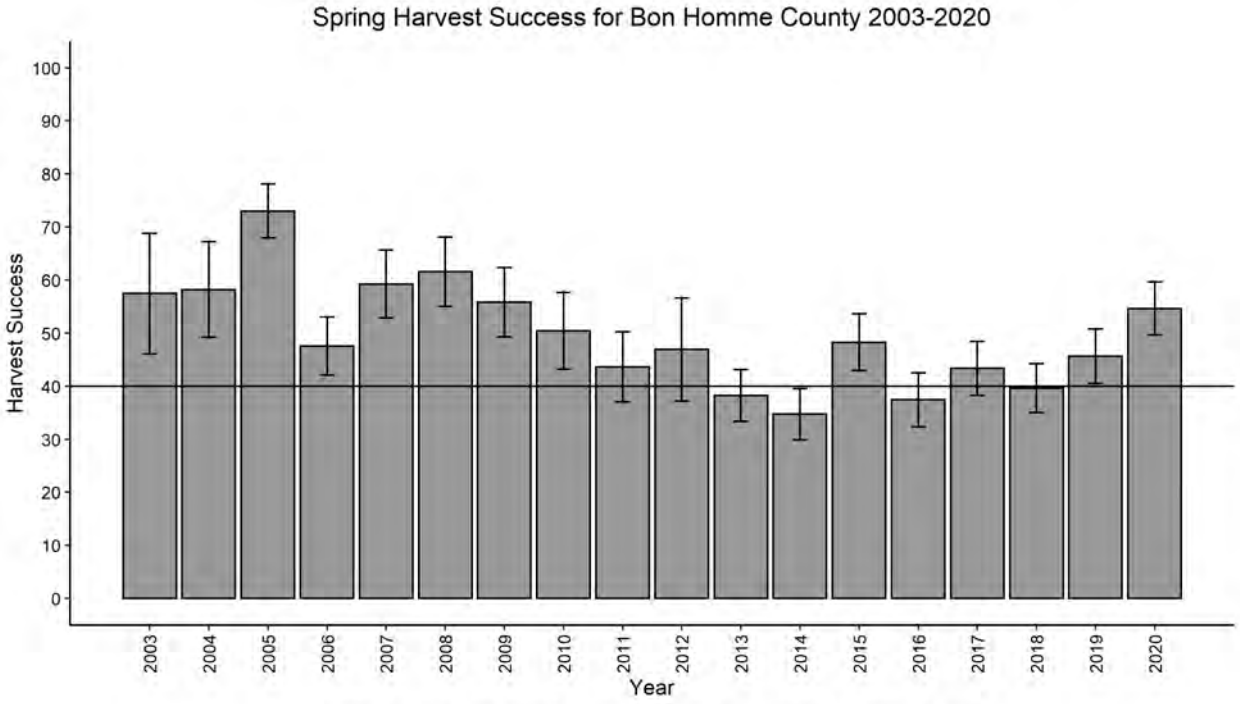
2017
2018
2019
year


Spring Harvest Success for Bon Homme County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
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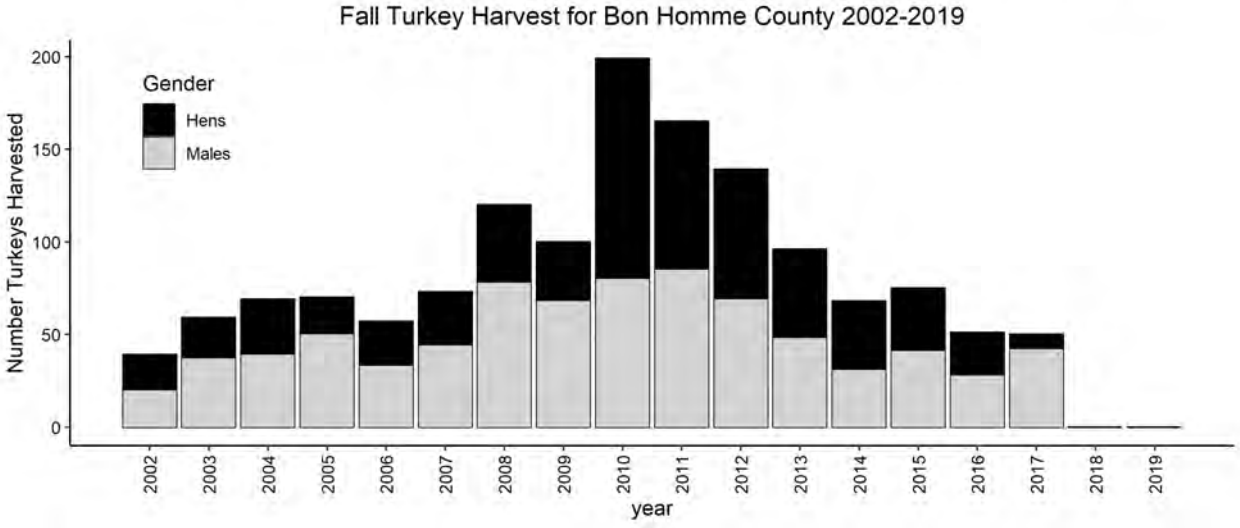
2019
2020
Year


Fall Turkey Harvest for Bon Homme County 2002-2019
Number Turkeys Harvested
Gender
Hens
Males
200
150
100
50
0
2002
2003
2004
2005
2006
2007
2008
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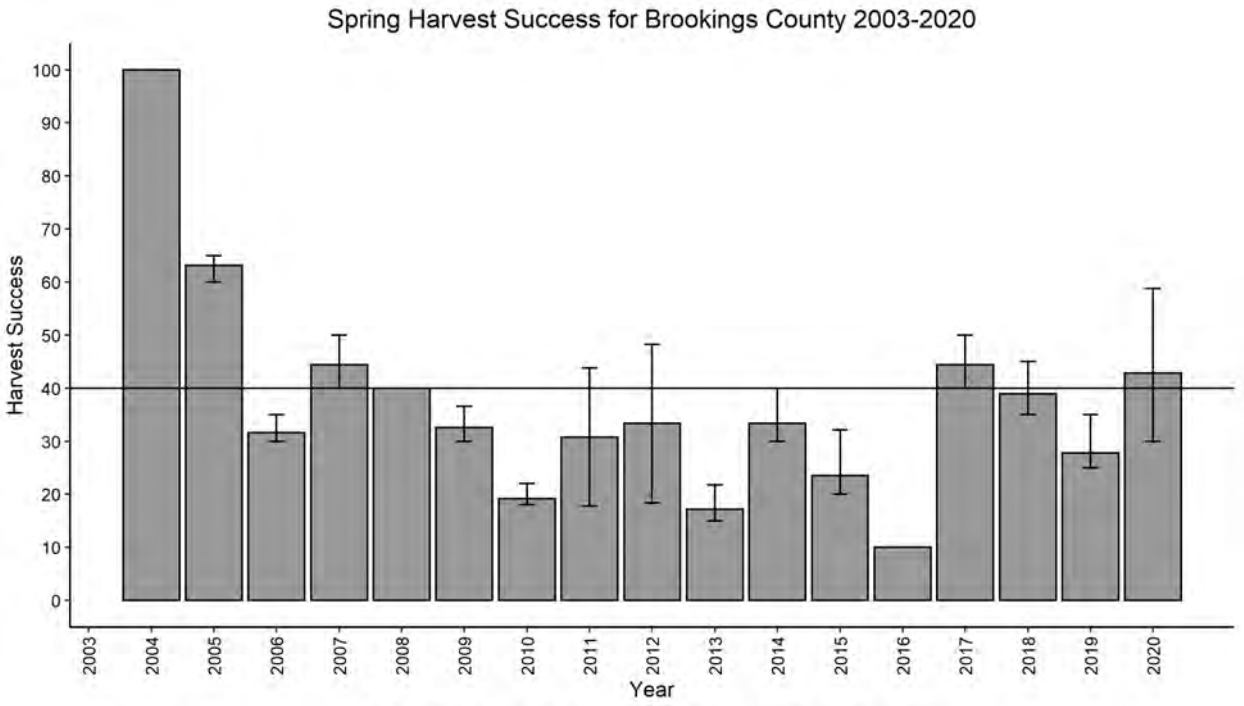
2017
2018
2019
year


Spring Harvest Success for Brookings County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
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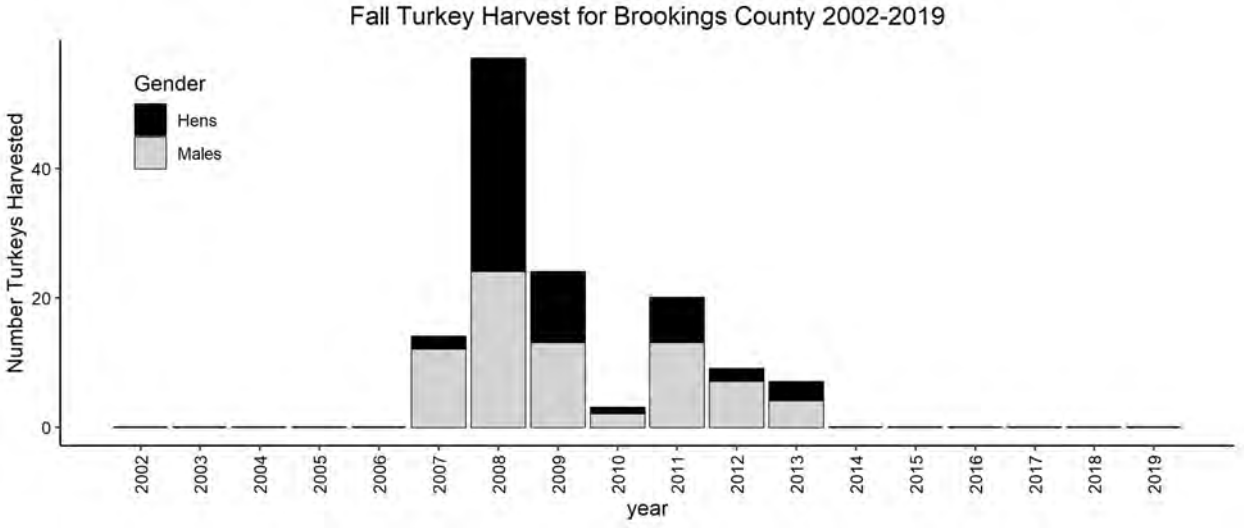
2019
2020
Year


Fall Turkey Harvest for Brookings County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
40
20
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
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2014
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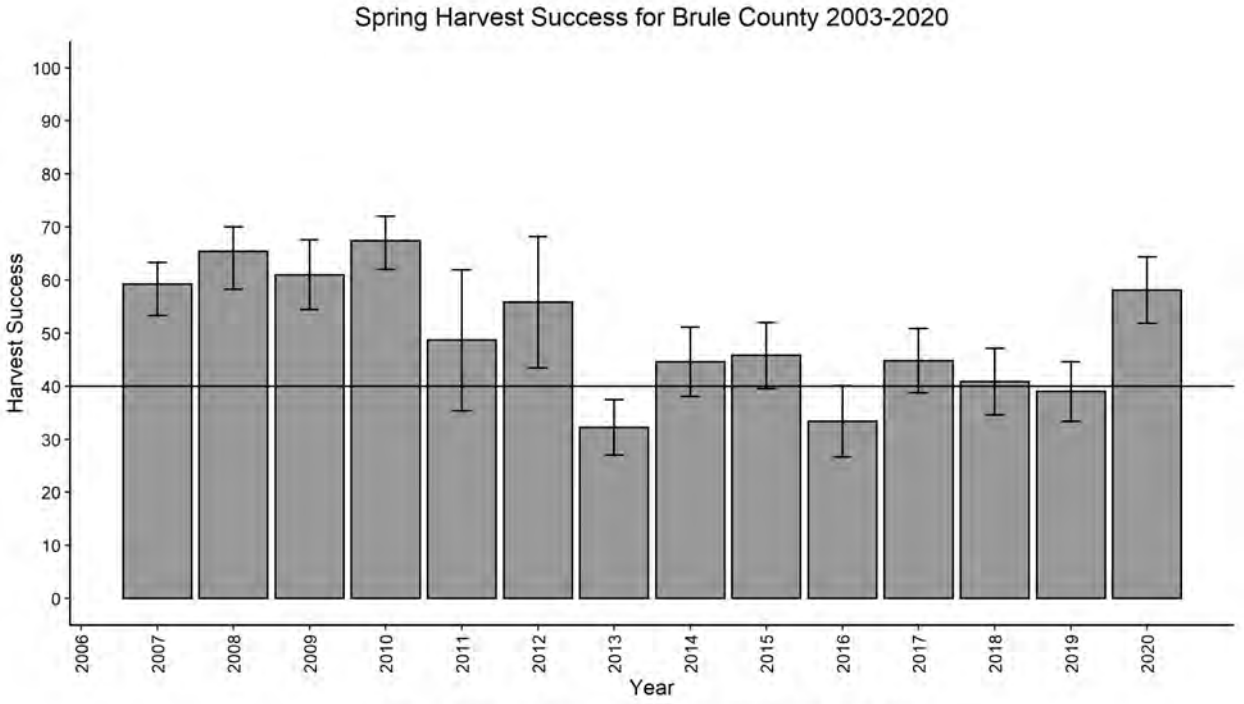
2016
2017
2018
2019
year


Spring Harvest Success for Brule County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2006
2007
2008
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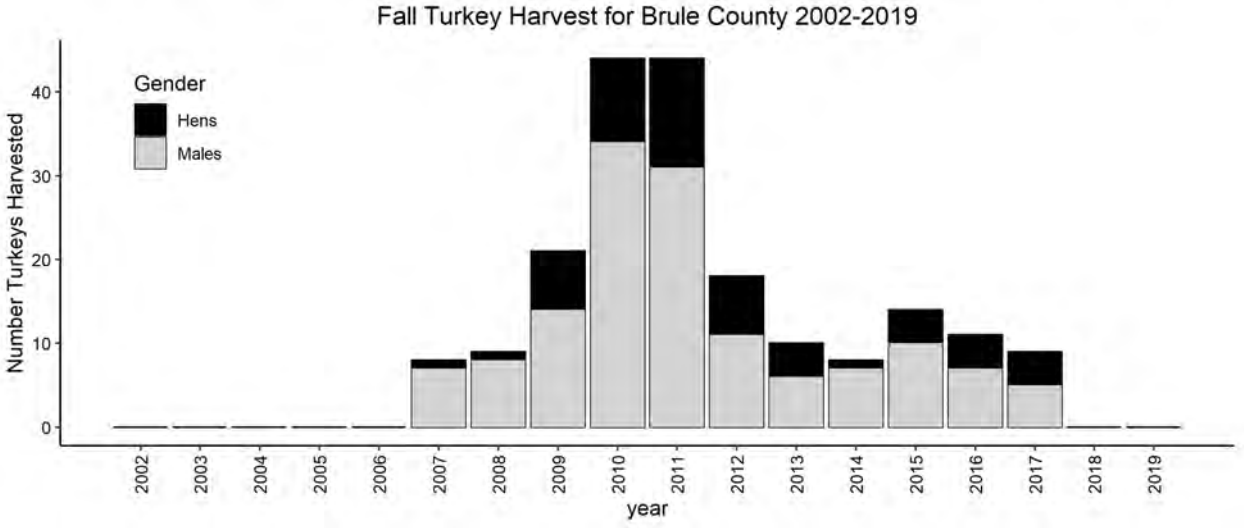
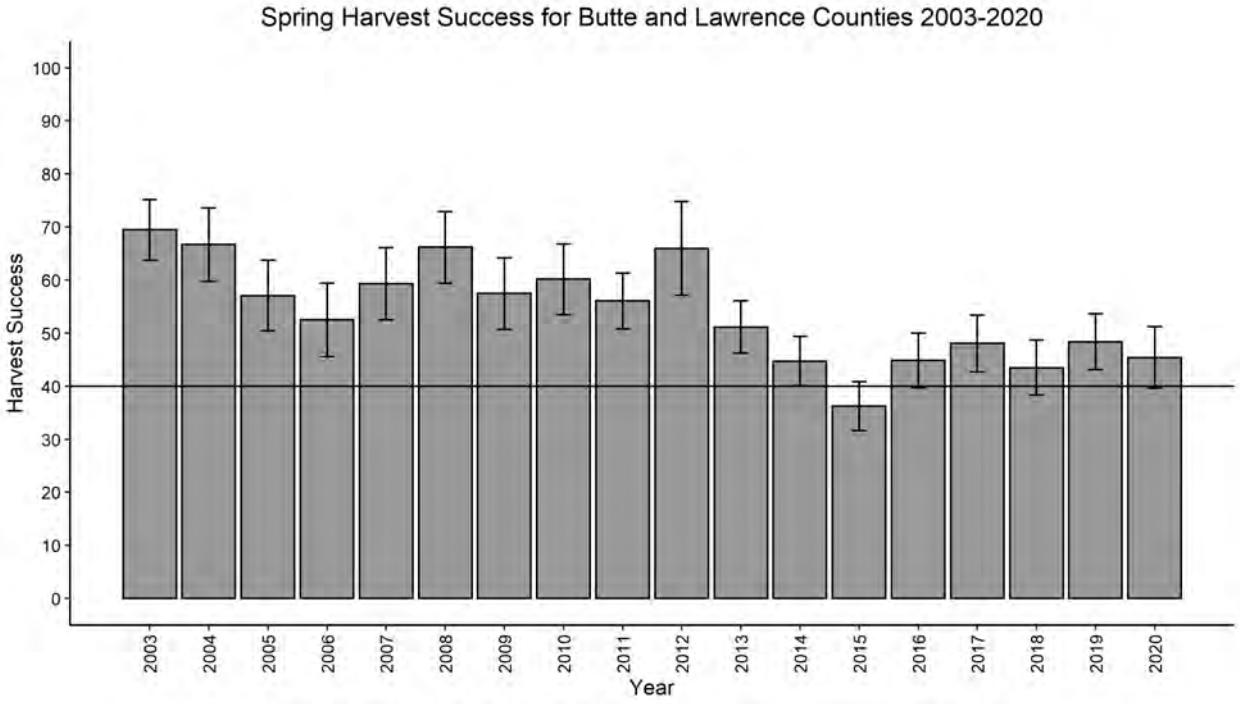
2019
2020
Year


Fall Turkey Harvest for Brule County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
40
30
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Butte and Lawrence Counties 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
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2008
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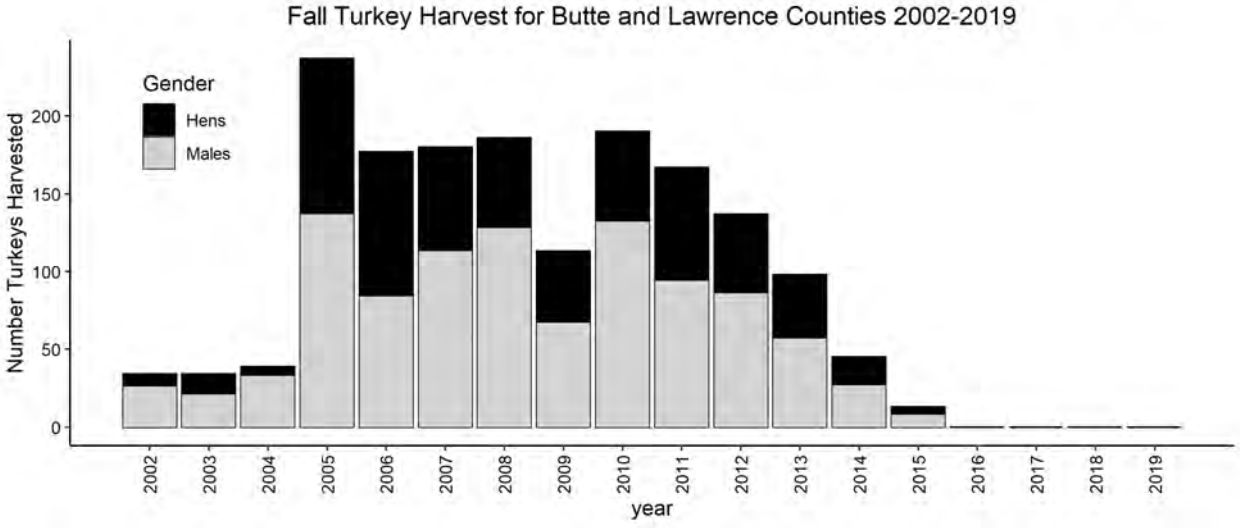
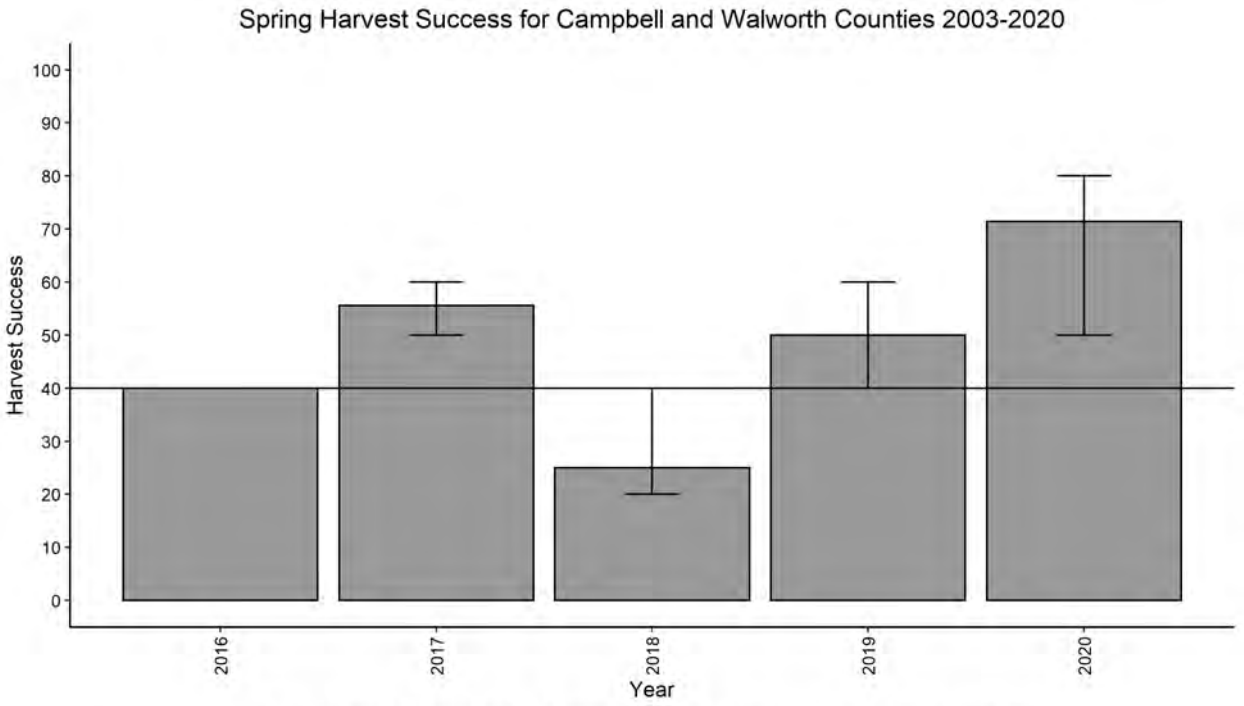
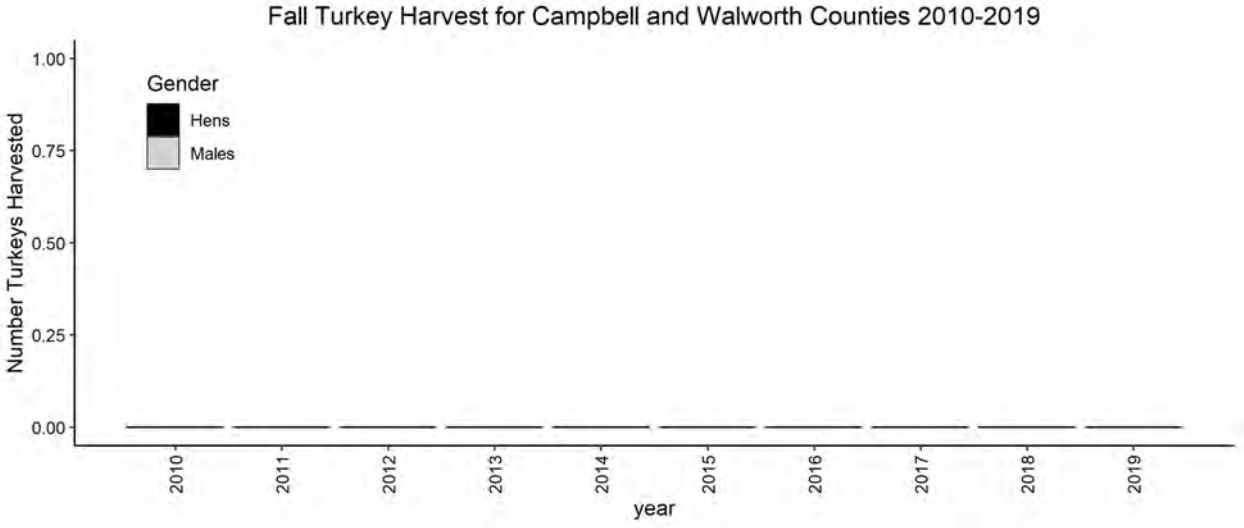
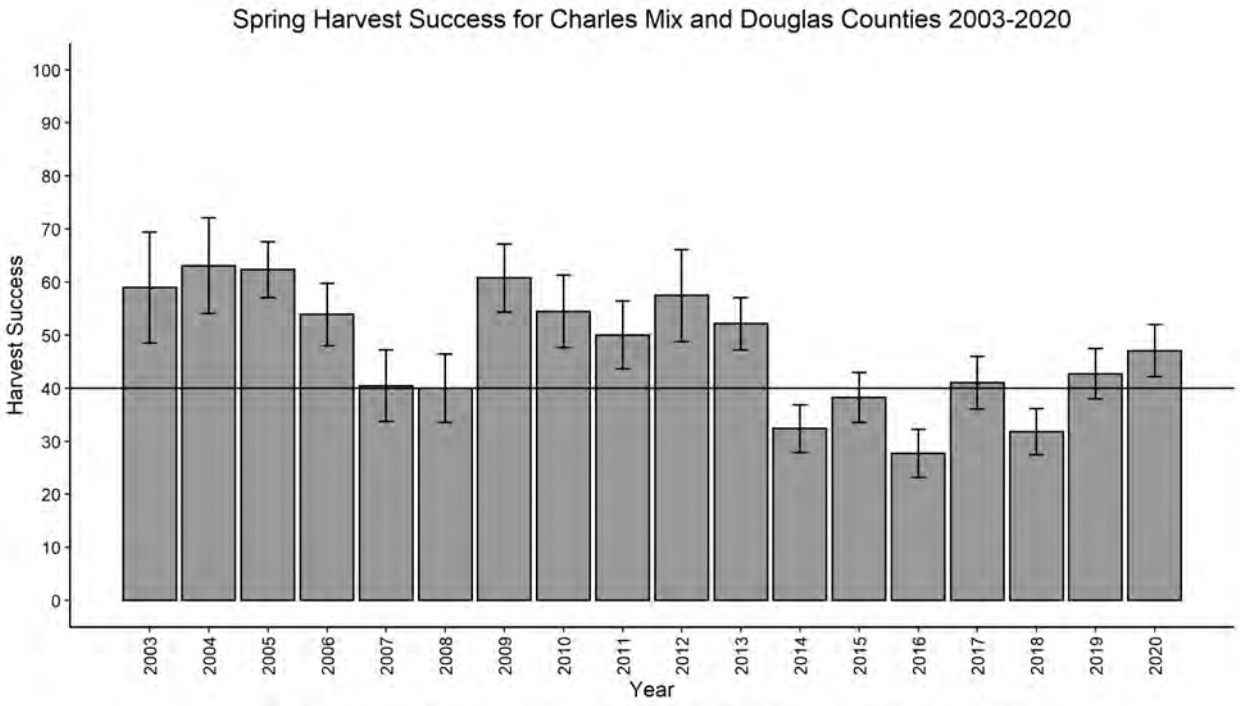
2020
Year


