Deer Hunter Observation Survey
2014-2024

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Abstract

The North Carolina Deer Hunter Observation Survey (DHOS) provides an economical and statistically robust means of monitoring populations of several wildlife species. From 2014-2024, approximately 1,000 deer hunters annually reported their observations from ~25,000 hunting trips encompassing ~100,000 observation hours each hunting season. Deer, gray squirrels, and turkeys were the most observed animals. Results were summarized as annual state and regional observation rates, including the effects of baiting and location type (private and game lands) on observation rates.

Introduction

The North Carolina Wildlife Resources Commission (NCWRC) initiated an annual volunteer Deer Hunter Observation Survey (DHOS) in 2014. Hunters were asked to record their daily observations of deer and other wildlife while still-hunting (hunting from a stationary position without the aid of dogs) for deer. The primary objective of the DHOS was to provide long-term indices of wildlife occurrences and demographics across North Carolina. These data increase understanding of spatial differences and temporal changes in populations, and supplement other surveys, harvest, and biological data collected by the NCWRC to monitor wildlife and evaluate management actions.

Since deer hunters are one of the most common hunter types across the state (~250K hunters) and spend many hours in the field (~3.8 million days, average 15 days/hunter/year), volunteer observers provide an economically viable means of monitoring several species of wildlife while providing statistically robust observation estimates at varying spatial scales for many species. Stand-hunting from fixed locations provides an ideal sampling scenario for detecting and counting many wildlife species within relatively comparable sized areas (area located around a stationary hunting location). When combined with measure of time (hours hunted), observation records can provide a standardized measure of sampling effort. Annual observation surveys like this one are used by many state wildlife agencies to provide a robust measure of species abundance and occurrence across their respective states.

Methods

Participant Recruitment: Potential volunteers were initially identified in 2014 from the NCWRC big game harvest registration database. Avid deer hunters (those hunters registering ≥3 deer during the previous hunting season) were initially selected for the mailing since it was assumed that they also spent more time afield. Because of a pressing question regarding the distribution of fox squirrels in North Carolina, an initial survey design was developed to focus recruitment of volunteer wildlife observers in known counties of the fox squirrel range. The initial goal was to obtain approximately 30-40 volunteers in each of North Carolina's priority fox squirrel counties.

An initial statewide sample of 30K avid deer hunters was selected for the 2014 mailing and produced a 4.6% volunteer response rate (1,350 participating hunters). As other species informational needs were

recognized by biologists (e.g. deer fawn recruitment), all deer hunters across the state were invited to participate in subsequent years via public news releases, email blasts, and various staff contacts. Annual survey mailings incorporated the previous season respondents and any additional volunteer signups. Additional avid deer hunters were identified and mailed survey forms each season to help boost sampling rates in counties with low participation. Survey nonrespondents are removed from the mailing list, if they do not respond after a few years. As of the 2024-25 season, 3,400 hunters were voluntarily enrolled in the project's annual mailing list.

Survey Materials and Logistics: A standardized paper survey form was developed for hunters to report their wildlife observations (Appendix 1). Surveys were mailed just before the start of the archery deer season, and the survey observation period was open until the close of general deer season. Immediately upon the end of deer season, hunters were instructed to fold and submit their form via the incorporated, pre-paid postage business reply address block, which was printed on the back of the form. Also, printed on the back of the form were the observation collection instructions, and the original hunter mailing information/identification number, which was used to uniquely account for each response. A small open text block was inserted for the hunter to list the name and address of any other individuals that may be interested in participating in the DHOS during future hunting seasons.

A web-based application was developed as a reporting option for volunteers in 2018 and incorporated a responsive design for use on both full-screen desktop and small-screen mobile devices. Volunteers were required to enter their hunter identification number (license number) and last name to report observations and/or to view their observation log. The application was accessible to all the public and could be used by all DHOS volunteers.

Hunters were asked to record the date they hunted, county, number of hours, location type, use of bait, and the number of animals seen. Hunters were instructed to separate morning and evening hunts when applicable. "Location type" was categorized into two options: 1) Game Lands – which included areas enrolled in the NCWRC Game Lands program, and 2) Private Lands – which included all other private and public lands not enrolled in the NCWRC Game Lands program. "Animal type" categories included antlered deer, adult doe deer, fawn deer (button bucks and doe fawns combined), unknown deer, gray squirrel, fox squirrel, bearded turkey, no beard turkey, unknown turkey, bobcat, red fox, gray fox, coyote, raccoon, adult bear, cub bear, and feral swine. When imprecise responses were recorded by the hunter (e.g. "a lot of squirrels"), a mean data imputation method was used. Mean imputation is a method in which the missing value on a certain variable is replaced by the mean of the available cases. The form also contained a comment field where hunters could write in any other wildlife not listed that they may have observed. Hunters were specifically instructed to list species of special interest which included: armadillo, domestic cat, elk, mink, red squirrel, spotted skunk, and weasel. Hunters were also instructed to report their hunting outing even if no wildlife was observed.

All responses and hunter contact information were entered and stored using the NCWRC's online PAWS (Portal Access to Wildlife Systems) database for maintenance and processing. A Hunter Observation Survey application was developed to allow staff to dynamically query the raw dataset for any selected survey parameter (e.g. year, location type, date range within season, use of bait) and to produce basic survey summary outputs at any desired scale (e.g. state, regional or county). For the purposes of this report, most results and analyses were limited to the statewide or management region scale.

Analyses: Hunter submitted observations were refined into sampling units to reduce the effects of pseudoreplication. Pseudoreplication occurs when some hunters remain in the same hunting stand for multiple days and often repeatedly count the same individual animals each day. The term "sampling unit" is used to describe unique combinations of hunter-location-county-bait observations. As a simple example of the refinement process, if a deer hunter hunts 20 days in County A on private land with bait, observation records are averaged for that single independent sampling unit. If a hunter hunts 20 days (10 days in County A and 10 days in County B, both on private land without bait), those records constitute 2 sampling units. Averaging data into refined sampling units for each scenario decreases sample size and creates unequal variances in some cases, but provides a conservative statistic based on truly independent samples.

Based on the 2024 survey, most sampling unit responses originated from counties within the central part of the state (Figure 1). The unbalanced distribution across counties was likely due to regionally specific recruitment efforts by biologists and actual deer hunter gradients within the state. Sampling units with less than 3 cumulative hunting hours were excluded from this analysis.

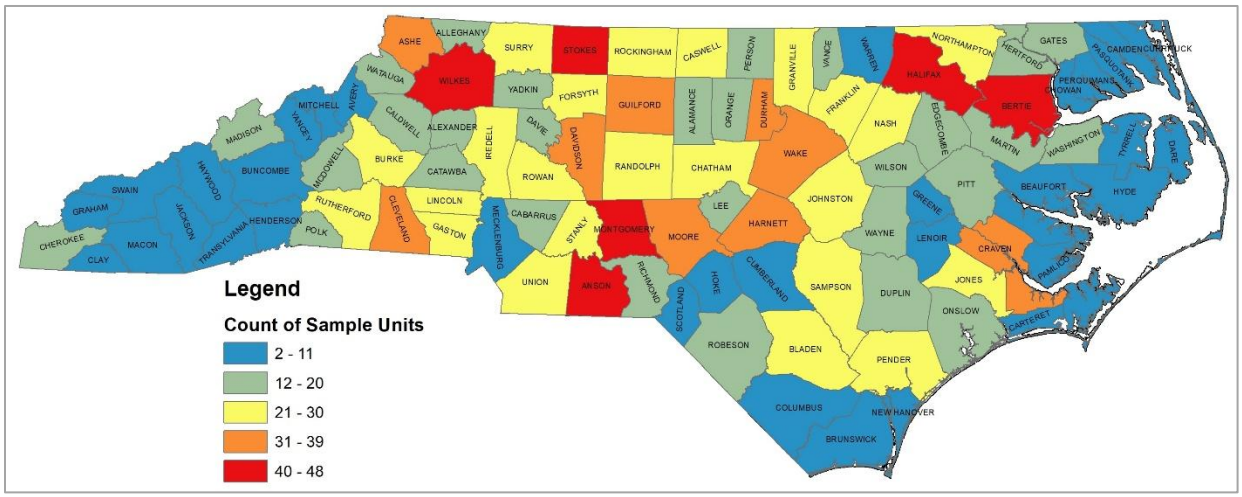

Figure 1. Total number of sampling units by county, North Carolina Deer Hunter Observation Survey, 2024.

Mean annual observation rates were calculated for each county for each animal type. When calculating annual regional and statewide estimates, sampling units were weighted for each county to balance unequal sampling distribution. Counties with fewer than 3 sampling units per year were excluded from annual regional and statewide estimates. Inadequate annual sample sizes sometimes occurred in 1-3 counties per year and were often located in the far western and far eastern counties, e.g. Dare, Graham, Jackson, and Swain.

Observation rates were standardized to observations per 1,000 hours, and 95% confidence intervals were computed for each of the 17 animal types. A higher number of records per hunter and a higher number of sampling units within a county generally provided a higher level of precision within each animal type. Precision among annual estimates for common species, such as gray squirrel and deer was high: proportional standard error (PSE) values were generally within ±10% at the state scale. However, for less common species, such as swine, bobcat, and fox, statewide precision was lower and there was considerable uncertainty at county scales. The scale within most of the species observation rate maps (Figures 4 – 32) was dictated by the precision of the data and were limited to average PSE values within ±30%.

Inherently, wildlife survey counts have a measure of imprecision. Annual counts may vary due in part to weather, wildlife movements, observer inconsistencies, and other factors that may not be related to wildlife numbers. For the purposes of trend analyses, all 10 years of data were presented in the tables and line graphs within this report. All years of data more accurately reflect the long-term trajectory of populations. However, for distribution mapping and attribute comparisons, analyses were limited to the most recent 5 years of data. Averaging annual estimates over a shorter 5-year time frame reduces the risk of long-term population change and improves the precision enough to provide confident biological estimates for most animal types at regional or county scales. Analysis of variance and linear regression were used to determine the effects of year and region within each animal type.

For refined location type and baiting analyses, comparisons were limited to those annual county samples with $\geq$3 sampling units within both respective paired treatment types. Since baiting and location types (private vs. game lands) were not equitably distributed or adequately sampled within some counties

across the state, nonparametric Wilcoxon match-pairs signed rank tests were used to determine significant effects at a 95% confidence level for each annual county estimate pairing. Average estimates were presented as medians with their associated quartile ranges. Nonparametric analyses and estimates present a more conservative analysis when testing for potential differences, since they are less affected by large deviations in the data and a high skewness towards zero observations.

Results

During each of the 2014-2024 hunting seasons, approximately 25,000 hunting trips (observation records) encompassing ~100,000 hours were annually reported by ~1,500 volunteer hunters each hunting season (Table 1). Hunters reported an average of 18.2 hunts per year and hunted 3.3 hours per hunt during the 114-day survey seasons. Each hunter provided an average of 1.8 sampling units within the 2024 season. Total animal counts by year are presented below (Table 2). Other animals reported included (listed in descending order): rabbits, domestic cats, crows, hawks, doves, opossums, ducks, owls, skunks, groundhogs, chipmunks, and quail.

The public online survey application data entry option was available to volunteers to enter their data, in addition to mailing in their paper form. In 2024, 21% of the observation records were submitted through the online application via desktop or internet-connected mobile phone devices.

Table 1. Statewide total survey responses, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	Hunters	Observation Records	Hours Hunted	Hours Hunted /Hunter	Observation Records/Hunter	Hours Hunted/ Observation Record	# of Sampling Units
2014	1,342	27,548	97,845	72.9	20.5	3.6	2,938
2015	1,385	26,498	92,206	66.6	19.1	3.5	2,845
2016	986	20,060	68,101	69.1	20.3	3.4	2,056
2017	1,705	31,646	106,310	62.4	18.6	3.4	3,342
2018	1,463	26,724	88,707	60.6	18.3	3.3	2,818
2019	1,785	28,762	94,908	53.2	16.1	3.3	3,146
2020	1,648	28,495	94,257	57.2	17.3	3.3	2,990
2021	1,371	23,998	77,954	56.9	17.5	3.2	2,496
2022	1,395	23,855	77,747	55.7	17.1	3.3	2,475
2023	1,016	19,042	61,506	60.5	18.7	3.2	1,855
2024	1,011	17,402	54,507	53.9	17.2	3.1	1,765
			Average	60.8	18.2	3.3	

Table 2. Statewide estimated total counts of animals observed, North Carolina Deer Hunter Observation Survey, 2014-2024. Counts include mean imputations for imprecise observer responses.

Year	Antlered Buck	Adult Doe	Total Adult Deer	Button Buck & Doe Fawn	Unknown Deer	Total Deer
2014	13,832	33,263	47,096	15,751	6,654	69,501
2015	13,692	34,090	47,782	17,377	7,306	72,464
2016	9,898	21,587	31,485	10,580	4,724	46,789
2017	17,035	40,189	57,224	19,388	8,702	85,314
2018	15,549	34,658	50,207	16,897	7,246	74,350
2019	17,707	40,437	58,144	20,004	8,293	86,441
2020	16,909	38,525	55,434	19,050	8,750	83,233
2021	15,859	34,973	50,832	17,550	7,656	76,038
2022	16,060	36,509	52,569	18,645	8,403	79,617
2023	14,808	31,995	46,802	15,047	7,233	69,082
2024	13,258	27,968	41,226	13,492	6,366	61,084

Year	Gray Squirrel	Fox Squirrel	Total Squirrels
2014	62,716	1,994	64,710
2015	69,225	1,549	70,774
2016	51,745	1,159	52,905
2017	90,284	2,071	92,355
2018	72,741	1,739	74,480
2019	74,805	1,822	76,627
2020	77,808	2,001	79,809
2021	62,277	1,598	63,875
2022	57,775	2,005	59,780
2023	54,903	1,721	56,624
2024	48,516	1,622	50,138

Year	Bearded Turkey	NonBearded Turkey	Total Known Turkey	Unknown Turkey	Total Turkey
2014	6,598	17,697	24,295	8,261	32,556
2015	5,649	17,936	23,585	8,897	32,482
2016	4,403	10,804	15,207	5,365	20,572
2017	6,806	18,625	25,431	8,989	34,420
2018	6,279	17,845	24,124	6,398	30,521
2019	6,520	21,771	28,291	8,294	36,585
2020	7,878	16,791	24,669	6,616	31,286
2021	4,743	14,833	19,576	5,392	24,968
2022	5,170	12,921	18,091	5,572	23,663
2023	4,511	10,279	14,790	3,589	18,380
2024	3,539	10,836	14,375	4,228	18,603

Year	Coyote	Bobcat	Gray Fox	Red Fox	Raccoon
2014	1,533	346	988	289	2,546
2015	1,190	237	645	310	1,888
2016	982	168	532	151	1,589
2017	1,474	298	713	282	2,682
2018	1,225	212	607	179	2,521
2019	1,073	249	611	211	2,385
2020	988	318	471	193	1,873
2021	838	209	467	161	1,747
2022	728	210	325	163	1,156
2023	495	203	249	92	1,060
2024	436	165	258	97	1,050

Year	Bear Adult	Bear Cub	Feral Swine
2014	791	468	410
2015	724	385	183
2016	401	184	86
2017	672	390	276
2018	559	335	335
2019	483	290	555
2020	464	303	299
2021	371	198	245
2022	428	218	299
2023	421	247	72
2024	245	124	175

Over the full 11-year survey timeframe, more trips and observation hours occurred on private lands than on game lands. Game land hunting accounted for 4.8% of trips and 6.8% of hunting hours, which was comparable to the overall percentage of the landscape that are game lands (roughly 5%). Baiting was reported on approximately half the hunting trips on private lands (60.0%), but was not reported on game lands, where its use is prohibited. Use of bait and location types by hunters was very consistent across years. Since the use of location types were relatively comparable to their availability and use of bait was similar to other recent deer hunter study estimates, no adjustments were made to statewide animal type observation rates between or within years (Table 3).

Caution should be taken when comparing observation rates between species or species groups. No correction for observer bias has been made and it is very likely that larger, more mobile species that move more during daylight or twilight hours are more likely to be seen than smaller more nocturnal animals. It is also important to note that animal type identifications are made solely by individual hunters and not authenticated by NCWRC staff. Observation rate estimates were limited to the most recent 5 years of data to minimize long term temporal biases.

Table 3. Observation rates for animal types based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024. Statewide mean estimates derived from annual county averages.

Animal Type	*Observation Rate (animals seen per 1,000 hours)*	*95% Confidence Interval*
All Deer *(including unknown age/sex)*	989.7	*(945.6-1033.7)*
Gray Squirrel	788.3	*(757.8-818.8)*
Doe Deer	464.2	*(443.7-484.6)*
All Turkey *(including unknown beard status)*	351.0	*(320.7-381.3)*
Fawn Deer	223.0	*(209.7-236.3)*
Antlered Buck Deer	197.4	*(188.5-206.2)*
Non-Bearded Turkey	194.7	*(174.6-214.8)*
Bearded turkey	70.0	*(62.9-77.2)*
Fox Squirrel	21.7	*(17.9-25.6)*
Raccoon	20.1	*(17.7-22.5)*
Adult Bear	11.6	*(8.8-14.4)*
Coyote	9.9	*(8.9-10.8)*
Cub Bear	6.0	*(4.3-7.6)*
Gray Fox	5.3	*(4.4-6.1)*
Bobcat	3.5	*(3.1-4)*
Swine	2.3	*(1.4-3.2)*
Red Fox	2.2	*(1.8-2.6)*
Doe/Buck	2.44	*(2.34-2.54)*
Bearded/Non-Bearded Turkey	0.54	*(0.44-0.64)*
Fawn/Doe	0.52	*(0.51-0.54)*
Fox Squirrel/Total Squirrel	0.05	*(0.04-0.05)*

During 2020-2024 seasons, roughly half of the observation sampling units statewide occurred from hunts with bait (48.1%, n=929) than without bait (51.9%, n=1,004). In most cases where significant differences were identified, baiting increased observation rates, except for coyote where the use of bait made observations less likely (Table 4). Many of the less observed species exhibited an average median of zero. Because some species are rarely observed and unequal sampling variance between annual county estimates existed, median averaging and nonparametric analyses presented a more conservative comparison.

