South Dakota
SURVEY REPORT

Deer Population Status Update

2023 Biennial Report

Prepared by:
Andrew J. Lindbloom, Senior Big Game Biologist
Lauren M. Wiechmann, Big Game Biologist
Steven L. Griffin, Big Game Biologist
Byron R. Buckley, Senior Big Game Biologist
Andrew S. Norton, Wildlife Program Administrator

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

WILDLIFE REPORT 2023-02

May 2023

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICIES

INTRODUCTION

South Dakota's diverse landscapes of grassland, cropland, and timbered areas are home to white-tailed deer (*Odocoileus virginianus*) across the entire state and mule deer (*Odocoileus hemionus*) primarily adjacent to and west of the Missouri River breaks. Deer hunting is a popular and much awaited outdoor activity for many sportsmen and women in South Dakota. Within South Dakota, approximately 62,900 residents and 8,700 non-residents hunted deer in 2022, with peak deer hunter participation occurring in 2010 when over 81,000 residents and non-residents pursued deer. Hunting remains the number one tool for managing deer populations across South Dakota and harvest strategies are intended to ensure the well-being of the species and its habitat while maintaining populations at levels compatible with human activity and land use.

White-tailed deer and mule deer management units are managed towards objectives to increase, maintain, or decrease populations. All management unit objectives are based on annual collection and evaluation of deer biological data, habitat resources, weather data, private land depredation issues, and substantial input from a wide variety of publics with an interest in deer management in South Dakota. South Dakota Department of Game, Fish, and Parks (GFP) will adopt harvest strategies that progressively allow white-tailed deer and mule deer to reach these population objectives.

The current over-riding goal for deer management is to "manage white-tailed deer and mule deer populations and habitats by fostering partnerships and stewardship and applying biological and social sciences" (SDGFP 2017). More specific information on deer population objectives, strategies, and research in South Dakota can be found in the South Dakota White-tailed Deer and Mule Deer Management Plan at https://gfp.sd.gov/UserDocs/nav/deer-mgmnt.pdf.

The following report provides a statewide overview of deer surveys and assessments conducted by GFP and an update on the population status of white-tailed deer and mule deer in South Dakota.

POPULATION SURVEYS AND ASSESSMENTS

Mule deer and white-tailed deer herds are monitored annually across their range in South Dakota. Survey efforts are completed to assess herd status and predict population trends in eight data analysis units (DAUs) for mule deer and 11 DAUs for white-tailed deer. We define a DAU as an aggregate of deer management units that is large enough to produce reliable estimates from population surveys while representing similar habitat, climatic, and demographic characteristics. The final product of an analysis performed by the University of Montana in collaboration with GFP resulted in the development of 11 DAUs (Figure 1; SDGFP 2017).

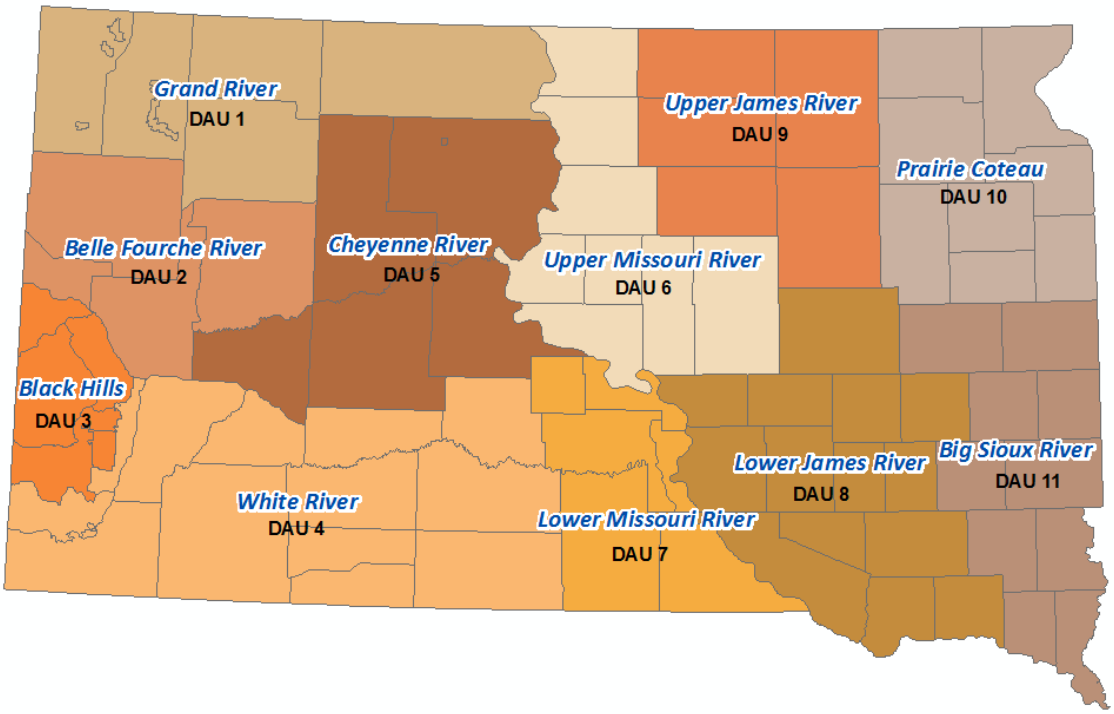


Figure 1. Data Analysis Units (DAUs) for deer management in South Dakota.

Current strategies to manage and evaluate deer populations include establishing population objectives, hunting season evaluations, disease monitoring, herd composition surveys, survival monitoring, calculating winter severity indices, abundance surveys, and population modeling. Survey data are presented at different forums at many geographic scales, but most data are collected and analyzed at the DAU level for purposes of evaluating herd abundance and trends and for determining proper license allocation. The following sections provide a general overview of the surveys and results, but more detailed datasets and descriptions of analyses can be found in Norton et al. (2021).

Population Objectives

Population objective directions (increase, maintain, or decrease) for each firearm deer hunting unit are set every 2 years when season recommendations are brought forward to the GFP commission (Figure 2). Deer population objectives for each unit are based on population assessments, habitat conditions, and social considerations.

Within the Black Hills data analysis unit, GFP has estimated white-tailed deer abundance for multiple years and therefore was able to define a pre-season abundance objective of 70,000 (65,000-75,000) white-tailed deer. In addition, because hunter satisfaction is strongly correlated with hunter success, GFP has established minimum success thresholds for licenses containing "any deer" or "any whitetail" firearm tags (Appendix A). Furthermore, in Limited Access Units, harvest must meet either hunter success or license density thresholds (Appendix A; firearm license densities no greater than 1.5 licenses/square mile for "any deer" licenses and no greater than 2.5 licenses/square mile for "any whitetail" licenses).