Fall Turkey Harvest for Butte and Lawrence Counties 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
200
150
100
50
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Campbell and Walworth Counties 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2016
2017
2018
2019
2020
Year


Fall Turkey Harvest for Campbell and Walworth Counties 2010-2019
Number Turkeys Harvested
1.00
0.75
0.50
0.25
0.00
Gender
Hens
Males
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Charles Mix and Douglas Counties 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
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2018
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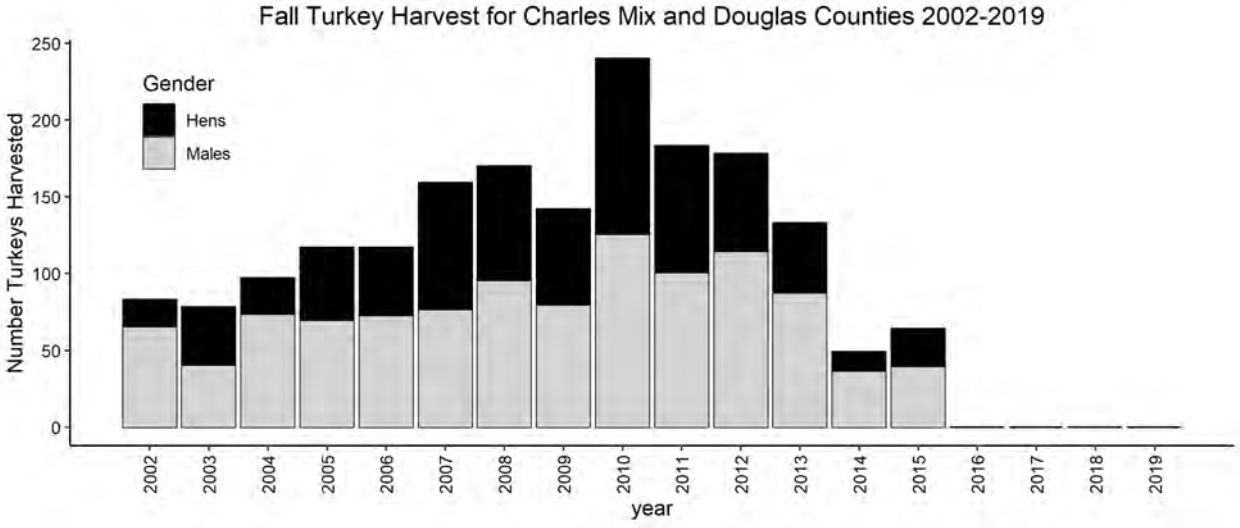
2020
Year


Fall Turkey Harvest for Charles Mix and Douglas Counties 2002-2019
Number Turkeys Harvested
250
200
150
100
50
0
Gender
Hens
Males
2002
2003
2004
2005
2006
2007
2008
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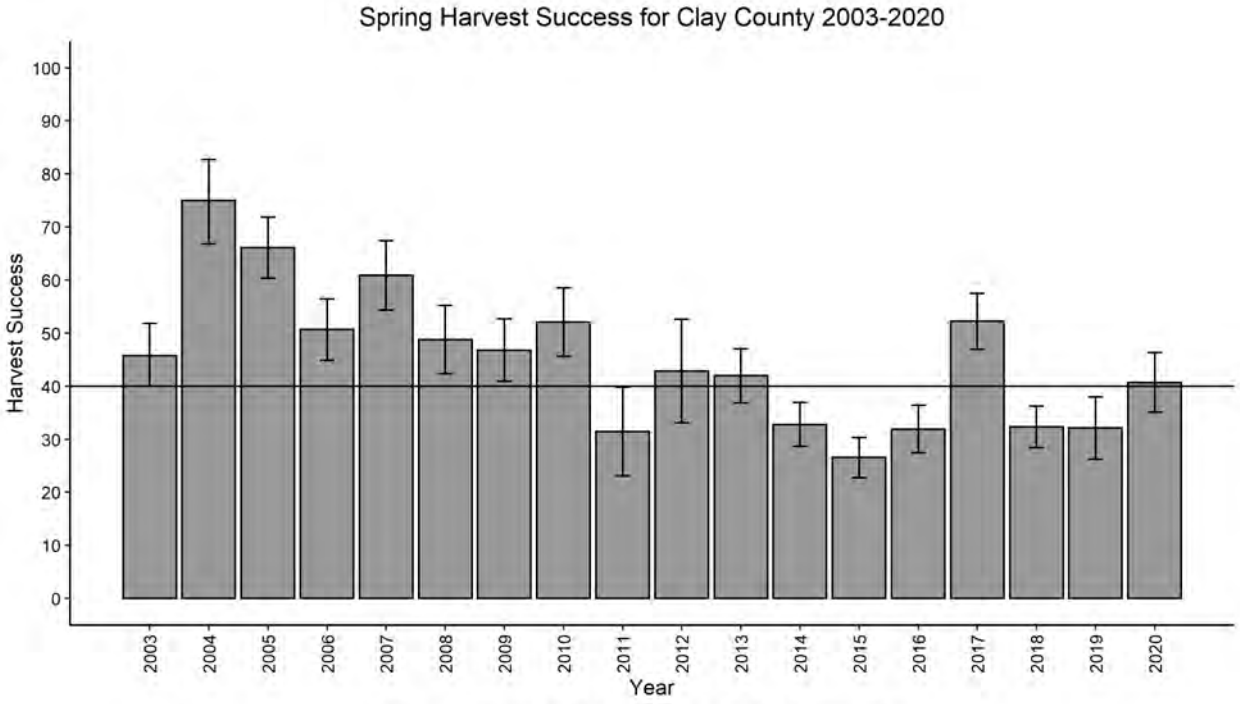
2017
2018
2019
year


Spring Harvest Success for Clay County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
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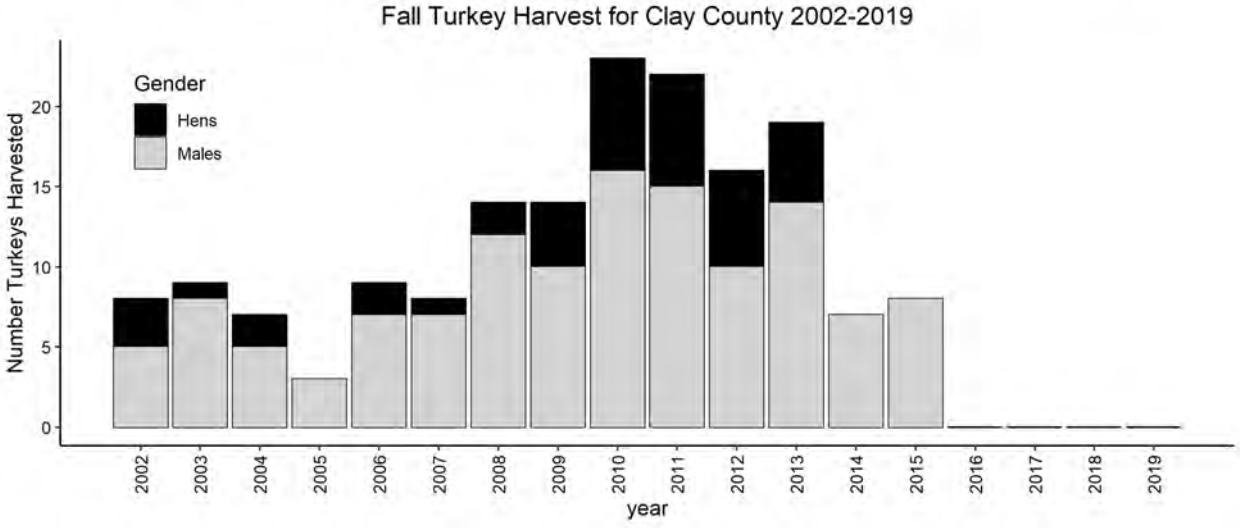
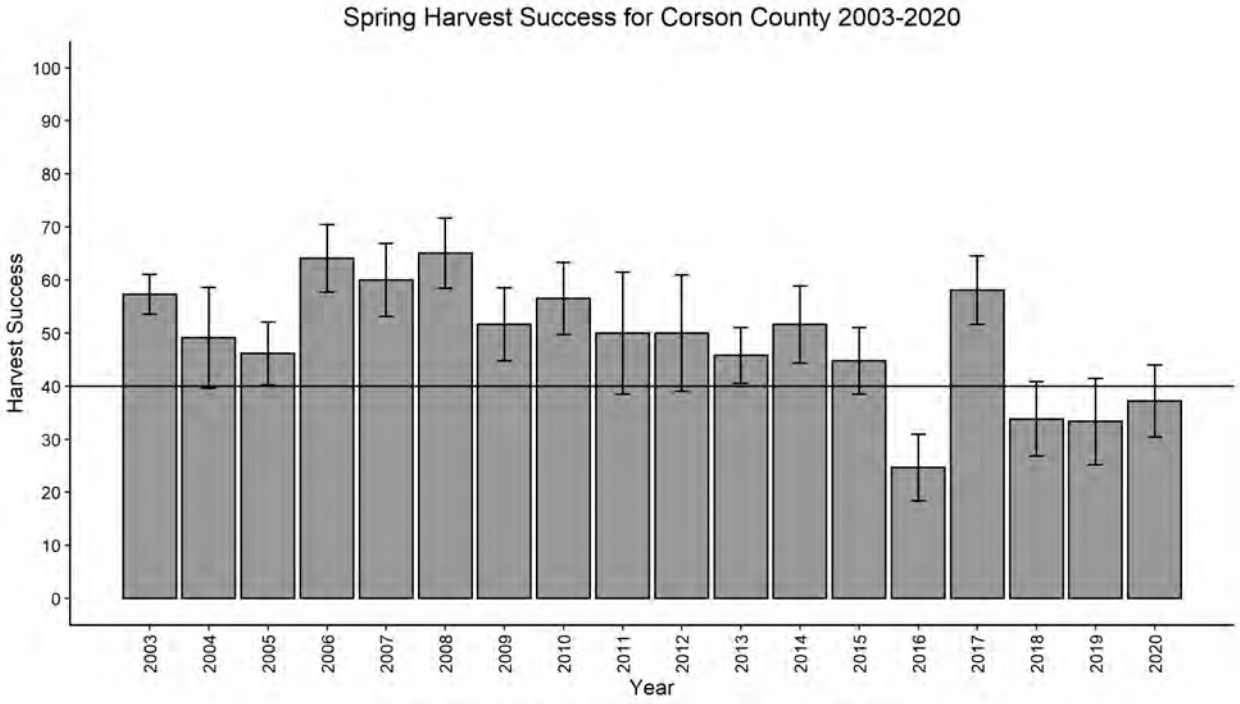
2019
2020
Year


Fall Turkey Harvest for Clay County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
20
15
10
5
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Corson County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
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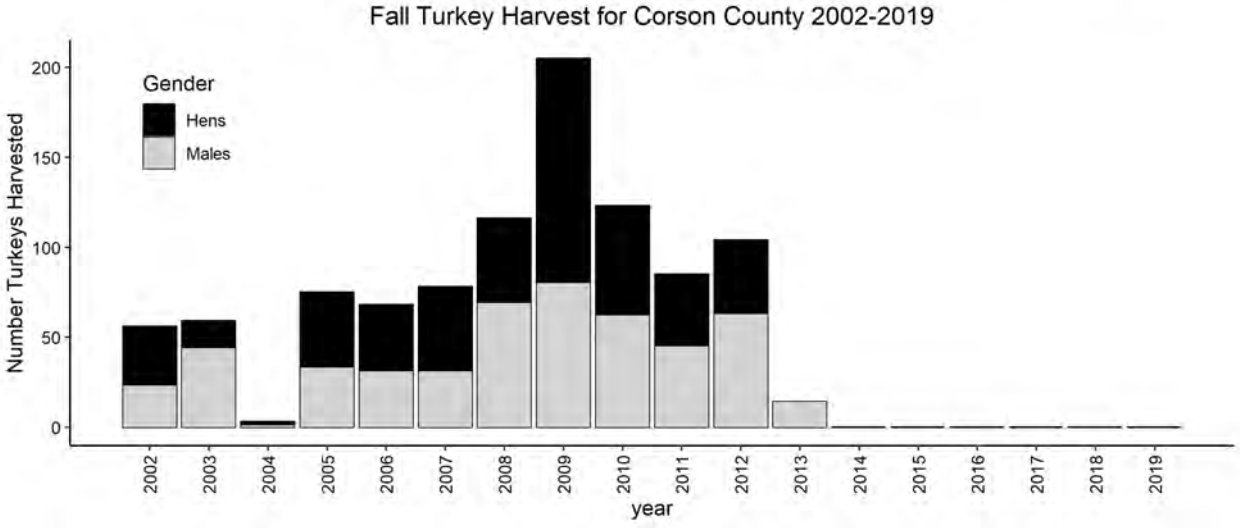
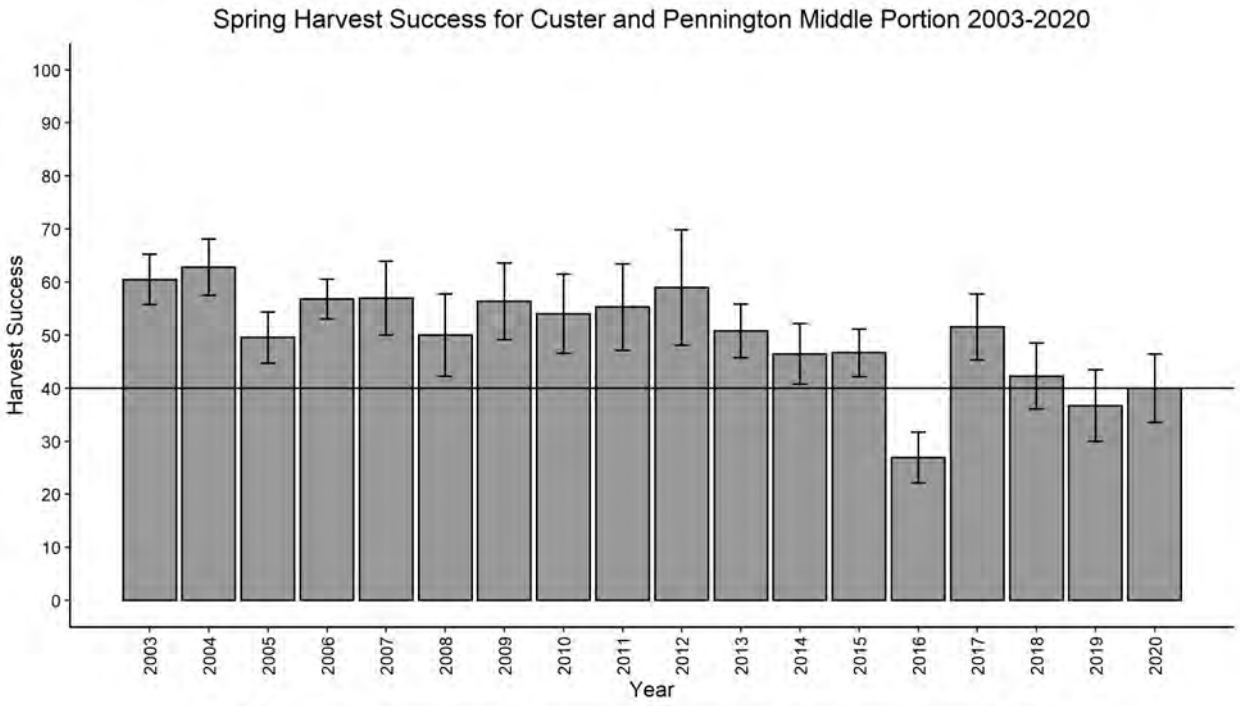
2019
2020
Year


Fall Turkey Harvest for Corson County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
200
150
100
50
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Custer and Pennington Middle Portion 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
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2012
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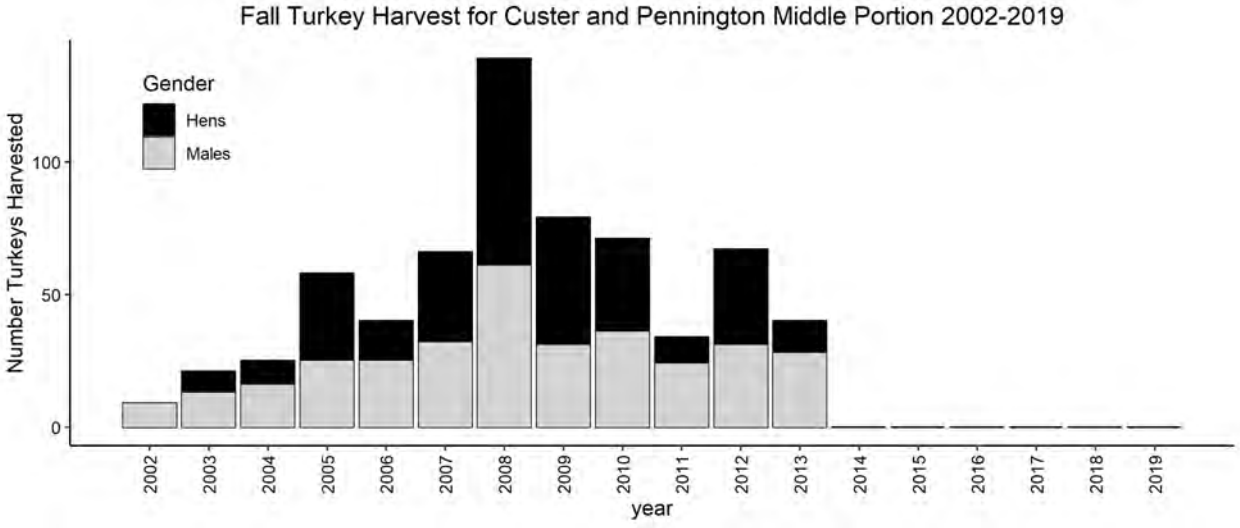
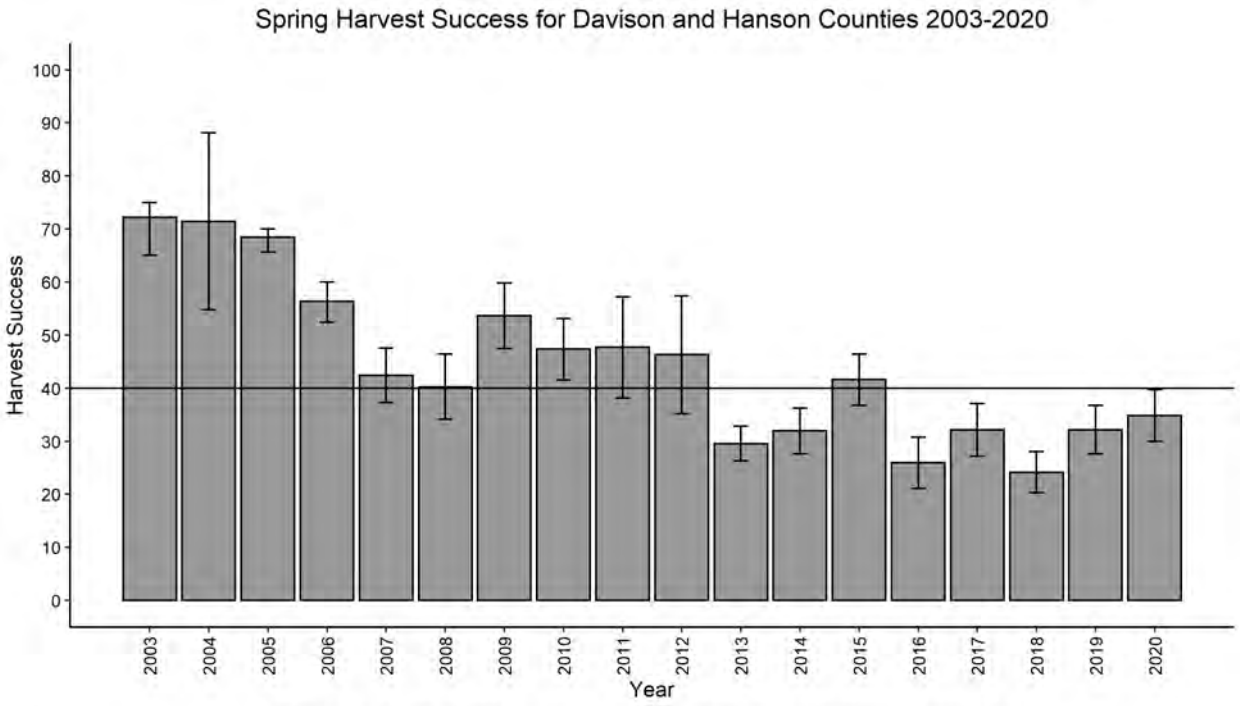
2019
2020
Year