Table 4. Species observation rates by use of bait and no bait based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024. Statewide median estimates derived from annual county averages. Parentheses indicate interquartile range.

	Animals seen per 1,000 hours				
Animal Type	Bait		No Bait		*P*
All Deer (including unknown age/sex)	**1,046.7**	**(813.7-1323.8)**	**815.5**	**(554.7-1117.1)**	**0.00**
Gray Squirrel	**870.9**	**(653.2-1146.3)**	**608.8**	**(403.9-861.5)**	**0.00**
Doe Deer	**489.2**	**(364.4-615)**	**386.3**	**(256.8-545.8)**	**0.00**
All Turkey (including unknown beard status)	**277.2**	**(140.1-509.8)**	**210.2**	**(100-398.8)**	**0.00**
Fawn Deer	**238.0**	**(172.1-322.7)**	**148.3**	**(89-236.9)**	**0.00**
Antlered Buck	**211.0**	**(162.5-287)**	**164.6**	**(109.3-230.1)**	**0.00**
Non-Bearded Turkey	**145.1**	**(65.7-261.5)**	**91.3**	**(26.3-206.9)**	**0.00**
Bearded turkey	**49.8**	**(21-98.9)**	**35.8**	**(11.1-75.1)**	**0.00**
Raccoon	**13.8**	**(4.4-31.7)**	**5.3**	**(0-15.8)**	**0.00**
Coyote	**4.8**	**(0.6-11)**	**6.8**	**(1.9-16.4)**	**0.00**
Gray Fox	1.2	(0-6.7)	0.0	(0-5.5)	0.45
Adult Bear	0.0	(0-4.5)	0.0	(0-3.4)	0.18
Bobcat	0.0	(0-3.4)	0.6	(0-4.3)	0.07
Cub Bear	**0.0**	**(0-0)**	**0.0**	**(0-0)**	**0.03**
Fox Squirrel	0.0	(0-24.4)	0.0	(0-22.2)	0.63
Red Fox	0.0	(0-2.4)	0.0	(0-1.8)	0.15
Swine	0.0	(0-0)	0.0	(0-0)	0.36
Doe/Buck	**2.15**	**(1.74-2.61)**	**2.29**	**(1.8-2.93)**	**0.00**
Fawn/Doe	**0.59**	**(0.45-0.72)**	**0.45**	**(0.31-0.57)**	**0.00**
Bearded/Non-Bearded Turkey	**0.30**	**(0.12-0.57)**	**0.35**	**(0.15-0.69)**	**0.05**
Fox Squirrel/Total Squirrel	**0.00**	**(0-0.06)**	**0.00**	**(0-0.08)**	**0.00**

*Significant differences between medians in bold (P<0.05), Wilcoxon matched-pairs signed rank test.

During 2020-2024 seasons, private land observations comprised considerably more of the sampling unit location types (92.2%, n=1,782) than game lands (7.8%, n=150). Location type analyses were limited to the most recent 5 years of data to minimize long term temporal biases. Since baiting is prohibited on all game lands and baiting often increased observations rates for most animal types, matched pair analyses were limited to "no use of bait" sampling units only (Table 5).

Private land observation rates for most animal types were higher than game lands. These differences likely occurred because public game lands are often located on less productive habitats and/or often have higher hunting pressure. Many of the less observed species exhibited an average median of zero. Because some species are rarely observed and unequal sampling variance between annual county estimates existed, median averaging and nonparametric analyses presented a more conservative comparison.

Table 5. Species observation rates by location type (private versus game lands) based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024. Statewide median estimates derived from annual county averages. Parentheses indicate interquartile range.

	Animals seen per 1,000 hours				
Animal Type	Private Land		Game Land		*P*
All Deer (including unknown age/sex)	**788.5**	**(597.1-1030.4)**	**265.2**	**(144.1-417.1)**	**0.00**
Gray Squirrel	593.0	(400.7-849.6)	576.8	(346.5-868.2)	0.20
Doe Deer	**385.6**	**(267.8-494.5)**	**105.1**	**(54.2-201.4)**	**0.00**
All Turkey (including unknown beard status)	**180.0**	**(88.6-378.7)**	**59.1**	**(2.3-180)**	**0.00**
Antlered Buck	**159.7**	**(108.9-213.1)**	**48.3**	**(25-92.7)**	**0.00**
Fawn Deer	**156.3**	**(106.3-217.6)**	**23.5**	**(5.4-66.7)**	**0.00**
Non-Bearded Turkey	**77.3**	**(23.6-202.4)**	**5.7**	**(0-89.7)**	**0.00**
Bearded turkey	**31.6**	**(9.7-71.9)**	**0.0**	**(0-24.5)**	**0.00**
Coyote	**5.4**	**(1.2-12.9)**	**0.0**	**(0-10.8)**	**0.03**
Raccoon	**4.7**	**(0-14.8)**	**0.0**	**(0-2.7)**	**0.00**
Adult Bear	0.0	(0-3)	0.0	(0-3.3)	0.56
Bobcat	**0.0**	**(0-3.5)**	**0.0**	**(0-0)**	**0.05**
Cub Bear	0.0	(0-0)	0.0	(0-0)	0.49
Fox Squirrel	**0.0**	**(0-20.3)**	**0.0**	**(0-3.1)**	**0.02**
Gray Fox	**0.0**	**(0-4)**	**0.0**	**(0-0)**	**0.00**
Red Fox	**0.0**	**(0-0)**	**0.0**	**(0-0)**	**0.00**
Swine	0.0	(0-0)	0.0	(0-0)	0.06
Doe/Buck	**2.28**	**(1.84-2.95)**	**1.84**	**(1.11-2.84)**	**0.01**
Fawn/Doe	**0.43**	**(0.33-0.61)**	**0.27**	**(0.11-0.47)**	**0.00**
Bearded/Non-Bearded Turkey	**0.36**	**(0.13-0.68)**	**0.00**	**(0-0.21)**	**0.00**
Fox Squirrel/Total Squirrel	0.00	(0-0.05)	0.00	(0-0.01)	0.13

*Significant differences between medians in bold (P<0.05), Wilcoxon matched-pairs signed rank test.

Species Specific Results and Comments:

When looking at each of the following sections and charts, use caution in making direct comparisons between regional estimates for any species. Observation rates between regions may reflect population levels but can also be biased by differences in many factors such as habitat, topography, land use, or any other factor affecting the detectability of animals. For each of the selected species, any differences between regions may NOT be entirely related to regional differences in population abundance. However, long term trends can provide a reliable index of abundance change for a given area.

Deer

Hunters were asked to report deer they saw according to four categories: Antlered Buck, Adult Doe, Doe Fawn/Button Buck, or Unknown. To account for division errors during analysis, each lone fawn per observation record was assumed to be associated with 0.1 doe. Greater than 10 does per observation record were moved to unknown, assuming age misidentification in the field by some hunters. Both transformations accounted for a small number of records. Observation data complement other annual deer data sets (reported harvest, hunter harvest survey, biological data collections) that biologists rely on to manage the herd. These observation data provide a baseline enabling biologists to monitor trends in deer observation rates (deer/hour) and ratios (fawns/doe, does/buck) over space and time.

It is important to note these observation data have not been scientifically tested to determine their accuracy as a true measure or estimate of herd demographics, so results should be interpreted with caution. For example, bait appears to inflate fawn observation rates and fawn/doe ratios (Table 5), so if differences in fawns are observed over time or space, those differences could be the result of differences in the use of bait over time or space rather than differences in actual fawns in the population. Even if the use of bait is accounted for, it remains unknown whether observed fawn/doe ratios are an accurate measure of the true fawn/doe ratio of the population.

In addition to bait, deer observation rates can vary throughout the deer hunting season, and time of observations should be critically considered before assuming observations are an accurate depiction of population demographics. Deer observation rates and ratios can change over the course of a hunting season because of seasonal changes in 1) deer movements (ex: rut activity, response to hunting pressure, shorter day length, variable food sources, fawns becoming more active), 2) a hunter's ability to detect deer (ex: leaf fall, crop harvest), 3) correct identification of deer classes (ex: fawns maturing, bucks shedding antlers), and 4) removal of deer from the herd (ex: disproportionate harvest of bucks to does or does to fawns). To further confound this issue, the influence of these factors may vary geographically and between years.

Deer observed per hour decreases slightly near the end of the deer hunting season because many deer have already been harvested (Figure 2). Additionally, diurnal activity may decrease in response to hunting pressure and shortening day length. Because buck movements and home-ranges increase around the rut, the lowest doe/buck ratio is typically observed during that time period. Fawn/doe ratios are highest at the beginning of the season, even though hunters harvest proportionally more adult does than fawns throughout the season. Natural mortality (predation, disease, etc.) is similar for adult does and fawns older than 3-4 months of age, so the observed decline in the ratio at the end of the season is likely not due to an actual decline in fawns per doe in the herd. The lower late season ratio may indicate an increasing rate of fawns being misidentified as adult does due to their increase in size during the season.

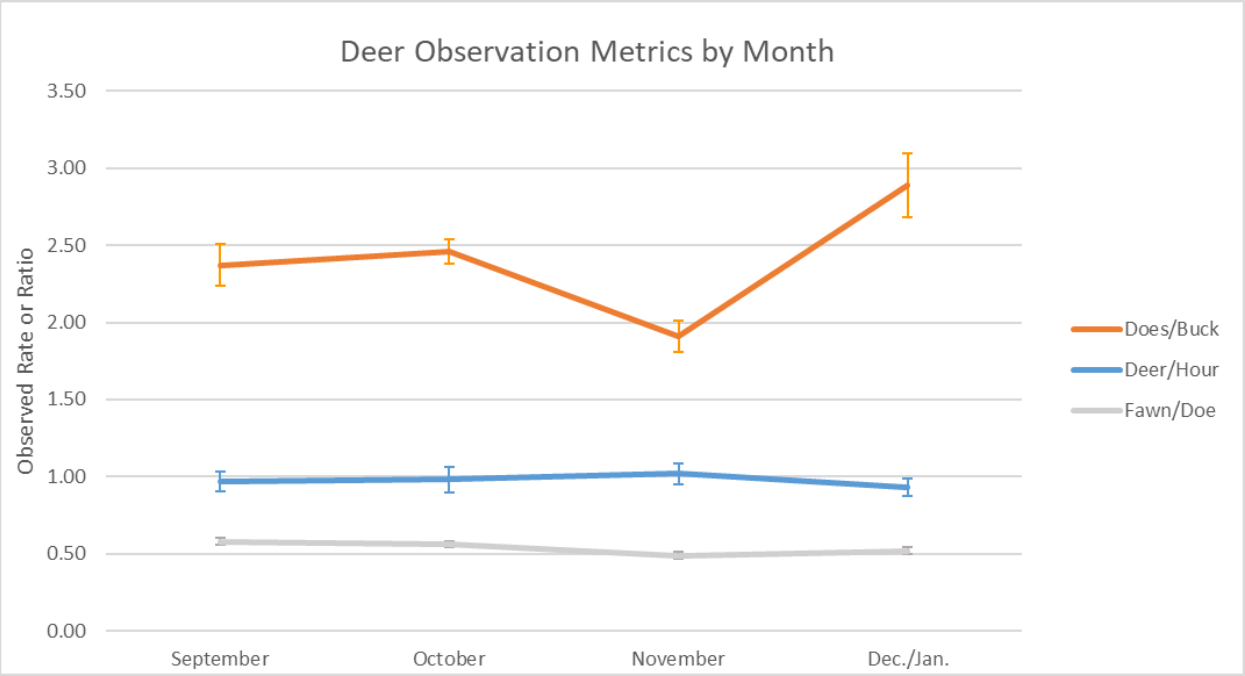

Figure 2. Deer observation rates and ratios by month, North Carolina Deer Hunter Observation Survey, 2020-2024. Deer observations vary over time of year due to changes in deer movements, hunter ability to detect and correctly identify types of deer, and deer harvest. For the raw data used to create this chart, see Appendix B1.

Observation Rates of Deer

Deer were the most observed animal type (989.7 deer per 1,000 hours) and were seen in all 100 counties (Table 3). Adult does were seen at a higher rate (464.2 does per 1,000 hours), than either fawns (223.0 fawns per 1,000 hours), or antlered bucks (197.4 bucks per 1,000 hours). Significantly more deer were observed on stand locations with bait (1,046.7 per 1,000 hours, than without bait (815.5 deer per 1,000 hours) (Table 4). Significantly more deer were observed on private lands (788.5 per 1,000 hours, than on game lands (265.2 deer per 1,000 hours) (Table 5).

Over the past 11 years, there was significant evidence that statewide observation rates have increased over time (+40.5 deer per 1,000 hours (+2.7%) annually, $P<0.01$, Figure 3). The rate increase has appeared to be very similar across all 5 season zones with the highest number of deer per 1,000 hours observed during the most recent season (Figure 3). For the 2024 season, the highest observation rates for deer occurred in the Northeastern season zone (1,425.8 deer per 1,000 hours) and were lowest in the Western season zone (863.1 deer per 1,000 hours).

Despite observation rate increases, annual county estimates maintained relatively consistent precision within past 5 years (average PSE 12.3%) and were adequate enough to map distributions at the county scale (Figure 4). However, counties in the extreme eastern and western ends of the state exhibited a high amount of annual variation due to small sample sizes.

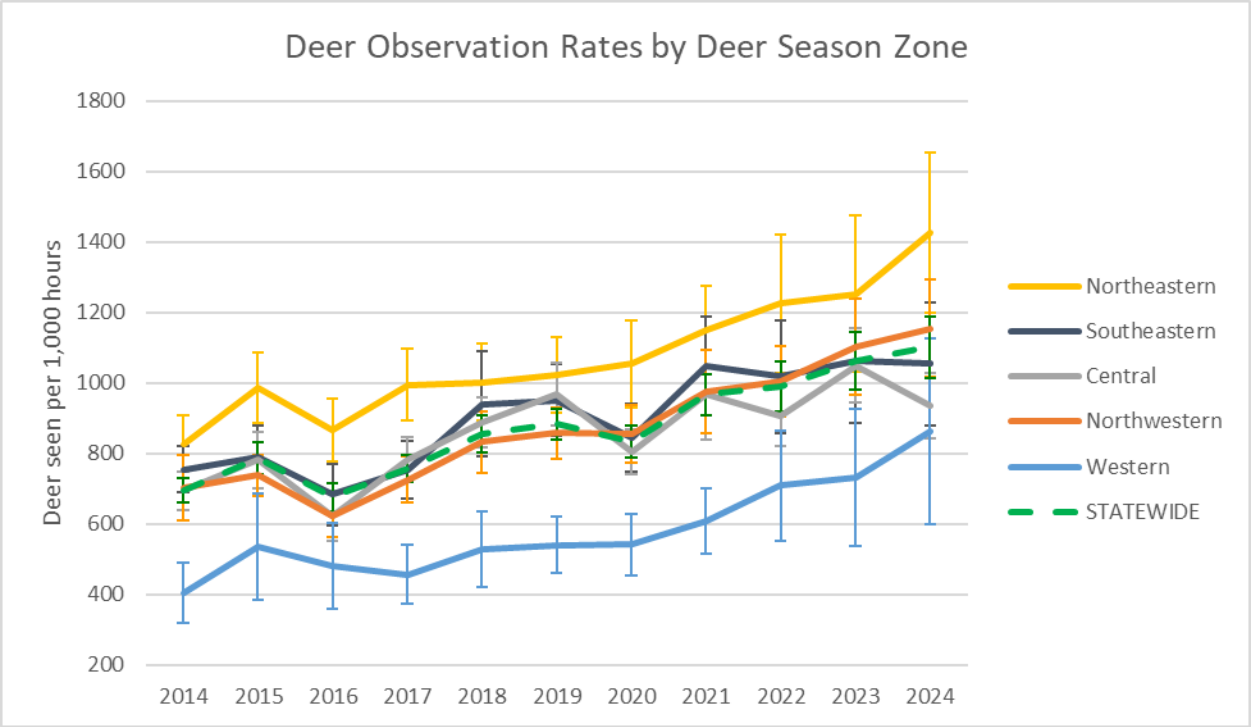

Figure 3. Annual deer observation rates by deer season zone (# of deer seen per 1,000 hours) with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B2.

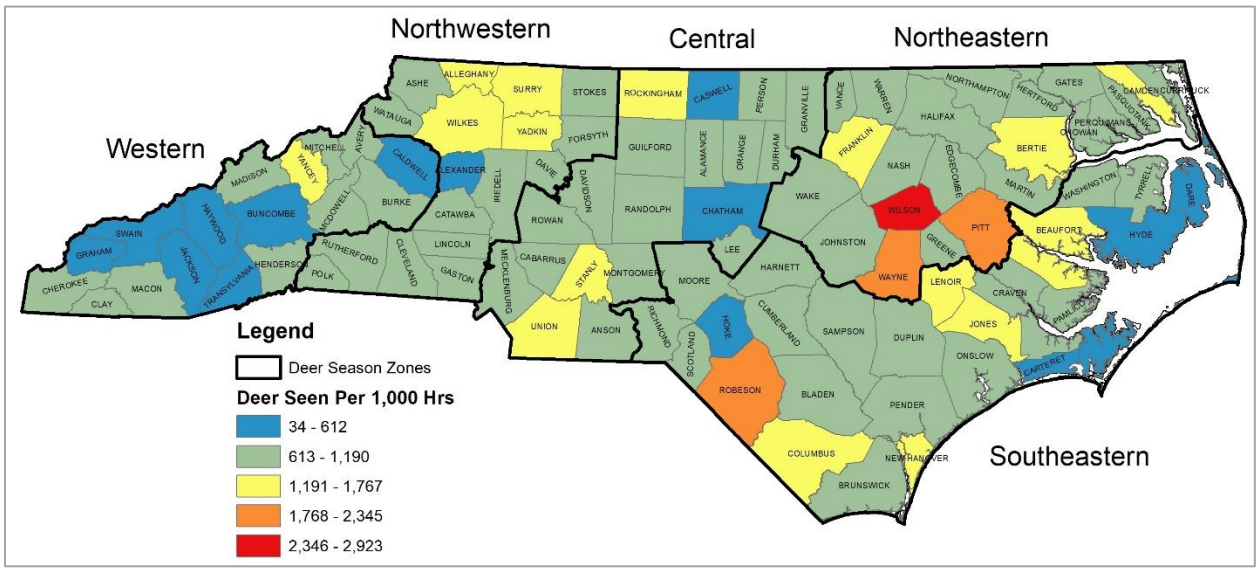

Figure 4. Deer observation rates by county based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

Ratio of Fawns Per Doe

This ratio offers insight into deer population recruitment. The two main influences on this ratio are adult doe (1.5+ years) reproductive output and fawn mortality. When changes in the ratio are observed over time, it will never be entirely clear which of these factors might be responsible, i.e. habitat quality, doe age/health, predation, and weather events. However, this ratio is extremely valuable and contributes to a more comprehensive assessment of deer population dynamics and sustainable harvest rates.