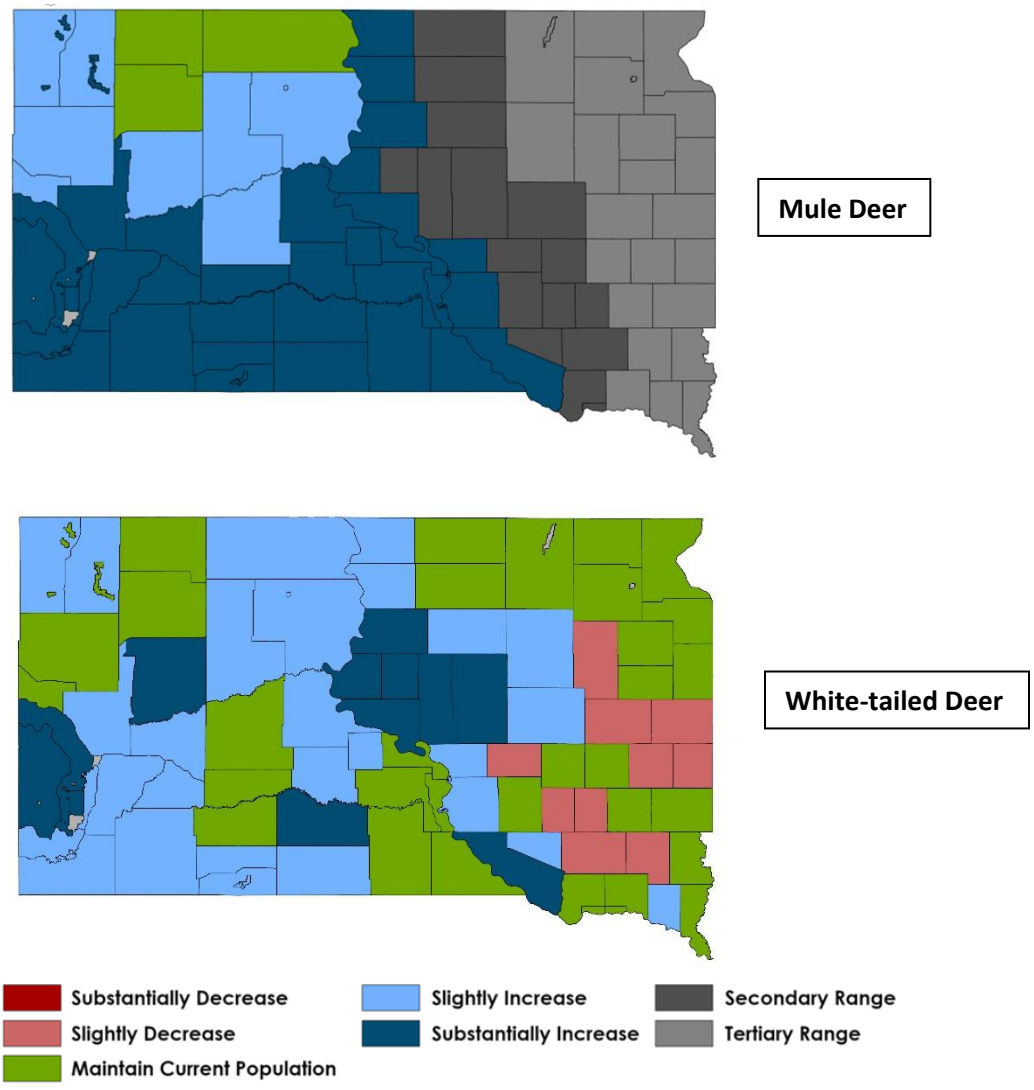


Figure 2. Population objectives for mule deer and white-tailed deer, 2023-24. Areas in gray are outside the primary range of the species and have limited suitable habitat.

Hunting Season Evaluations

There are currently a variety of deer hunting opportunities and a number of license types that a hunter can choose from when applying for a deer license. Each deer hunting season has an assortment of license types available which determines the available tag distribution. License types define the type and number of deer tags available for a respective license. For each license type, GFP estimates harvest by species, sex, and age cohorts allowing staff to be able to predict harvest composition based on previous years' success. This provides wildlife managers the ability to reduce or increase harvest pressure on specific species and sex classes of the deer population in order to reach unit population objectives.

Currently all deer hunters are surveyed via email or electronic submission methods. Annual deer hunter surveys are conducted to estimate harvest at each management unit for each species and age/sex cohorts. Statewide harvest for white-tailed deer has slowly increased from a recent low of about 41,200 in 2014 to 55,500 deer in 2022 (Figure 3
Figure 3). GFP has maintained a low statewide white-tailed deer doe harvest of about 20,000 for the past couple years to allow many herds in the state to increase to more desirable levels while maintaining harvest in other areas that are closer to objectives. Statewide mule deer harvest has slowly increased as well from a low of about 5,300 in 2014 to 6,800 in 2022, mostly due to increased buck harvest since doe harvest has been substantially restricted for the past 9 years (Figure 3). A consistently low mule deer doe harvest of approximately 1,500 has allowed some deer herds of the state to grow to more desirable levels although many areas are still substantially below objective (Figure 2 and Figure 3).

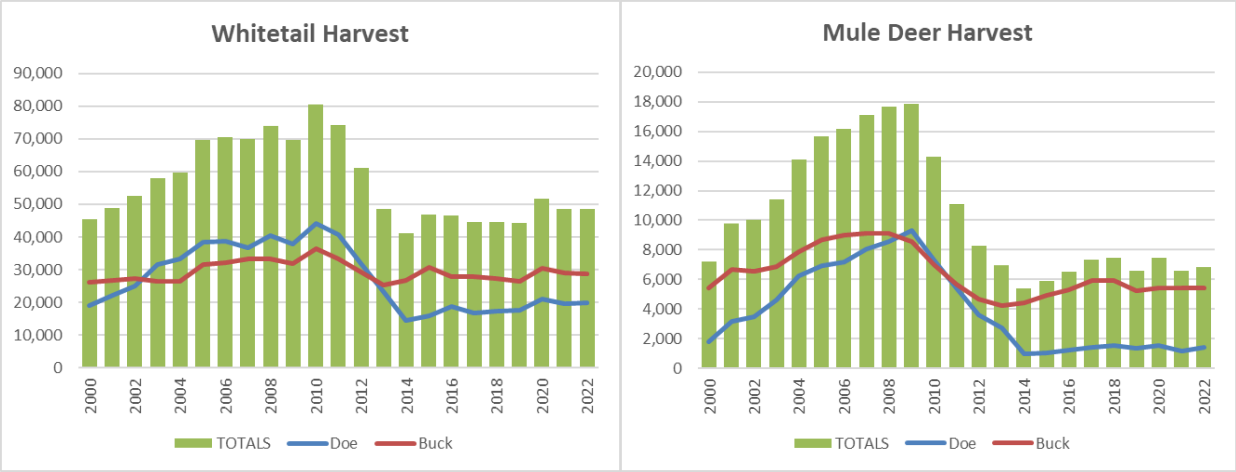


Figure 3. Estimated white-tailed deer and mule deer harvest trends, 2000-2022.

License sales for all deer seasons combined were 115,102 in 2021 and 115,952 in 2022. In 2022, there were about 71,500 unique deer hunters that overall spent around 632,200 days participating in deer hunting. Harvest by weapon type for all firearm seasons in 2022 was about 40,100 deer, while archery and muzzleloader hunters harvested approximately 9,100 and 1,100 deer respectively (Table 1). License sales and harvest information for each hunting season for 2022 can be found in Appendix B. Harvest

data are evaluated at both the firearm unit and DAU level. See Appendices C-M for trend figures of DAU harvest by species and Norton et al. (2021) for more harvest information at the unit level.

Table 1. Deer harvest in 2022 by weapon type in South Dakota.

	White-tailed Deer	Mule Deer	Total
Firearm	39,855	5,471	45,326
Archery	7,805	1,281	9,086
Muzzleloader	1,039	93	1,132
TOTAL	48,699	6,845	55,544

Disease Monitoring

Chronic Wasting Disease

Since 2001, chronic wasting disease (CWD) has been found in 282 elk, 141 mule deer, and 297 white-tailed deer in numerous areas of South Dakota. In the past 2 hunting seasons, GFP has detected CWD in 54 white-tailed deer and 25 mule deer (Figure 4). There were no positive deer detected over the last 2 years within the boundaries of Wind Cave National Park, nor within the boundaries of Custer State Park. One CWD positive white-tailed deer and 1 mule deer were detected within the Black Hills firearm units, 43 white-tailed deer and 21 mule deer within West River firearm units, and 1 mule deer and 2 white-tailed deer within East River firearm units. Additionally, 8 white-tailed deer and 2 mule deer were found positive for CWD from city deer removals within the last 2 years. Figure 4 shows the documentation of CWD within South Dakota over the past 2 years. Prior to 2021, CWD had been documented in 16 counties in West River, and 1 county in East River. During the 2021 hunting seasons, CWD was documented in 2 additional counties in West River, and 2 additional counties in East River (Figure 4). A total of 20 counties within SD have documented CWD in at least one deer (17 West River, 3 East River).

The South Dakota Chronic Wasting Disease Action Plan was approved by the GFP Commission in June of 2019 and updated in 2020 (https://gfp.sd.gov/userdocs/docs/Final_SD_CWD_Action_Plan_August_2020.pdf). Communication with all stakeholders within South Dakota is key to a successful CWD Action Plan. This is a working Action Plan with the key discussion points including: investigating regulations regarding interstate and intrastate movement of carcasses, baiting and feeding of wildlife, use of urine-based lures, translocation of cervids, game processors, taxidermist, donation of venison, and expansion of surveillance areas to determine current presence of CWD surrounding known endemic areas. In 2021, the GFP Commission updated CWD regulations for the transportation and disposal of deer and elk carcasses from other states and from any unit of harvest within South Dakota: https://gfp.sd.gov/cwd-regulations/ . The new regulations went into effect during the 2021 hunting seasons.