Fall Turkey Harvest for Custer and Pennington Middle Portion 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
100
50
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Davison and Hanson Counties 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
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2011
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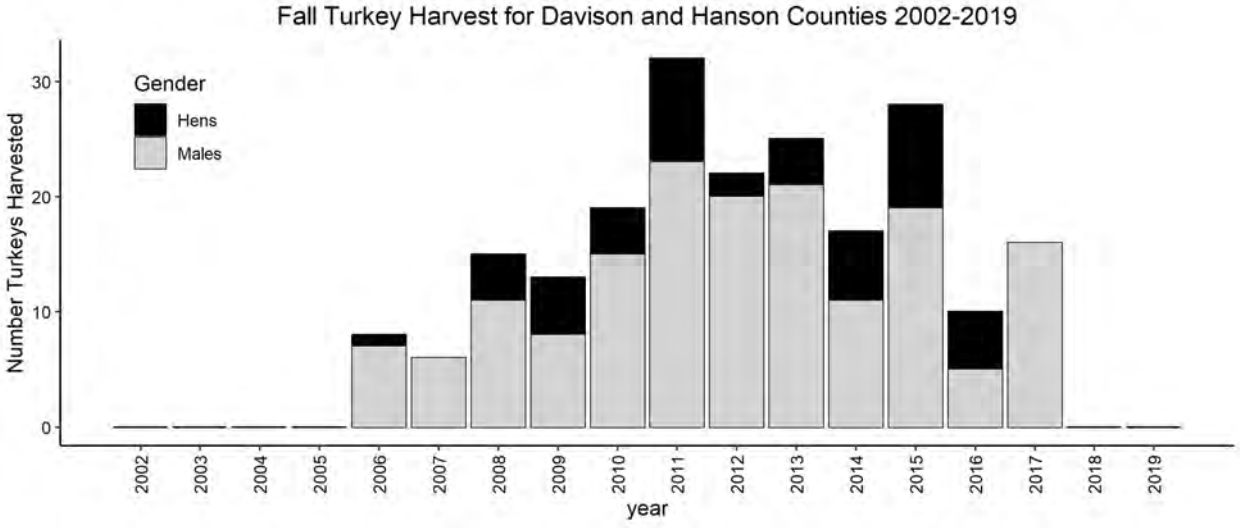
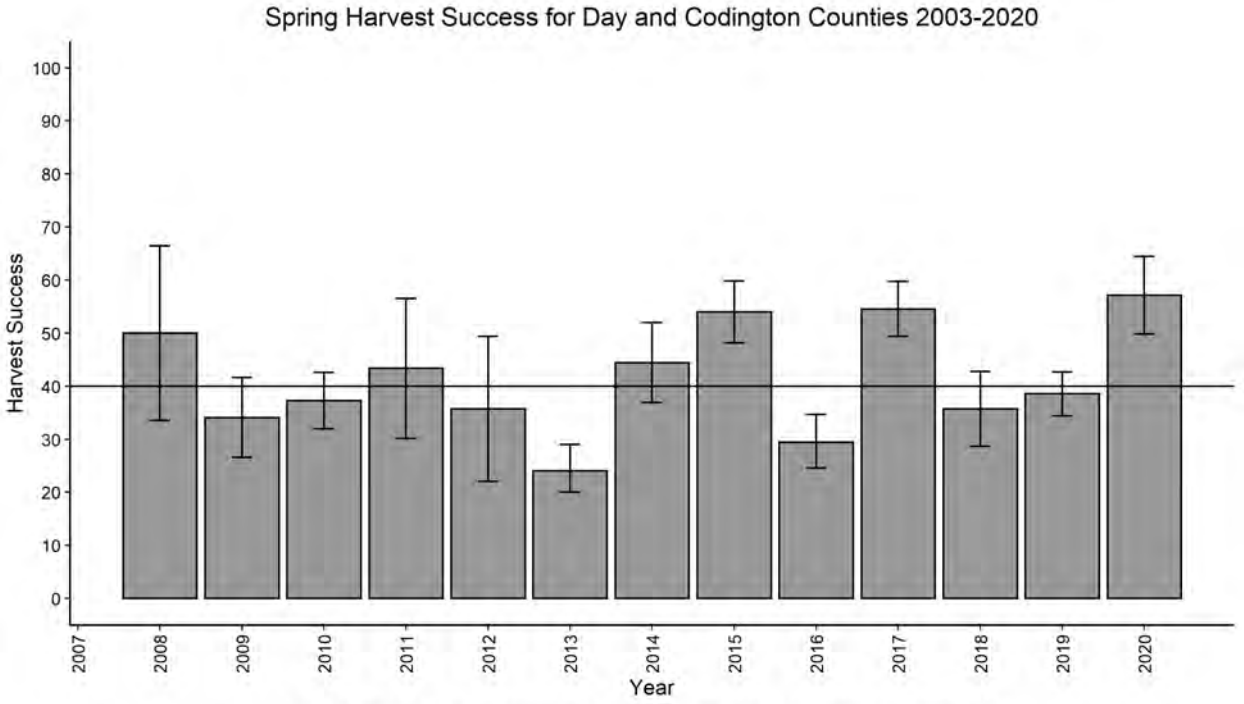
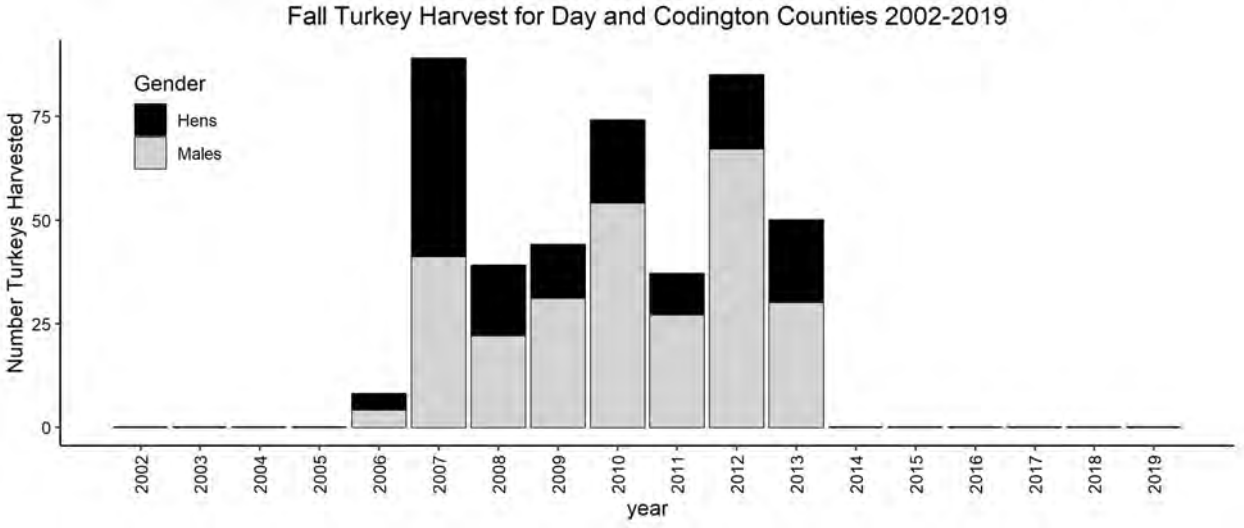
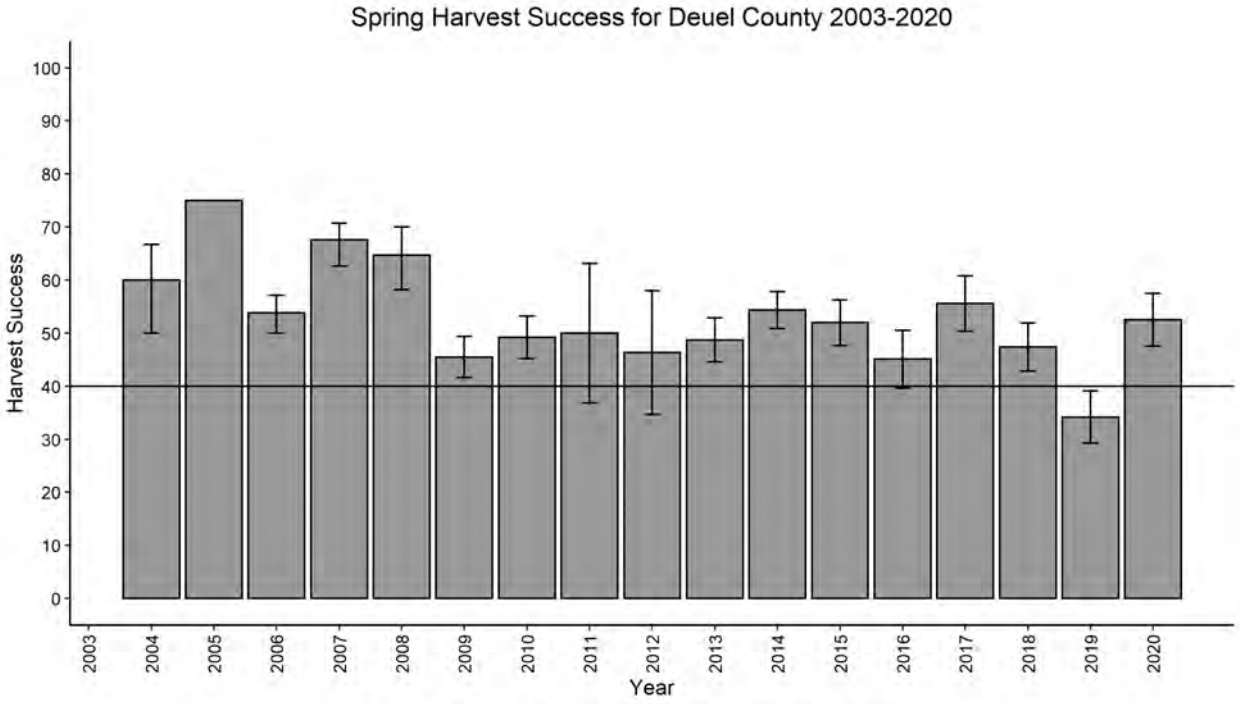
2018
2019
2020
Year


Fall Turkey Harvest for Davison and Hanson Counties 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
30
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Day and Codington Counties 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year


Fall Turkey Harvest for Day and Codington Counties 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
75
50
25
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Deuel County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
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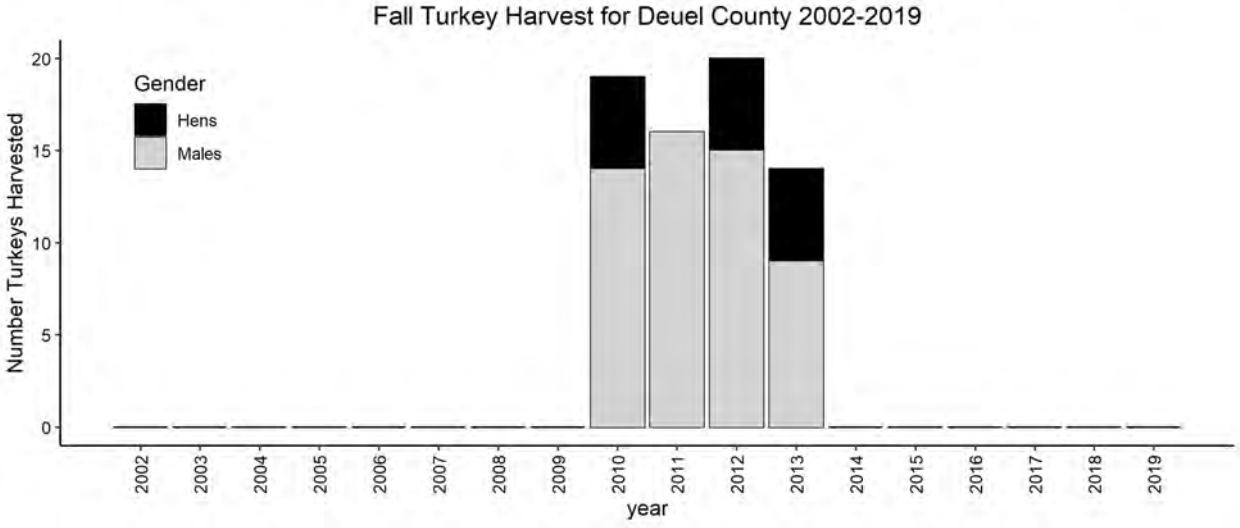
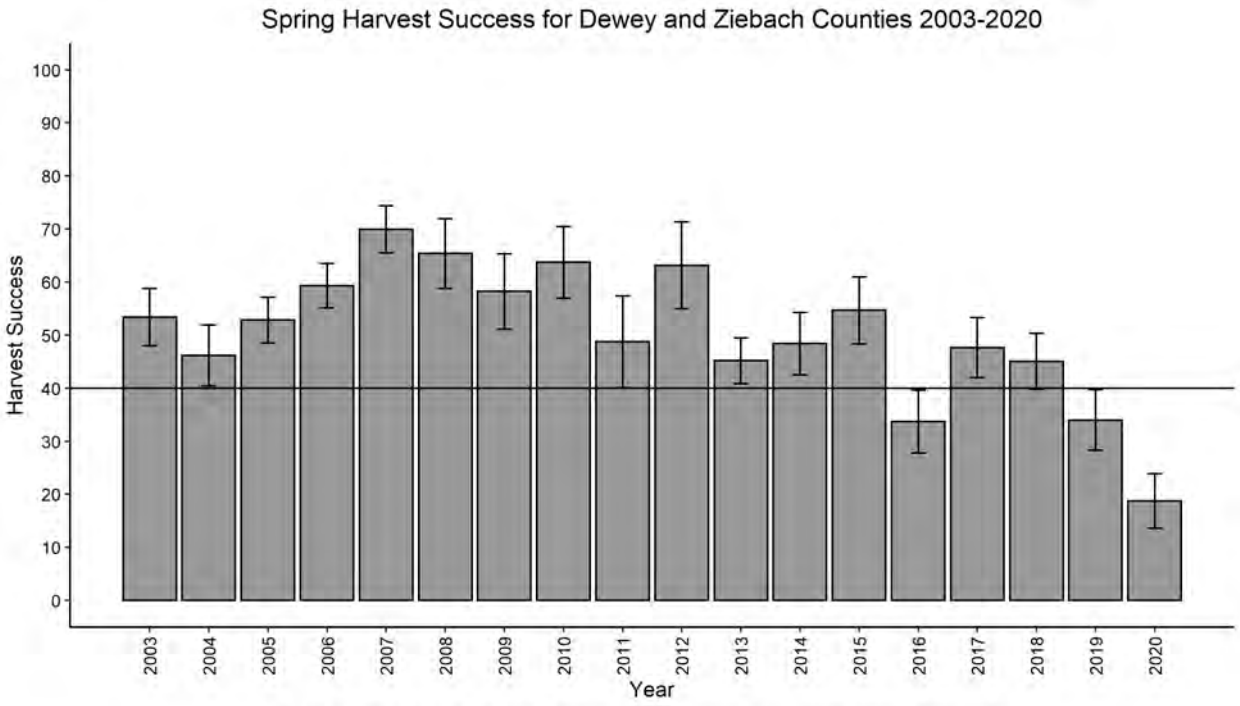
2016
2017
2018
2019
2020
Year


Fall Turkey Harvest for Deuel County 2002-2019
Number Turkeys Harvested
Gender
Hens
Males
20
15
10
5
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Dewey and Ziebach Counties 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
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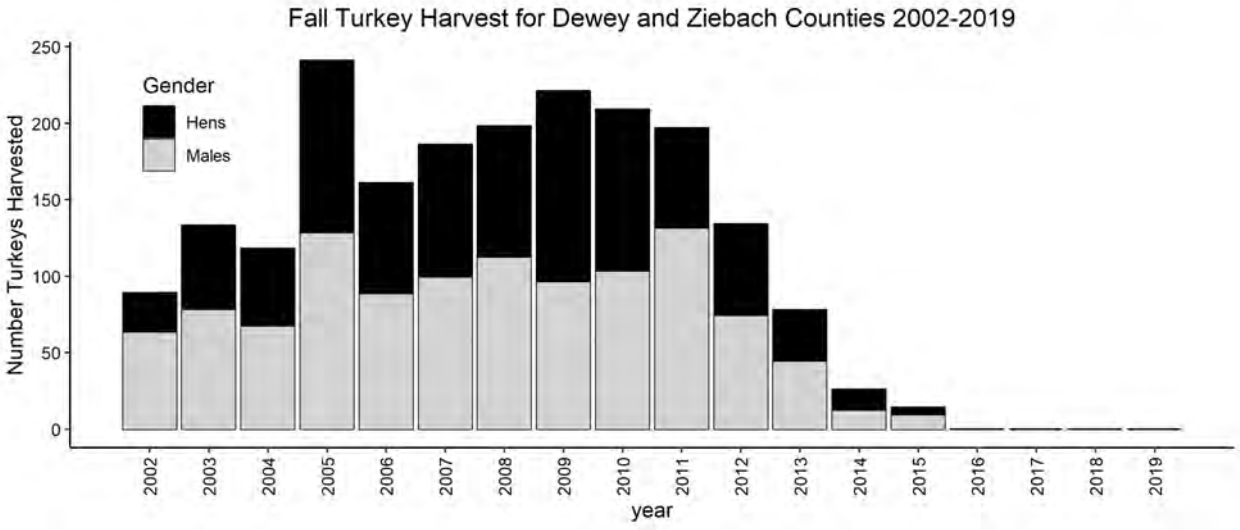
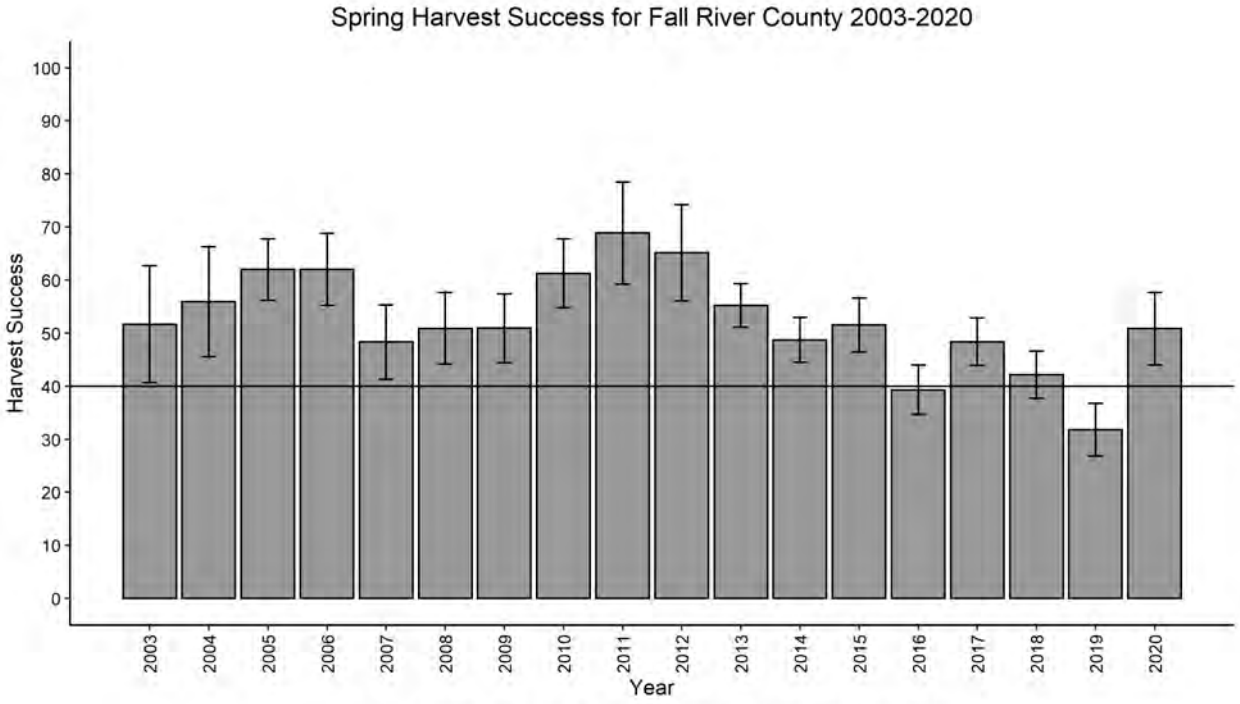
2016
2017
2018
2019
2020
Year


Fall Turkey Harvest for Dewey and Ziebach Counties 2002-2019
Number Turkeys Harvested
250
200
150
100
50
0
Gender
Hens
Males
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Fall River County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
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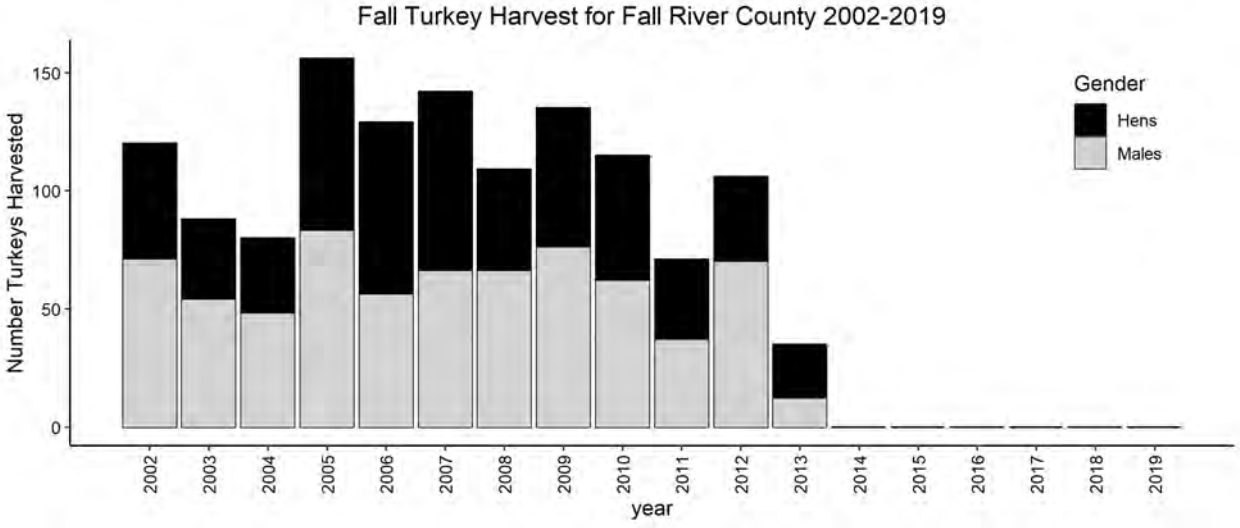
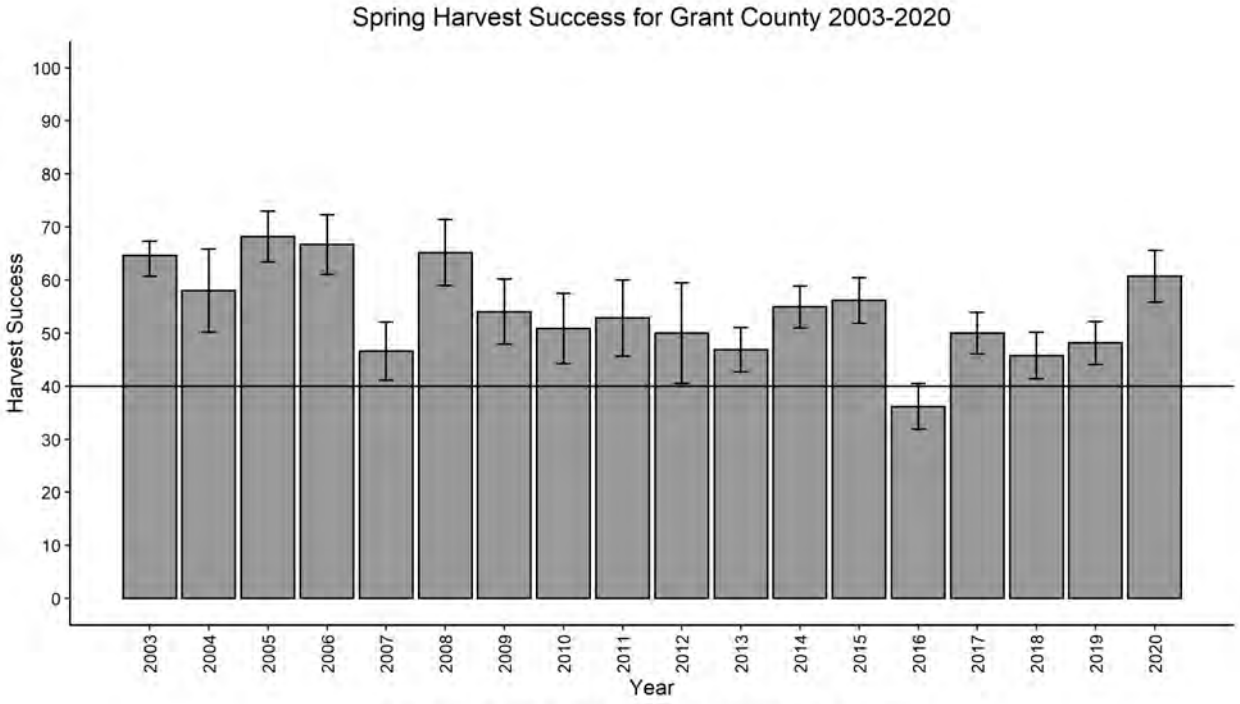
2014
2015
2016
2017
2018
2019
2020
Year


Fall Turkey Harvest for Fall River County 2002-2019
Number Turkeys Harvested
150
100
50
0
Gender
Hens
Males
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Grant County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
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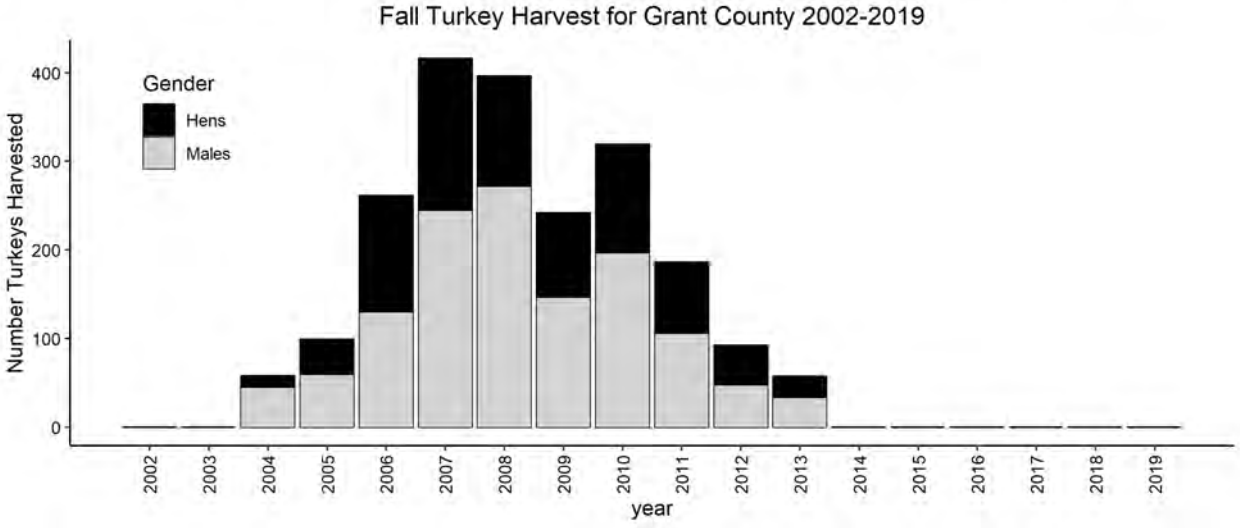
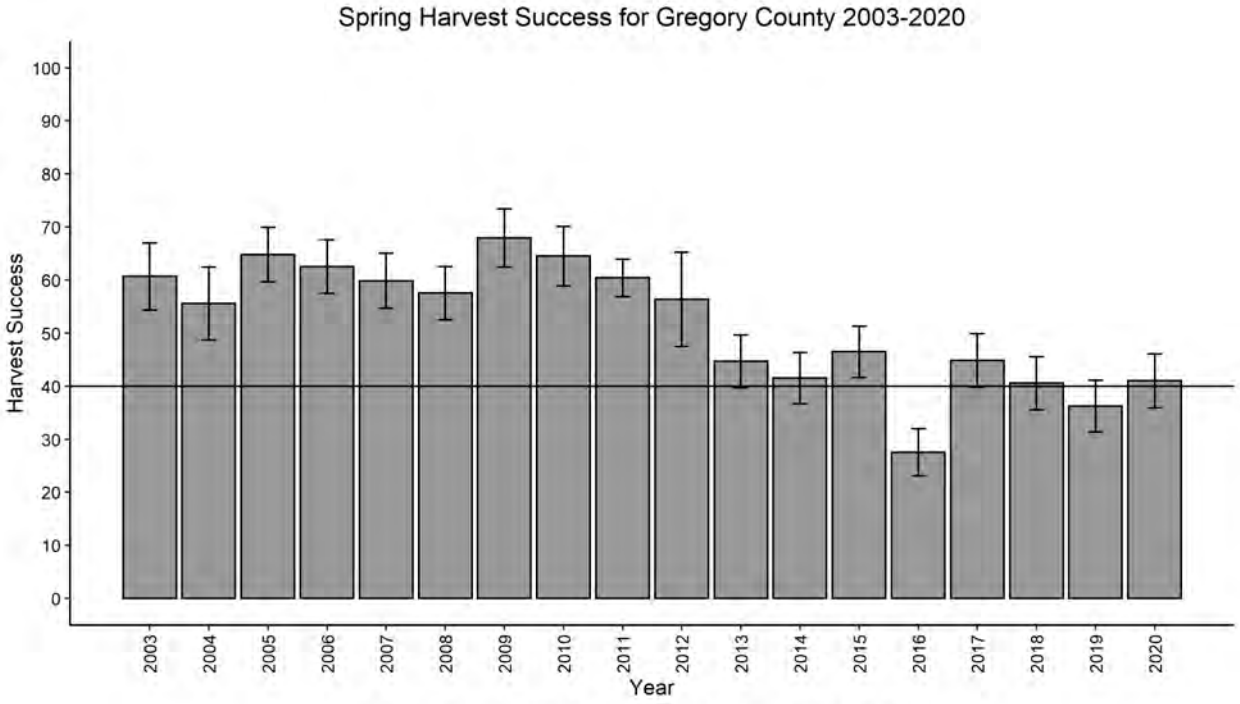
2016
2017
2018
2019
2020
Year