The statewide average was 0.51 fawns for every adult doe (Table 3). Baiting analyses suggest that the use of bait significantly increases the observed fawn per doe ratio by ~31% (0.59 fawns per doe with bait, 0.45 fawns per doe without bait). This appears to be influenced by fawns exhibiting a higher tendency to visit baited sites compared to adult does (Table 4). Location type analyses also suggest that fawn per doe ratios were higher on private lands by ~59% (0.43 fawns per doe on private lands, 0.27 fawns per doe on game lands, Table 5).

Annual trends across the state and within each of the season zones showed no significant change over the past 11 years (P>0.05, Figure 5). Ratios have typically been lower in the Southeastern, Northeastern, and Western and higher in the Northwestern and Central zones (P<0.05). Considerable annual variation existed in the Western season zone, most notably a low ratio in 2017. Weather and mast likely influence reproductive output and fawn mortality, but the relationship is complex and currently unclear.

Within the past 5 years, annual county estimates maintained relatively consistent precision (average PSE 12.1%) and were adequate to map distributions at the county scale (Figure 6). However, several counties in the mountains and coast exhibited a higher amount of annual imprecision due to small sample sizes.

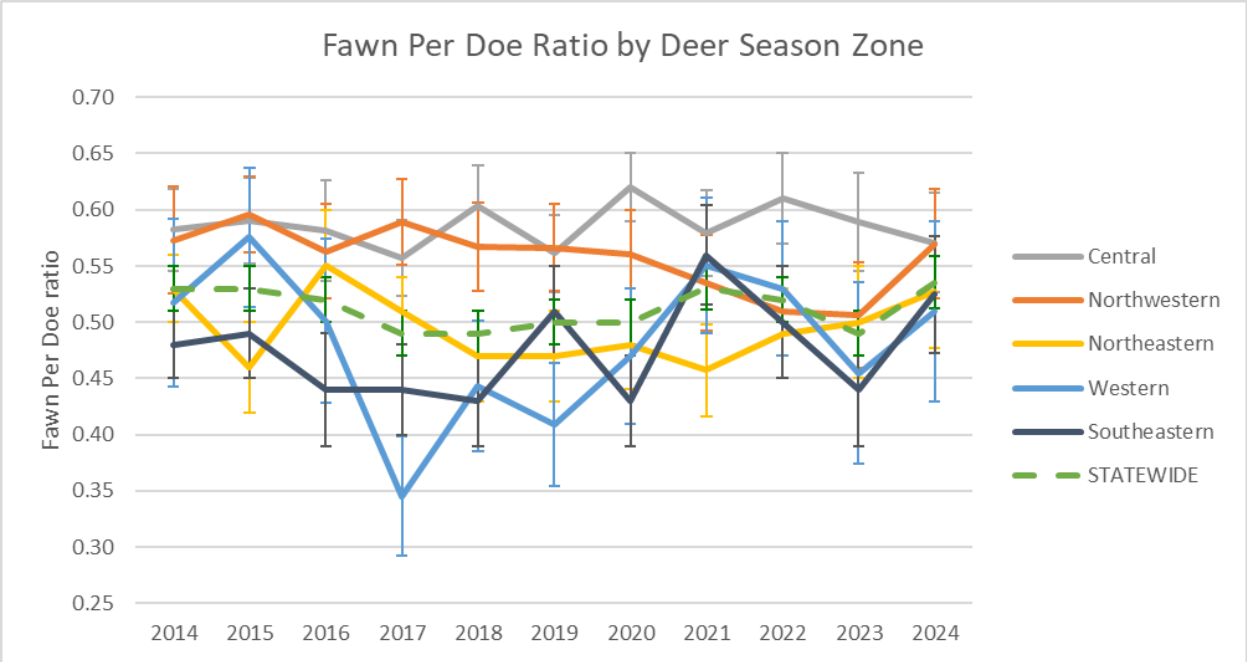

Figure 5. Annual fawn per doe observation rates by deer season zone with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B3.

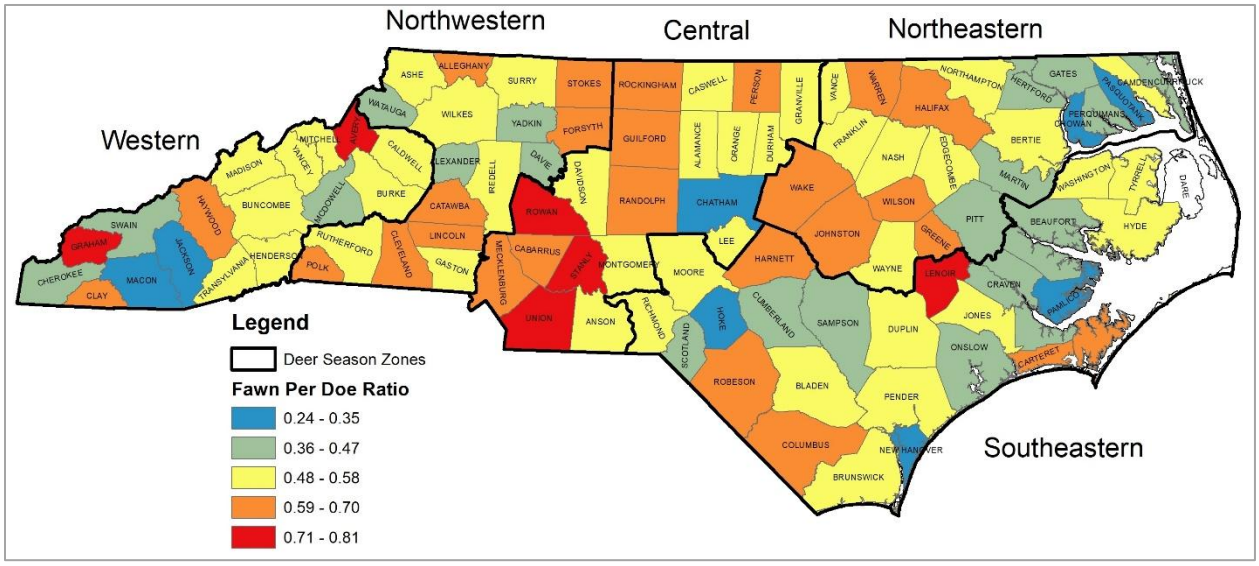

Figure 6. Fawn per doe observation rates by county based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024. Counties with no shading indicate insufficient sample sizes for estimation purposes (<3 sampling units per year).

Ratio of Adult Does Per Antlered Buck

This ratio offers insight into the sex ratio of the deer herd. Since birth rates and natural mortality are similar for males and females, skewed ratios in the herd are primarily indicative of hunting harvest rate differences. When changes in the ratio are observed over time, changes in harvest management strategies are likely responsible.

The statewide ratio was 2.27 does per antlered buck (Table 3). The central and northwestern zones had significantly lower annual adult doe per antlered buck ratios than the other 3 season zones (P<0.01). Baiting analyses suggested that the use of bait significantly reduces the observed doe per buck ratio (2.15 does per buck with bait, 2.29 does per buck without bait, P<0.01, Table 4). This difference likely occurs because antlered bucks had a slightly higher tendency to visit baited sites (32% higher with bait) compared to adult does (27% higher with bait). Location type analyses also suggest that doe per buck ratios were higher on private lands by ~24% (2.28 does per buck on private lands, 1.84 does per buck on game lands, Table 5).

There was no evidence that statewide ratios have changed in the state during the past 11 years (P=0.11). However, ratios in the central and northwestern zones have significantly decreased (-0.03 doe per buck annually, P<0.01, Figure 7). There was no significant evidence that ratios have changed in the season zones (P>0.05).

During the past 5 years, annual county estimates maintained relatively consistent precision (average PSE 11.7%) and were adequate to map distributions at the county scale (Figure 8). However, several counties in the mountains and coast exhibited a higher amount of annual imprecision due to small sample sizes.

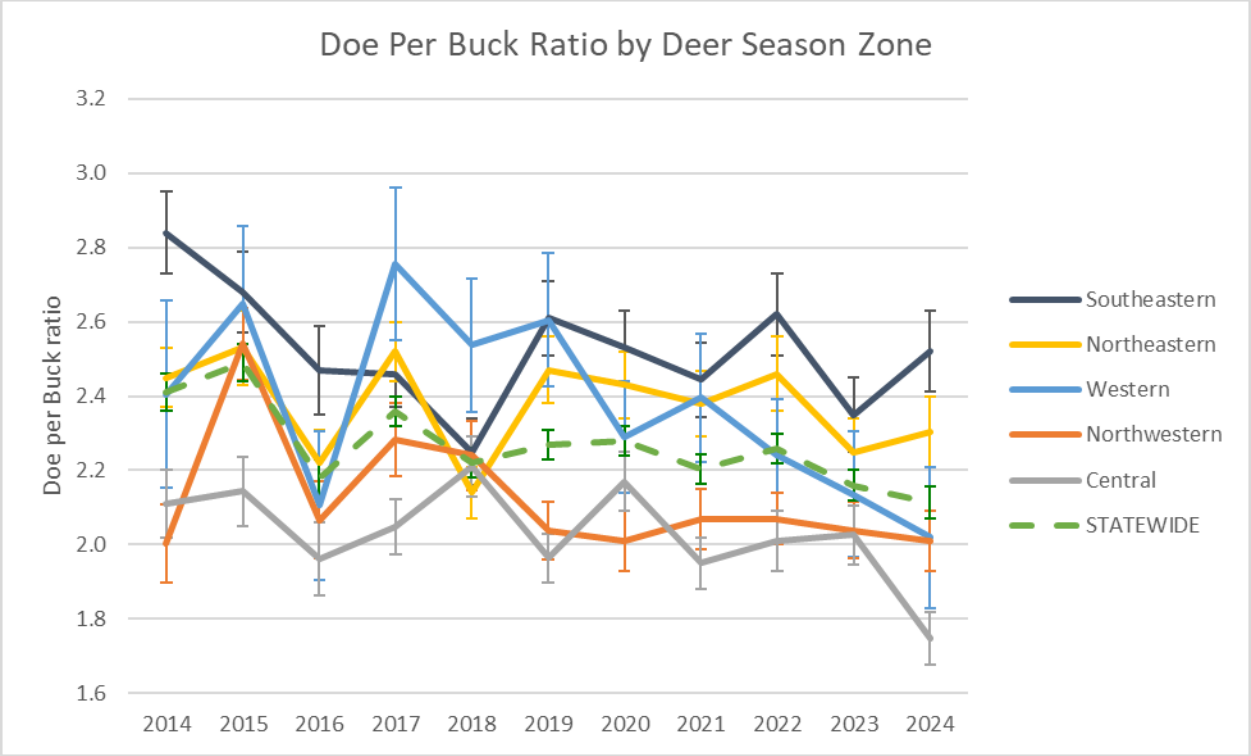

Figure 7. Adult doe per antlered buck observation rates by deer season zone with 95% confidence intervals), North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B4.

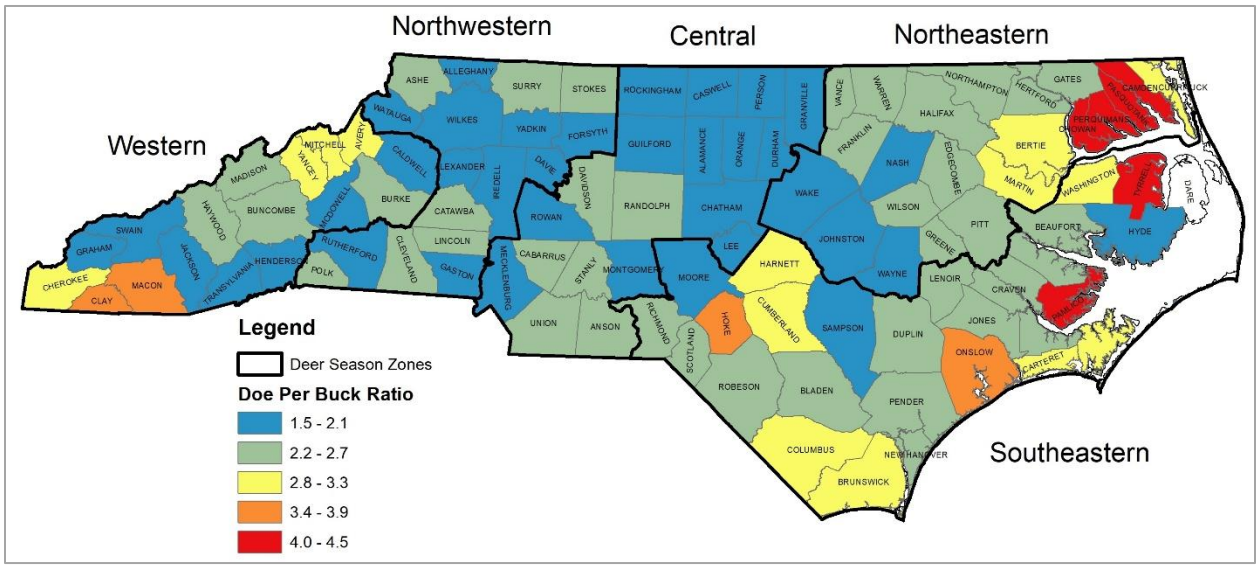

Figure 8. Adult does per antlered buck observation rates by county based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024. Counties with no shading indicate insufficient sample sizes for estimation purposes (<3 sampling units per year).

Gray Squirrel

Gray squirrels were the second most observed animal type (788.3 squirrels per 1,000 hours) and were seen in all 100 counties (Table 3). Significantly more gray squirrels were observed on stand locations with bait (870.9 squirrels per 1,000 hours), than without bait (608.8 squirrels per 1,000 hours), since squirrels appear to utilize bait as a direct food source (Table 4). There was no significant evidence that there were more gray squirrels observed on private lands than on game lands (P=0.20, Table 5).

There was significant evidence that statewide rates have decreased during the past 11 years (-9.4 gray squirrels seen per 1,000 hours (2.3%) annually, P<0.01, Figure 9). Within the past 5 years, annual county estimates maintained relatively consistent precision (average PSE 12.7%) and were adequate to map distributions at the county scale (Figure 10). The highest observations rates occurred in the central piedmont of the state.

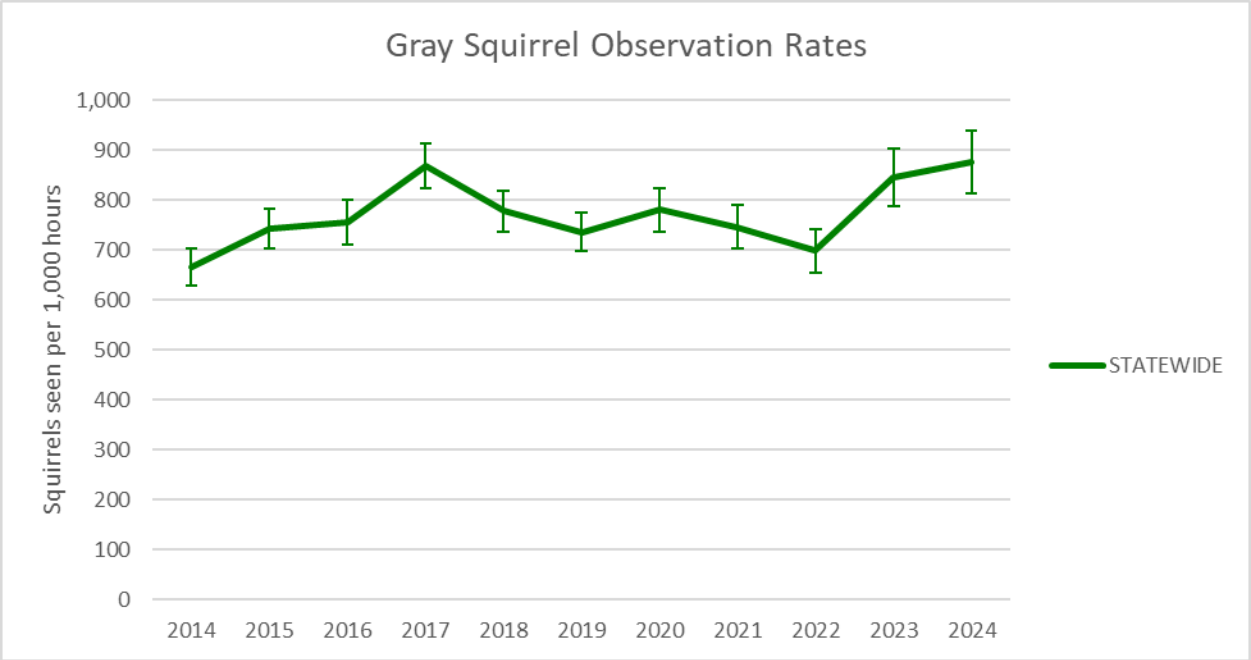

Figure 9. Annual statewide gray squirrel observation rates (# of gray squirrels seen per 1,000 hours) with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B5.