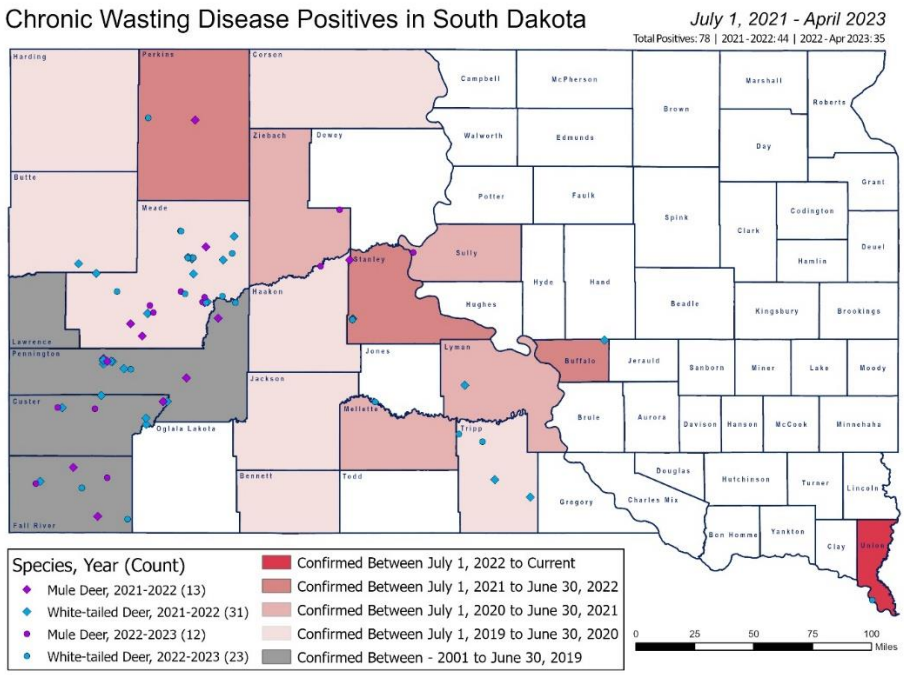


Figure 4. Chronic wasting disease positive wild white-tailed and mule deer in South Dakota, July 2021-April 2023.

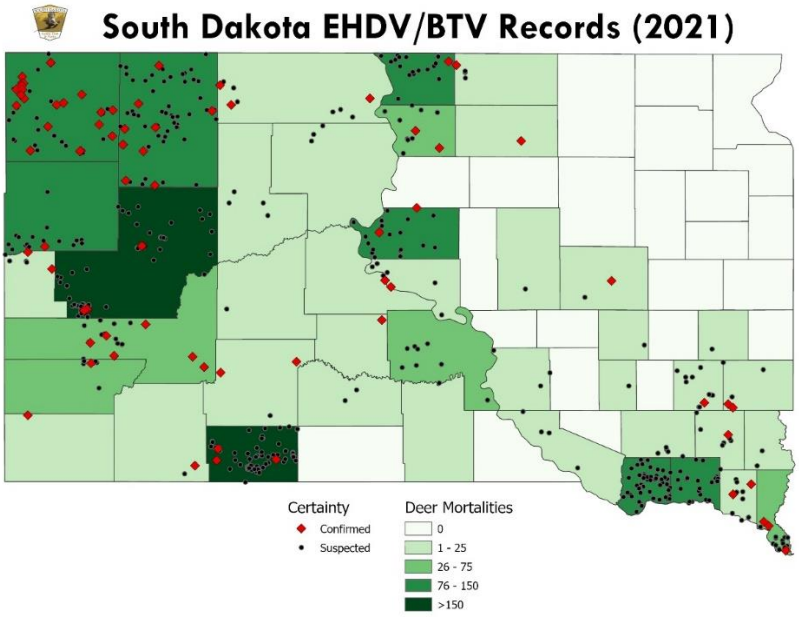
Hemorrhagic Disease

The State of South Dakota experienced a substantial mortality event of mainly white-tailed deer during July-November 2021 due to Epizootic Hemorrhagic Disease (EHDV) and Blue Tongue (BTV) (Figure 5). In 2022, a relatively minor mortality event of mainly white-tailed deer during August-October 2022 due to EHDV and BTV occurred again in the State (Figure 5). During both years, GFP received reports of sick and deceased white-tailed deer, mule deer, pronghorn, elk, or bighorn sheep. As in previous years with mortality in the summer months, hemorrhagic disease was suspected, and efforts were made to document the virus through the Diagnostic Lab at South Dakota State University. Through laboratory testing, confirmation was received that EHDV or BTV was present in 60 white-tailed deer, 7 pronghorn, 6 mule deer, 3 bighorn sheep, and 1 elk in 2021 (Figure 5). Additionally, through laboratory testing in 2022, confirmation was received that EHDV or BTV was present in 17 white-tailed deer, 4 pronghorn, and 3 mule deer (Figure 5). During both years of documentation, GFP investigated many sick and dead ungulates that would be associated with EHDV/BTV.

Forty-two counties in 2021 and twenty-one counties in 2022 in South Dakota had suspected, reported, or confirmed EHDV or BTV in white-tailed deer, mule deer, or pronghorn (Figure 5). Statewide, a total of 1,639 dead or sick animals were recorded in 2021, which included 1,584 white-tailed deer, 27 pronghorn, 24 mule deer, 3 bighorn sheep, and 1 elk. In 2022, a total of 208 dead or sick animals were recorded which included 194 white-tailed deer, 10 pronghorn, and 4 mule deer. Figure 6 shows annual mortality recorded from reported hemorrhagic deaths in South Dakota.

Reported losses from hemorrhagic disease in 2021 and 2022 affected populations to the extent that some leftover tags were pulled during each year in some units. Hunters could also return deer licenses

in any affected units across the state. In addition, GFP offered refunds to hunters who wished to return deer licenses for any reason.



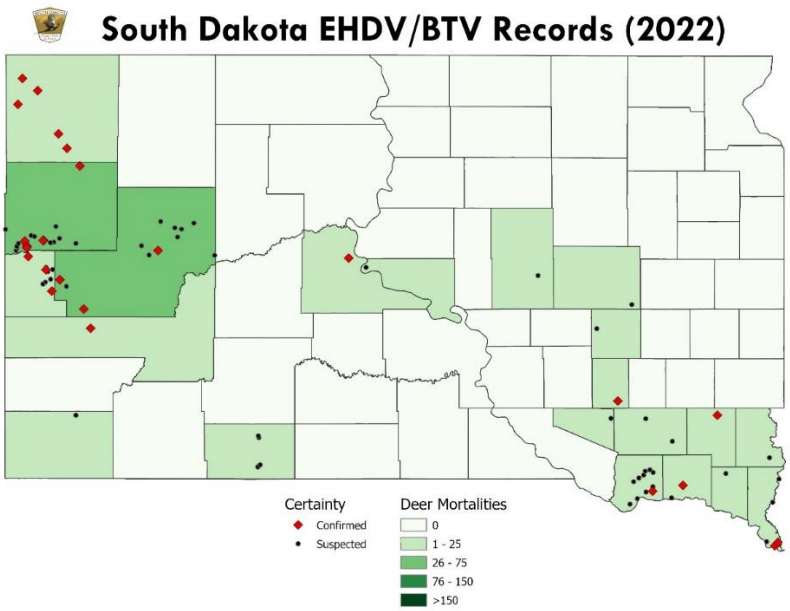


Figure 5. Locations of reported deer, pronghorn, and elk mortalities presumably caused by Hemorrhagic disease in South Dakota in 2021 (top) and 2022 (bottom). Red locations indicate positive results from laboratory testing.

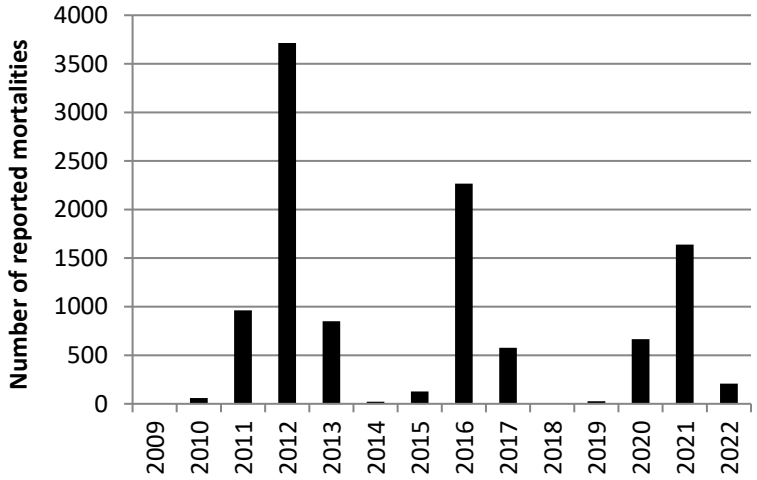


Figure 6. Annual reported hemorrhagic disease mortalities of deer, elk, pronghorn, and bighorn sheep in South Dakota, 2009-2022.