Fall Turkey Harvest for Grant County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
400
300
200
100
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Gregory County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
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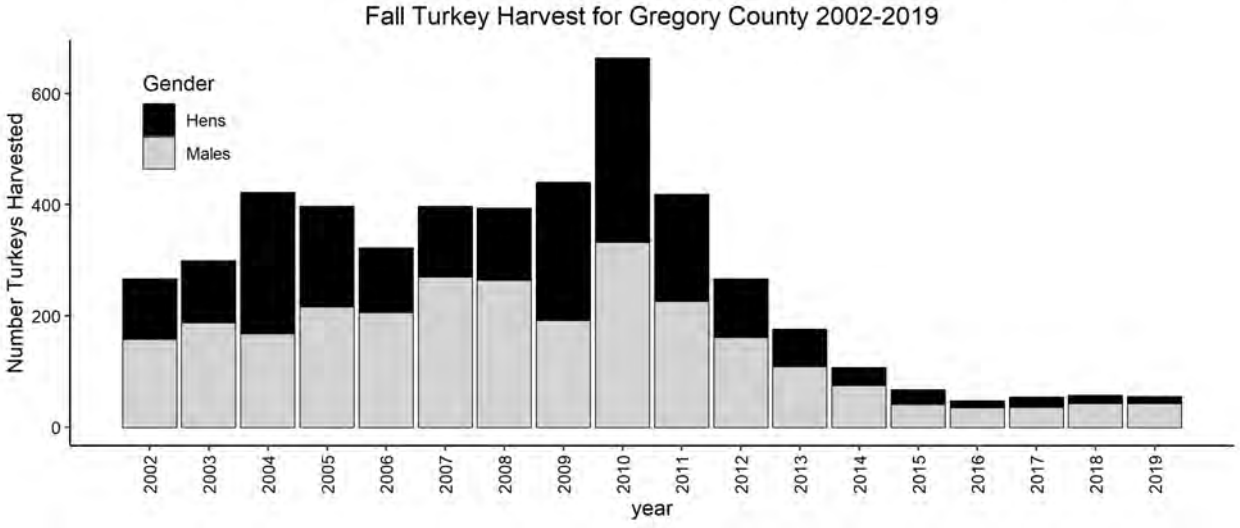
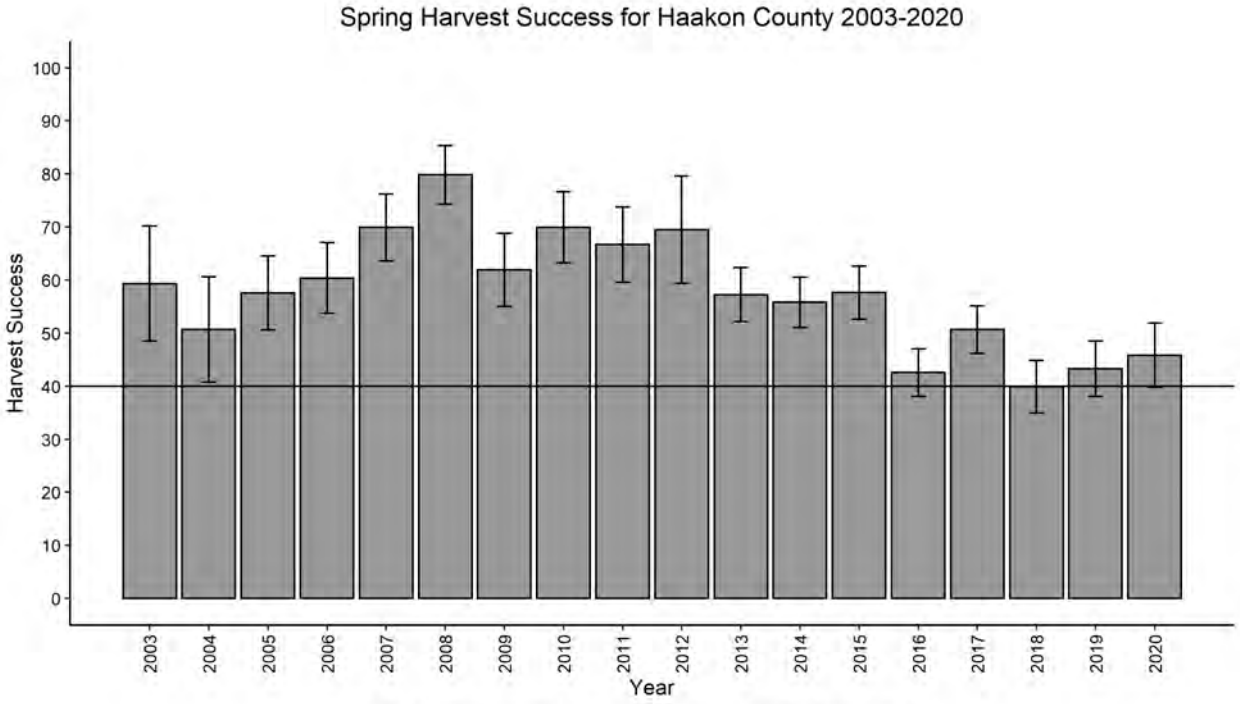
2017
2018
2019
2020
Year


Fall Turkey Harvest for Gregory County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
600
400
200
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Haakon County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
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2011
2012
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2014
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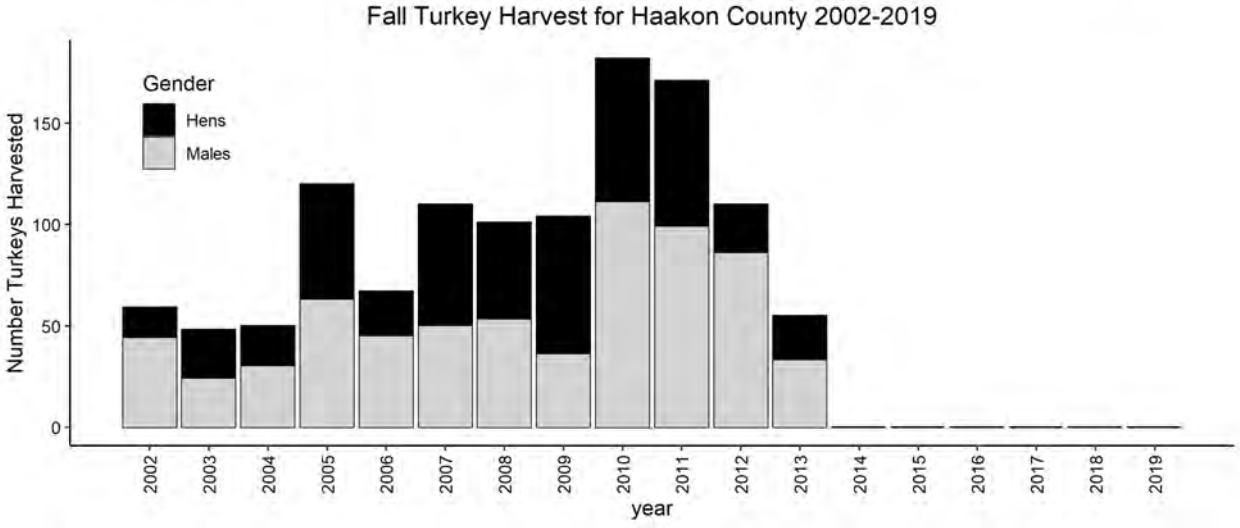
2017
2018
2019
2020
Year


Fall Turkey Harvest for Haakon County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
150
100
50
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
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2017
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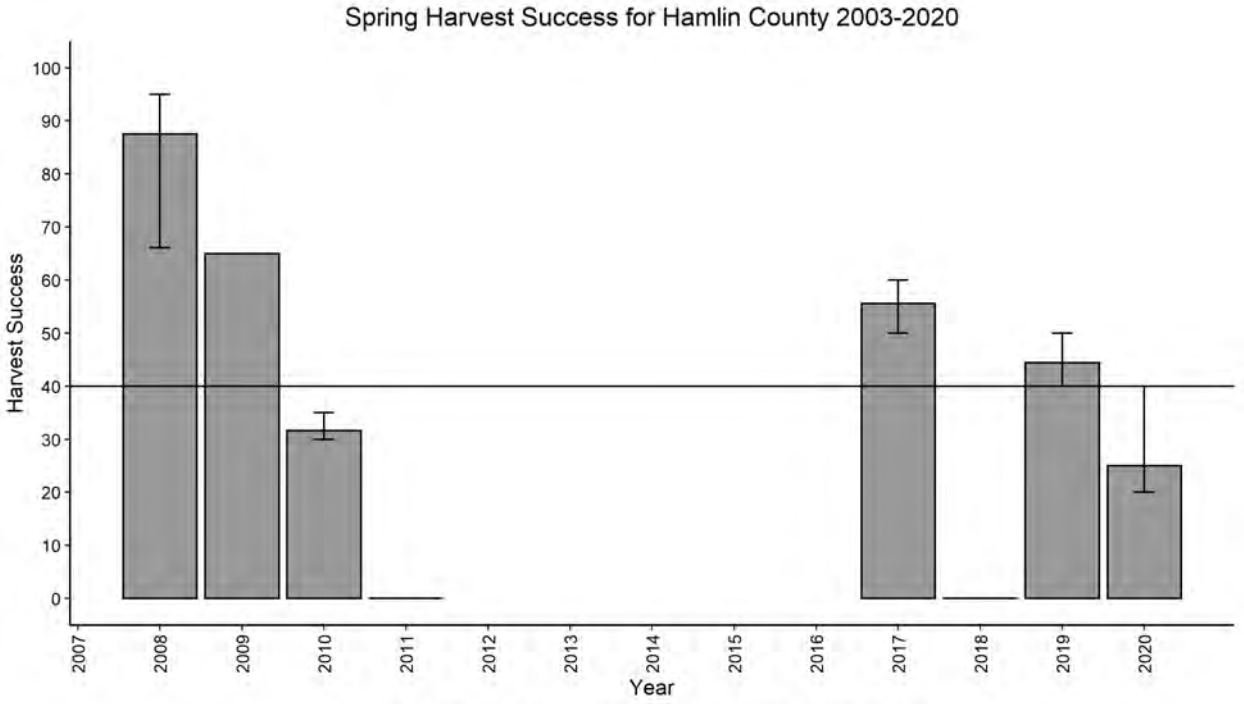
2019
year


Spring Harvest Success for Hamlin County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
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10
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2007
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2009
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2011
2012
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2014
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2018
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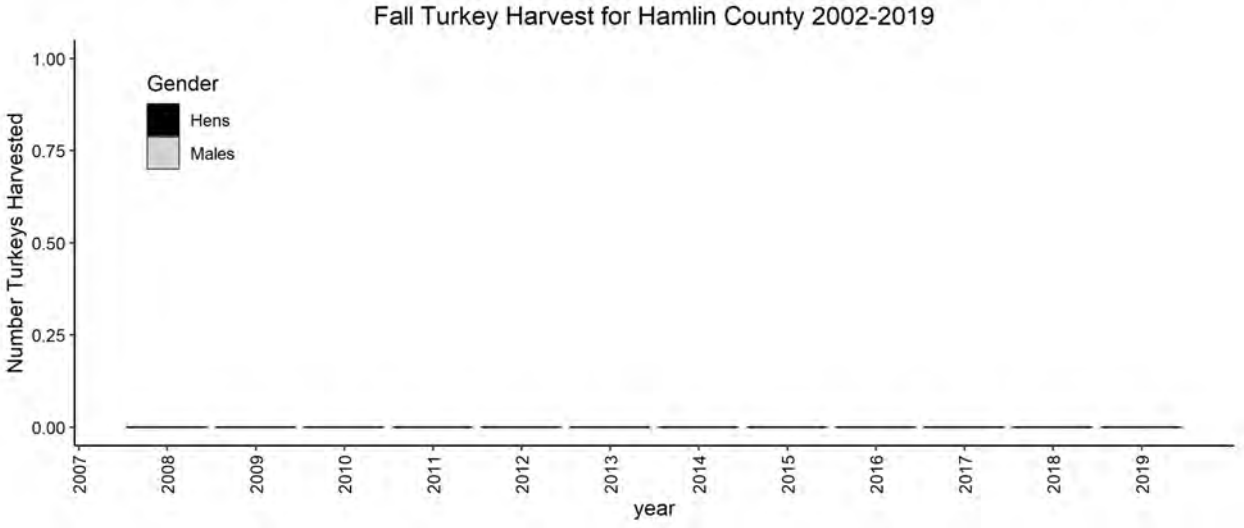
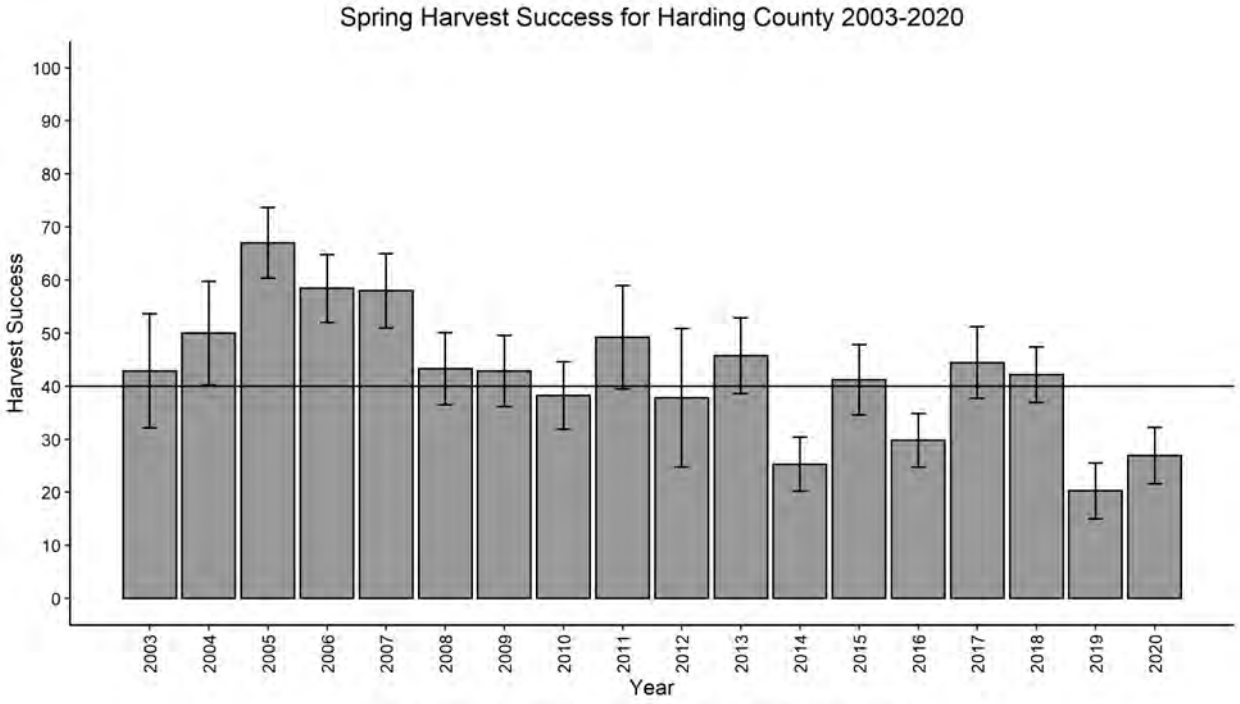
2020
Year


Fall Turkey Harvest for Hamlin County 2002-2019
Number Turkeys Harvested
1.00
0.75
0.50
0.25
0.00
Gender
Hens
Males
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Harding County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
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2007
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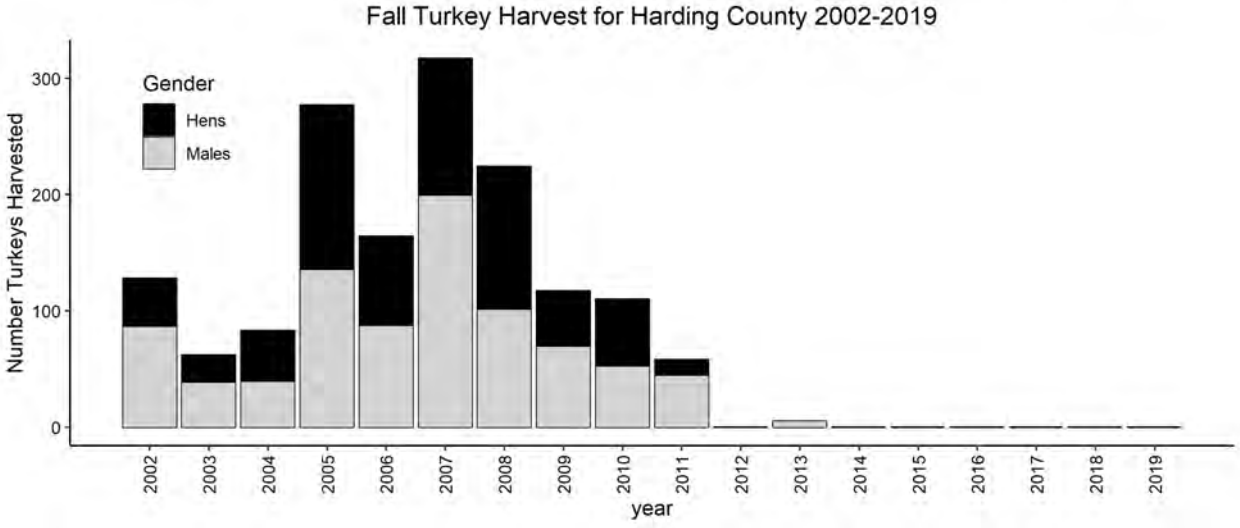
2019
2020
Year


Fall Turkey Harvest for Harding County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
300
200
100
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
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2013
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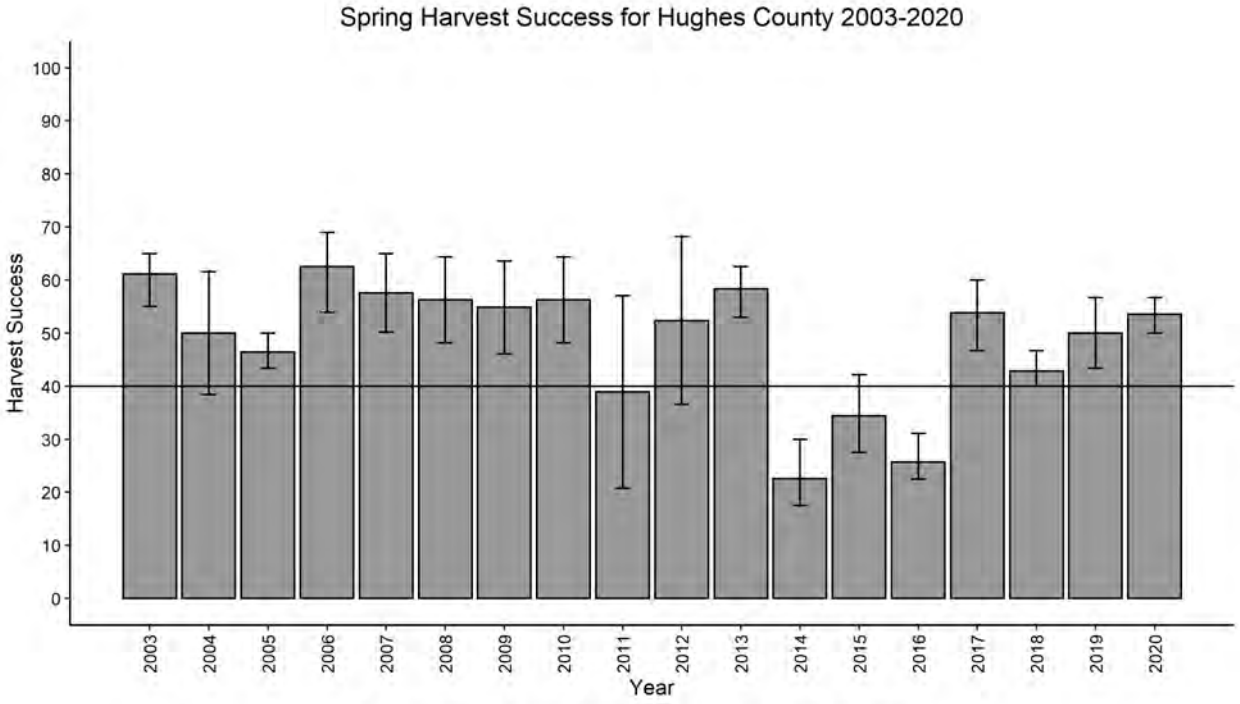
2016
2017
2018
2019
year


Spring Harvest Success for Hughes County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
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2007
2008
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2011
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2018
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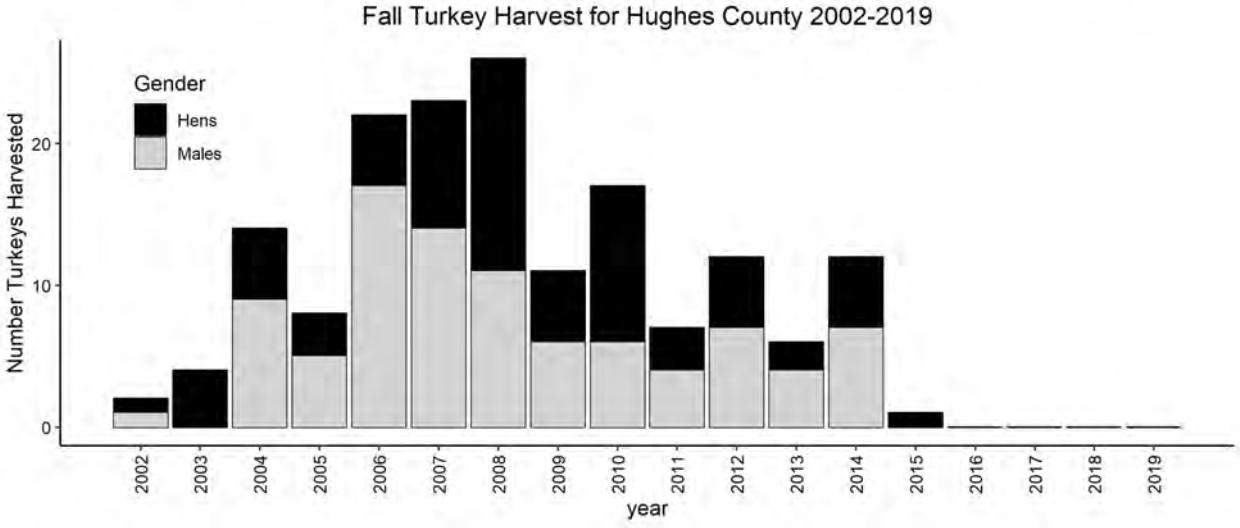
2020
Year


Fall Turkey Harvest for Hughes County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
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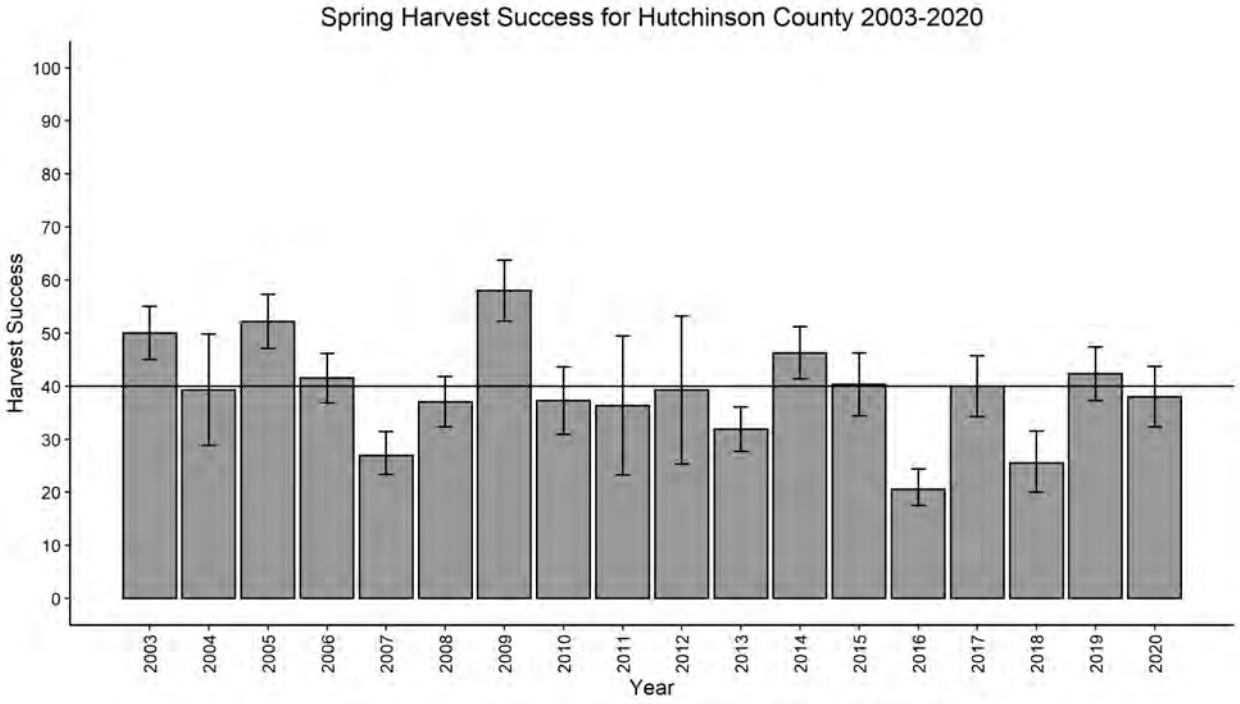
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Hutchinson County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
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2012
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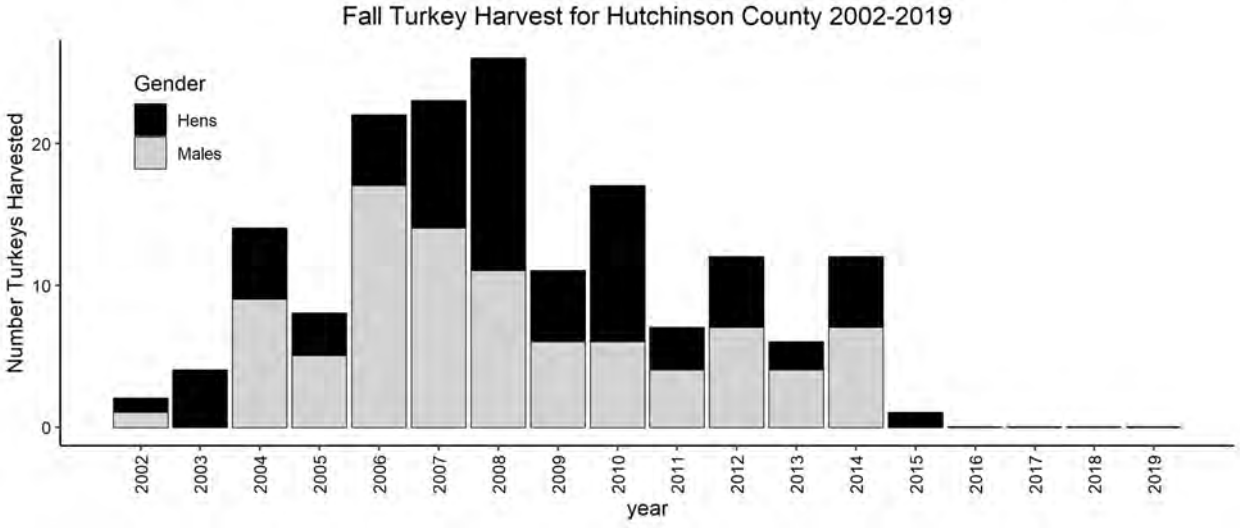
2018
2019
2020
Year