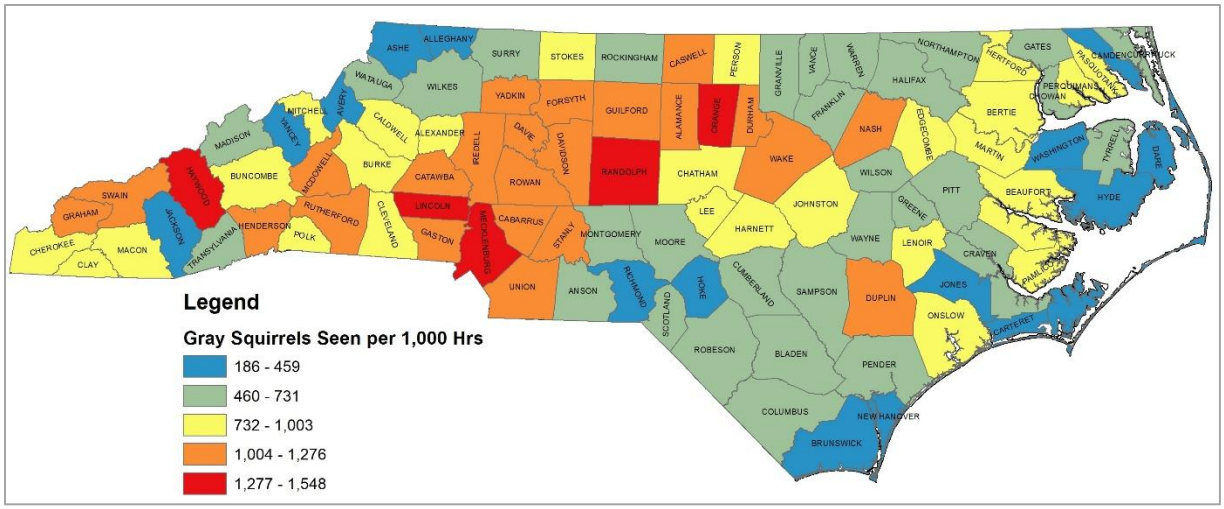

Figure 10. North Carolina gray squirrel observation rates by county based on 5-year averages (# of gray squirrels seen per 1,000 hours), Deer Hunter Observation Survey 2020-2024.

Fox Squirrel

Fox squirrels were a relatively uncommon animal type (21.7 squirrels per 1,000 hours) and were seen in 64 counties (Table 3). Since the known fox squirrel population distribution only covers a portion of the state, many annual county hunter observation rates were zero. As opposed to gray squirrels, the use of bait did not appear to have a significant influence on median observation rates (P=0.63, Table 4). There was significant evidence that there were more fox squirrels observed on private lands than on game lands (P=0.02, Table 5).

There was no significant evidence that statewide observation rates have changed within the past 11 years (P=0.09, Figure 11). Within the past 5 years, the annual statewide average estimate maintained a relatively poor precision (average PSE 51.3%) because many counties were outside the state's fox squirrel population distribution and contained no or very few observations. Highest observations rates occurred in the Sandhills region and the central coastal area of the state. However, counties within the core of the state's fox squirrel population provided estimates with adequate precision to map at the county scale (Figure 12). Many of the deer hunter survey observations have included new occurrences outside of the previously known historical ranges and have been used to update the agency's fox squirrel distribution maps.

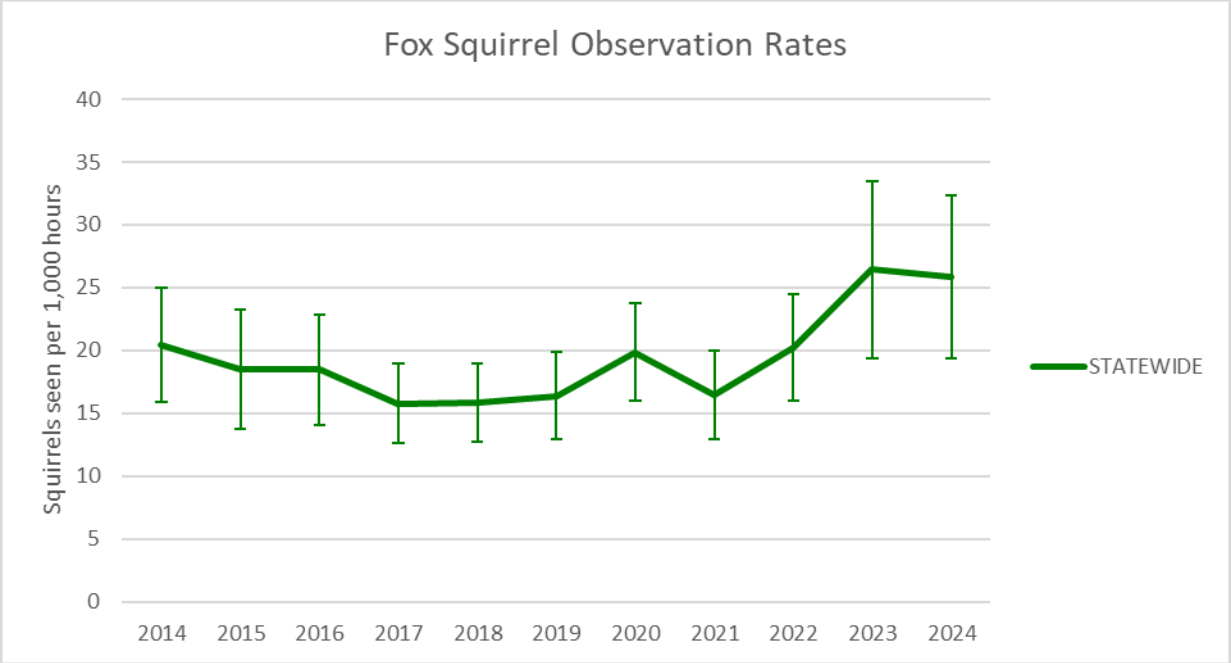

Figure 11. Annual statewide fox squirrel observation rates (# of fox squirrels seen per 1,000 hours) with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B6.

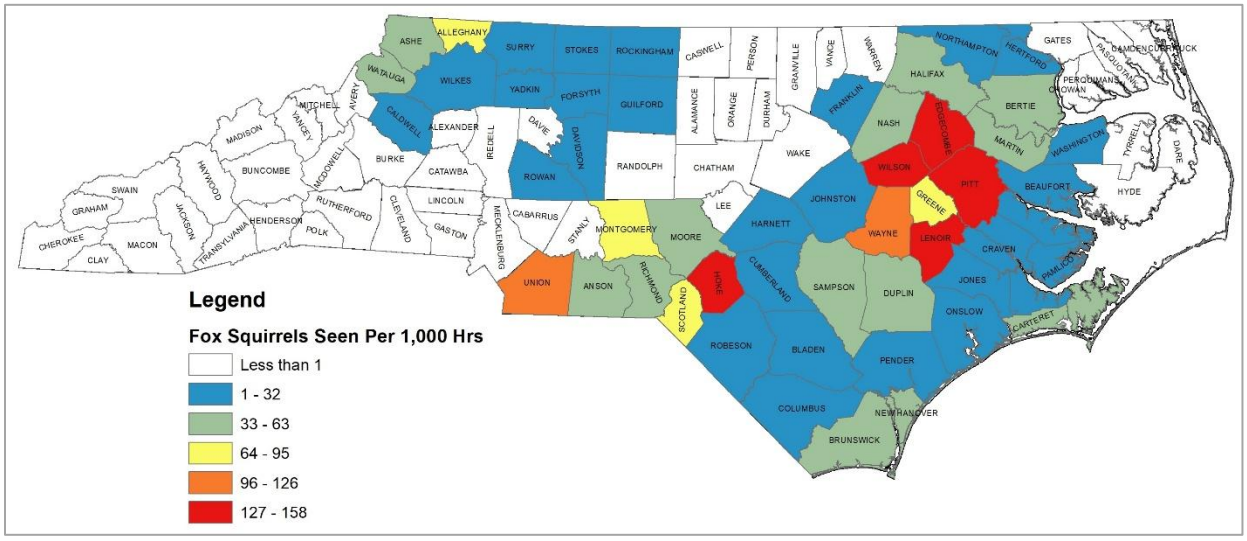

Figure 12. North Carolina fox squirrel observation rates by county based on 5-year averages (# of fox squirrels seen per 1,000 hours), Deer Hunter Observation Survey 2020-2024.

Turkey

Hunters were asked to report all turkeys they saw according to three categories: Bearded, No Beard, or Unknown. Turkey observation data can be used in several ways. Primarily, they are used to compute observation rates (i.e., turkeys seen/1,000 hours) and a ratio of bearded (adult males) to non-bearded (females and young of the year).

Observation Rates of Turkeys

Turkeys were a commonly observed animal type (351.0 turkeys per 1,000 hours) and were seen in all 100 counties (Table 3). Hunters reported seeing more non-bearded turkeys (194.7 turkeys per 1,000 hours) than bearded turkeys (70.0 turkeys per 1,000 hours). Turkey observations contained a relatively high degree of variance due to the flocking characteristic of turkeys making estimates less precise. Significantly more turkeys were observed when bait was used (277.2 turkeys per 1,000 hours with bait, 210.2 turkeys per 1,000 hours without bait, Table 4). There was significant evidence that median observation rates for turkeys were different between location types (180.4 turkeys per 1,000 hours on private lands, 59.1 turkeys per 1,000 hours on game lands, Table 5).

There was no significant evidence that turkey observation rates have changed at the statewide scale within the past 11 years (P=0.31, Figure 13). However, observation rates have shown a significant decrease in the mountain management region (-15.3 turkeys per 1,000 hours (-6.9%) annually, P<0.01) and a significant Increase in the coastal management region (16.9 turkeys per 1,000 hours (+2.8%) annually, P<0.01). There was no significant evidence that rates have changed in the piedmont region (P=0.97).

For the past 5 years, annual county estimates maintained relatively consistent observation rates (average PSE 25.2%) and were precise enough to map distributions at the county scale. (Figure 14). Observation rates for turkeys were significantly higher in the coastal region (550.3 turkeys per 1,000 hours), than the piedmont or mountain regions (234.2 turkeys per 1,000 hours), P<0.01). There was not significant evidence that observation rates were different in the mountain or piedmont region within the past 5 years (P=0.32)

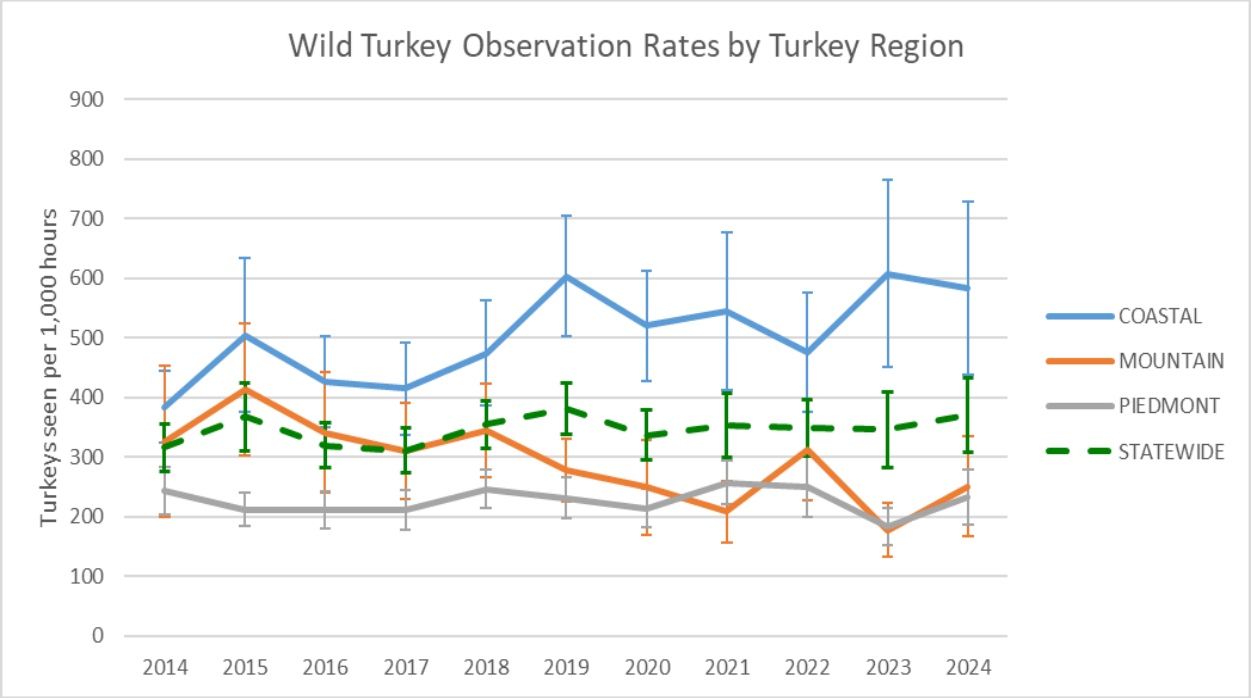

Figure 13. Annual turkey observation rates (# of turkeys seen per 1,000 hours) by turkey management region with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B7.

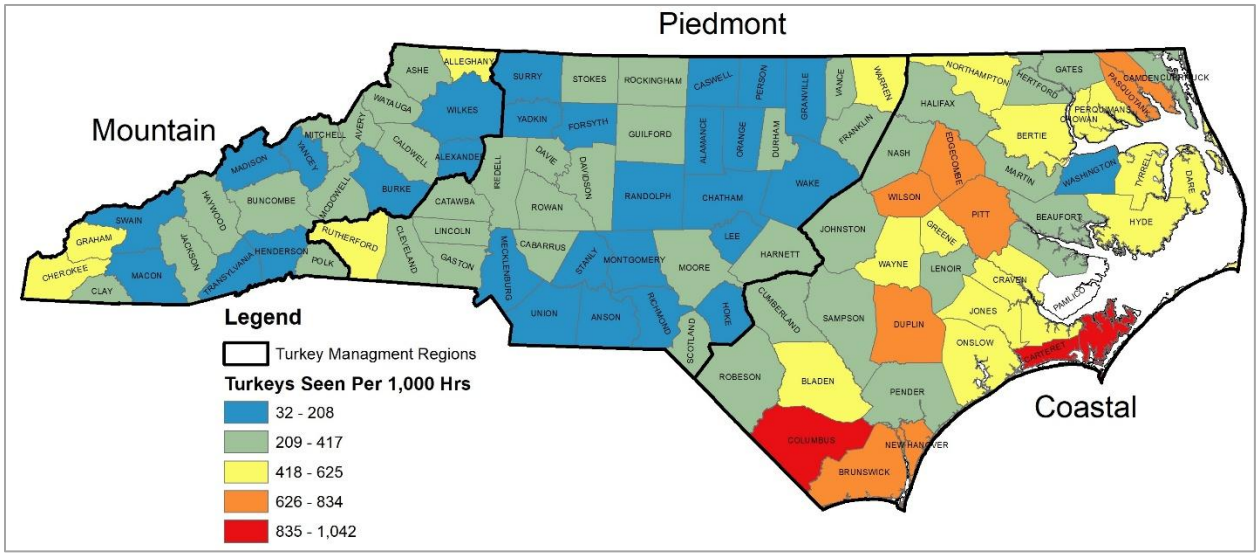

Figure 14. North Carolina turkey observation rates by county based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024. Counties with no shading indicate insufficient sample sizes for estimation purposes (<3 sampling units per year).

Ratio of Bearded Per Non-Bearded Turkeys

This ratio offers insight into turkey population dynamics. This ratio can be influenced by the survival/harvest rates of males, survival of females, and production of young turkeys during summer nesting and brood rearing. Changes in the ratio over time may indicate changes in these parameters, though it may not be clear which parameters have changed. For example, if the ratio of bearded to non-bearded turkeys decreased over time, over-harvest of males during the spring hunting season might be responsible. Data from the observation survey are extremely valuable and can be used in combination with information from the annual Summer Wild Turkey Observation Survey and reported annual spring harvest numbers to provide a more comprehensive assessment of the turkey population and management strategies.

The statewide mean average ratio was 0.54 bearded/non-bearded turkey (Table 3). Baiting analyses suggested that the use of bait significantly affected the median ratio (0.30 bearded/non-bearded turkey with bait, 0.35 bearded/non-bearded turkey without bait, P=0.05, Table 4). These ratio differences suggested that non-bearded turkeys use bait at a slightly higher proportional rate than bearded turkeys. Location type analyses showed significant evidence that the median ratio was significantly higher on private lands than on game lands (0.36 bearded/non-bearded turkey on private lands, 0.00 bearded/non-bearded turkey on game lands, Table 5). These comparisons were relatively imprecise due to the low availability of game land observation ratios, but significant differences may be the result of gobblers having higher harvest rates on public game lands as compared to private lands.

There was no significant evidence that ratios have changed at the statewide or regional scales over the past 11 years (P>0.05, Figure 15). Despite some notable single season increases during the 2020 and 2023 fall observation seasons, no significant change in trends existed within the mountain (P=0.58), piedmont (P=0.37), or coastal zones (P=0.52).

During the past 5 years, the bearded to non-bearded turkey ratios were not significantly different between any of the turkey regions (P>0.05). Counties within management regions had a relatively high degree of variation, with no discernable statewide pattern. Annual county observation ratios only maintained marginal consistency (average PSE 36.5%), so the mapping presented at the county scale should be interpreted cautiously (Figure 16). Counties in the far mountains and coast exhibited a higher amount of annual imprecision, likely due to small sample sizes.