Herd Composition Surveys

Pre-season herd composition surveys of white-tailed deer and mule deer populations have been conducted annually throughout the state of South Dakota since the early 1940s in some areas, but decent records only exist back to the 1970s or 1980s. Current herd composition ground surveys are completed by driving roads or hiking in areas of known deer concentrations in September and October (Appendices C-M). All deer herds that are observed in their entirety are classified to numbers of fawns, does, and bucks. Spatial data are also recorded for each observation in order to reduce double-counting occurrences. A minimum sample size of 200-400 independent group observations per species per DAU is currently obtained to ensure sufficient precision in herd composition estimates. Age ratios are calculated as fawns:100 does and are used as an indicator of fall recruitment into the population. Sex ratios are calculated as bucks:100 does and are an important parameter used in population modeling.

In 2022, GFP staff counted and classified 16,274 deer (6,465 mule deer; 9,809 white-tailed deer) to estimate herd composition across the state. Statewide sex ratios were 25 bucks:100 does (95% CI: 23-26) for white-tailed deer and 36 (34-39) for mule deer. Statewide recruitment of white-tailed deer is consistently higher than that observed in mule deer populations (Figure 7). In 2022, mule deer recruitment was 61 fawns:100 does (95% CI: 58-65) statewide but varied from a high of 67 (60-75) in DAU 1 to a low of 35 (22-53) in DAU 8. For white-tailed deer, recruitment varied from 40 (34-46) in DAU 2 to 104 (91-119) in DAU 10 but averaged 70 (67-73) statewide. Quantifying deer recruitment for each DAU (Appendices C-M) is critical to estimate growth rates and determine appropriate license allocation for deer herds throughout the variable landscapes of South Dakota.

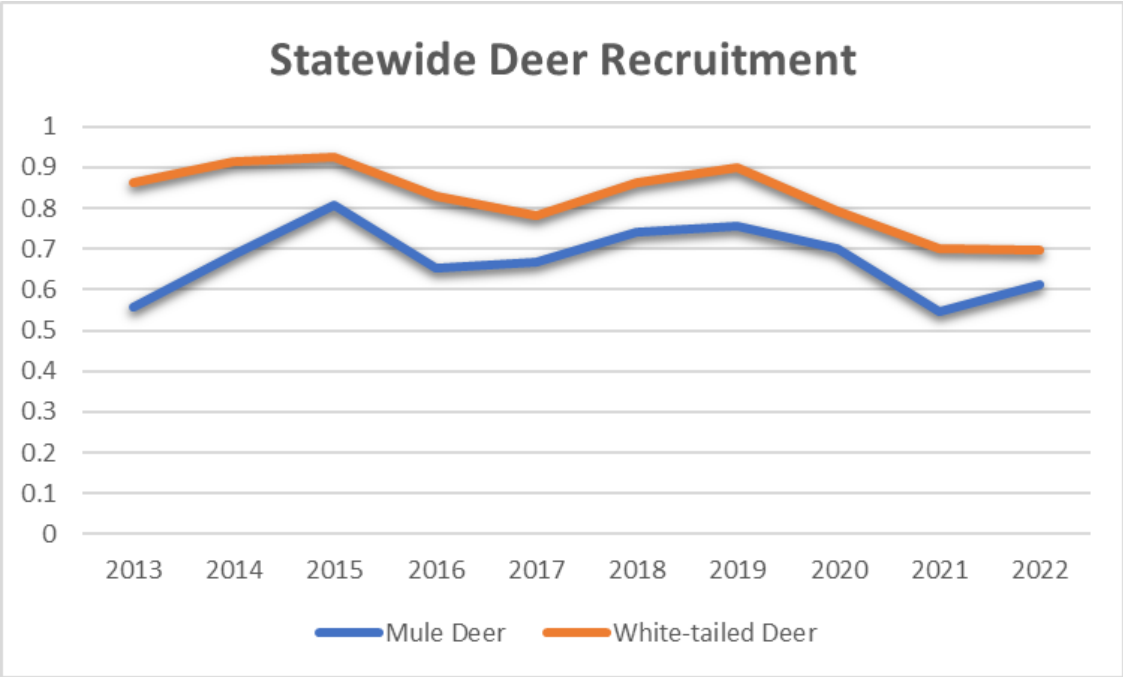


Figure 7. Statewide fawn:doe ratios observed during herd composition surveys to estimate recruitment for white-tailed deer and mule deer in South Dakota, 2013 – 2022.

Survival Monitoring

Understanding population dynamics of both white-tailed and mule deer and determining annual rates of population change requires knowledge of fawn, juvenile, and adult survival rates. Annual rates of change within a deer population are influenced primarily by adult survival and the number of fawns that reach one year of age. Radio-collared deer have been used to produce survival estimates in South Dakota for over 20 years, and methods continue to evolve to provide more robust estimates (see Norton et al. 2021). Within active monitoring areas, adult females (17+ months) and juveniles (5-16 months) are captured primarily via helicopter net gun and fitted with a VHF or GPS radio collar. Monitoring occurs one time each month for VHF collared individuals and continuously for GPS collared animals.

Survival rates are used to estimate deer numbers and monitor changes in populations as the result of changes in winter conditions, disease outbreaks, or harvest strategies. Increased efforts to obtain statistically valid survival estimates within a defined data analysis unit have been occurring in recent years, with sample sizes of radio-collared mule deer and white-tailed increased significantly (105 adults and 110 juveniles per study area). Since 2013, over 4,600 deer have been radio-collared to evaluate survival in South Dakota for 2 species, 2 sexes, and 2 age cohorts (Figure 8). Future capture and collaring efforts have currently been suspended; however, monitoring continues of GPS collared mule and white-tailed deer in DAU 1 (approximately 176 adults).

Preliminary survival estimates are available in 3 DAUs for white-tailed deer and 3 DAUs for mule deer in 2021 and/or 2022 (Tables 2 and 3). Annual survival of adult does varied from 74-85% for mule deer and 65-79% for white-tailed deer. Adult doe survival for white-tailed deer in DAU 1 was lower than mule deer survival both years, presumably related to the impacts of drought and associated increases in

hemorrhagic disease (Tables 2 and 3). White-tailed deer survival for juveniles was 88% (95% CI:82-95) in 2021 in DAU 1, and higher than the 67% (58-78) survival documented for juvenile mule deer.

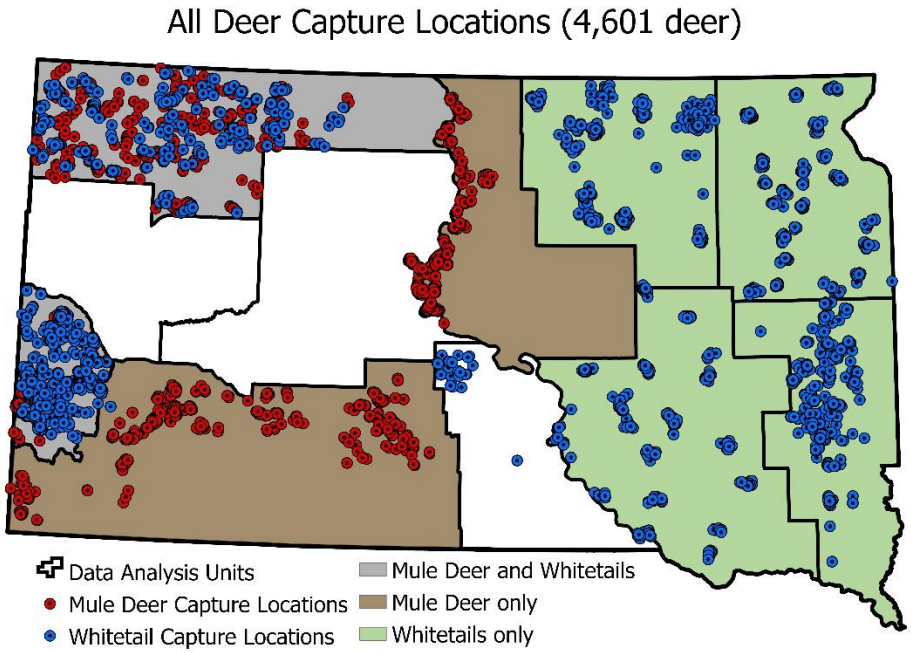


Figure 8 . Winter capture and radio-collaring locations of mule deer and white-tailed deer in South Dakota, 2013-2021.