Fall Turkey Harvest for Hutchinson County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
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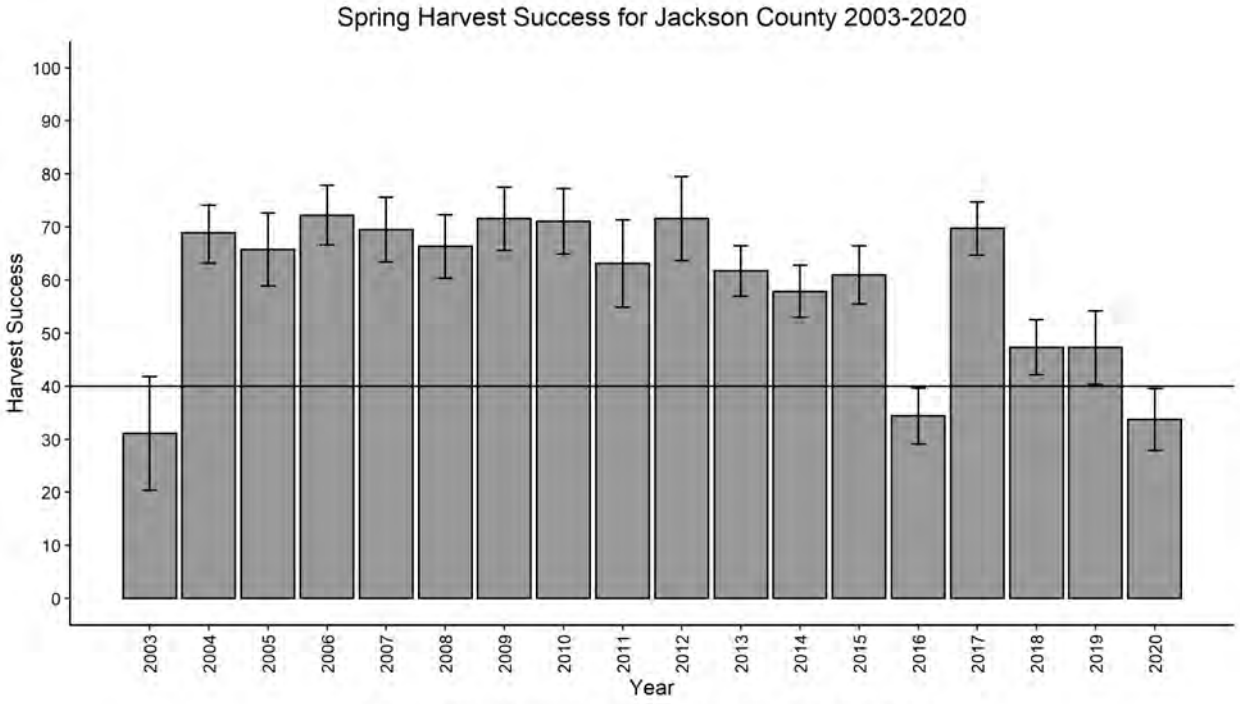
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Jackson County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
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2012
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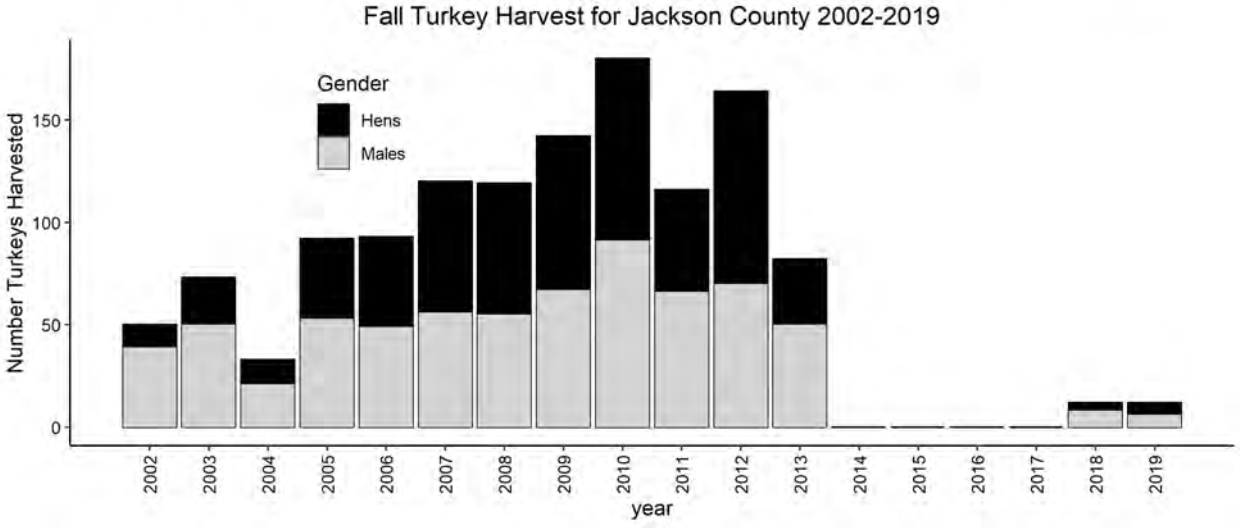
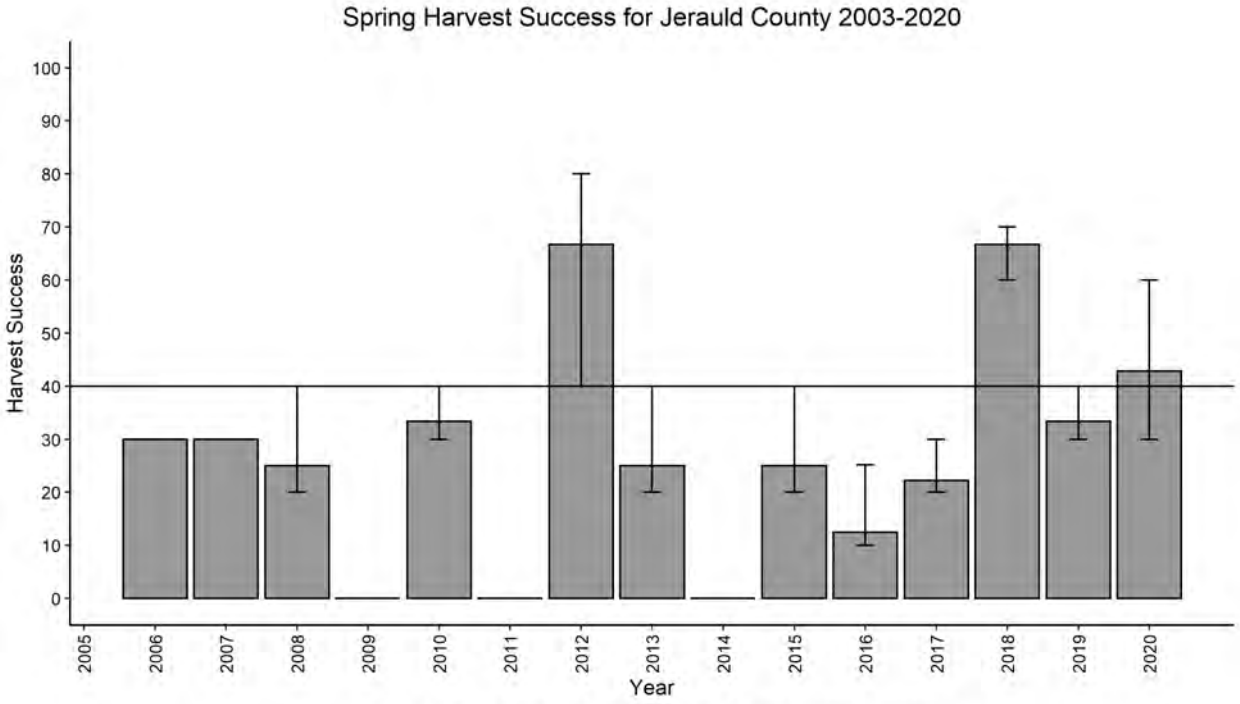
2018
2019
2020
Year


Fall Turkey Harvest for Jackson County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
150
100
50
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Jerauld County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2005
2006
2007
2008
2009
2010
2011
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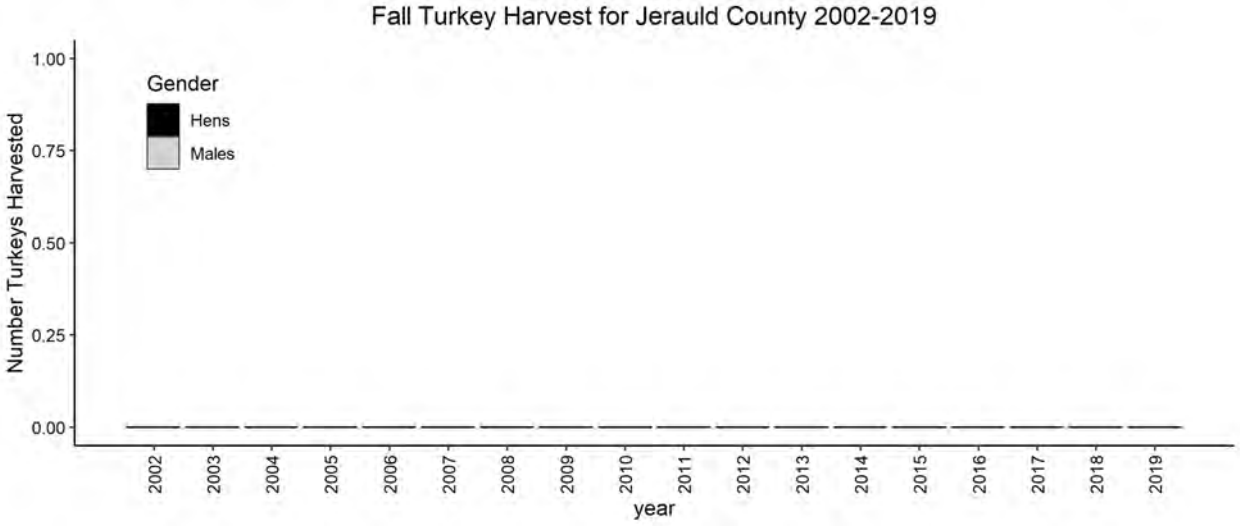
2018
2019
2020
Year


Fall Turkey Harvest for Jerauld County 2002-2019
Number Turkeys Harvested
1.00
0.75
0.50
0.25
0.00
Gender
Hens
Males
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
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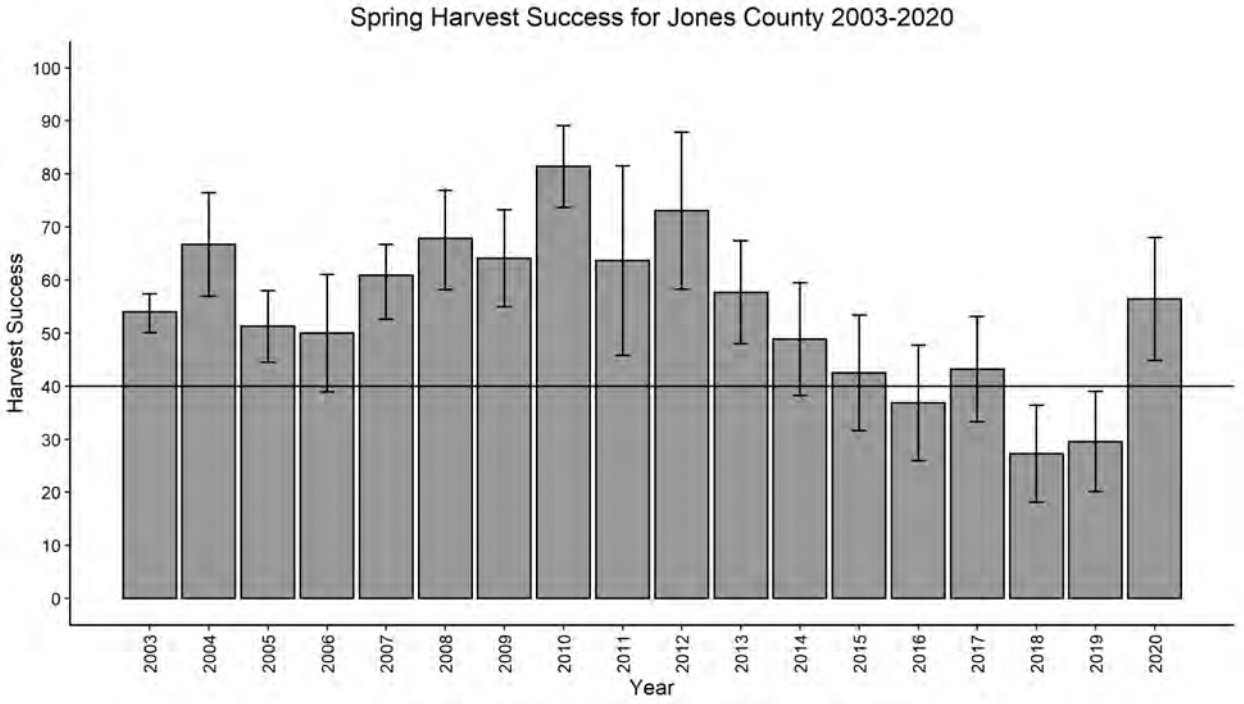
2015
2016
2017
2018
2019
year


Spring Harvest Success for Jones County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
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2012
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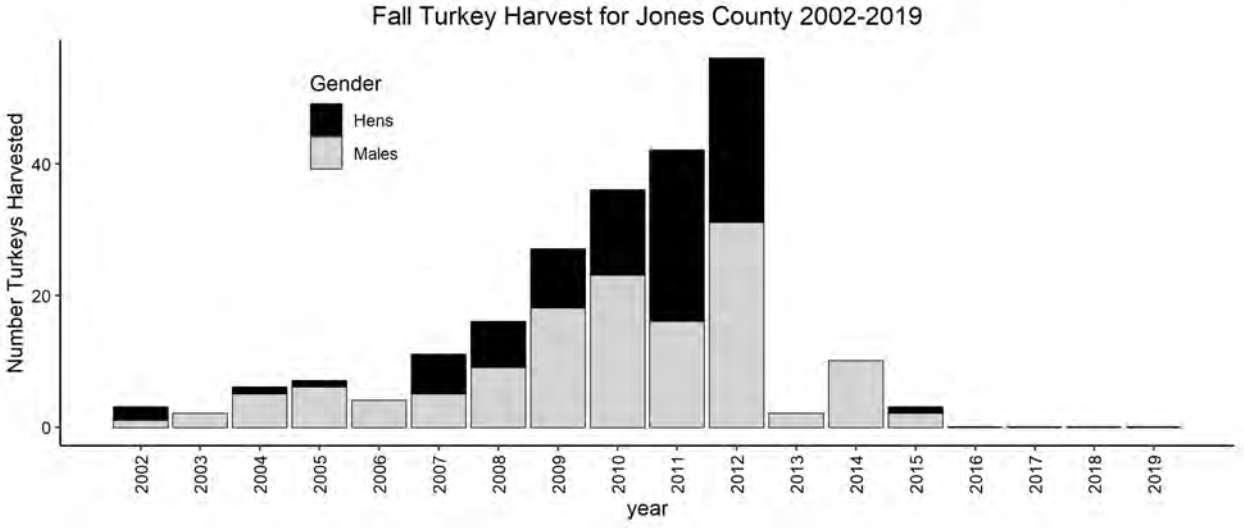
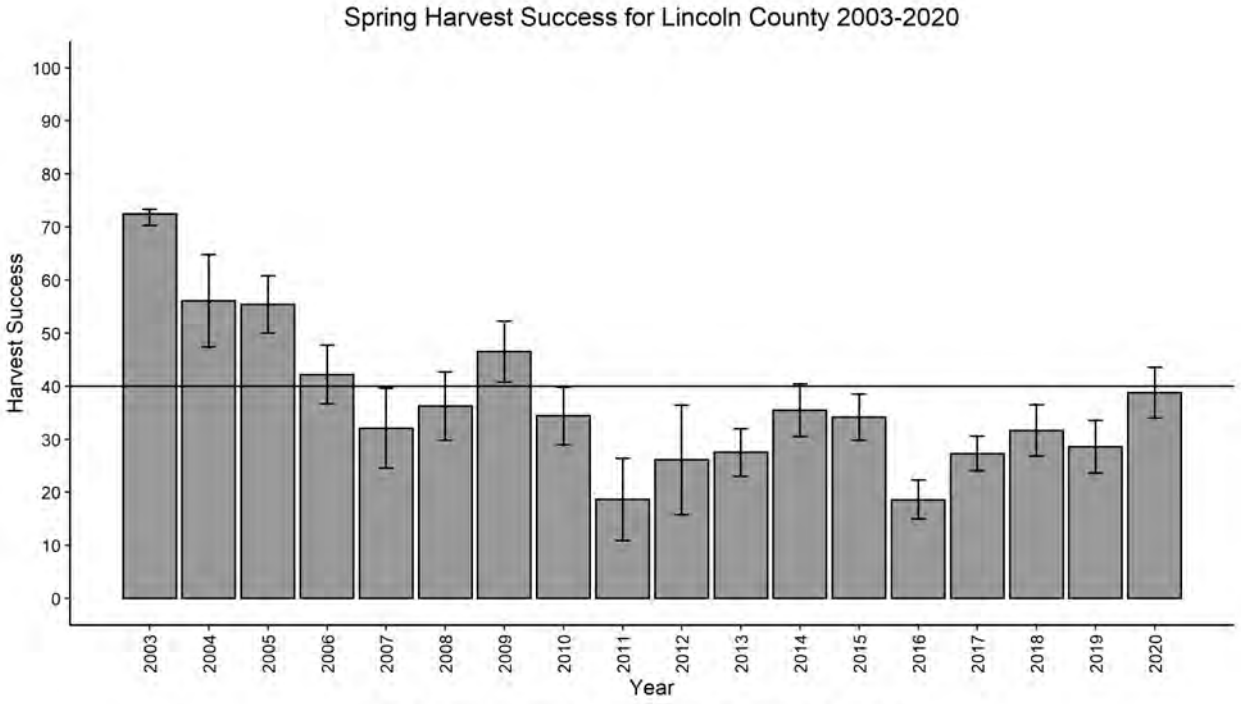
2018
2019
2020
Year


Fall Turkey Harvest for Jones County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
40
20
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Lincoln County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
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2011
2012
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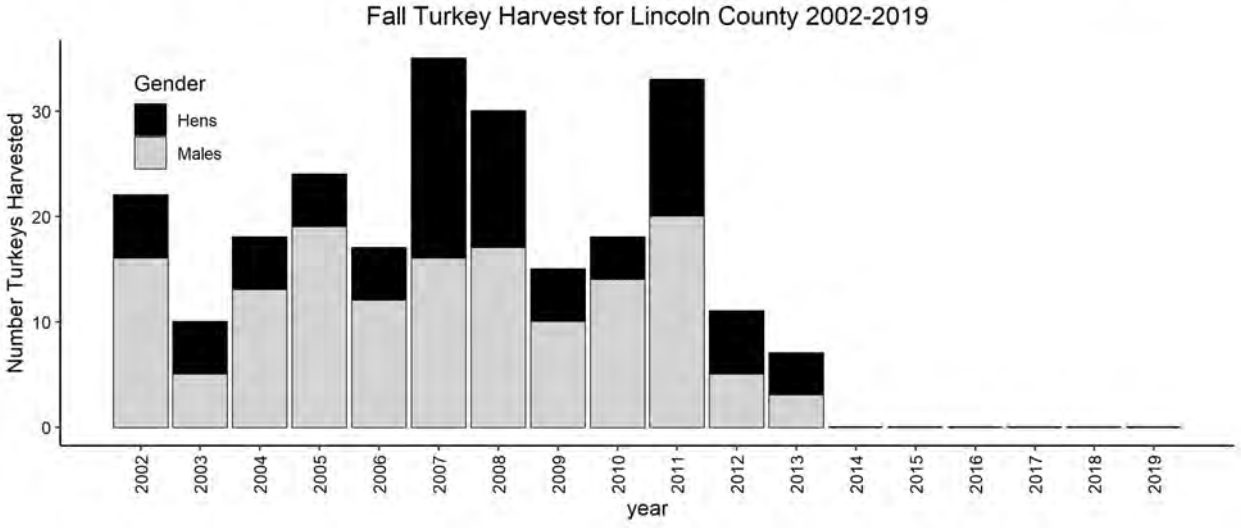
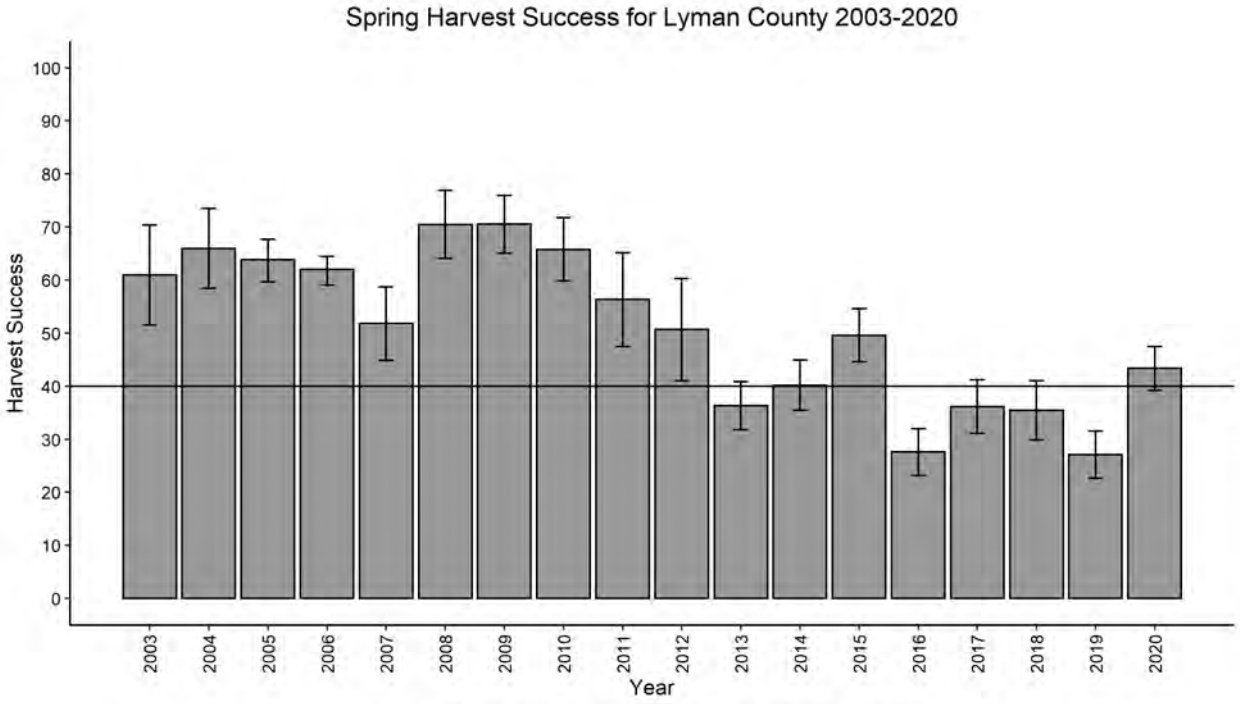
2018
2019
2020
Year


Fall Turkey Harvest for Lincoln County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
30
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Lyman County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
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2010
2011
2012
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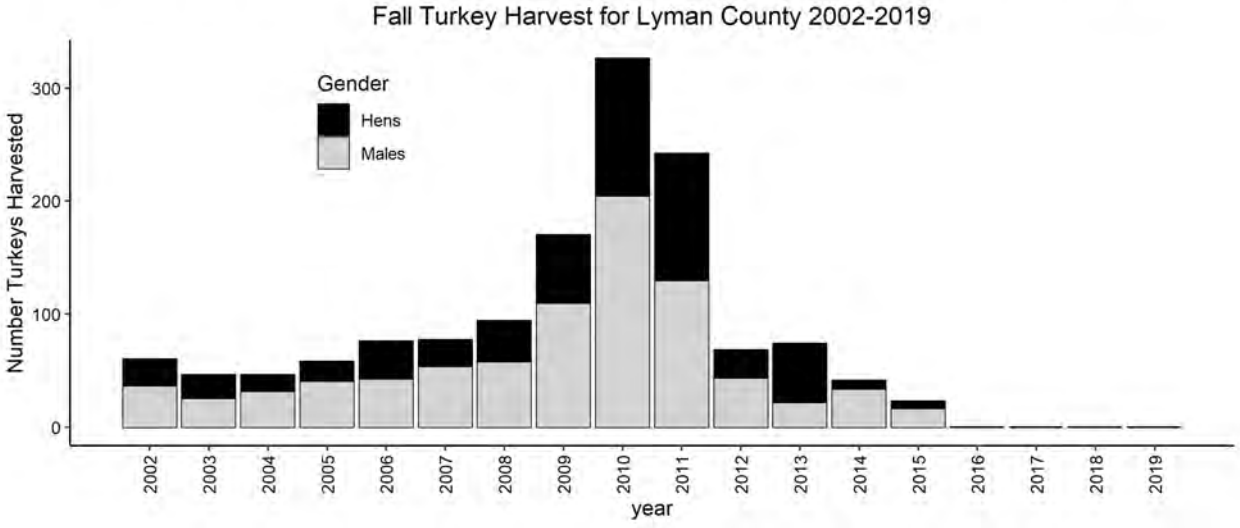
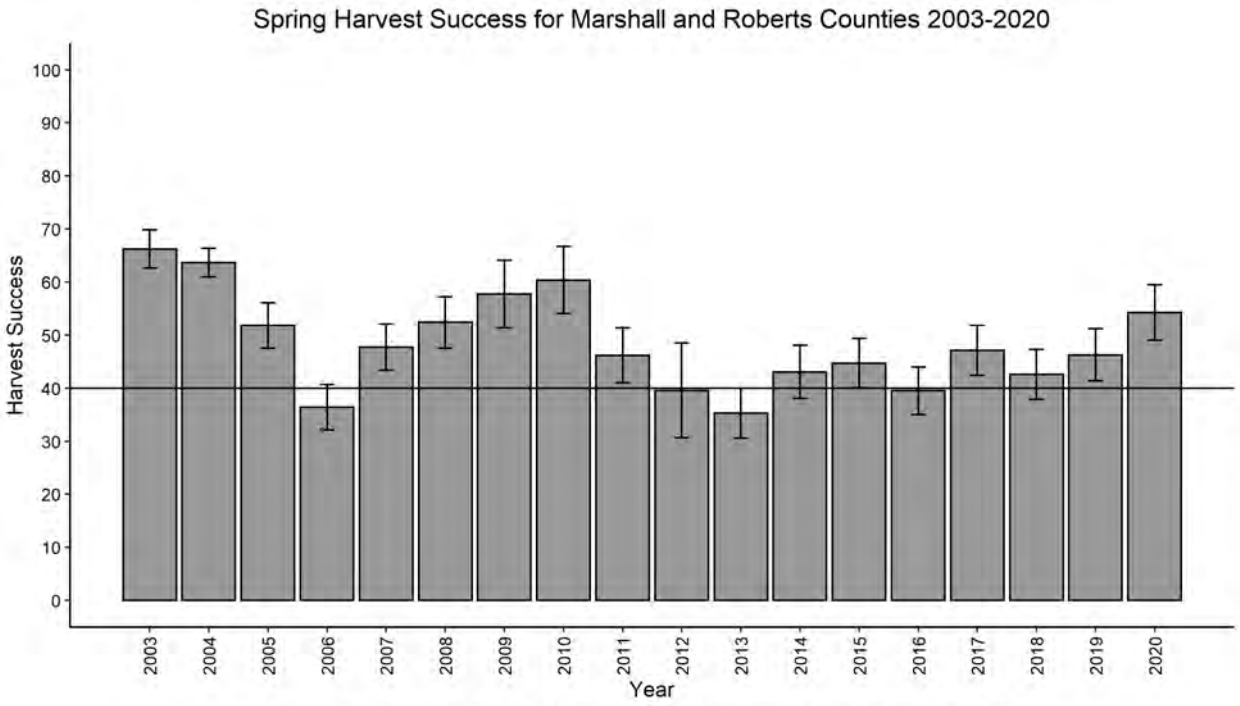
2018
2019
2020
Year