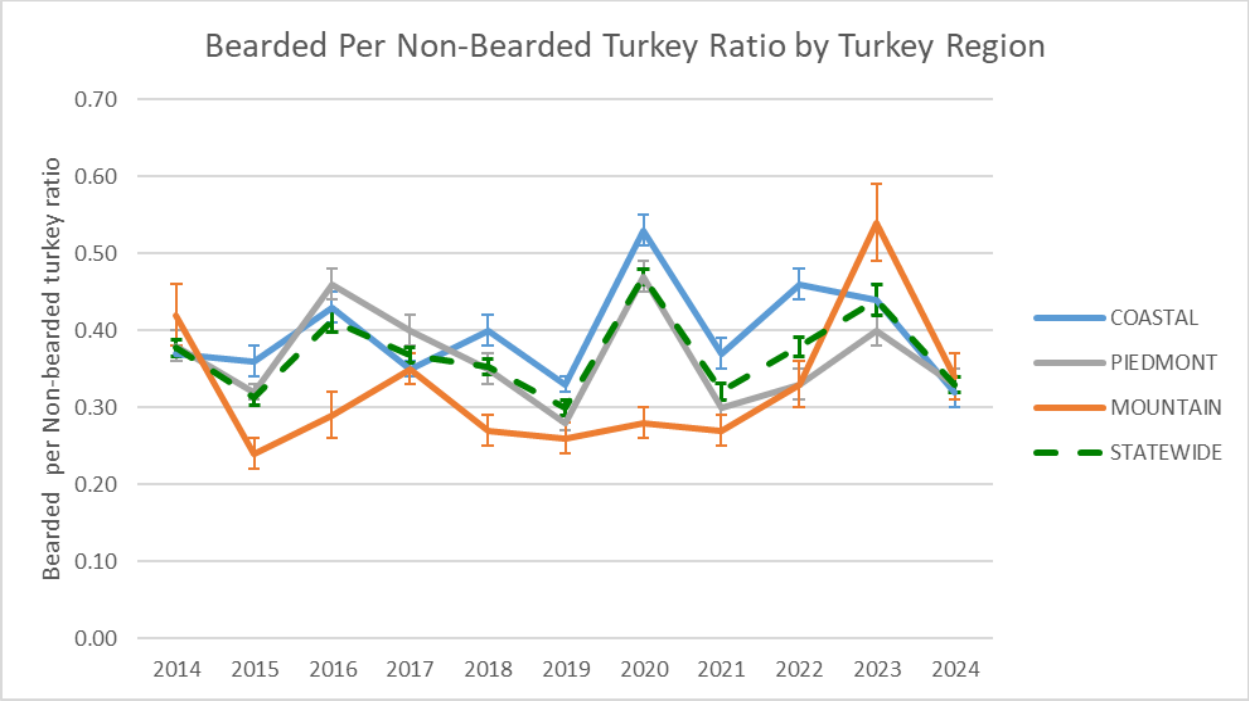

Figure 15. Annual bearded per non-bearded turkey observation rates with 95% confidence intervals by turkey management region, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B8.

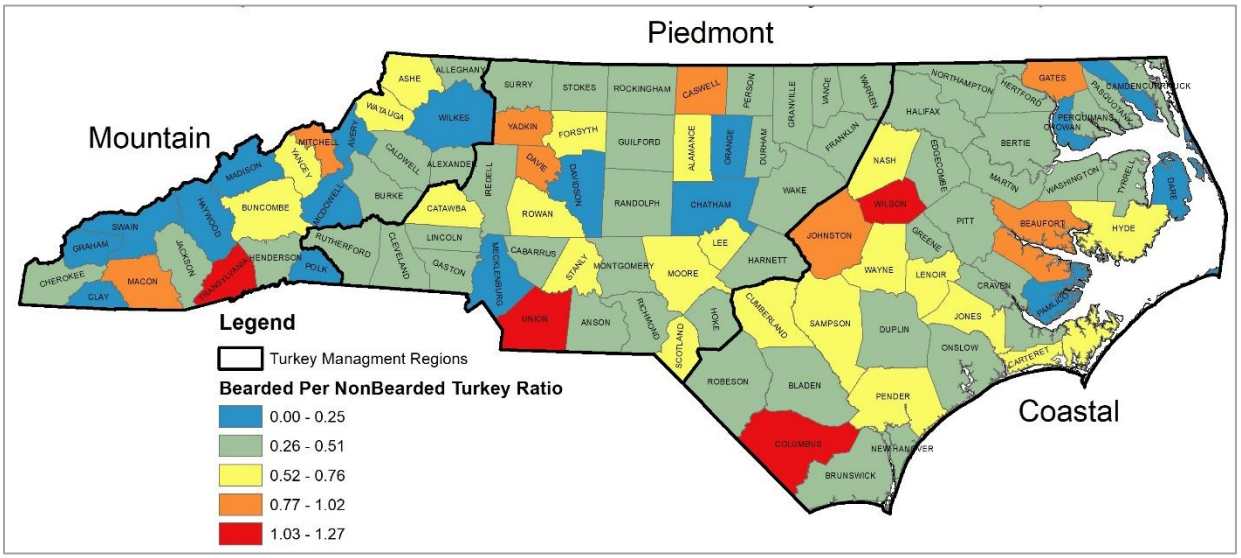

Figure 16. Bearded turkey per non-bearded turkey observation ratio by turkey management region based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

Raccoon

Observations of raccoon have generally followed their statewide range and were recorded in 99 of the 100 counties. Statewide raccoon observation rates were the highest for any furbearer species but were still relatively rare (20.1 raccoons per 1,000 hours) when compared to other game species (Table 3). Low observation rates likely occur because raccoons are primarily nocturnal, and deer hunter observations are made during the day. Baited sites were highly attractive to raccoons since they provided a direct food source. Significantly more raccoons were observed on stand locations with bait (13.8 raccoons per 1,000 hours), than without bait (5.3 raccoons per 1,000 hours, Table 4). Location type analyses show significant evidence that median observation rates were significantly higher on private lands than on game lands (4.7 raccoons per 1,000 hours on private lands, 0.00 raccoons per 1,000 hours on game lands, Table 5). These comparisons were relatively imprecise due to the low availability of raccoon observations on game lands, but significant differences were likely the result of harvest rate or habitat quality differences.

During the past 11 years, there was significant evidence that statewide observation rates have declined over time (-0.9 raccoon seen per 1,000 hours (-3.2%) annually, $P<0.01$, Figure 17). This decline was primarily driven by the significant decrease occurring in the coastal and piedmont Fur Management Units (FMU), ($P<0.05$). There was no significant evidence that raccoon observation rates have changed over time within the mountain FMU ($P=0.26$).

During the past 5 years, observation rates were significantly higher in the coastal plain FMU (32.5 raccoons per 1,000 hours), followed by piedmont (14.2 raccoons per 1,000 hours) and mountain (9.6 raccoons per 1,000 hours) ($P<0.05$, Figure 18). Annual county observation rates only maintained marginal consistency (average PSE 39.7%), but mapping was presented at the county scale.

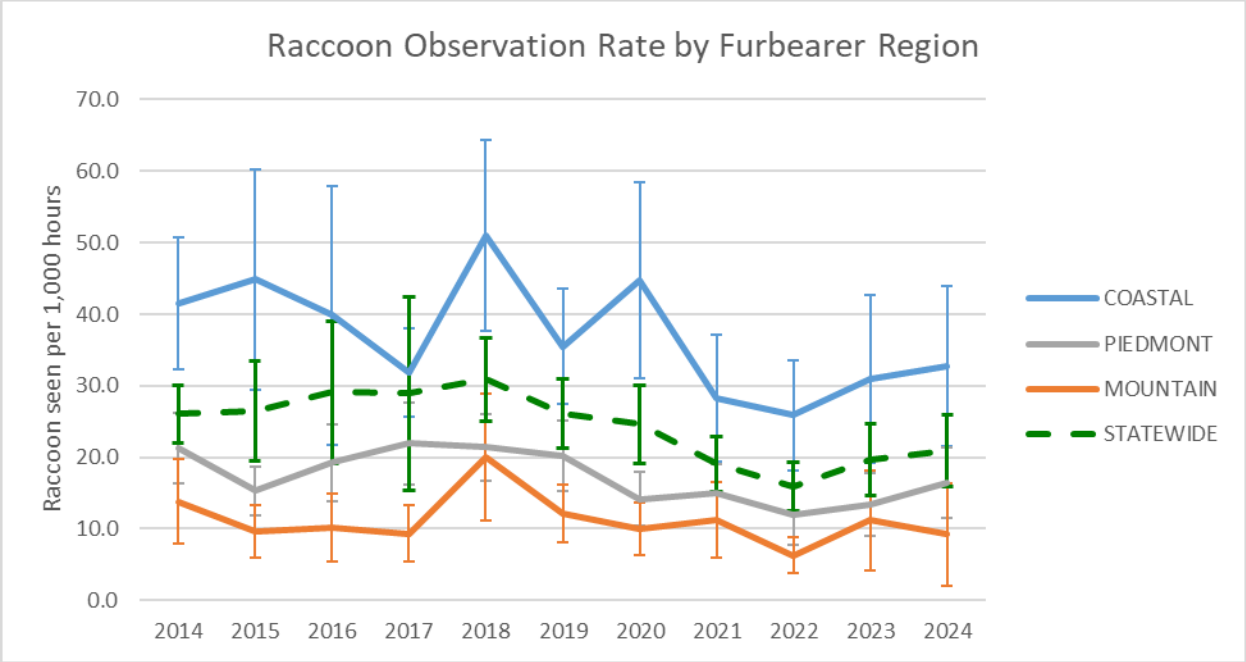

Figure 17. Annual raccoon observation rates by furbearer management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B9.

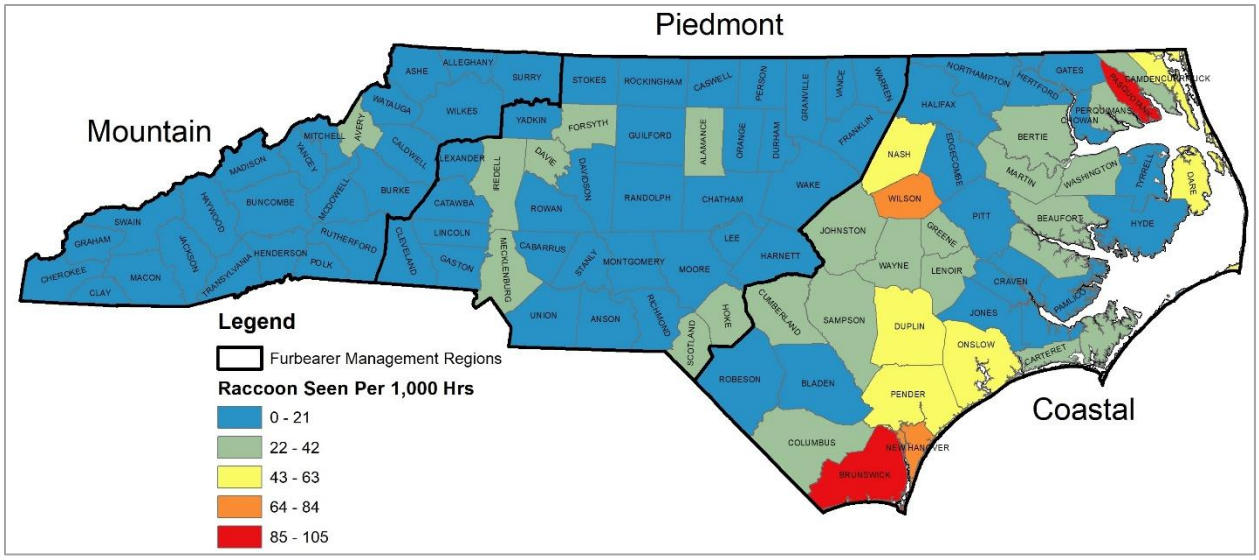

Figure 18. North Carolina raccoon observation rates by county based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

Coyote

Observations for coyotes have generally followed their statewide range and were recorded in 99 of the 100 counties. Statewide coyote observation rates were generally rare compared to other species (9.9 coyotes per 1,000 hours, Table 3). Significantly less coyotes were observed on stand locations with bait (4.8 coyotes per 1,000 hours, than without bait (6.8 coyotes per 1,000 hours, Table 4). Coyotes were the only species to have a significant negative response to the use of bait. Location type analyses show significant evidence that the median rates were significantly higher on private lands than on public game lands (5.4 coyotes per 1,000 hours on private lands, 0.00 coyotes per 1,000 hours on game lands, Table 5). These comparisons were relatively imprecise due to the low availability of coyote observations on game lands, but significant differences were likely the result of the coyote's avoidance of locations that have higher human activity (e.g., hikers, dog walkers, hunters, anglers).

There was significant evidence that statewide rates have decreased during the past 11 years (-0.6 coyotes seen per 1,000 hours (-5.7%) annually, $P<0.01$, Figure 19). Regional annual estimates were relatively imprecise generally due to the scarcity of observations. However, this decline was seen in all three FMUs ($P<0.05$).

For the past 5 years, there was no evidence that coyote observation rates were different between the three FMUs ($P>0.05$). These results match that of other indices the NCWRC uses to track coyote population distributions which indicate that populations were fully distributed across the state and are adaptable to a wide range of habitats. Observations ratios did not have any discernable pattern across the state. Annual county observation rates only maintained marginal precision (average PSE 39.5%) primarily due to low observation rates, but mapping was presented at the county scale (Figure 20).

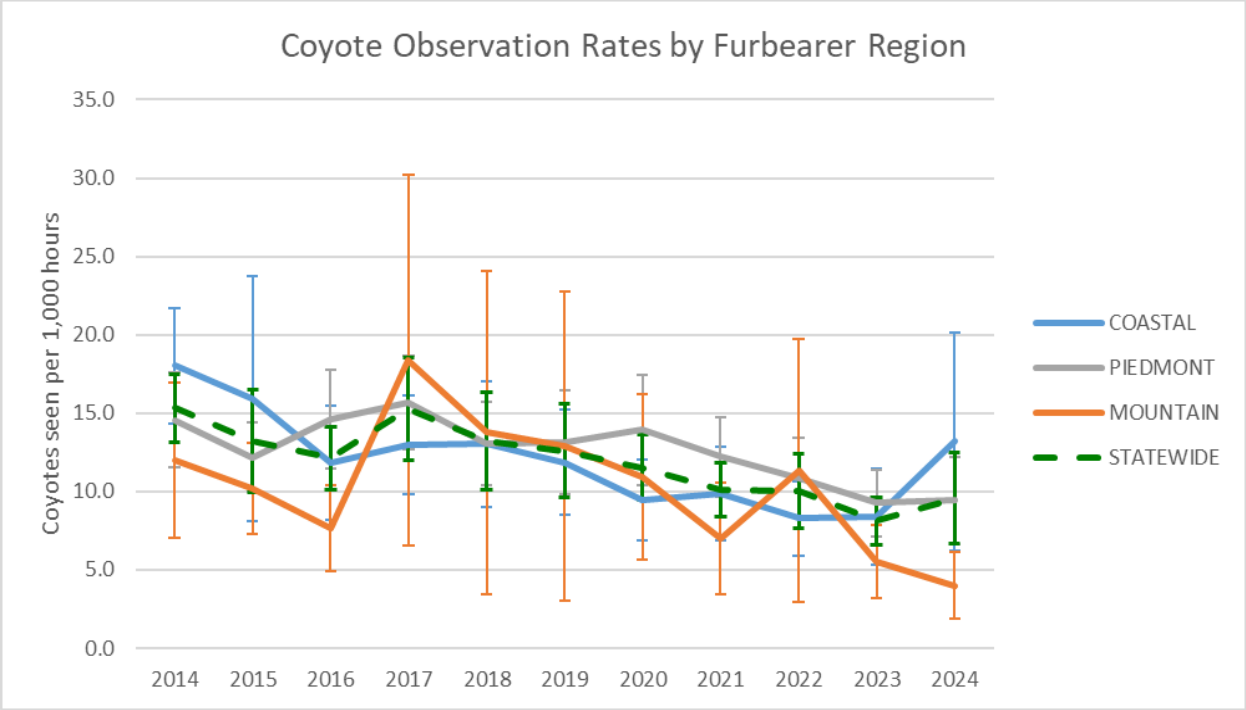

Figure 19. Annual coyote observation rates by furbearer management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B10.

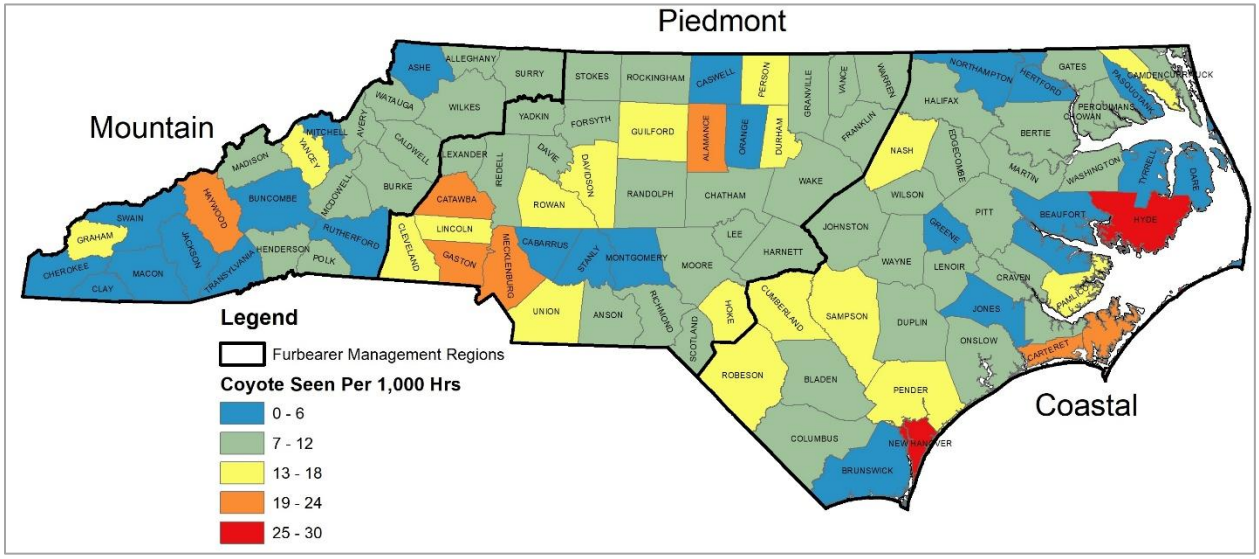

Figure 20. Coyote observation rates by furbearer management unit based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

Gray Fox

Observations of gray fox have generally followed their statewide range and were seen in 91 of the 100 counties. Statewide gray fox observation rates were relatively rare compared to other species (5.3 gray fox per 1,000 hours, Table 3). There was no significant evidence that baited sites had any influence on gray fox observation rates (P=0.45, Table 4). Location type analyses show significant evidence that observation rates were significantly higher on private lands than on game lands (P<0.01, Table 5). These comparisons were relatively imprecise due to the low availability of observations, but significant differences were likely the result of higher harvest rates and/or habitat differences between public game lands and private lands.