Table 2. Preliminary annual survival rates of white-tailed deer by DAU in 2021 and 2022.

Adult Bucks				
Year	**Study Area**	**Survival**	**95% CI**	***n***
2022	**DAU 1**	71%	60-84	55
Adult Does				
Year	**Study Area**	**Survival**	**95% CI**	***n***
2022	**DAU 1**	65%	58-73	152
2021	**DAU 1**	68%	61-75	158
2021	**DAU 8**	71%	62-82	85
2021	**DAU 10**	79%	71-89	93
Juveniles (Jan-Aug)				
Year	**Study Area**	**Survival**	**95% CI**	***n***
2021	**DAU 1**	88%	82-95	100

Table 3. Preliminary annual survival rates of mule deer by DAU in 2021 and 2022.

Adult Bucks				
Year	**Study Area**	**Survival**	**95% CI**	***n***
2022	DAU 1	64%	52-79	51
Adult Does				
Year	**Study Area**	**Survival**	**95% CI**	***n***
2022	DAU 1	79%	72-86	148
2021	DAU 1	85%	79-92	129
2021	DAU 4	79%	66-95	67
2021	DAU 6	74%	62-88	67
Juveniles (Jan-Aug)				
Year	**Study Area**	**Survival**	**95% CI**	***n***
2021	DAU 1	67%	58-78	104

Survival studies have been instrumental in providing area specific biological data for GFP managers to use in evaluating deer populations and management options. Although these data often provide the only means to estimate population abundance and trends for local deer herds, survival rate data are still lacking in many areas. Future evaluations of spatial and temporal relationships in survival data will be critical in assessing the need for continued survival studies. In addition, a current collaborative research project with University of Montana is further evaluating mule deer and white-tailed deer survival in DAU 1 and the relationships between survival, weather, movements, and habitat.

Abundance Surveys

Aerial sightability surveys

Sightability models are used to calculate the detection probability of individual groups and correct for groups missed during surveys by documenting factors affecting animal detection (Samuel et al. 1987). Models are developed by flying over groups of animals that include radio-collared individuals and by recording covariates for individual groups both observed and undetected by observers (Samuel et al. 1987). A sightability model developed by Robling (2011) is applicable to DAU 9 and DAU 10 with a detection rate of 84.4% and visibility significantly influenced by group size and canopy cover.

In the winter of 2022-23, both DAUs 9 and 10 were surveyed during 100% snow cover conditions. A fixed–wing aircraft was flown at speeds <100 miles per hour, and altitudes between 100 to 200 feet above ground level. Two observers, not including the pilot, recorded and classified all deer observed ≤0.25 miles of each side of the aircraft. Transects of ½ mile width were established over the entire area, and a systematic 50% of those were surveyed. A total of 29,139 deer were observed during the survey.

The estimate for white-tailed deer in DAU 9 in the winter of 2022-23 was 37,357 (95% CI:35,312-39,706), which is higher than the estimate of 32,359 from the last survey in 2018-19. In DAU 10, the white-tailed deer estimate was 27,471 (95% CI:25,513-29,791) in 2022-23. This was also higher than the estimate of 19,655 in 2016-17.

Road transect distance sampling

Beginning in 2016, spotlight road surveys were completed by GFP within the boundaries of the Black Hills DAU (i.e., DAU 3), where distance sampling models have recently been developed to estimate white-tailed deer abundance (Cudmore 2017). Sixty transect routes have been selected by General Randomized Tessellation Stratified sampling (Stevens and Olsen 2004), with transect lengths varying from 3.5 km to 16 km (Figure 9). Surveys are conducted during the last two weeks of August, beginning ½ hour after sunset and generally lasting 3-5 hours depending on transect length and the number of deer observed. Spotlights are used to locate deer on both sides of the transect. Each survey has two observers, with the driver serving as one of the observers.

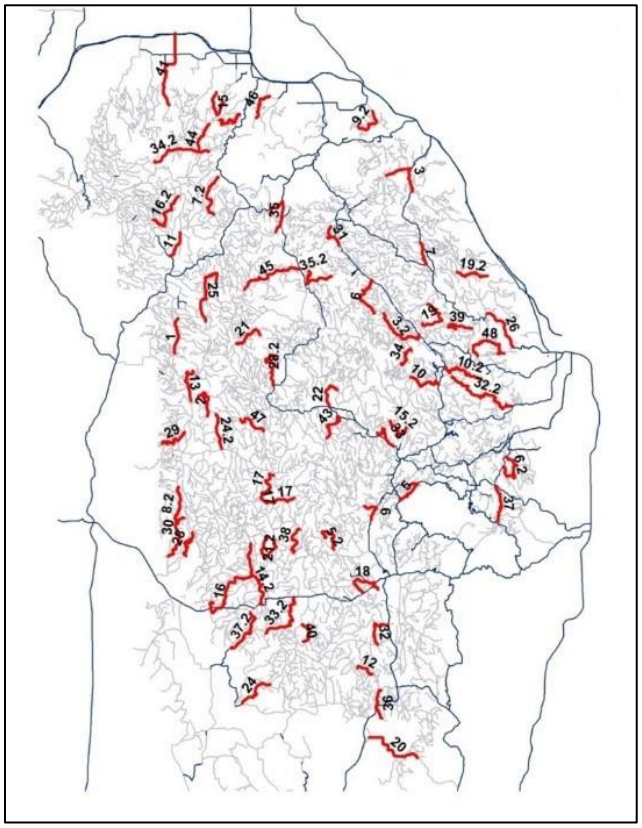


Figure 9. Road transects used for spotlight deer survey in the Black Hills.

Distance sampling surveys over the past 2 years have resulted in a Black Hills white-tailed deer population estimate of 35,620 (± 4,487 SE) in 2021 and 38,200 (± 1,641 SE) in 2022, substantially lower than the 2018 estimate that was around 60,000 deer (Figure 10). Variability and low precision make interpretation of distance sampling surveys challenging, but the results suggest that white-tailed deer are below the 70,000 deer objective established for the Black Hills.