Fall Turkey Harvest for Lyman County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
300
200
100
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Marshall and Roberts Counties 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
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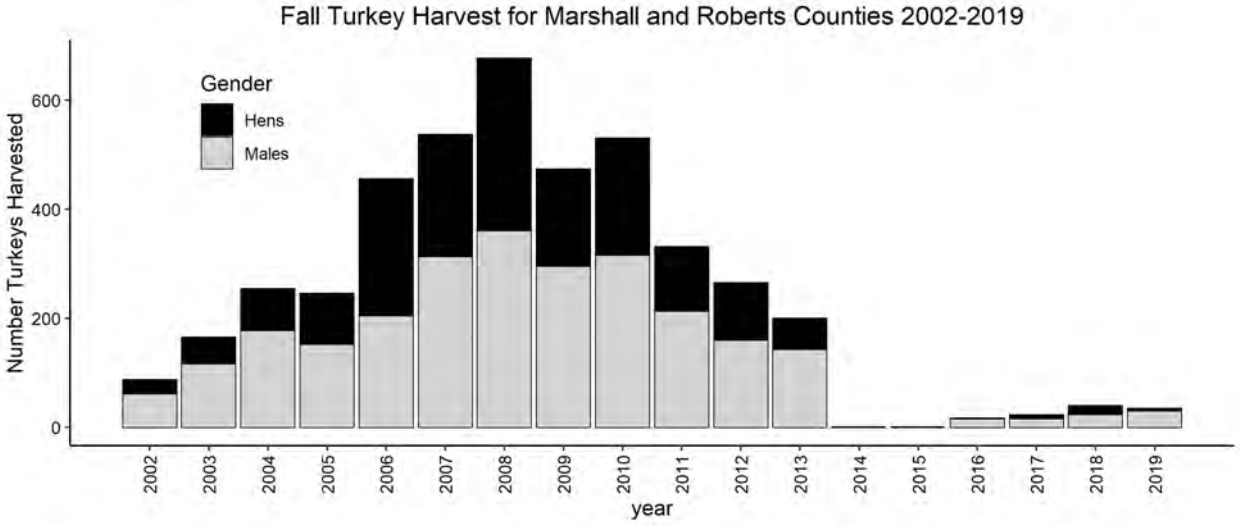
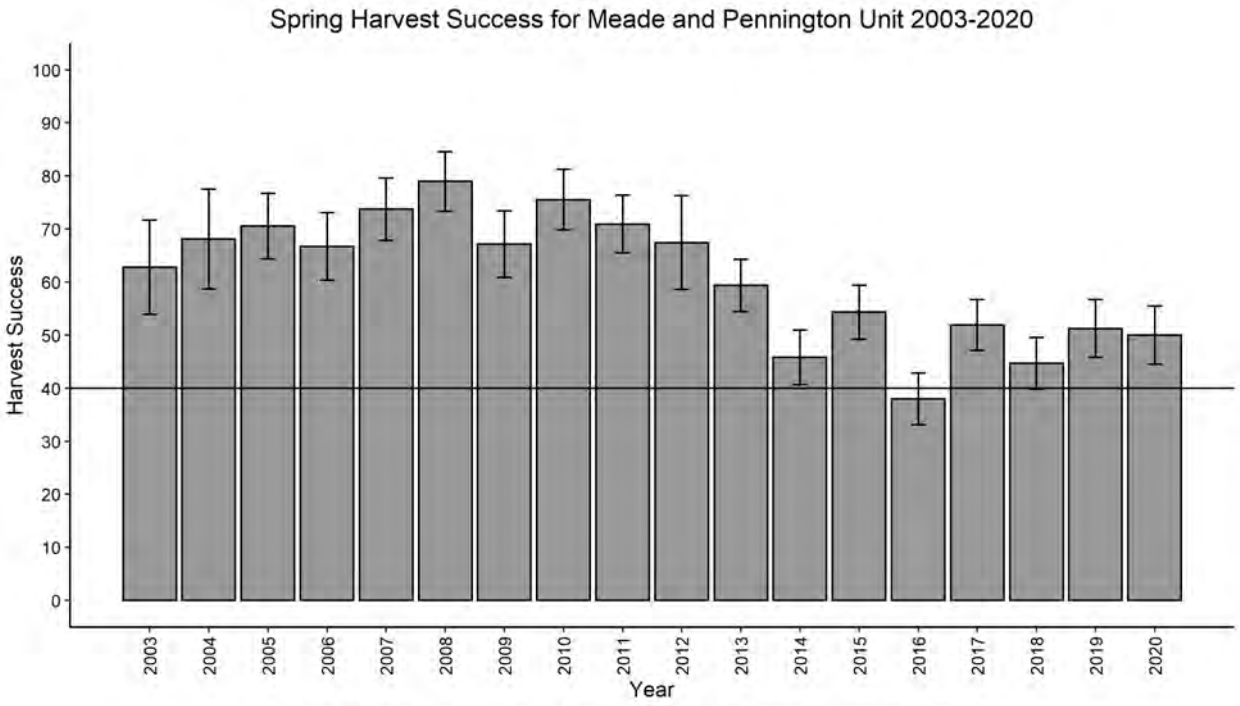
2018
2019
2020
Year


Fall Turkey Harvest for Marshall and Roberts Counties 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
600
400
200
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Meade and Pennington Unit 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
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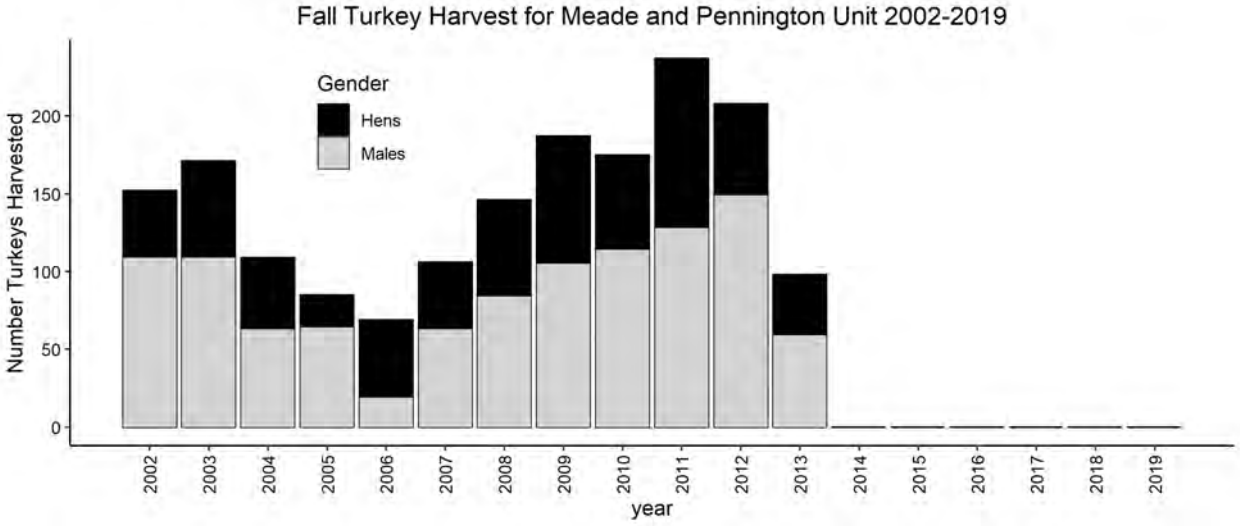
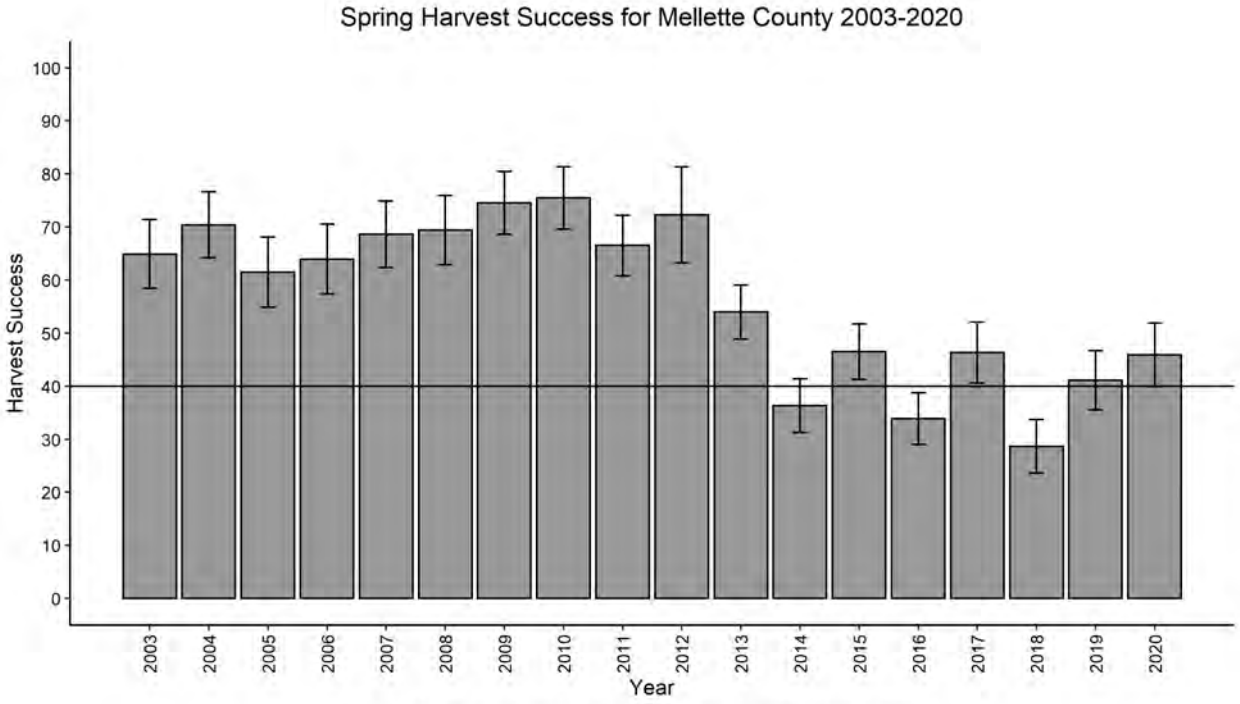
2017
2018
2019
2020
Year


Fall Turkey Harvest for Meade and Pennington Unit 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
200
150
100
50
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Mellette County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
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2012
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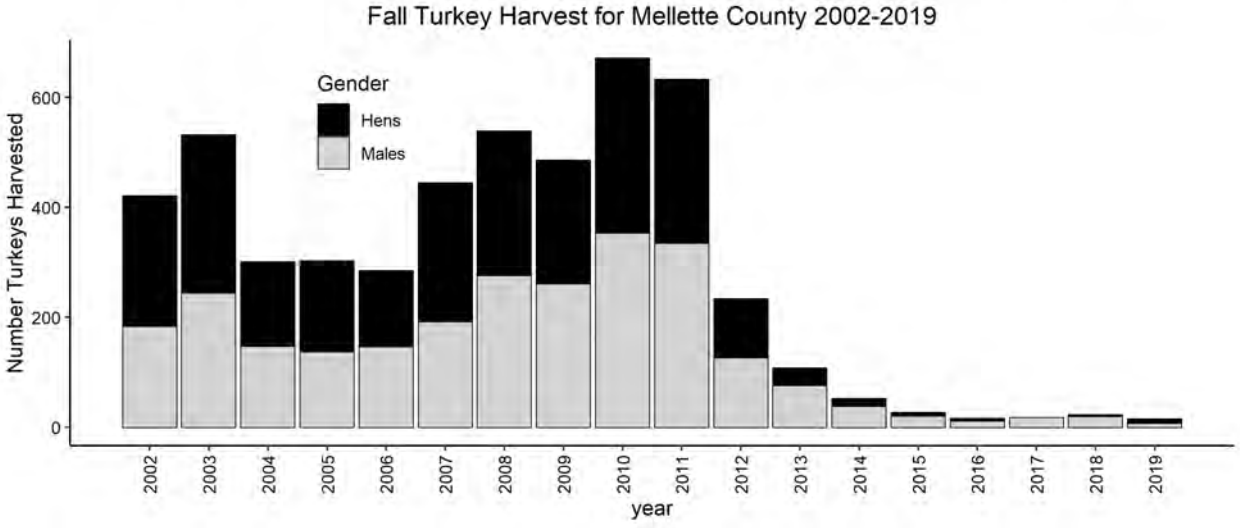
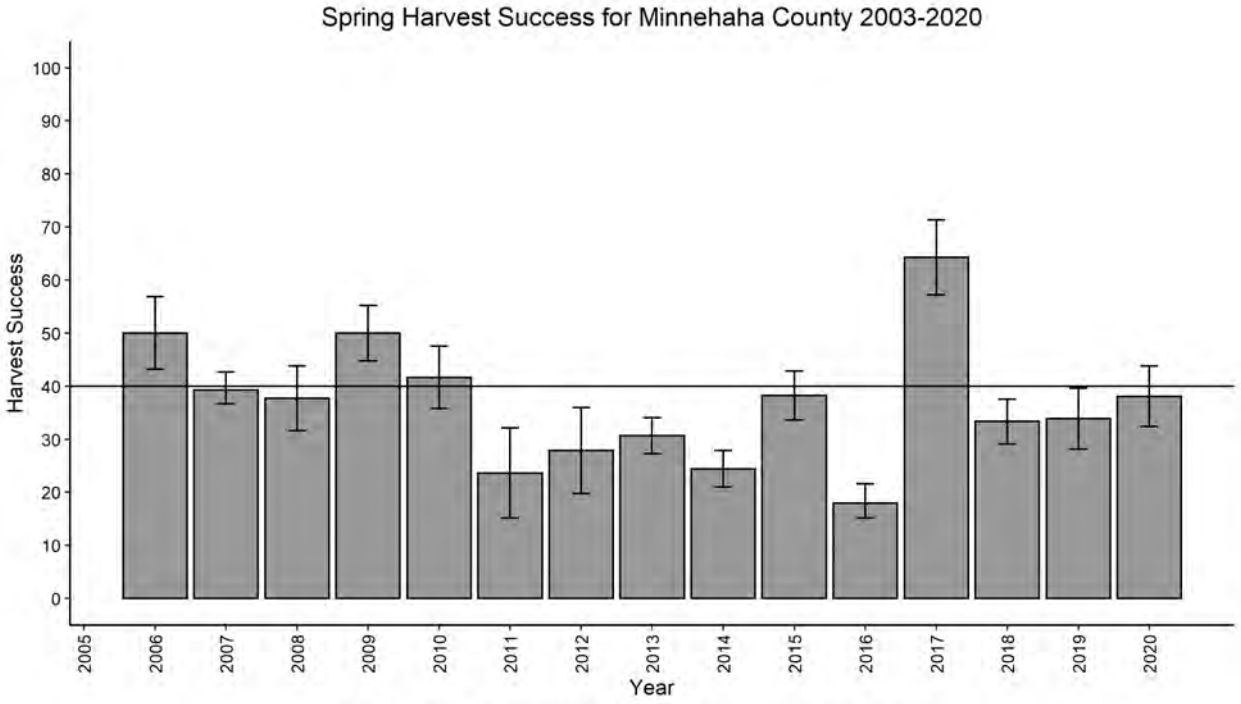
2017
2018
2019
2020
Year


Fall Turkey Harvest for Mellette County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
600
400
200
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Minnehaha County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2005
2006
2007
2008
2009
2010
2011
2012
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2014
2015
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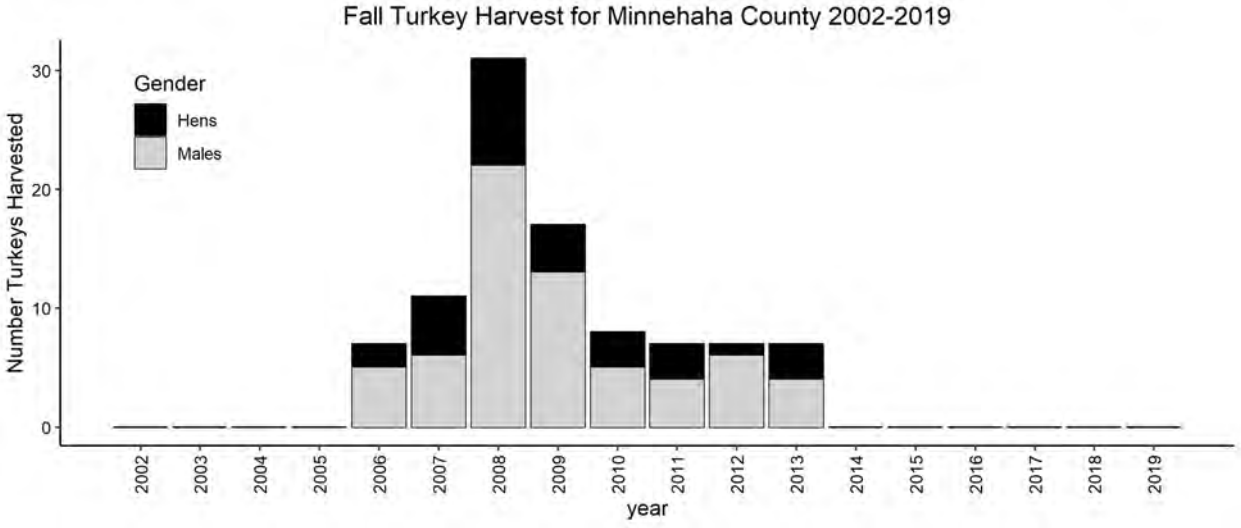
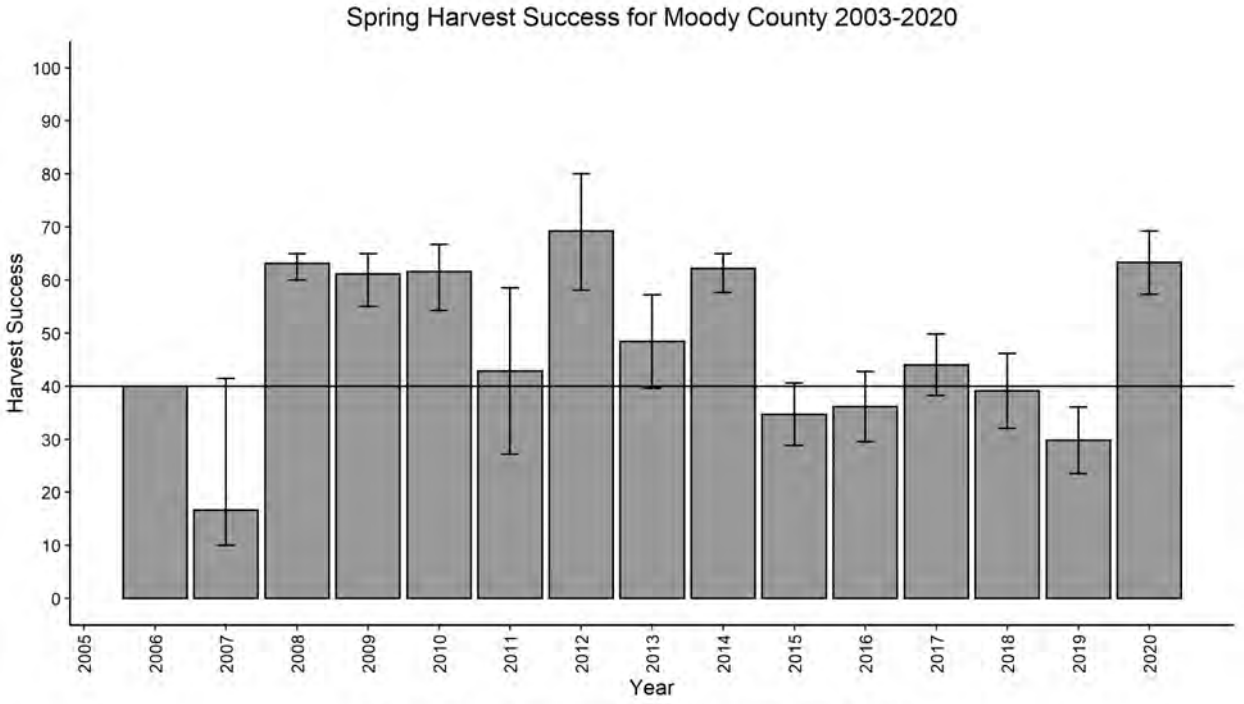
2018
2019
2020
Year


Fall Turkey Harvest for Minnehaha County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
30
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Moody County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2005
2006
2007
2008
2009
2010
2011
2012
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2014
2015
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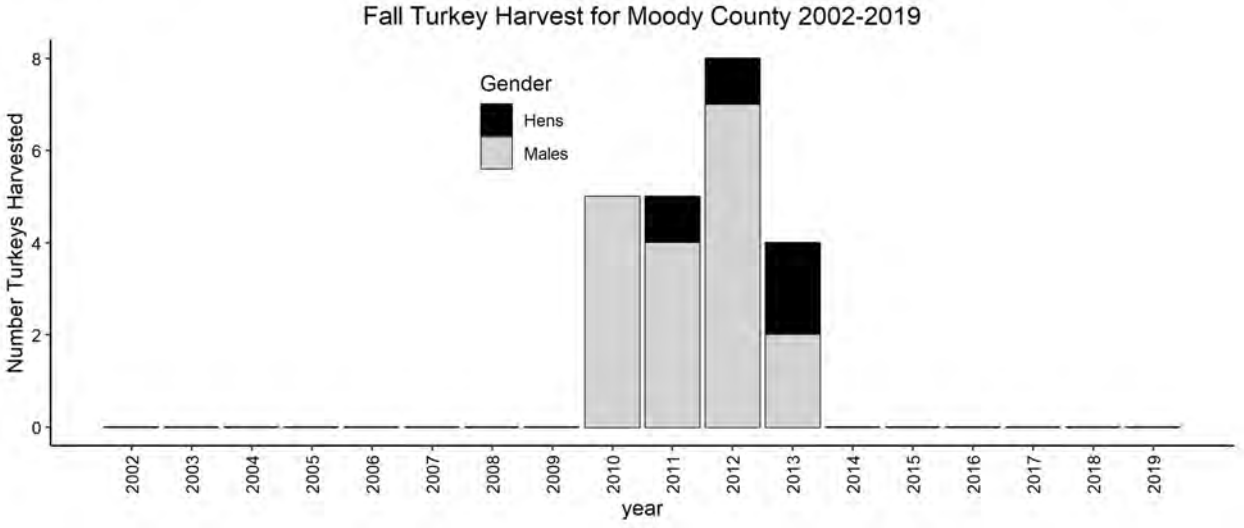
2017
2018
2019
2020
Year