During the past 11 years, there was significant evidence that statewide observation rates have declined over time (-0.5 gray fox seen per 1,000 hours (-14.1%) annually, P<0.01, Figure 21). This decline was seen in all three FMUs (P<0.05).

Within the past 5 years, annual county estimates did not maintain consistent precision (average PSE 56.0%) primarily due to low observation rates and were only adequate to map distributions at the regional scale (Figure 22). Gray observation rates were significantly lower in the mountain FMU (-5.7 gray fox per 1,000 hours annually, P<0.01) than the coastal and piedmont FMUs. There was no significant difference in observation rates between the coastal and piedmont FMUs (P=0.56).

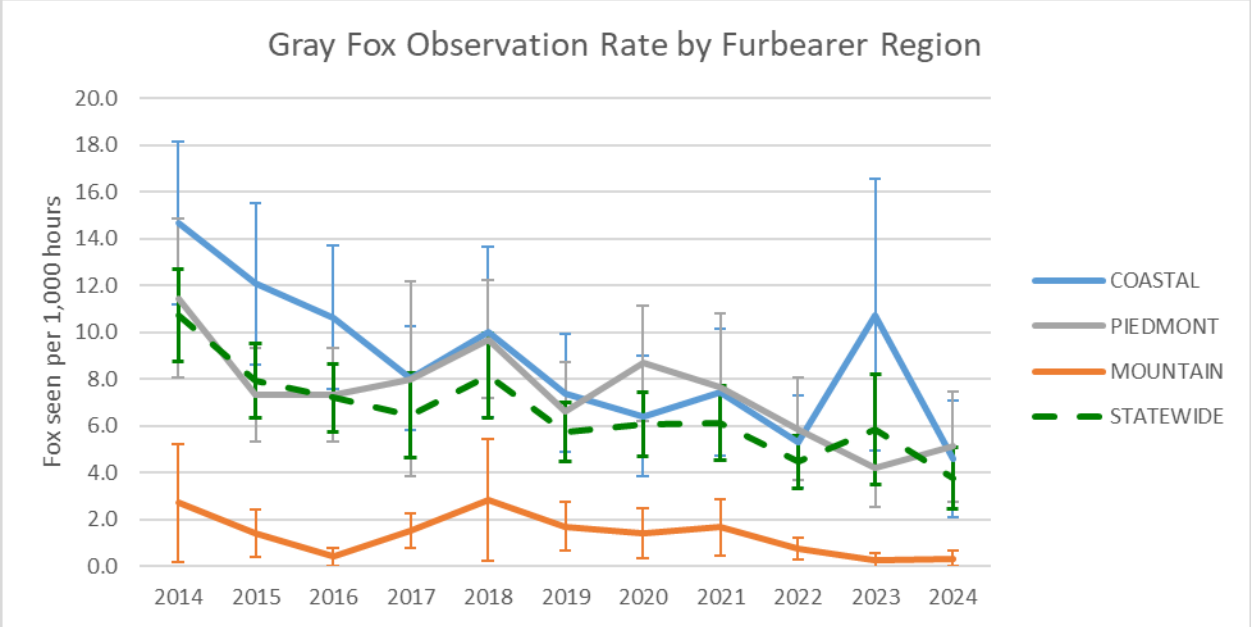

Figure 21. Annual gray fox observation rates by furbearer management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B11.

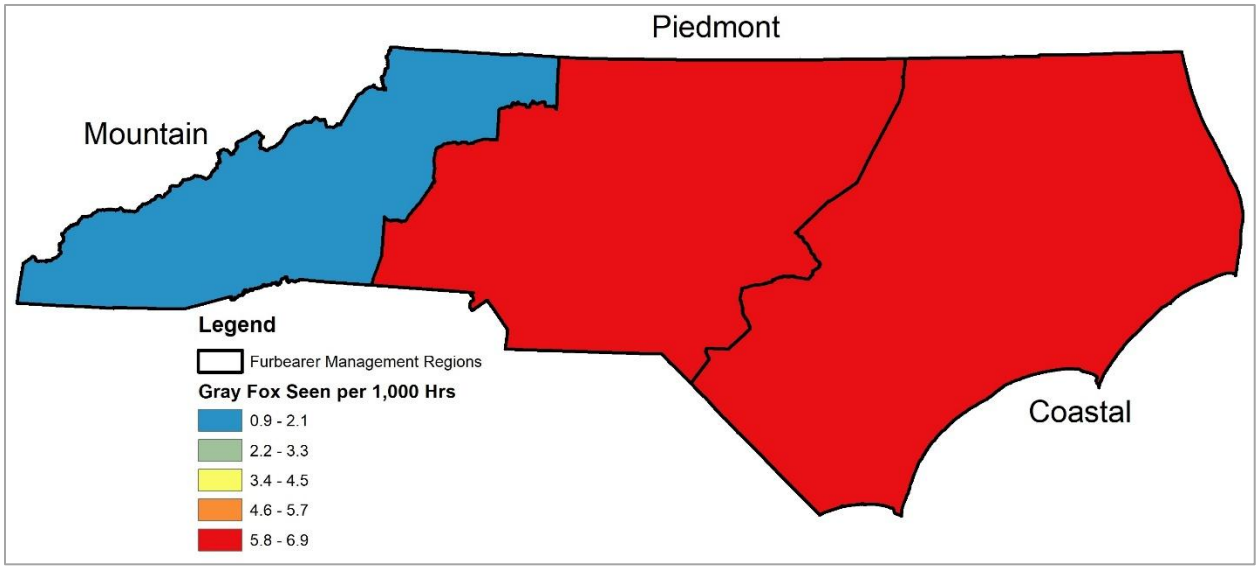

Figure 22. Gray fox observation rates by furbearer management unit based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

Red Fox

Observations for red foxes have generally followed their statewide range and were seen in 88 of the 100 counties. Red foxes were a relatively rare observation for deer hunters (2.2 red fox per 1,000 hours, Table 3). There was no significant evidence that baited sites had any influence on red fox observation rates (P=0.15), as compared to coyotes (Table 4). Location type analyses show significant evidence that observation rates were significantly higher on private lands than on game lands (P<0.01, Table 5). These comparisons were relatively imprecise due to the low availability of observations, but significant differences were likely the result of higher harvest rates and/or habitat differences between public game lands and private lands.

During the past 11 years, there was significant evidence that statewide observation rates have declined (-0.2 red fox seen per 1,000 hours (-12.6%) annually, P<0.01). Regional annual estimates were relatively imprecise generally due to the scarcity of observations. However, this decline was seen in all three FMUs (P<0.05).

Within the past 5 years, annual county estimates did not maintain consistent precision (average PSE 63.2%) primarily due to low observation rates and were only adequate to map distributions at the regional scale (Figure 24). Observation rates were significantly lower in the mountain FMU (-1.3 red fox per 1,000 hours annually P<0.01) than the coastal and piedmont FMUs. There was not a significant difference in observation rates between the coastal and piedmont FMUs (P=0.60).

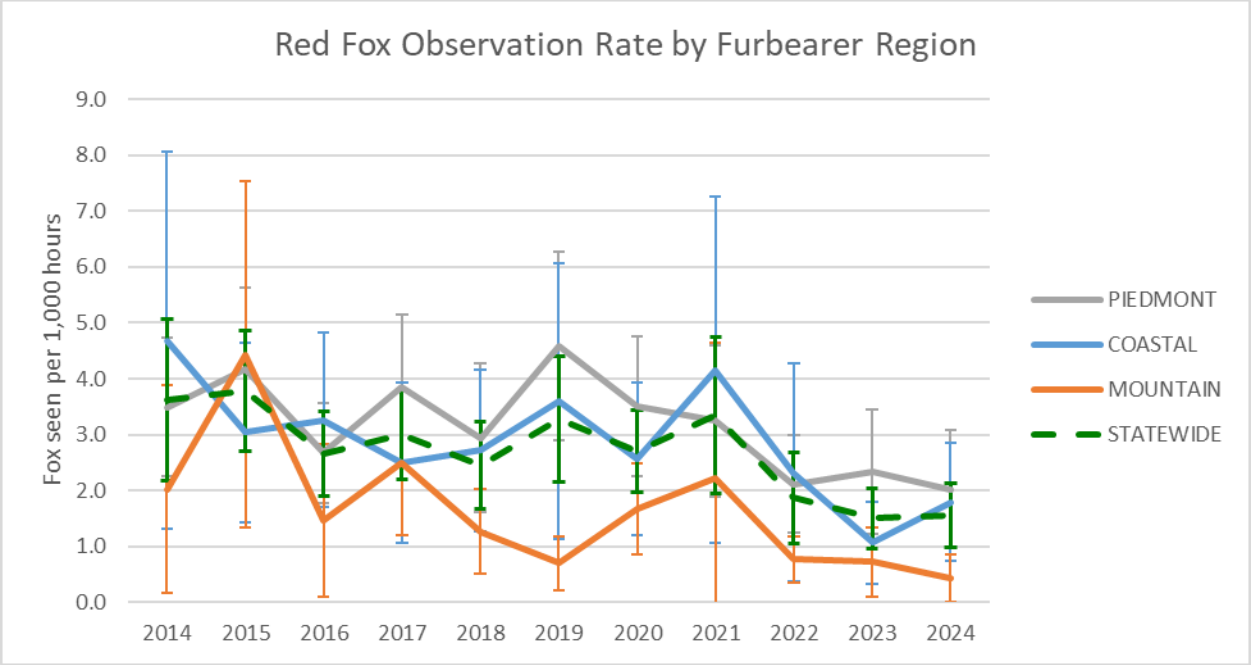

Figure 23. Annual red fox observation rates by furbearer management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B12.

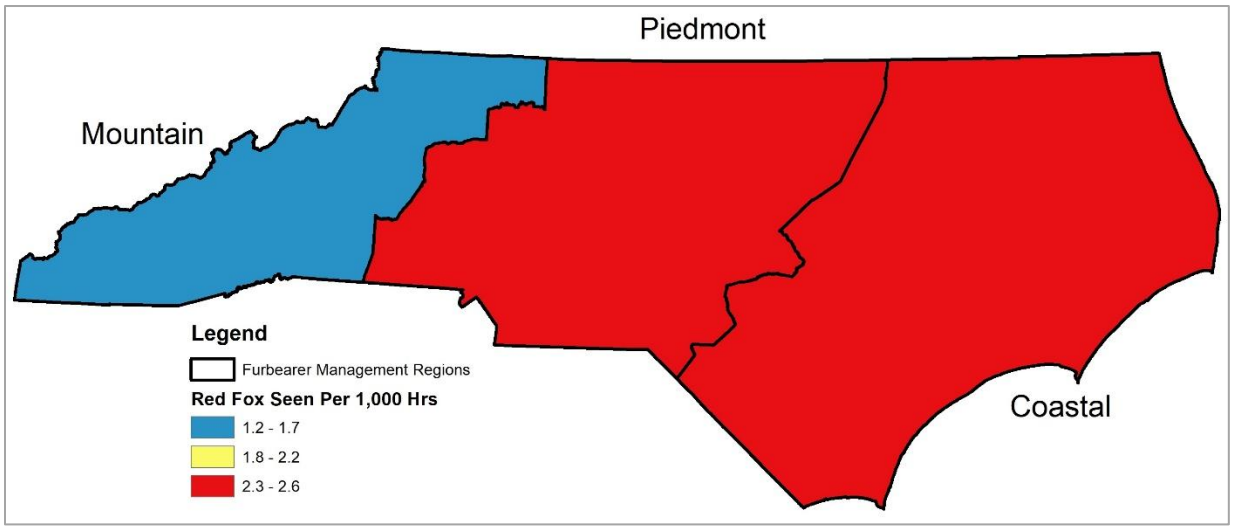

Figure 24. Red fox observation rates by furbearer management unit based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

Bobcat

Observations of bobcat have generally followed their statewide range and were seen in 94 of the 100 counties. Bobcat observations were relatively rare (3.5 bobcat per 1,000 hours, Table 3). There was no significant evidence that baited sites had any influence on bobcat observation rates (P=0.07), as compared to coyotes (Table 4). Location type analyses showed significant evidence that median observation rates were significantly different on private lands than on game lands ((P=0.05, Table 5). However, these comparisons were relatively imprecise due to the low availability of observations, but significant differences were likely the result of higher harvest rates and/or habitat differences between public game lands and private lands.

During the past 11 years, there has been no evidence that statewide observation rates have changed over time (P=0.85, Figure 25). Regional annual estimates were relatively imprecise generally due to the scarcity of observations. However, there was no significant evidence that bobcat observation rates have changed over time in any of the 3 FMUs (P>0.05).

Within the past 5 years, annual county estimates did not maintain consistent precision (average PSE 55.1%) primarily due to low observation rates and were only adequate enough to map distributions at the regional scale (Figure 26). Observation rates were significantly different between each of the furbearer management FMUs (P<0.05). Observation rates were significantly higher in the coastal FMU (5.7 bobcat per 1,000 hours), followed by the mountain FMU (2.6 bobcat per 1,000 hours), and lowest in the piedmont FMU (2.0 bobcat per 1,000 hours).

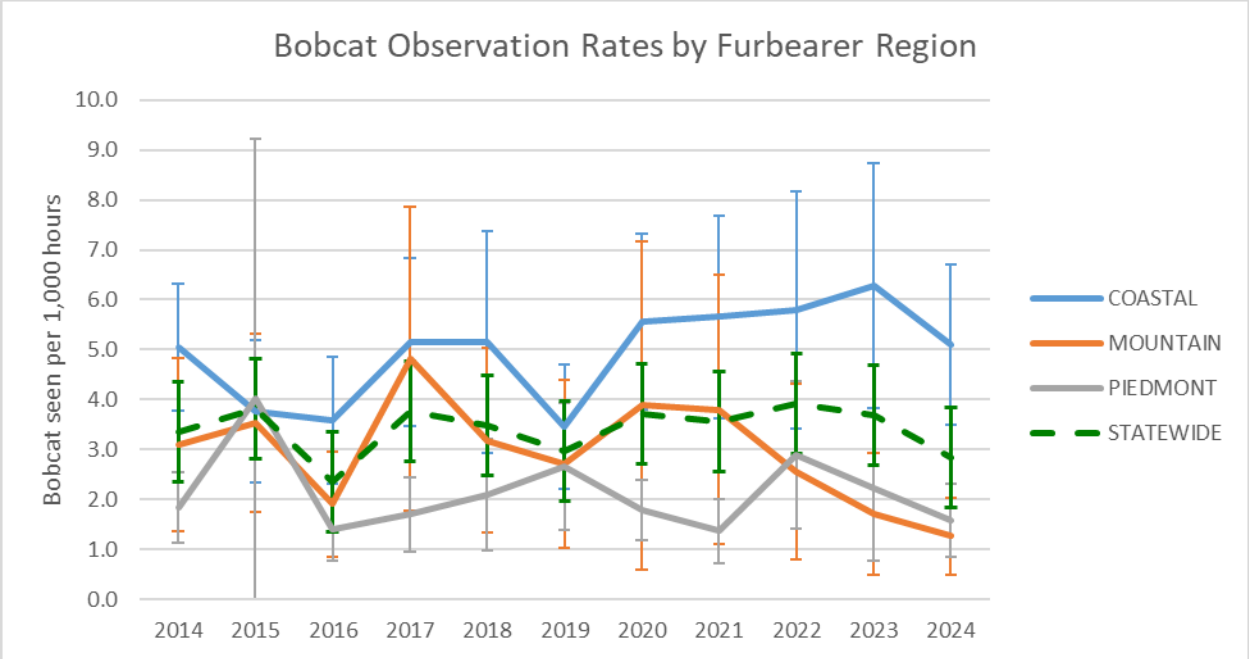

Figure 25. Annual bobcat observation rates by furbearer management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B13.

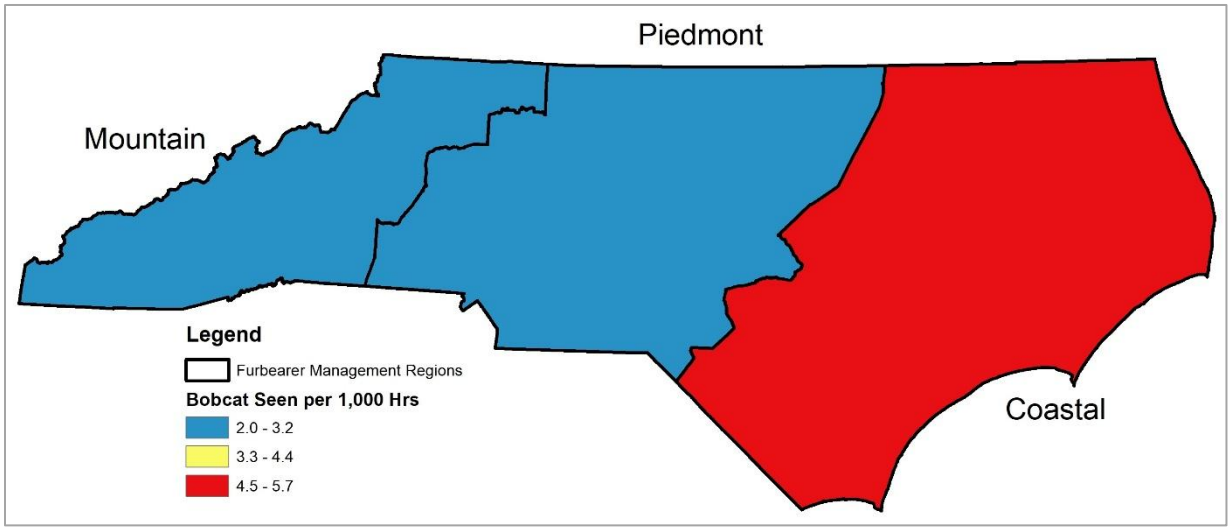

Figure 26. Bobcat observation rates by furbearer management unit based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

Bear

Adult bears were observed in 68 of the 100 counties. Bear observations were relatively rare (11.6 adult bears per 1,000 hours and 6.0 cub bears per 1,000 hours, Table 3). There was no significant evidence that the use of bait had any influence on adult bear observation rates (P=0.18), however cub bear observations significantly increased with the presence of bait (P=0.03, Table 4). There was no significant evidence that location type had any influence on either adult (P=0.56) or cub bear (P=0.49) observation rates by deer hunters (Table 5).