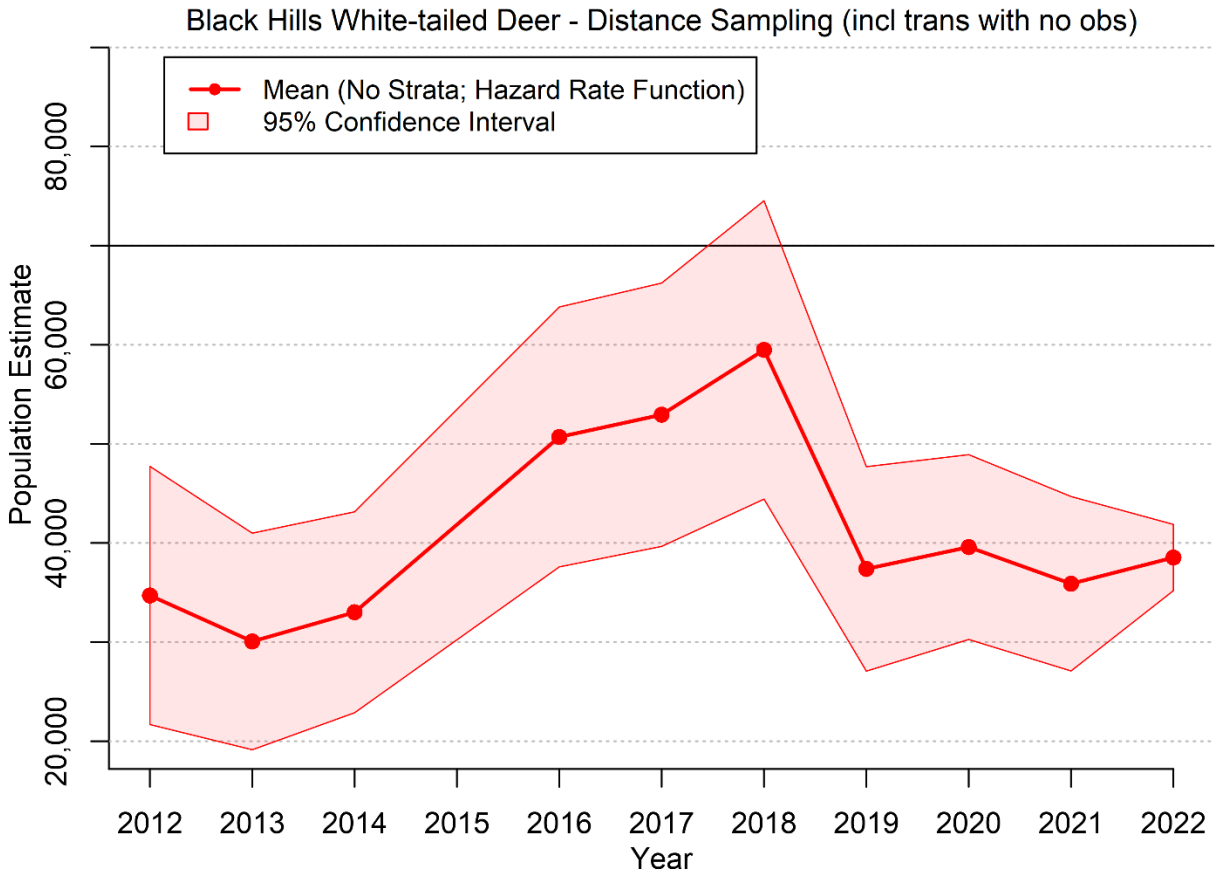


Figure 10. Estimates of white-tailed deer in the Black Hills from distance sampling transects, 2012 – 2022.

Population Modeling

One of the first and most important steps in modeling deer populations is to first define a qualitative population objective (i.e., substantially decrease, slightly decrease, maintain current level, slightly increase, substantially increase). This process involves GFP staffs obtaining stakeholder's opinions regarding the status of deer populations within individual firearm deer hunting units throughout the year (SDGFP 2017). Multiple sources of public opinion are used in formulating population objectives and include personal contacts with landowners and hunters, open houses, regional advisory meetings, hunter and landowner opinion surveys, hunter harvest surveys quantifying success and satisfaction ratings, and other submitted comments. Once the data are reviewed and summarized, internal staff meetings are then conducted at the regional level to discuss public input received regarding deer population abundance levels, deer depredation issues, landowner tolerance, hunter comments, and harvest results from the previous season. The end result is a defined qualitative population objective for each firearm management unit.

After a qualitative management unit objective is defined, a numerical value is assigned to that management unit (i.e., substantially decrease = 1, slightly decrease = 2, maintain current level = 3, slightly increase = 4, substantially increase = 5), which is used in defining a population objective at a

larger Data Analysis Unit level. The first step in the development of a DAU population objective is to determine how much weight each firearm unit objective contributes to the overall DAU objective. This step incorporates unit harvest proportions within a DAU to weight each unit objective appropriately because not all units within a DAU have equal harvest rates. Unit harvest proportions are calculated by taking the 5-year harvest average of white-tailed deer or mule deer within the defined management unit divided by the total 5-year harvest average for the entire DAU. The management unit objective is then multiplied by the harvest proportion for that unit and the sum of the weighted values for all the units within the DAU then becomes the numerical DAU population objective. The DAU objective is then assigned a lambda rate (i.e., rate of change to population abundance) objective based on pre-determined ranges that are realistic for most deer herds in South Dakota (Table 4). To quantify the objective lambda value, the DAU objective is entered into the following linear regression equation: 0.1456 (DAU Objective) + 0.5631 = Lambda Objective.

Table 4. Categorical objective values based on qualitative objective.

Qualitative Objective	Unit Objective	DAU Objective	Lambda Objective
Substantially decrease	1	1.0 - 1.5	0.7 - 0.8
Slightly decrease	2	1.5 - 2.5	0.8 - 0.9
Maintain	3	2.5 - 3.5	0.9 - 1.1
Slightly increase	4	3.5 - 4.5	1.1 - 1.2
Substantially increase	5	4.5 - 5.0	1.2 - 1.3

Once the lambda objective is defined, integrated population models are used to generate population projections for each DAU (lambda and abundance estimates) based on modeling inputs (e.g., adult female survival, adult male survival, juvenile survival, recruitment). Harvest-based population models are used to reconstruct the previous year pre-hunting season population and project abundance to future years for each DAU while considering various harvest management strategies for each management unit (Norton et al. 2021). The projected (model generated) and objective lambdas are then compared and future antlerless harvest strategies are manipulated to achieve the desired lambda objective rate derived from the DAU population objective. Antlerless harvest is assumed to be additive and the number of antlerless deer added or removed from the population is calculated at the DAU level and then distributed to the unit level in accordance with the defined unit objective. Three-year average harvest success rates are calculated for all previously used license types within the management unit and license combinations needed to achieve unit level antlerless harvest recommendations are selected for future harvest season license recommendations. This process is repeated for all mule deer and white-tailed deer management firearm management units across the state.

Reliable DAU abundance estimates are lacking in most areas of the state, therefore population estimates are most valuable for assessing population trends and license allocations. Before the hunting season in 2022, harvest reconstruction estimates resulted in ~377,000 white-tailed deer and ~87,000 mule deer in South Dakota.

Winter Severity Index

Winter severity is an important metric contributing to survival of mule deer and white-tailed deer populations (Verme 1968). Relating how climatic conditions impact deer survival and subsequent recruitment has potential predictive value and can assist managers in determining if severe winter weather impacts population growth rates. Based on a winter severity index (WSI) developed by Baccante and Woods (2010), GFP currently utilizes mean monthly temperature and total monthly snowfall data from November through April as covariates for the following linear model that quantifies a WSI:

- Monthly WSI = (Mean monthly temperature * (-0.1) +1) * (Total monthly snowfall)
- Annual WSI Value = Sum [mean monthly WSI values (Nov + Dec + Jan + Feb + Mar +Apr)]

Weather data are obtained through an annual data request via the National Oceanic and Atmospheric Administration (NOAA). Program R, a statistical software package (R Core Team 2015), is used to extrapolate weather data across all deer units using an inverse distance weighted interpolation (IDW) function. The winters of 2020-21 and 2021-22 were relatively mild compared with normal 30-year average winter data and little if any deer losses were expected (Figure 11 and 12).