Fall Turkey Harvest for Moody County 2002-2019
Number Turkeys Harvested
8
6
4
2
0
Gender
Hens
Males
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
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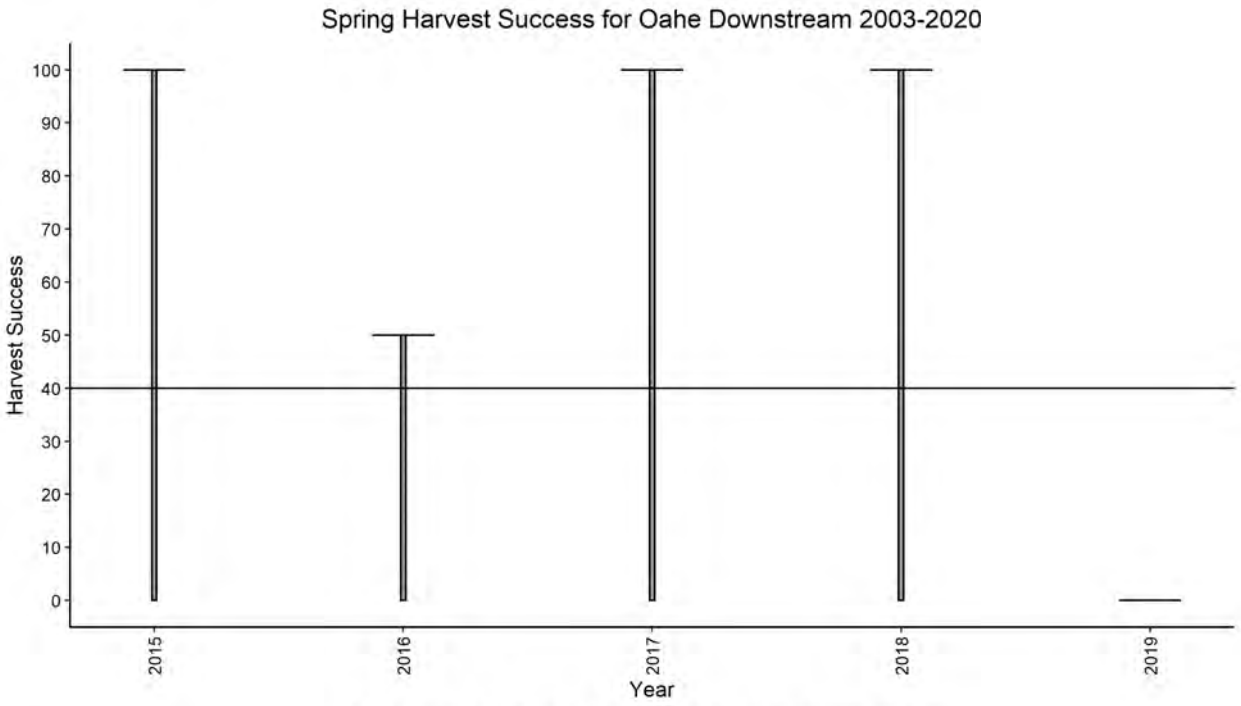
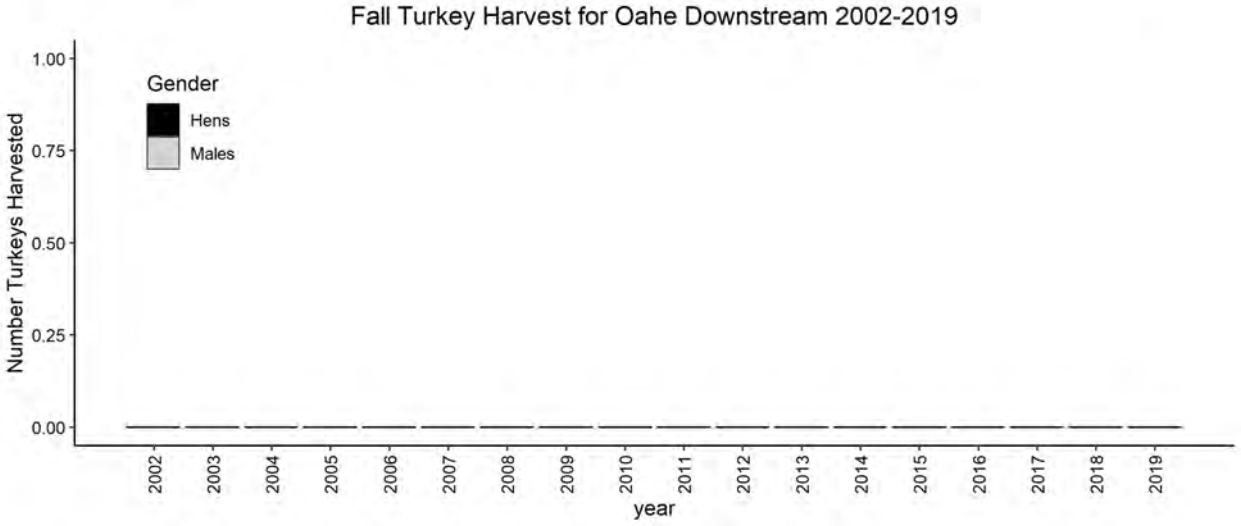
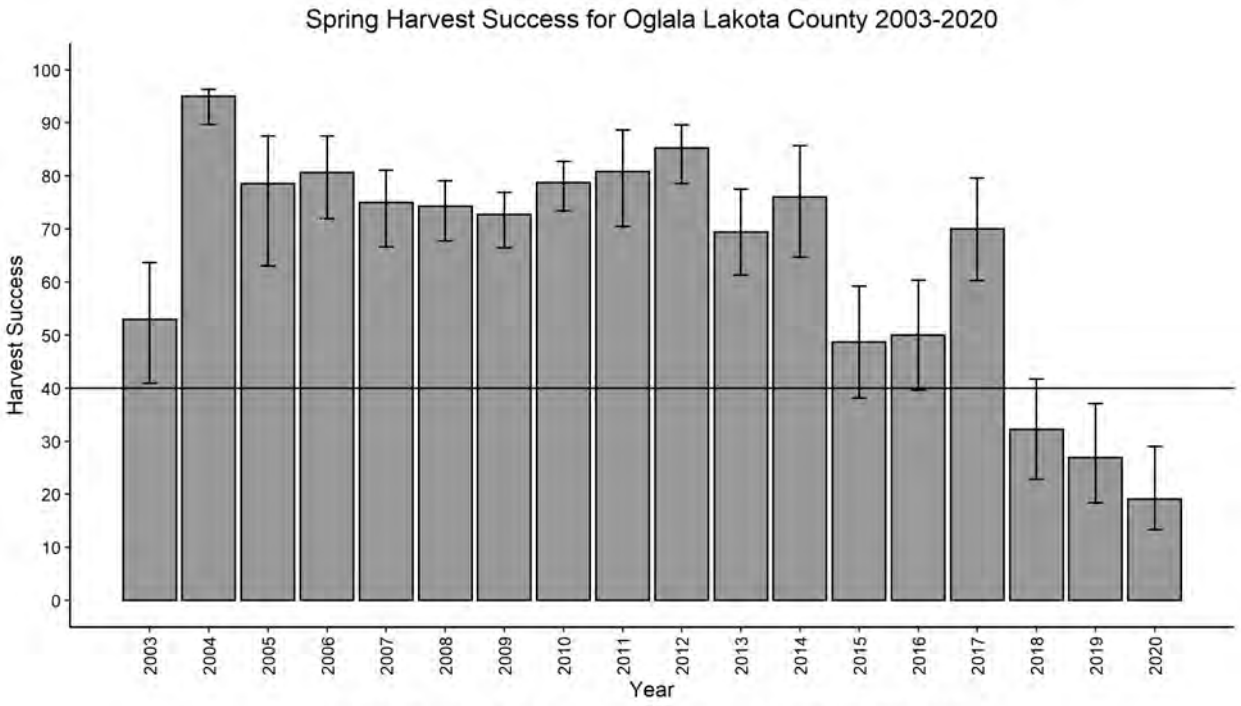
2016
2017
2018
2019
year


Spring Harvest Success for Oahe Downstream 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2015
2016
2017
2018
2019
Year


Fall Turkey Harvest for Oahe Downstream 2002-2019
Number Turkeys Harvested
1.00
0.75
0.50
0.25
0.00
Gender
Hens
Males
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Oglala Lakota County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
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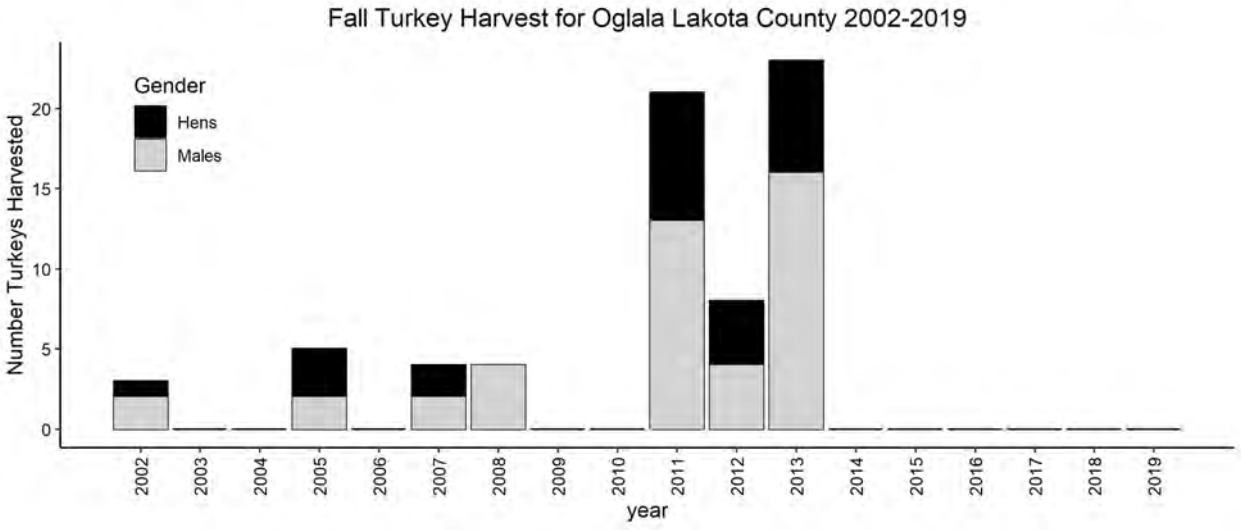
2018
2019
2020
Year


Fall Turkey Harvest for Oglala Lakota County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
20
15
10
5
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
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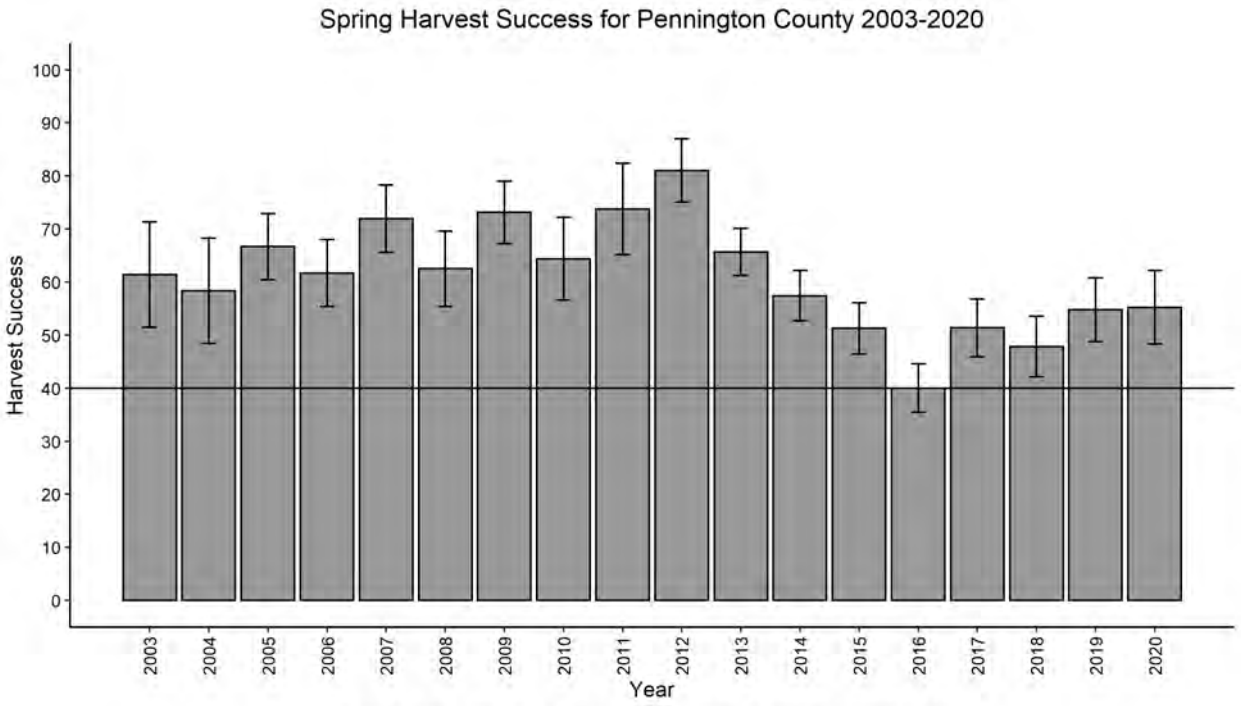
2016
2017
2018
2019
year


Spring Harvest Success for Pennington County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
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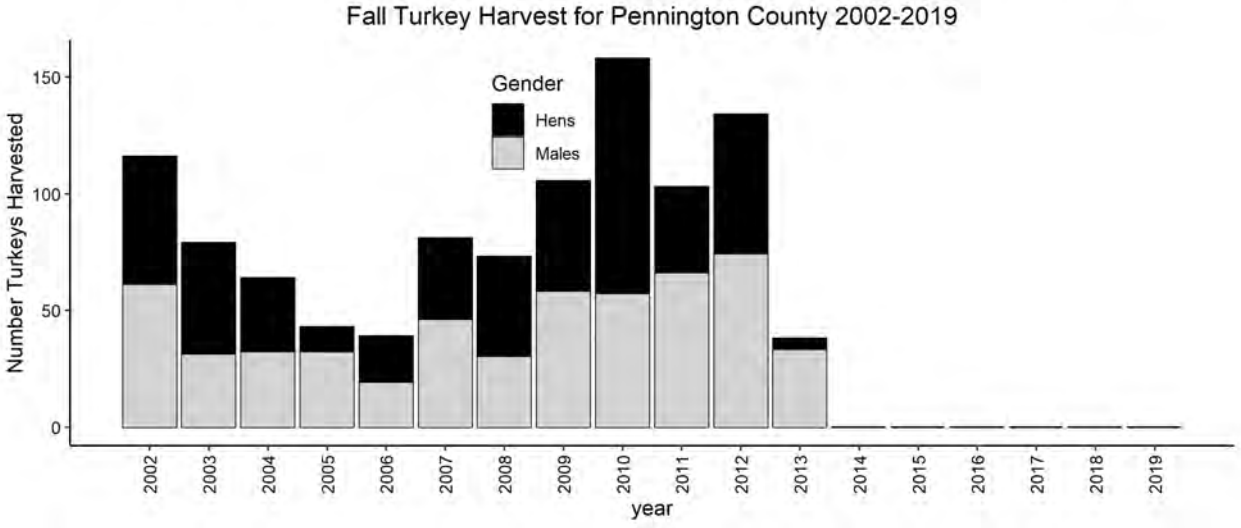
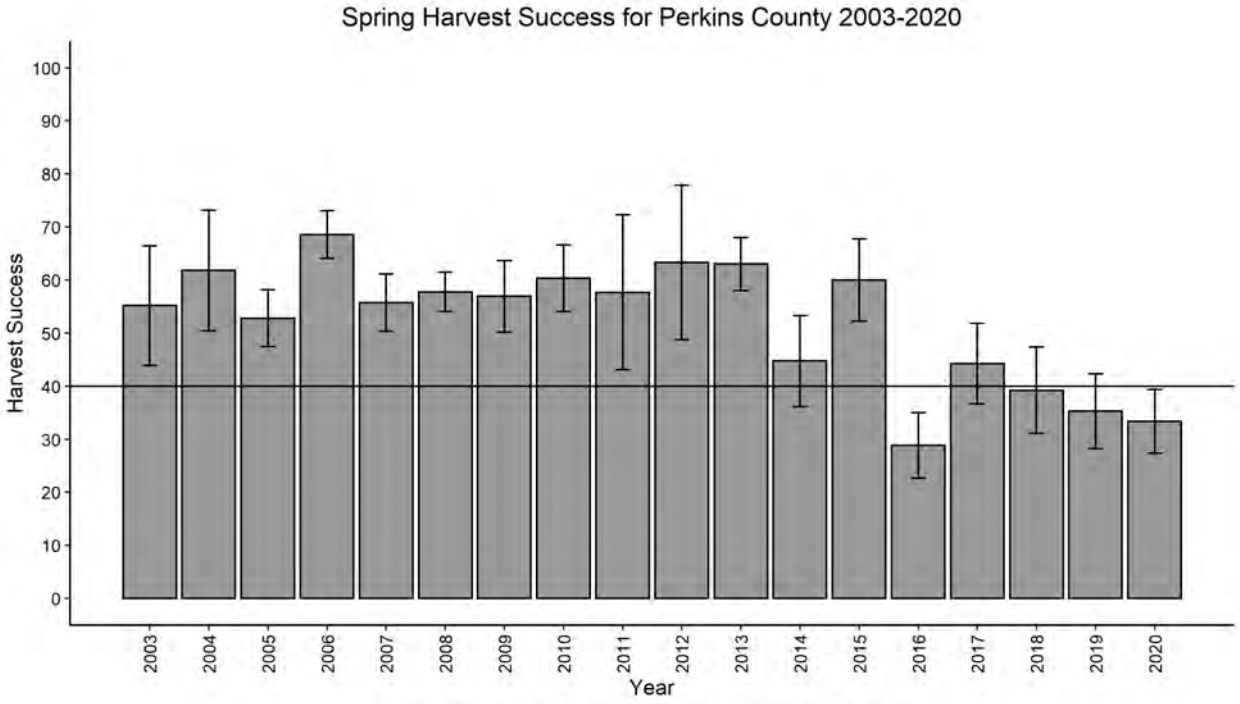
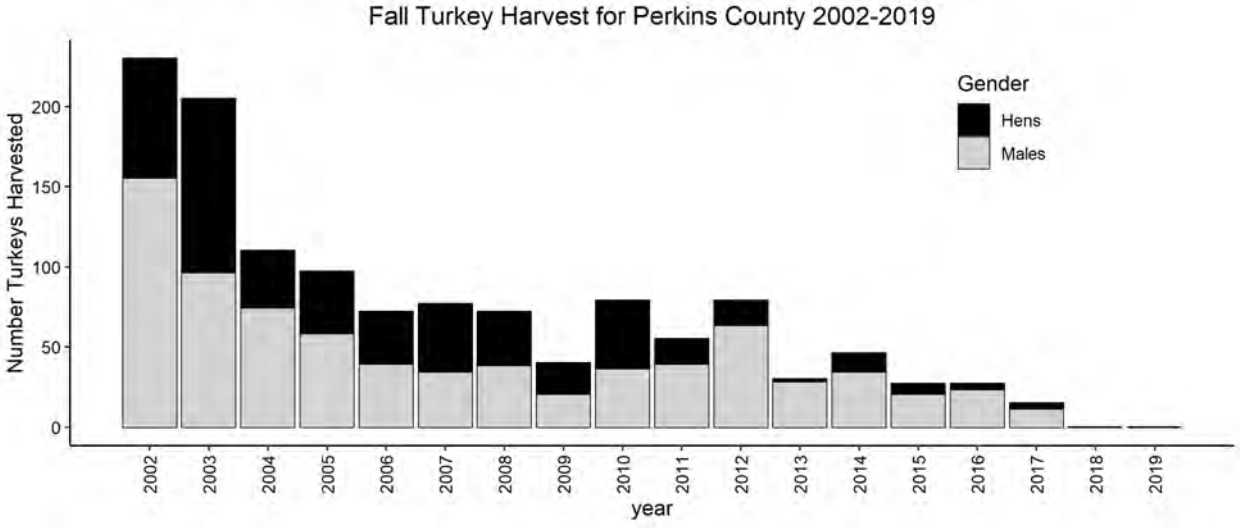
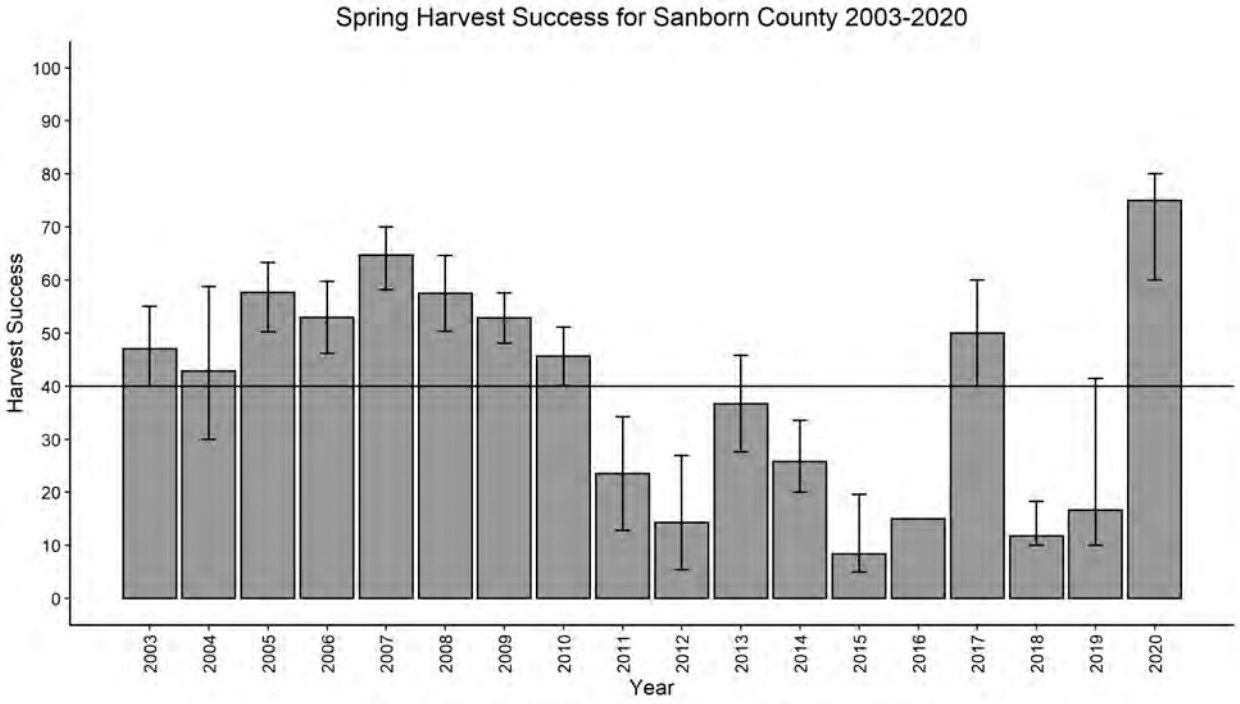
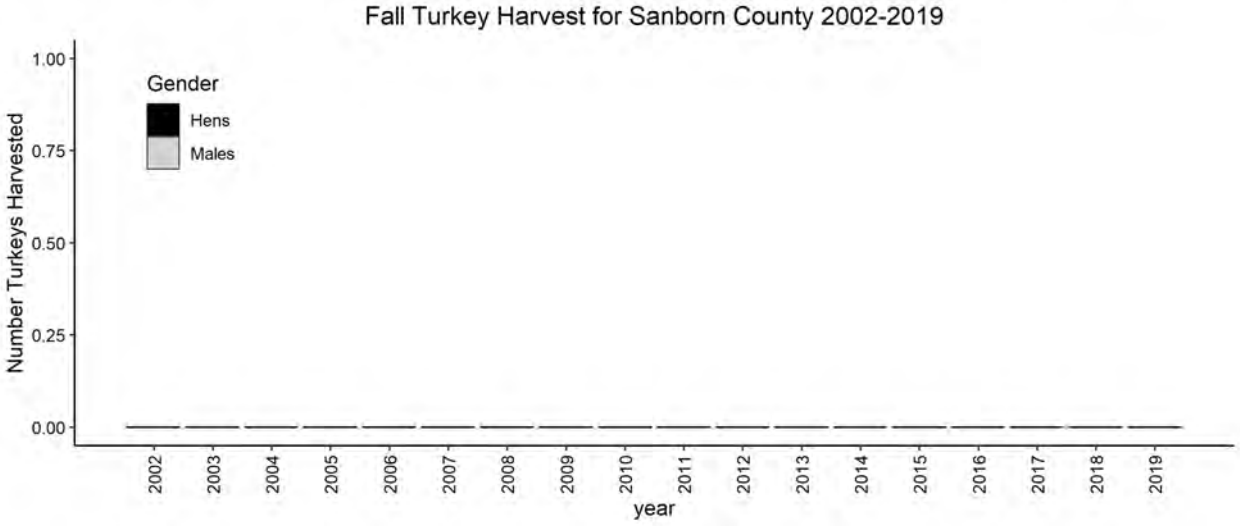
2018
2019
2020
Year

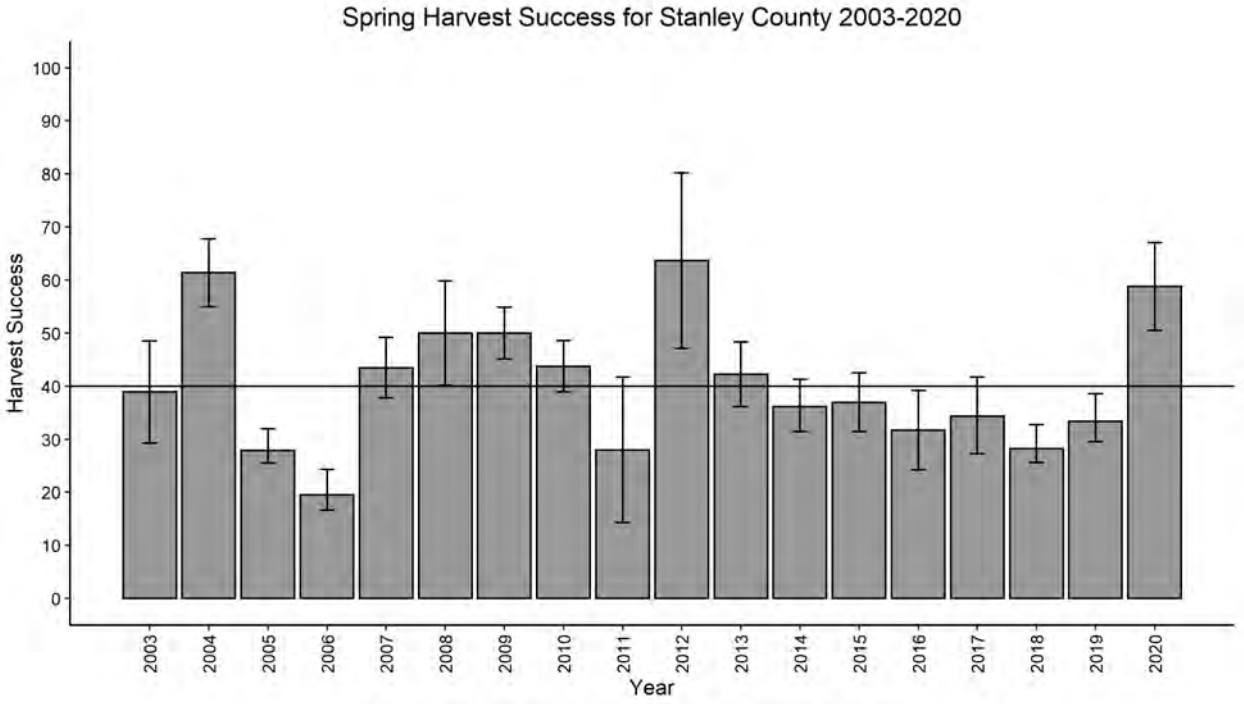

Fall Turkey Harvest for Pennington County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
150
100
50
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year

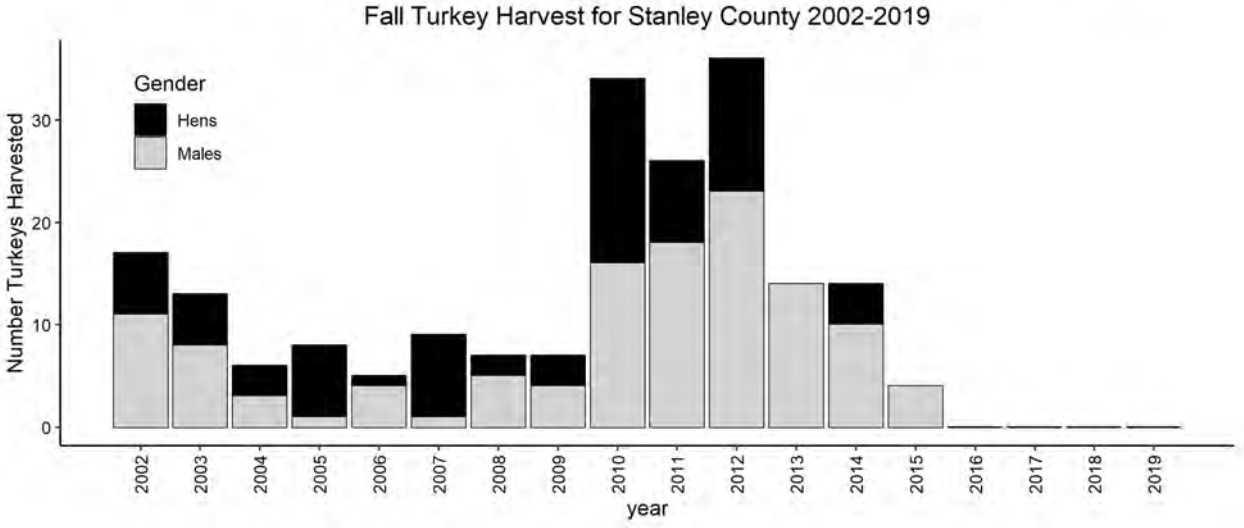

Spring Harvest Success for Perkins County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year