There was no statistical evidence that statewide or regional observation rates for adult bears have changed over time within the past 11 years (P=0.99, Figure 27). There was also no significant evidence that statewide cub bear observation rates have changed (P=0.94).

Within the past 5 years, annual county estimates did not maintain consistent precision (average PSE 50.7%) and were only adequate enough to map distributions at the regional scale. The bulk of the bear observations occurred in the coastal unit (27.4 adult bears per 1,000 hours) compared to the mountain unit (5.6 adult bears per 1,000 hours), or the piedmont unit (0.3 adult bears per 1,000 hours, Figure 28). Despite large populations of bears in the mountain unit, more open habitat (e.g., agricultural fields), coupled with the more widespread use of bait likely contributes to higher bear observation rates in the coast.

Observations of adult bears generally followed their known presence within counties across the state, including the piedmont unit, which are a combination of transient or new colonized young males and an expanding bear population, especially along the Virginia and North Carolina state line (Figure 29). Cubs of the year were observed in 58 of the 100 counties (Figure 30). The presence of cub bears is used to determine the establishment of a locally reproducing and established bear population. Hunter observations of cubs generally followed the known presence of bears across the state, including the upper piedmont.

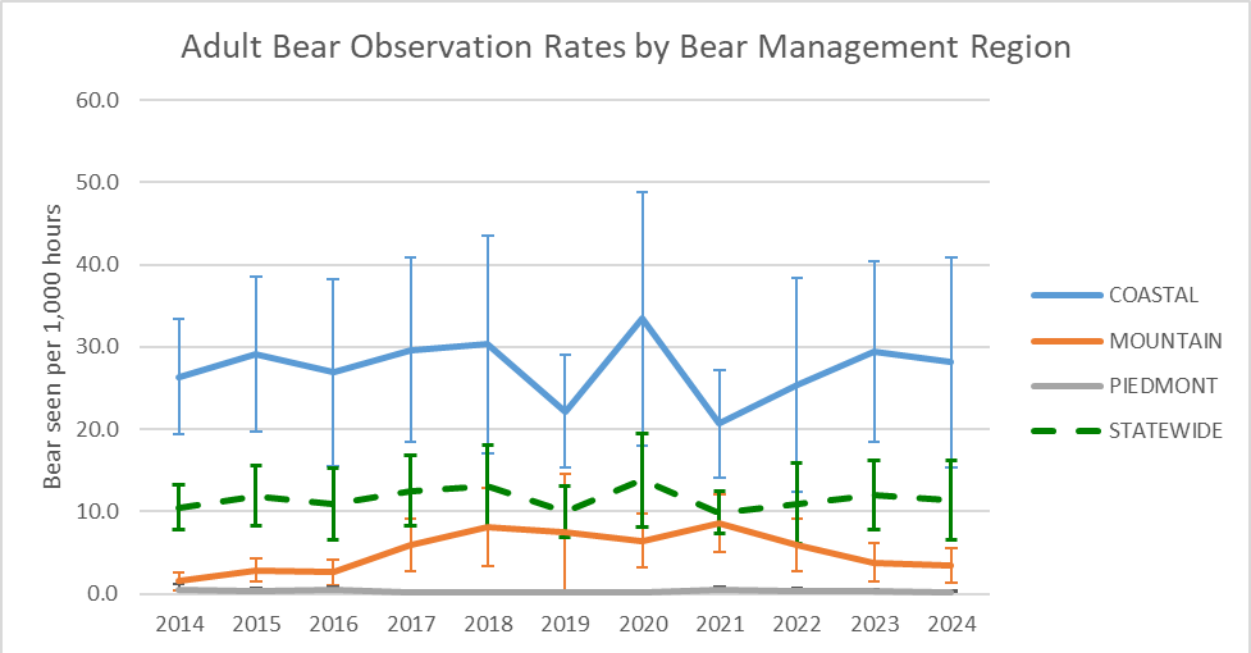

Figure 27. Adult bear observation rates by bear management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B14.

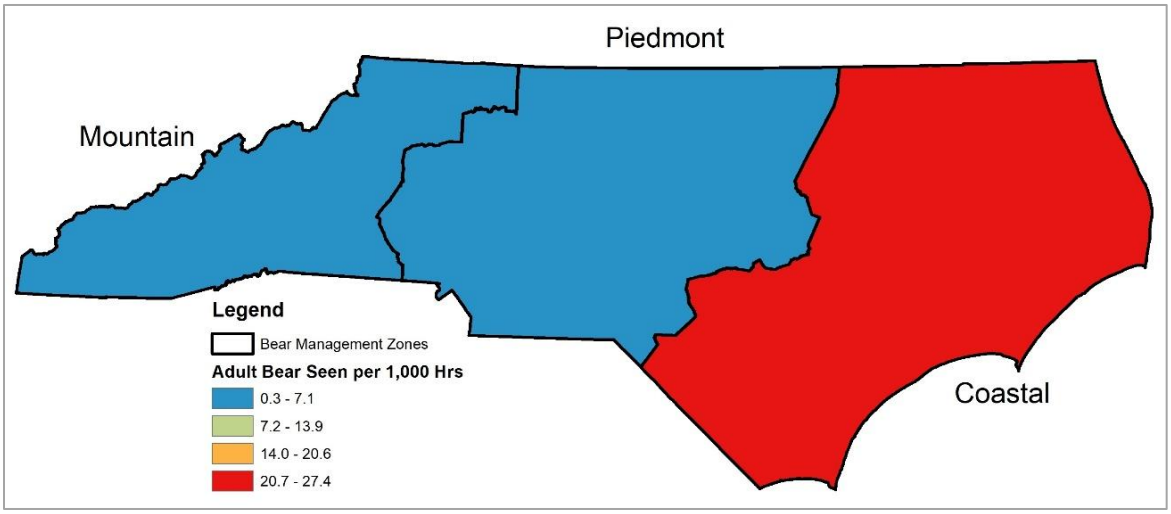

Figure 28. Adult bear observation rates by bear management unit based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

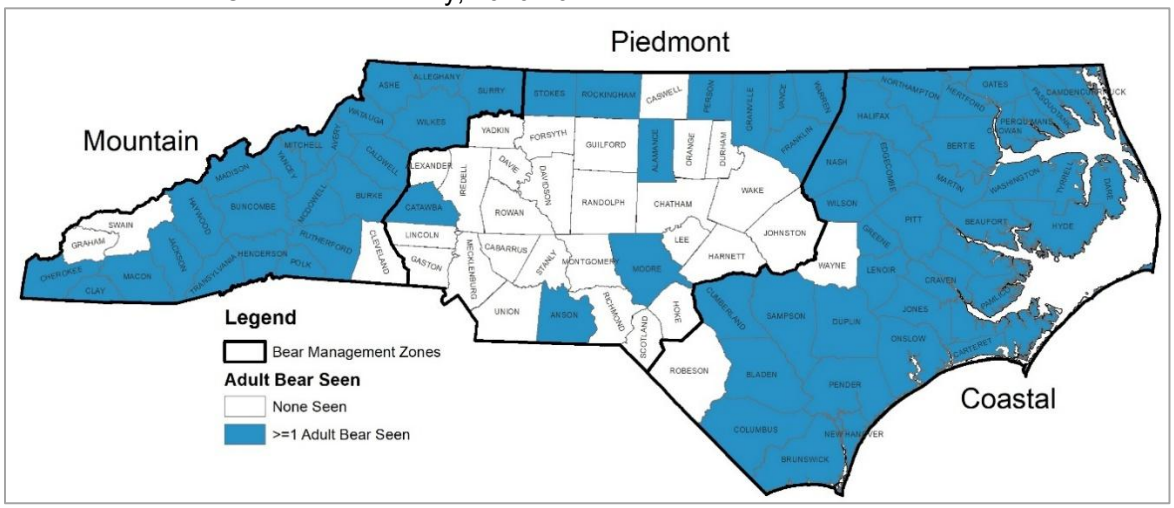

Figure 29. Adult bear presence (≥1 animal observed) by county based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

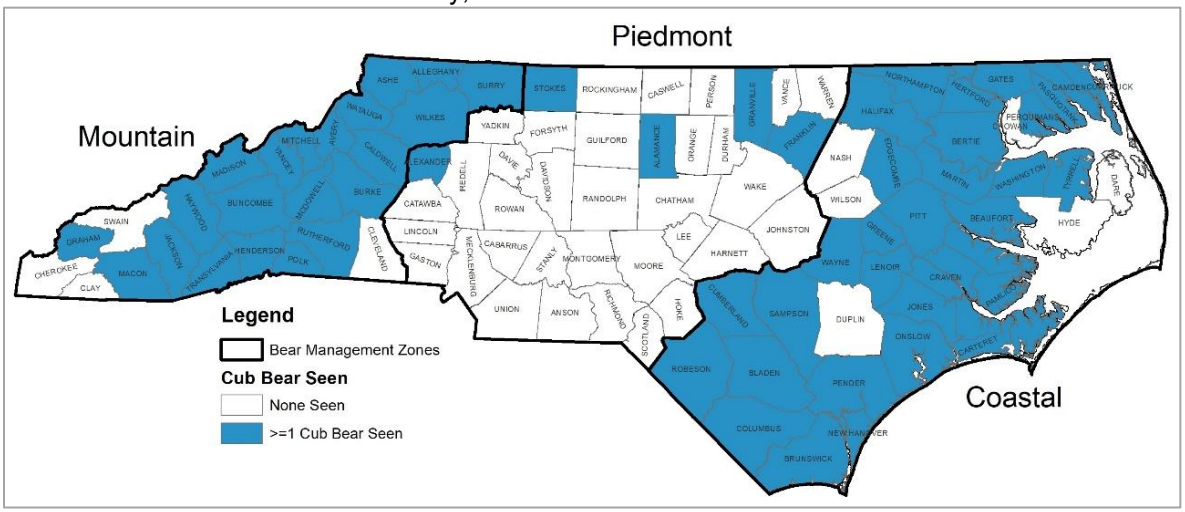

Figure 30. Cub bear presence (≥1 animal observed) by county based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

Feral Swine

Swine were observed in 30 of the 100 counties and statewide observation rates were relatively low (2.3 feral swine per 1,000 hours). Confident observation rate estimates could not be confidently derived due the relatively low observation count and high variability due to swine's herding behavior. There was no significant evidence that the use of bait or location type had any influence on swine observation rates (P>0.05, Table 4 & 5).

For the purposes of this section, analyses were limited to the occurrence of the species (≥1 feral swine seen per hunting trip, Figure 31). Within the past 11 years, there has been no evidence that statewide occurrence rates have changed over time (P=0.32). Occurrences of feral swine generally followed their known presence within most counties across the state during the past 5 years (Figure 32).

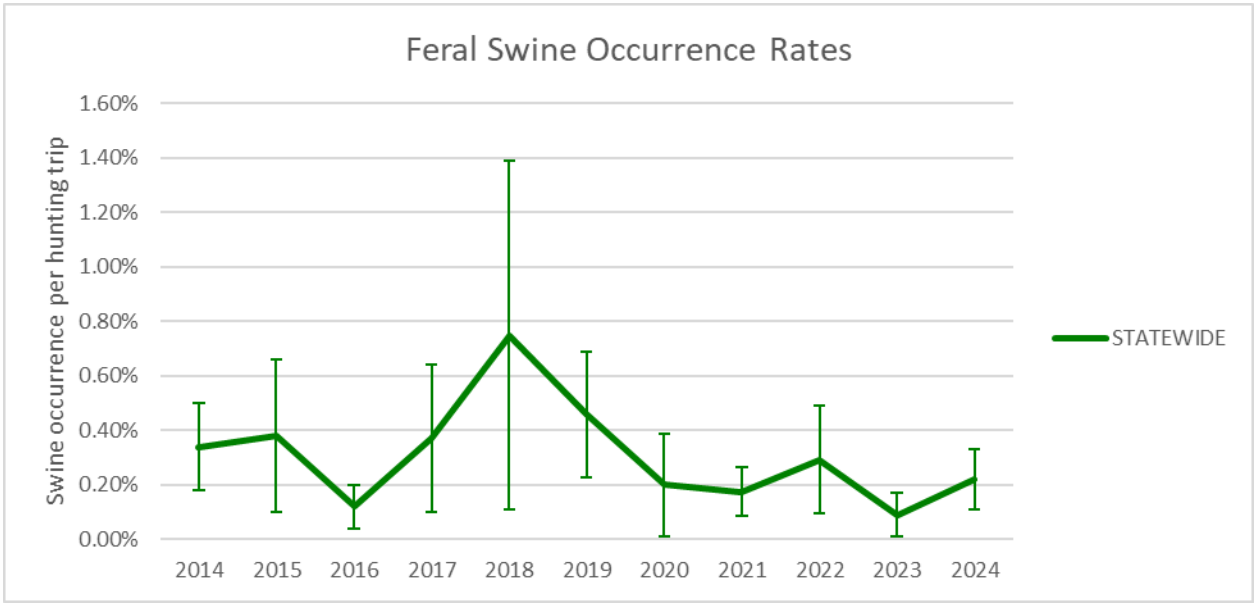

Figure 31. Feral swine occurrence rates (≥ 1 animal seen per hunting trip) with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024. For the raw data used for this chart, see Appendix B15.

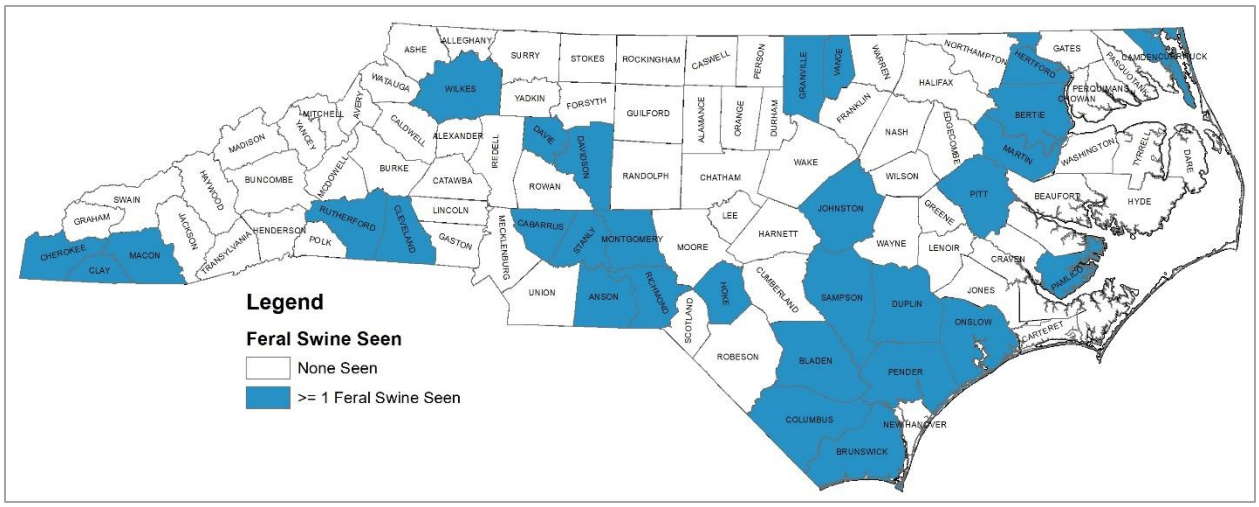

Figure 32. Feral swine presence (≥1 animal observed) by county based on 5-year averages, North Carolina Deer Hunter Observation Survey, 2020-2024.

Appendix A: Deer Hunter Observation Survey Form

Thank you for taking an active part in the conservation of North Carolina's wildlife resources!

Do you know of other deer hunters who would like to participate in the Deer Hunter Observation Survey?
If so, please enter their information in the block below.

(name)
(address)
(city/state/zip)
(WRC Customer #)

«CustomerID»
«First_Name» «Middle_Name» «Last_Name» «Suffix»
«Address_1_»
«Address_2_»
«City» «State_» «Zip» «Zip_4»

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INSTRUCTIONS

The NC Wildlife Resources Commission is seeking volunteers to report wildlife observations this deer season to help biologists improve management decisions. These observations help track long-term wildlife population and distribution changes. Deer observations also provide information on fawn survival and buck to doe ratios.

Observations should only be recorded while *still/stand hunting* for deer. Please attempt to provide an accurate count for the animals listed in the table on the front of this form. Record observations from each hunt (morning, evening, or daily) on a single row on the table. Separate morning and evening hunts on different rows for the same day, when applicable. Record all the animals you observe on each hunt, even if you suspect you have seen some of them on previous hunts. Record hours spent hunting even if no animals were observed. Do not record observations of others with whom you hunted.

Please return this form immediately after the deer season (no later than January 15). To return, *fold* this form along the lines above so that the Business Reply Mail address shows and *tape* on the areas indicated. If you have any questions about this survey, please call Ryan Myers at (919)218-3376, or email at ryan.myers@ncwildlife.org.

Tape here *Tape here*

Deer Hunter Observation Survey

North Carolina Wildlife Resources Commission

Please see instructions on the back of this form. Return this form immediately after your last hunt of the deer season.