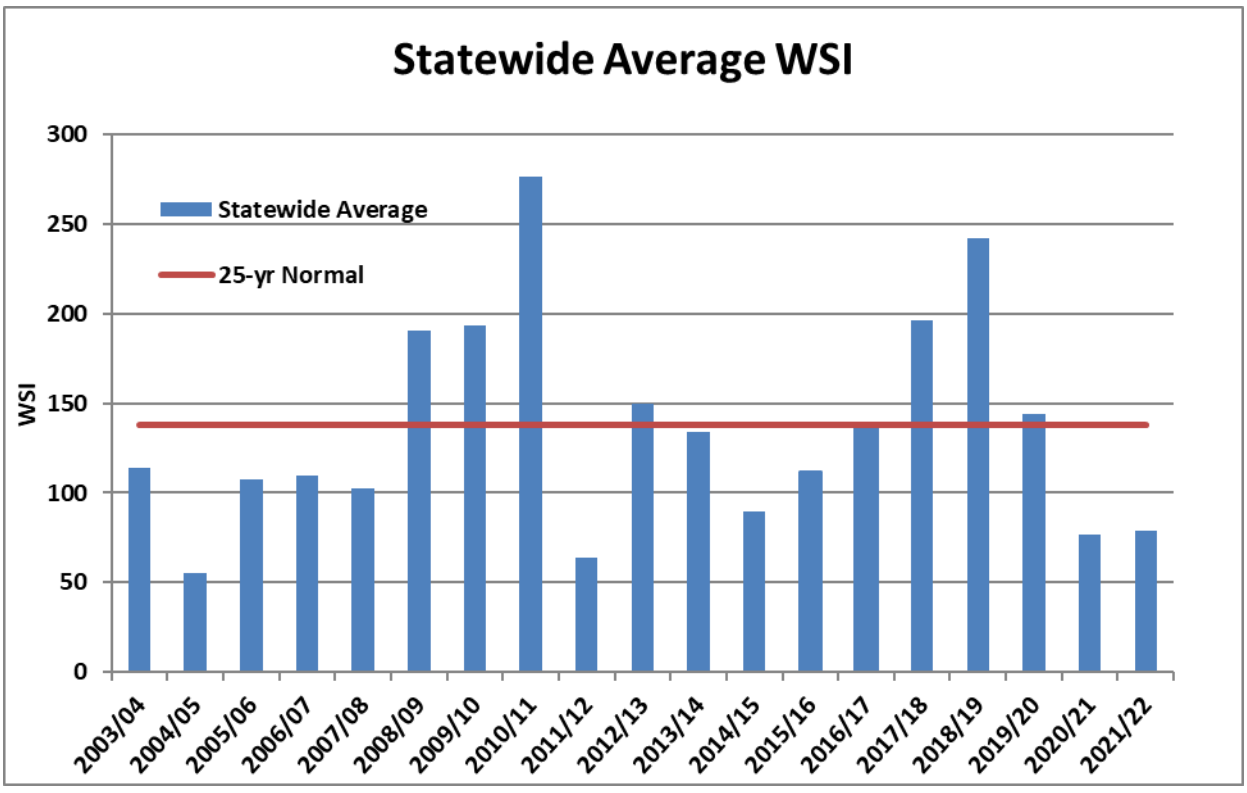
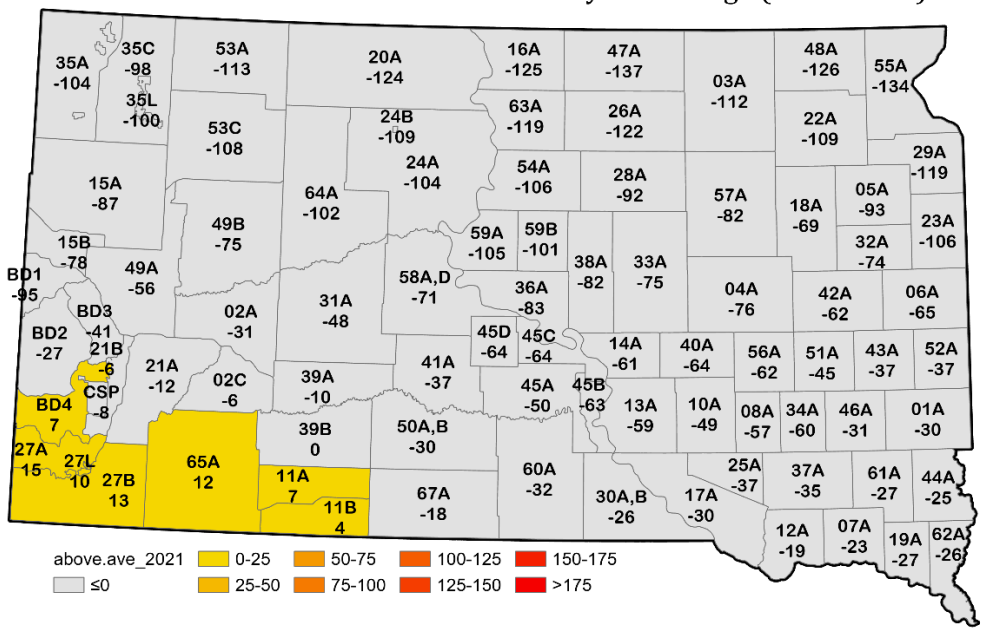


Figure 11. Yearly statewide winter severity indices in South Dakota compared with 25-year average, 2003-04 to 2021-22.

2020-2021 WSI Unit Values Above 25-year Average (1996-2020)



2021-2022 WSI Unit Values Above 25-year Average (1996-2020)

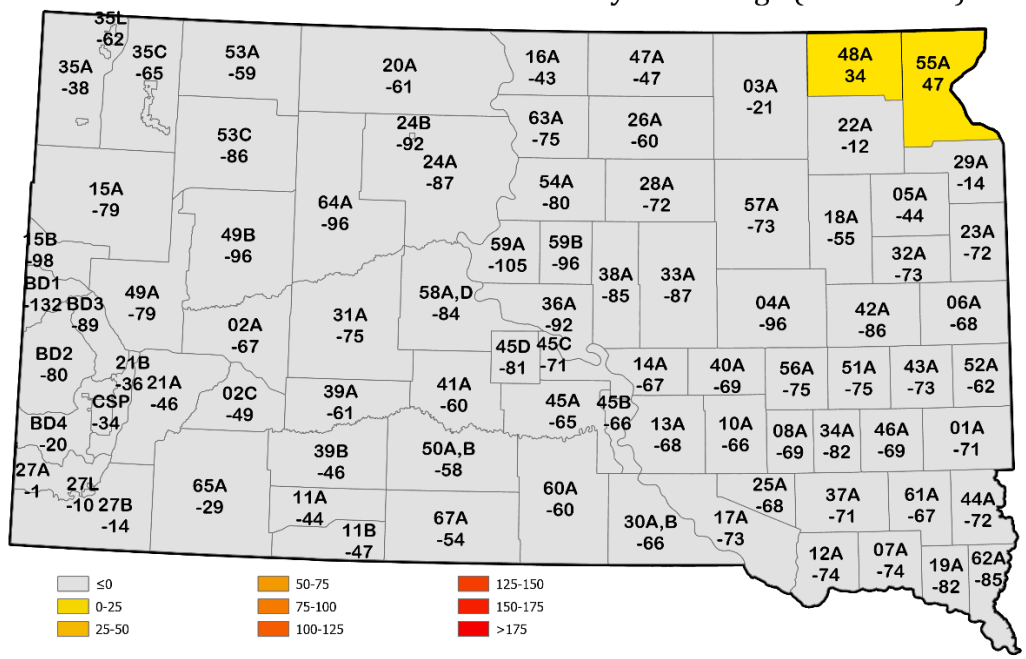


Figure 12 . Winter severity index values compared with 25-30 year normal in South Dakota for the winters of 2020-21 and 2021-22.

The winter of 2022-23 was more severe than average in much of eastern South Dakota and suspected losses will affect GFP license allocations for 2023-24. Weather data are not yet available to calculate the WSI, however, an indirect measure of winter severity is overwinter deer mortality. GFP collects and maintains a database of dead deer reported to staff from the public, along with suspected cause of death. Some specimens are submitted to the South Dakota State Diagnostics Laboratory for disease testing and determining cause of death. In the winter of 2022-23, approximately 155 reports were recorded of deer that died presumably to severe winter conditions, and approximately 1,582 dead deer were documented. No deer mortalities were reported the previous 2 years. These data provide a relative assessment of overwinter mortalities from year to year and represent an approximate spatial distribution of where those losses occur (Figure 13).

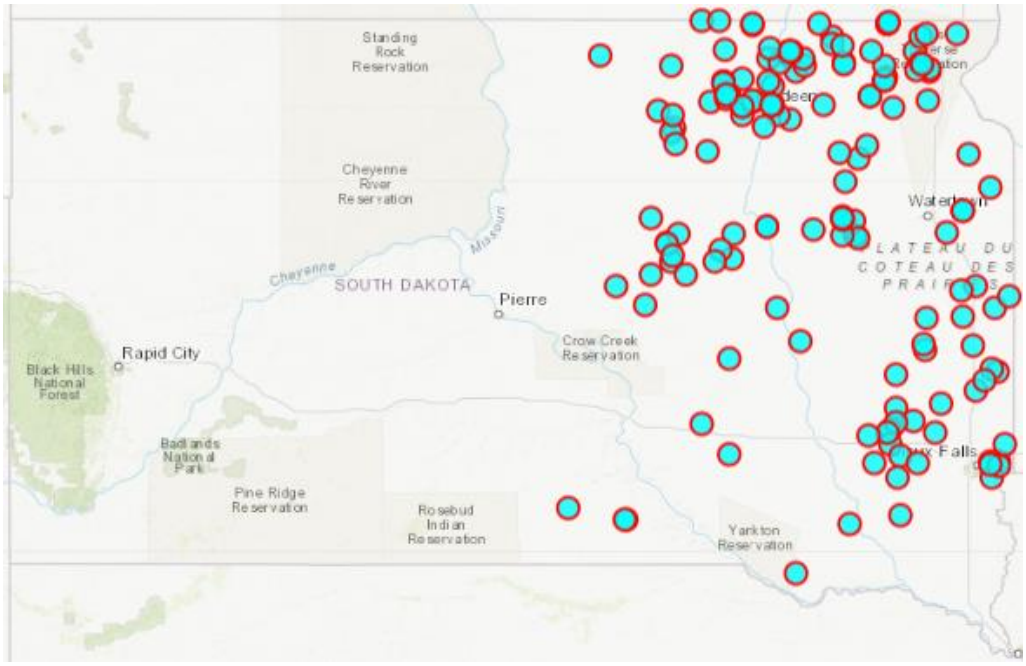


Figure 13. Reported winter mortalities of white-tailed deer in South Dakota, 2022-23.