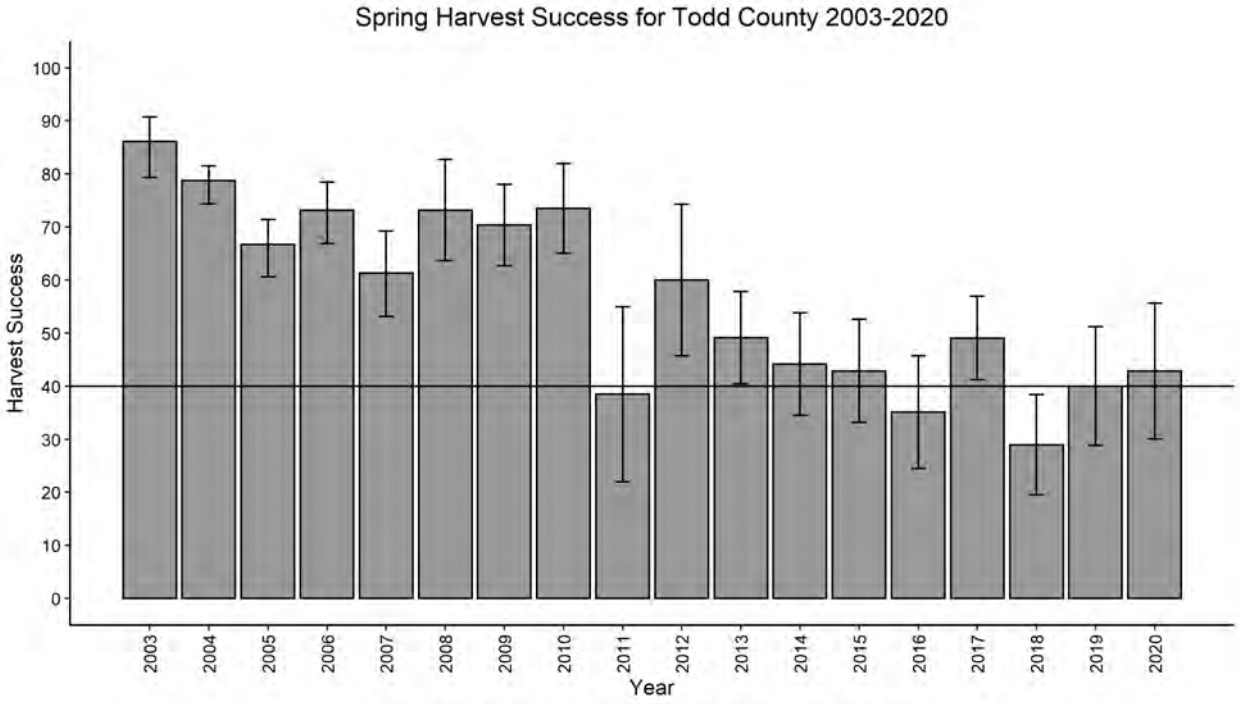

Fall Turkey Harvest for Perkins County 2002-2019
Number Turkeys Harvested
200
150
100
50
0
Gender
Hens
Males
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year

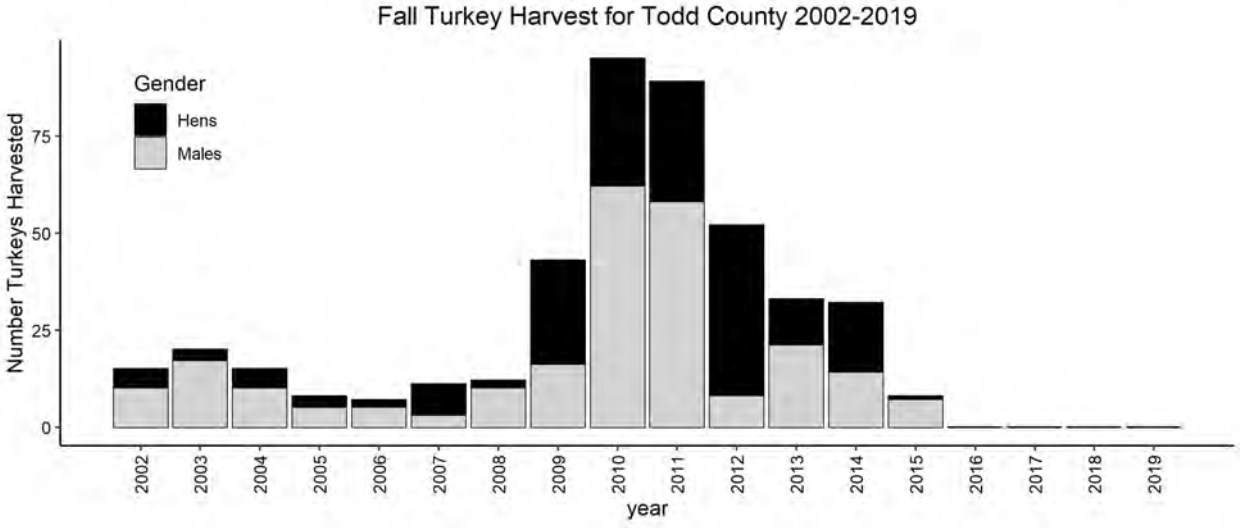

Spring Harvest Success for Sanborn County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year

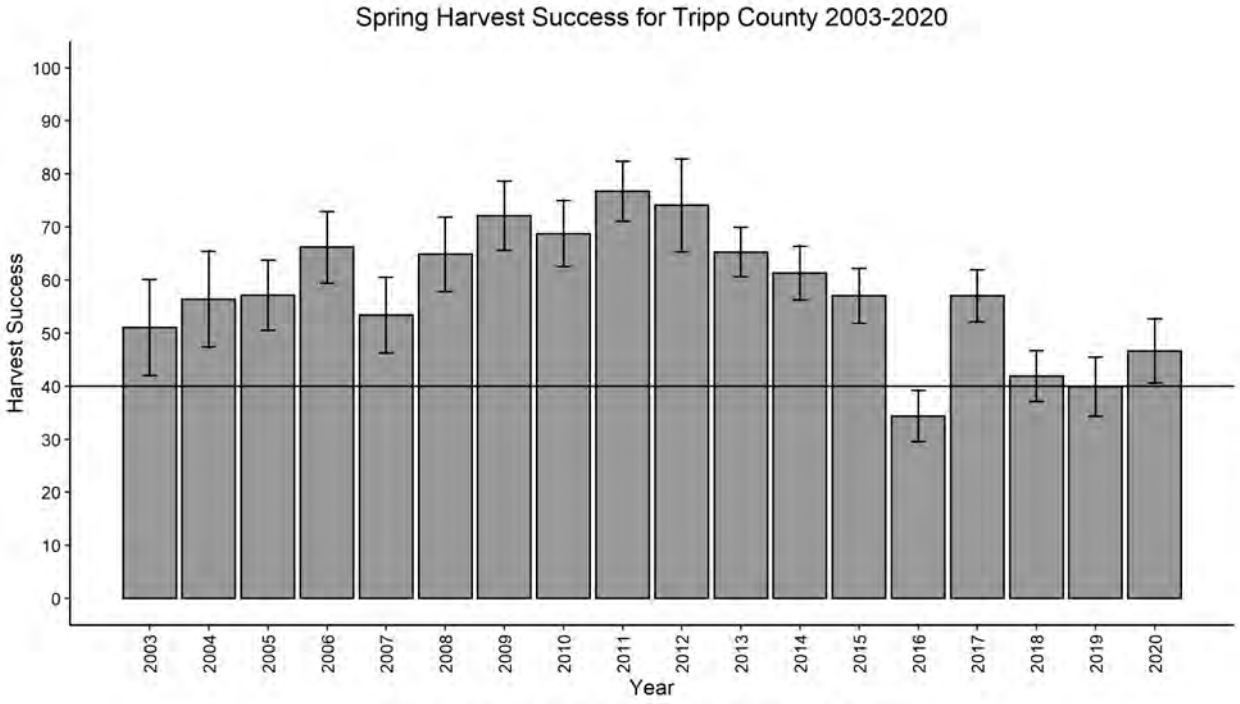

Fall Turkey Harvest for Sanborn County 2002-2019
Number Turkeys Harvested
1.00
0.75
0.50
0.25
0.00
Gender
Hens
Males
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year

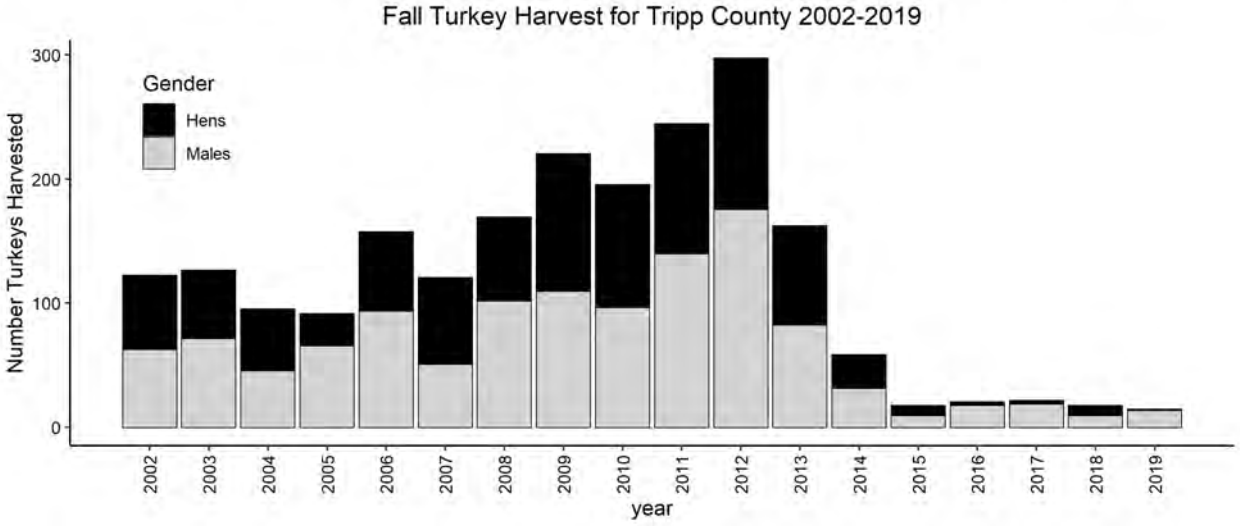

Spring Harvest Success for Stanley County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year

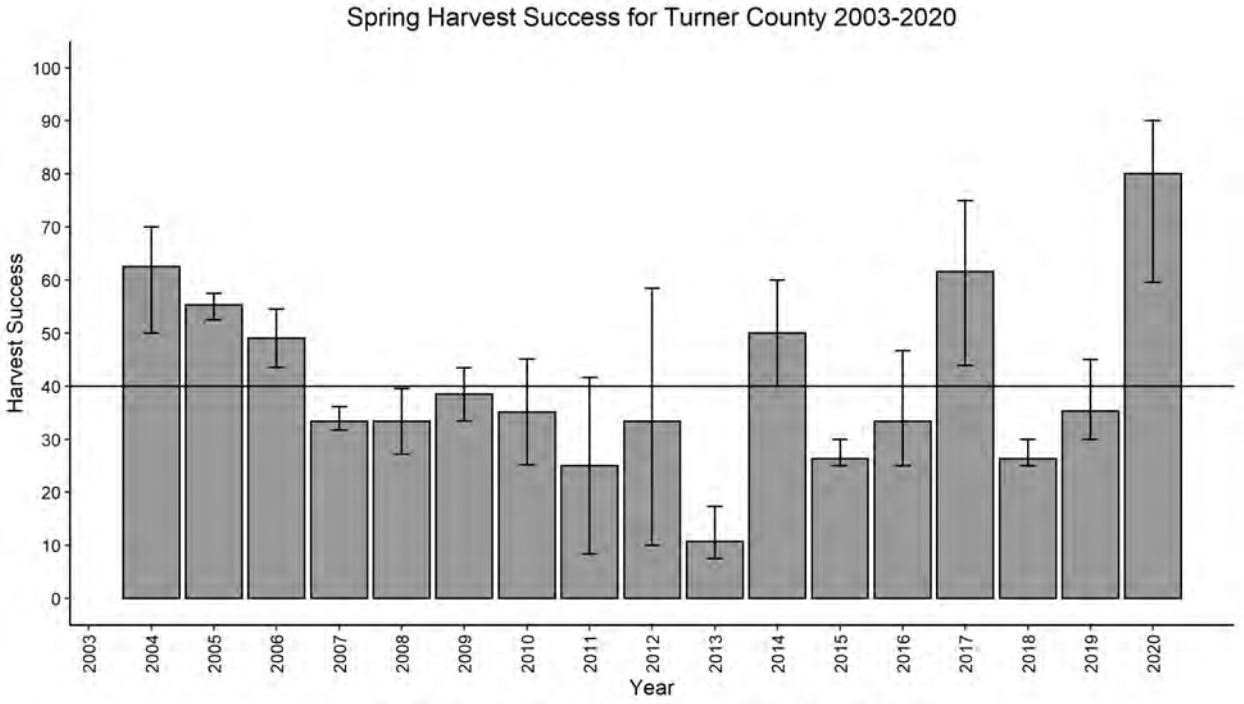

Fall Turkey Harvest for Stanley County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
30
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year

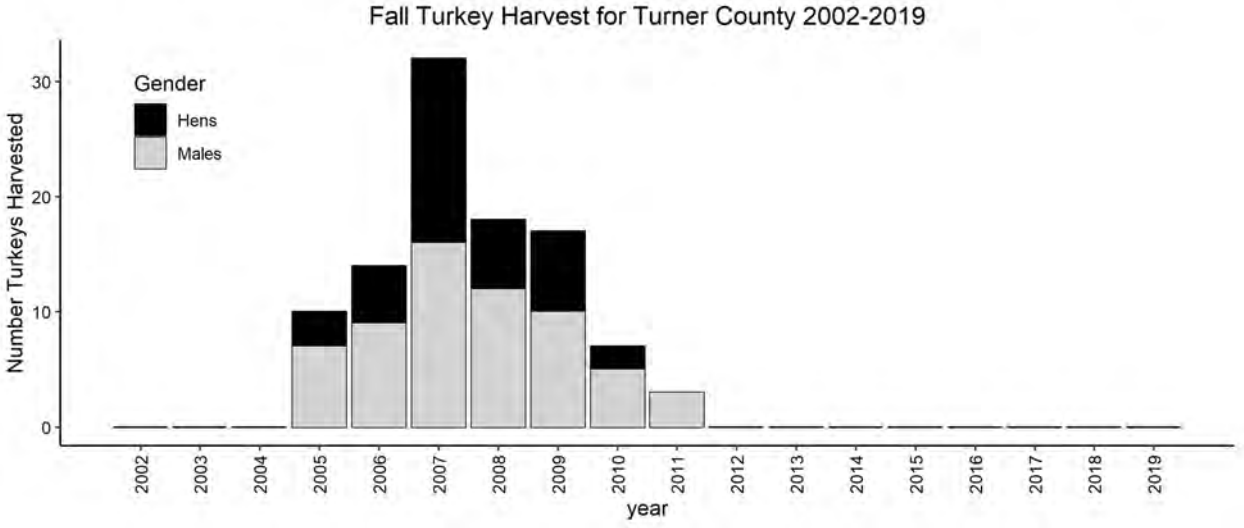

Spring Harvest Success for Todd County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year

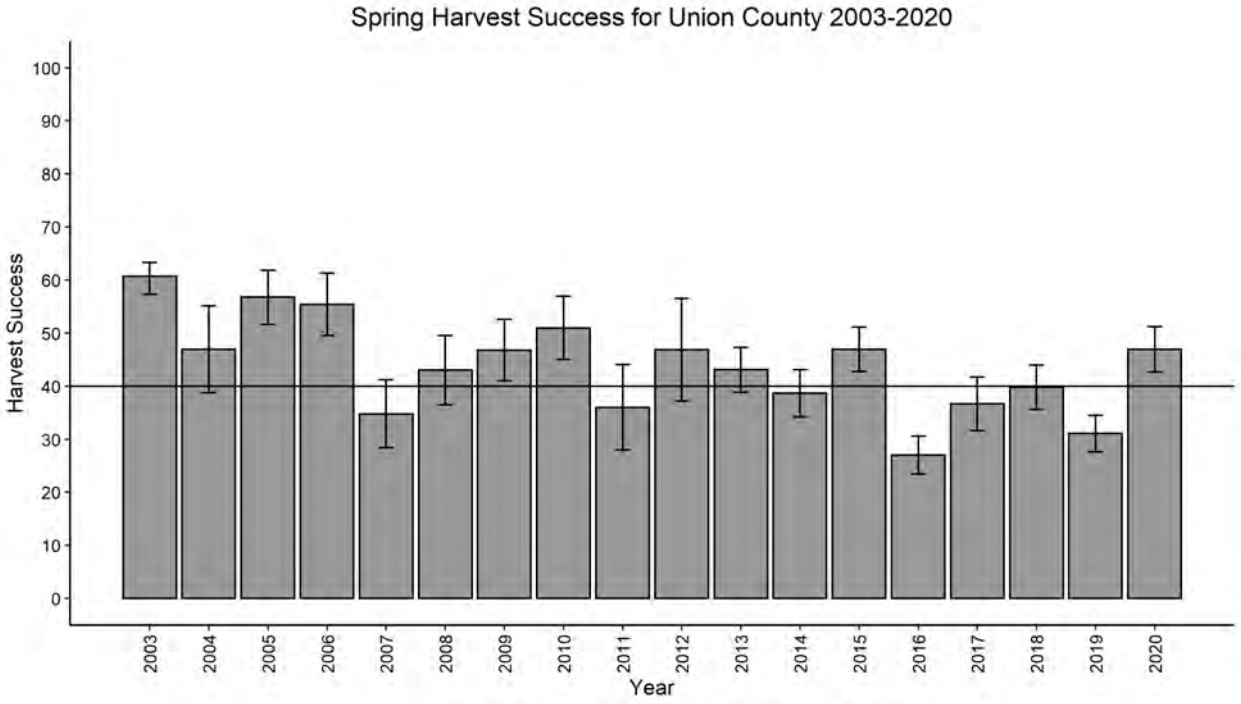

Fall Turkey Harvest for Todd County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
75
50
25
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year

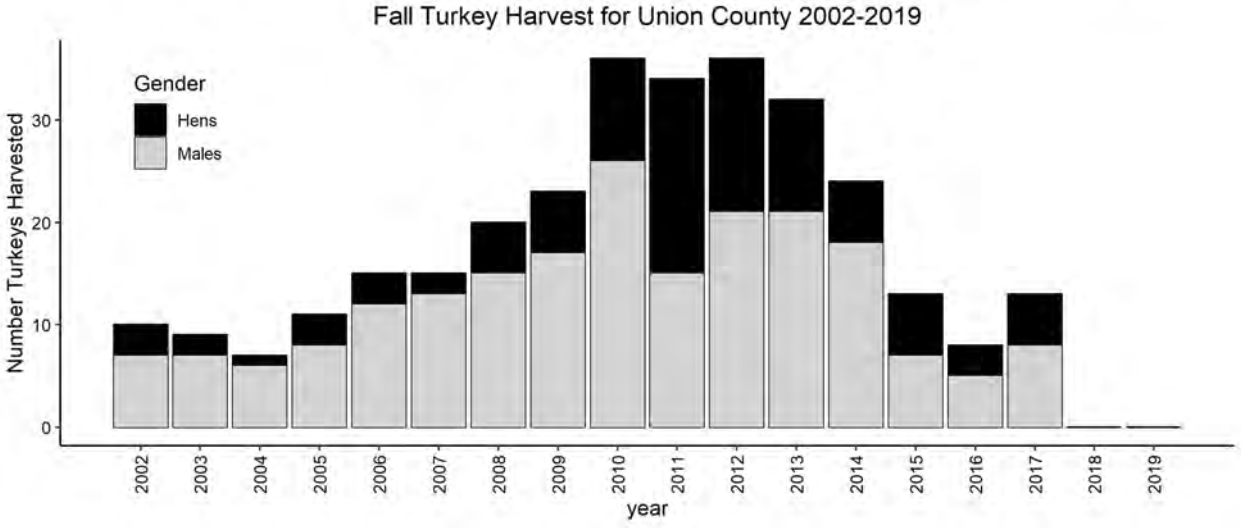

Spring Harvest Success for Tripp County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year

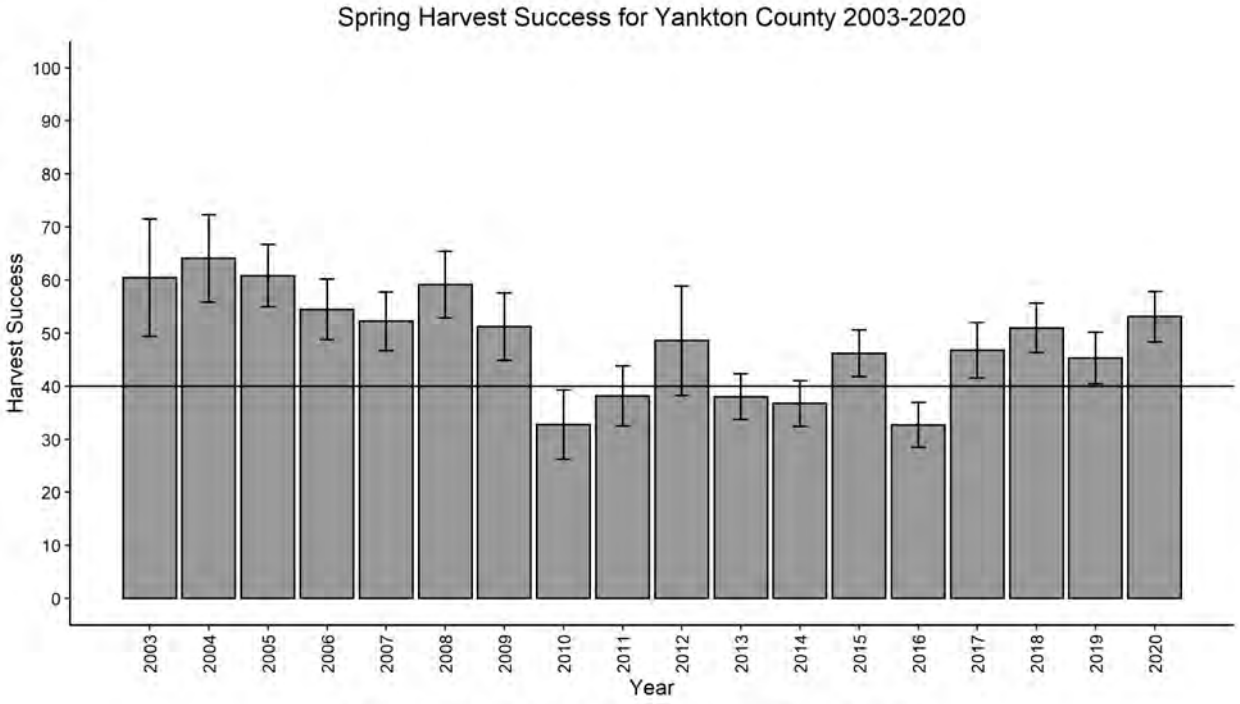

Fall Turkey Harvest for Tripp County 2002-2019
Number Turkeys Harvested
300
200
100
0
Gender
Hens
Males
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year

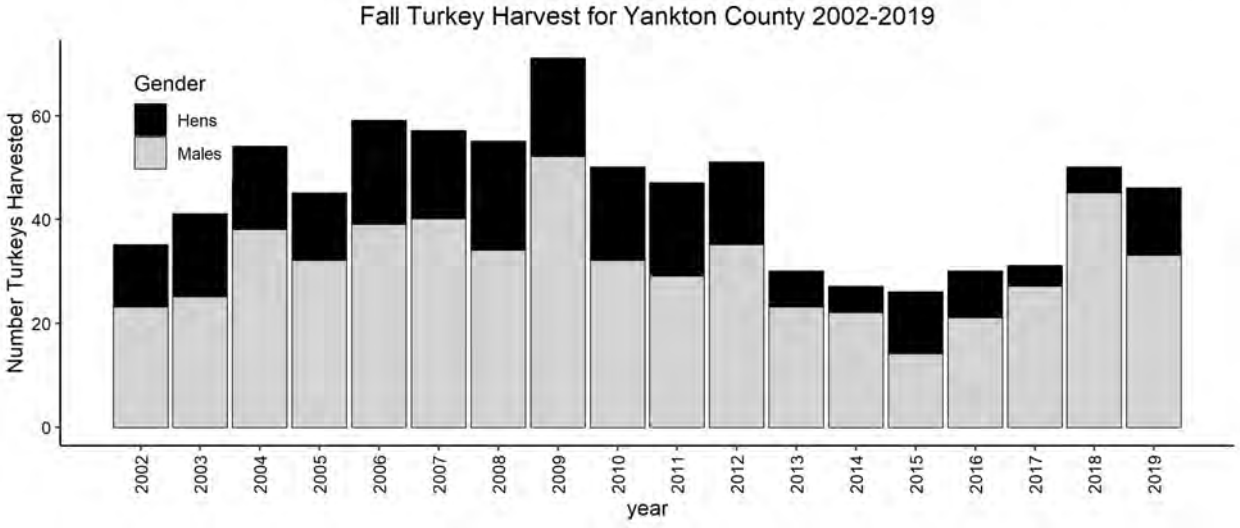

Spring Harvest Success for Turner County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year


Fall Turkey Harvest for Turner County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
30
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Union County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year


Fall Turkey Harvest for Union County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
30
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year


Spring Harvest Success for Yankton County 2003-2020
Harvest Success
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year


Fall Turkey Harvest for Yankton County 2002-2019
Gender
Hens
Males
Number Turkeys Harvested
60
40
20
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
year