					Deer				Squirrels		Turkey									Bear			
Date	Hours Hunted	County	Location*	Hunt with Bait	Antlered Buck	Adult Doe	Button Buck/ Doe Fawn	Unknown	Gray Squirrel	Fox Squirrel	Bearded	No Beard	Unknown	Coyote	Bobcat	Gray Fox	Red Fox	Raccoon	Adult	Cub	Feral Swine	Other Animals & Number Seen**
10/8/17	2.5	Example	GL / (PVT)	Yes / (No)		1	2		10						1							Armadillo : 1
			GL / PVT	Yes / No																		
			GL / PVT	Yes / No																		
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			GL / PVT	Yes / No																		

*Location types: GL=Game Lands, PVT = Private Land or other property not in the NC Game Lands Program

**Other animals of survey interest include: *armadillo, domestic cat, elk, mink, red squirrel, spotted skunk, and weasel*

Appendix B: Raw data tables

Table B1. Statewide deer observation rates and ratios by month, North Carolina Deer Hunter Observation Survey, 2020-2024.

Month	Deer/Hour	95% CI	Does/Buck	95% CI	Fawn/Doe	95% CI
September	0.97	±0.06	2.37	±0.14	0.58	±0.05
October	0.98	±0.08	2.46	±0.08	0.56	±0.01
November	1.02	±0.07	1.91	±0.10	0.49	±0.01
Dec./Jan.	0.93	±0.06	2.89	±0.21	0.52	±0.02

Table B2. Annual deer observation rates (# of deer seen per 1,000 hours) by deer season zone, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	Western	95% CI	Northwestern	95% CI	Central	95% CI	Northeastern	95% CI	Southeastern	95% CI	STATEWIDE	95% CI
2014	403.5	±84.5	702.1	±91.3	693.7	±55.5	826.6	±80.1	754.0	±65.9	695.9	±34.1
2015	534.0	±150.5	737.2	±58.5	781.6	±79.7	986.3	±101.3	790.2	±90.0	786.7	±44.5
2016	481.7	±122.5	623.3	±61.4	624.0	±71.1	866.4	±87.8	684.1	±87.2	675.7	±39.4
2017	456.2	±83.7	724.8	±65.1	781.7	±63.9	995.1	±100.4	753.9	±82.8	756.7	±37.4
2018	526.6	±106.9	831.8	±85.8	888.4	±71.3	1,002.1	±109.1	939.8	±148.9	854.3	±51.9
2019	540.4	±79.2	858.3	±72.9	967.4	±89.5	1,021.4	±107.9	951.0	±100.9	883.4	±43.0
2020	540.9	±86.7	856.0	±82.6	805.4	±63.7	1,054.5	±124.2	844.0	±96.0	833.3	±44.0
2021	606.7	±93.3	974.2	±119.1	966.9	±128.1	1,148.5	±125.7	1,047.3	±141.3	966.2	±57.2
2022	708.8	±156.0	1,005.3	±100.5	907.3	±86.5	1,224.5	±196.9	1,017.4	±159.5	990.1	±70.2
2023	731.1	±193.8	1,101.2	±136.8	1,049.6	±107.1	1,252.9	±221.4	1,062.7	±175.2	1,062.2	±80.3
2024	863.1	±263.9	1,154.8	±137.9	935.0	±93.7	1,425.8	±227.4	1,053.8	±174.6	1,101.1	±86.4

Table B3. Annual fawn per doe observation rates by deer season zone with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	Western	95% CI	Northwestern	95% CI	Central	95% CI	Northeastern	95% CI	Southeastern	95% CI	STATEWIDE	95% CI
2014	0.52	±0.07	0.57	±0.05	0.58	±0.04	0.53	±0.03	0.48	±0.03	0.53	±0.02
2015	0.58	±0.06	0.60	±0.03	0.59	±0.04	0.46	±0.04	0.49	±0.04	0.53	±0.02
2016	0.50	±0.07	0.56	±0.04	0.58	±0.04	0.55	±0.05	0.44	±0.05	0.52	±0.02
2017	0.35	±0.05	0.59	±0.04	0.56	±0.03	0.51	±0.03	0.44	±0.04	0.49	±0.02
2018	0.44	±0.06	0.57	±0.04	0.60	±0.03	0.47	±0.04	0.43	±0.04	0.49	±0.02
2019	0.41	±0.05	0.57	±0.04	0.56	±0.03	0.47	±0.04	0.51	±0.04	0.50	±0.02
2020	0.47	±0.06	0.56	±0.04	0.62	±0.03	0.48	±0.04	0.43	±0.04	0.50	±0.02
2021	0.55	±0.06	0.54	±0.04	0.58	±0.04	0.46	±0.04	0.56	±0.04	0.53	±0.02
2022	0.53	±0.06	0.51	±0.04	0.61	±0.04	0.49	±0.04	0.50	±0.05	0.52	±0.02
2023	0.45	±0.08	0.51	±0.05	0.59	±0.04	0.50	±0.05	0.44	±0.05	0.49	±0.02
2024	0.51	±0.08	0.57	±0.05	0.57	±0.04	0.53	±0.05	0.52	±0.05	0.54	±0.02

Table B4. Annual adult doe per antlered buck observation rates by deer season zone with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	Western	95% CI	Northwestern	95% CI	Central	95% CI	Northeastern	95% CI	Southeastern	95% CI	STATEWIDE	95% CI
2014	2.41	±0.25	2.00	±0.10	2.11	±0.09	2.45	±0.08	2.84	±0.11	2.41	±0.05
2015	2.65	±0.21	2.54	±0.10	2.14	±0.09	2.53	±0.10	2.68	±0.11	2.49	±0.05
2016	2.11	±0.20	2.07	±0.10	1.96	±0.10	2.22	±0.09	2.47	±0.12	2.18	±0.05
2017	2.76	±0.20	2.28	±0.10	2.05	±0.07	2.52	±0.08	2.46	±0.09	2.36	±0.04
2018	2.54	±0.18	2.24	±0.09	2.21	±0.08	2.14	±0.07	2.25	±0.09	2.22	±0.04
2019	2.61	±0.18	2.04	±0.08	1.96	±0.07	2.47	±0.09	2.61	±0.10	2.27	±0.04
2020	2.29	±0.15	2.01	±0.08	2.17	±0.08	2.43	±0.09	2.53	±0.10	2.28	±0.04
2021	2.40	±0.17	2.07	±0.08	1.95	±0.07	2.38	±0.09	2.44	±0.10	2.20	±0.04
2022	2.24	±0.15	2.07	±0.07	2.01	±0.08	2.46	±0.10	2.62	±0.11	2.26	±0.04

2023	2.14	±0.17	2.04	±0.08	2.03	±0.08	2.25	±0.09	2.35	±0.10	2.16	±0.04
2024	2.02	±0.19	2.01	±0.08	1.75	±0.07	2.30	±0.09	2.52	±0.11	2.11	±0.04

Table B5. Annual statewide gray squirrel observation rates (# of gray squirrels seen per 1,000 hours) with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	STATEWIDE	95% CI
2014	665.2	±36.9
2015	742.0	±40.7
2016	755.2	±44.1
2017	868.4	±45.3
2018	777.6	±41.1
2019	734.8	±38.4
2020	780.1	±43.5
2021	746.0	±44.8
2022	697.7	±42.8
2023	844.9	±56.9
2024	874.3	±62.8

Table B6. Annual statewide fox squirrel observation rates (# of fox squirrels seen per 1,000 hours) with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	STATEWIDE	95% CI
2014	20.4	±4.5
2015	18.5	±4.8
2016	18.5	±4.4
2017	15.8	±3.2
2018	15.8	±3.1
2019	16.4	±3.5
2020	19.9	±3.8
2021	16.5	±3.5
2022	20.2	±4.2
2023	26.5	±7.1
2024	25.8	±6.5

Table B7. Annual turkey observation rates by turkey management region intervals (# of turkeys seen per 1,000 hours) with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	MOUNTAIN	95% CI	PIEDMONT	95% CI	COASTAL	95% CI	STATEWIDE	95% CI
2014	326.2	±127.7	243.6	±39.4	384.2	±61.1	315.9	±39.6
2015	413.6	±111.4	211.8	±27.6	504.3	±129.0	368.1	±57.1
2016	341.2	±101.8	210.9	±31.7	427.0	±76.7	319.8	±38.5
2017	309.8	±81.1	210.4	±33.4	414.6	±77.9	310.9	±37.6
2018	344.8	±79.1	246.1	±32.3	474.6	±88.6	354.4	±40.4
2019	278.2	±52.9	231.4	±33.6	603.9	±101.2	381.4	±42.6
2020	249.0	±79.7	214.0	±31.8	521.0	±92.5	337.0	±41.8
2021	208.3	±51.7	256.7	±36.9	544.1	±132.0	352.9	±53.3
2022	312.2	±84.0	250.3	±51.9	476.0	±100.7	349.3	±47.8
2023	177.8	±44.9	183.3	±30.3	608.3	±157.4	345.8	±63.6
2024	250.7	±83.7	232.4	±45.9	583.6	±145.9	370.5	±62.4

Table B8. Bearded per non-bearded turkey observation rates by turkey management region and year with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	MOUNTAIN	95% CI	PIEDMONT	95% CI	COASTAL	95% CI	STATEWIDE	95% CI
2014	0.42	±0.04	0.38	±0.02	0.37	±0.01	0.38	±0.01
2015	0.24	±0.02	0.32	±0.01	0.36	±0.02	0.31	±0.01

2016	0.29	±0.03	0.46	±0.02	0.43	±0.02	0.41	±0.01
2017	0.35	±0.02	0.40	±0.02	0.35	±0.01	0.37	±0.01
2018	0.27	±0.02	0.35	±0.02	0.40	±0.02	0.35	±0.01
2019	0.26	±0.02	0.28	±0.01	0.33	±0.01	0.30	±0.01
2020	0.28	±0.02	0.47	±0.02	0.53	±0.02	0.47	±0.01
2021	0.27	±0.02	0.30	±0.01	0.37	±0.02	0.32	±0.01
2022	0.33	±0.03	0.33	±0.02	0.46	±0.02	0.38	±0.01
2023	0.54	±0.05	0.40	±0.02	0.44	±0.02	0.44	±0.02
2024	0.34	±0.03	0.33	±0.02	0.32	±0.02	0.33	±0.01

Table B9. Annual raccoon observation rates (# of raccoons seen per 1,000 hours) by furbearer management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	MOUNTAIN	95% CI	PIEDMONT	95% CI	COASTAL	95% CI	STATEWIDE	95% CI
2014	13.8	±6.0	21.3	±4.9	41.5	±9.3	26.0	±4.1
2015	9.6	±3.7	15.3	±3.4	44.9	±15.4	26.5	±7.0
2016	10.2	±4.7	19.2	±5.3	39.9	±18.1	29.1	±10.0
2017	9.4	±4.0	21.9	±5.8	31.9	±6.2	28.9	±13.5
2018	20.1	±8.9	21.4	±4.7	51.0	±13.3	30.9	±5.8
2019	12.1	±4.0	20.2	±4.9	35.5	±8.1	26.2	±4.8
2020	10.1	±3.7	14.2	±3.7	44.8	±13.7	24.6	±5.4
2021	11.3	±5.3	15.1	±4.0	28.3	±8.8	19.1	±3.9
2022	6.3	±2.5	12.1	±4.3	25.9	±7.7	15.9	±3.4
2023	11.2	±7.1	13.4	±4.3	31.0	±11.7	19.7	±5.1
2024	9.2	±7.1	16.5	±5.0	32.7	±11.2	20.9	±5.0

Table B10. Annual coyote observation rates (# of coyotes seen per 1,000 hours) by furbearer management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	MOUNTAIN	95% CI	PIEDMONT	95% CI	COASTAL	95% CI	STATEWIDE	95% CI
2014	12.0	±5.0	14.6	±3.0	18.0	±3.7	15.3	±2.2
2015	10.2	±2.9	12.2	±2.2	15.9	±7.8	13.2	±3.2
2016	7.7	±2.7	14.6	±3.2	11.9	±3.7	12.1	±2.0
2017	18.4	±11.8	15.7	±3.0	13.0	±3.1	15.3	±3.3
2018	13.8	±10.3	13.1	±2.7	13.1	±4.0	13.2	±3.1
2019	12.9	±9.9	13.1	±3.3	11.9	±3.4	12.6	±3.0
2020	10.9	±5.3	13.9	±3.5	9.5	±2.6	11.5	±2.1
2021	7.0	±3.5	12.2	±2.5	9.9	±3.0	10.1	±1.7
2022	11.3	±8.4	10.9	±2.6	8.3	±2.4	10.0	±2.4
2023	5.5	±2.3	9.3	±2.1	8.4	±3.1	8.1	±1.5
2024	4.0	±2.1	9.4	±2.8	13.2	±7.0	9.6	±2.9

Table B11. Annual gray fox observation rates (# of gray fox seen per 1,000 hours) by furbearer management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	MOUNTAIN	95% CI	PIEDMONT	95% CI	COASTAL	95% CI	STATEWIDE	95% CI
2014	2.7	±2.5	11.5	±3.4	14.7	±3.5	10.8	±2.0
2015	1.4	±1.0	7.3	±2.0	12.1	±3.5	7.9	±1.6
2016	0.4	±0.4	7.4	±2.0	10.6	±3.1	7.2	±1.5
2017	1.5	±0.7	8.0	±4.2	8.0	±2.2	6.5	±1.8
2018	2.8	±2.6	9.7	±2.5	10.0	±3.7	8.2	±1.8
2019	1.7	±1.0	6.6	±2.1	7.4	±2.5	5.7	±1.3
2020	1.4	±1.1	8.7	±2.5	6.4	±2.6	6.1	±1.4
2021	1.7	±1.2	7.7	±3.1	7.4	±2.7	6.1	±1.6

2022	0.8	±0.5	5.9	±2.2	5.3	±2.0	4.5	±1.1
2023	0.3	±0.3	4.2	±1.6	10.8	±5.8	5.9	±2.3
2024	0.4	±0.3	5.1	±2.4	4.6	±2.5	3.8	±1.3

Table B12. Annual red fox observation rates (# of red fox seen per 1,000 hours) by furbearer management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	MOUNTAIN	95% CI	PIEDMONT	95% CI	COASTAL	95% CI	STATEWIDE	95% CI
2014	2.0	±1.9	3.5	±1.2	4.7	±3.4	3.6	±1.5
2015	4.4	±3.1	4.2	±1.5	3.0	±1.6	3.8	±1.1
2016	1.5	±1.4	2.7	±0.9	3.3	±1.6	2.7	±0.8
2017	2.5	±1.3	3.8	±1.3	2.5	±1.4	3.0	±0.8
2018	1.3	±0.8	2.9	±1.3	2.7	±1.5	2.5	±0.8
2019	0.7	±0.5	4.6	±1.7	3.6	±2.5	3.3	±1.1
2020	1.7	±0.8	3.5	±1.3	2.6	±1.4	2.7	±0.7
2021	2.2	±2.4	3.3	±1.4	4.2	±3.1	3.3	±1.4
2022	0.8	±0.4	2.1	±0.9	2.3	±2.0	1.9	±0.8
2023	0.7	±0.6	2.3	±1.1	1.1	±0.7	1.5	±0.5
2024	0.4	±0.4	2.0	±1.1	1.8	±1.1	1.6	±0.6

Table B13. Annual bobcat observation rates (# of bobcat seen per 1,000 hours) by furbearer management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	MOUNTAIN	95% CI	PIEDMONT	95% CI	COASTAL	95% CI	STATEWIDE	95% CI
2014	3.1	±1.7	1.8	±0.7	5.0	±1.3	3.4	±0.7
2015	3.5	±1.8	4.0	±5.2	3.8	±1.4	3.8	±2.2
2016	1.9	±1.1	1.4	±0.6	3.6	±1.3	2.4	±0.6
2017	4.8	±3.0	1.7	±0.8	5.2	±1.7	3.8	±1.0
2018	3.2	±1.9	2.1	±1.1	5.1	±2.2	3.5	±1.0
2019	2.7	±1.7	2.7	±1.3	3.5	±1.2	3.0	±0.8
2020	3.9	±3.3	1.8	±0.6	5.6	±1.8	3.7	±1.1
2021	3.8	±2.7	1.4	±0.6	5.7	±2.0	3.6	±1.0
2022	2.6	±1.8	2.9	±1.5	5.8	±2.4	3.9	±1.1
2023	1.7	±1.2	2.2	±1.5	6.3	±2.5	3.7	±1.1
2024	1.3	±0.8	1.6	±0.7	5.1	±1.6	2.8	±0.7

Table B14. Adult bear observation rates (# of bear seen per 1,000 hours) by bear management unit with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	MOUNTAIN	95% CI	PIEDMONT	95% CI	COASTAL	95% CI	STATEWIDE	95% CI
2014	1.5	±1.1	0.6	±0.7	26.3	±7.0	10.5	±2.7
2015	2.9	±1.4	0.3	±0.4	29.1	±9.5	11.9	±3.7
2016	2.6	±1.6	0.4	±0.5	26.9	±11.4	10.8	±4.4
2017	5.9	±3.1	0.2	±0.2	29.6	±11.2	12.5	±4.3
2018	8.1	±4.8	0.2	±0.1	30.3	±13.2	13.1	±5.0
2019	7.5	±7.0	0.1	±0.1	22.2	±6.8	10.0	±3.1
2020	6.4	±3.3	0.1	+0.1	33.4	±15.4	13.8	±5.7
2021	8.6	±3.5	0.5	+0.4	20.7	±6.5	9.9	±2.6
2022	5.9	±3.2	0.4	±0.4	25.4	±13.0	10.9	±4.9
2023	3.8	±2.3	0.3	±0.3	29.4	±11.0	12.0	±4.2
2024	3.4	±2.1	0.2	±0.2	28.1	±12.7	11.4	±4.8

Table B15. Feral swine occurrence rates (≥ 1 swine seen per hunting trip) with 95% confidence intervals, North Carolina Deer Hunter Observation Survey, 2014-2024.

Year	STATEWIDE	95% CI
2014	0.33%	±0.16%

2015	0.37%	±0.28%
2016	0.12%	±0.08%
2017	0.36%	±0.26%
2018	0.70%	±0.57%
2019	0.41%	+0.20%
2020	0.20%	±0.19%
2021	0.18%	±0.09%
2022	0.29%	±0.20%
2023	0.09%	±0.08%
2024	0.22%	±0.11%