Data analyses to evaluate how varying degrees of winter severity values impact deer population performance are on-going. The continued compilation of juvenile and adult survival and recruitment data are necessary to make sound scientific relationships between WSI values and how those values impact mule deer and white-tailed deer population performance spatially and temporally. The occurrence of a severe winter while statistically valid sample sizes are available is vitally important in formulating robust regression equations that can predict survival and potential reproductive rates during years with similar winter severity values.

SUMMARY

Deer are the most abundant and sought-after big game species in South Dakota, with approximately 71,600 unique deer hunters spending well over one half million days hunting in 2022. The South Dakota

Game, Fish, and Parks conducts numerous surveys to obtain important biological data for the management of both mule deer and white-tailed deer populations across the state. Herd composition surveys are conducted every fall and provide important data on age and sex ratios. Over the past 2 years statewide deer recruitment has been lower than long-term averages, although rates vary between areas. Hunting seasons are managed to align deer densities with unit specific objectives, while also considering established hunter success thresholds. Hunter surveys are conducted annually to estimate harvest, hunter success, and satisfaction. The total deer harvest in 2022 was about 48,700 white-tailed deer and 6,800 mule deer, very similar to 2021. Survival rates are currently monitored in 1 study area for white-tailed deer and mule deer. Survival rates for white-tailed deer adult does were lower than average and lower than mule deer the past 2 years, presumably due to drought and hemorrhagic disease. Aerial deer surveys in the northeast part of the state were conducted in both DAUs 9 and 10, and results showed increases in white-tailed deer populations in eastern South Dakota. Distance sampling road transects in the Black Hills were conducted and suggest white-tailed deer densities are below objective. Deer abundance in the remainder of the state is estimated using harvest and harvest rate data, while population trends are estimated using biological data from surveys such as annual survival, recruitment, and harvest. In addition, other important data include diseases and extreme weather. Deer losses to hemorrhagic disease were minimal in most areas in 2022, but substantial losses were reported in primarily the northwest, central, and southeast portions of the state in 2021. Winter severity varies by area of the state, but statewide the winters were mostly mild in 2021 and 2022. The winter of 2022-23 has just concluded, but substantial losses of deer due to over-winter mortality were observed in many management units in eastern South Dakota. Overall, white-tailed deer populations have suffered some substantial mortality events during the past 2 years and GFP has reduced antlerless licenses where needed to meet population objectives. Mule deer populations occur mostly in low densities but growth rates appear to be positive due to conservative harvests and minimal environmental mortality events. These observations can vary by unit, however, with some areas showing strong growth rates while others very minimal. In general, white-tailed deer herds are growing at a faster rate than mule deer.

LITERATURE CITED

Baccante, D. and R. Woods. 2010. Relationship between winter severity and survival of mule deer fawns in the Peace Region of British Columbia. BC Journal of Ecosystems and Management 10(3):145-153 pp.

Cudmore, Kristopher W. 2017. An evaluation of deer and pronghorn surveys in South Dakota. M.S. Thesis, South Dakota State University, Brookings, USA.

Norton, A. S., A. J. Lindbloom, L. M. Wiechmann, and S. L. Griffin. 2021. Compilation of Deer Survey Methods and Results Reports. South Dakota Game, Fish, and Parks.

Samuel, M. D., E. O. Garton, M. W. Schlegel, and R. G. Carson. 1987. Visibility bias during aerial surveys of elk in northcentral Idaho. Journal of Wildlife Management 51:622-630 pp.

South Dakota Department of Game, Fish and Parks. 2017. South Dakota white-tailed deer and mule deer management plan, 2017-2023. Completion Report 2017-02. South Dakota Department of Game, Fish and Parks, Pierre, South Dakota, USA.

Verme, L. J. 1968. An index of winter weather severity for northern deer. Journal of Wildlife Management 32(3):566-574 pp.

APPENDIX

Appendix A. The 2017 Deer Management Plan objectives to manage white-tailed deer and mule deer populations for both maximum and quality recreational hunting opportunities, considering all social and biological inputs.

Strategy 3E. Manage Limited Access Units (24B, 27L, 35L; see *Quality Deer Management* section) and CSP for a quality hunting experience by using the following established thresholds:

1. Maintain a minimum 1st tag harvest success of 75% (3-year average) for licenses containing "any deer" or "any whitetail" firearm tags; or
2. Maintain firearm license densities no greater than 1.5 licenses/square mile for "any deer" licenses and no greater than 2.5 licenses/square mile for "any whitetail" licenses.

Strategy 3F. Manage for a minimum 1st tag harvest success of 70% (3-year average) for licenses containing "any deer" or "any whitetail" tags in the Black Hills firearm deer season.

Strategy 3G. Manage for a minimum 1st tag harvest success of 60% (3-year average) for licenses containing "any deer" or "any whitetail" tags in each West River firearm deer season unit.

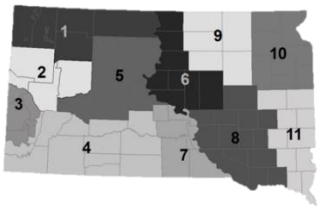
Strategy 3H. Manage for a minimum 1st tag harvest success of 50% (3-year average) for licenses containing "any deer" or "any whitetail" tags in each East River and National Wildlife Refuge firearm deer season unit.

Strategy 3I. Manage for a minimum 1st tag harvest success of 40% (3-year average) for muzzleloader licenses containing "any deer" or "any whitetail" tags in each USFWS Refuge deer hunting unit.

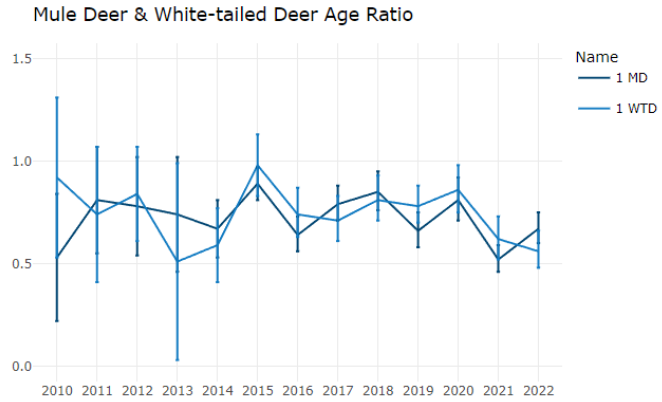
Appendix B. Harvest information for mule deer and white-tailed deer hunting season in 2022 in South Dakota.

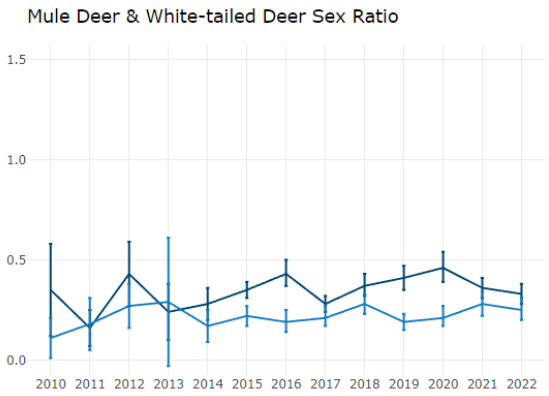
			mule deer harvest			white-tailed deer harvest		
Season	**tags sold**	**tag success**	**buck**	**doe**	**total**	**buck**	**doe**	**total**
Archery	35,220	26%	1,101	180	1,281	5,328	2,479	7,806
Apprentice	3,975	49%	8	262	269	182	1,486	1,668
Mentored	6,723	49%	6	324	330	331	2,602	2,933
Muzzleloader	3,187	36%	85	8	93	280	759	1,039
LOL Free Antlerless	2,152	33%	0	0	0	36	683	719
WR Deer	26,363	69%	3,020	398	3,418	6,364	4,941	11,305
WR Deer LOL	4,000	39%	429	159	588	627	344	971
WR Special Buck	1,967	69%	443	8	451	885	18	903
ER Deer	27,283	56%	208	9	217	9,404	4,778	14,182
ER Deer LOL	11,465	40%	51	50	101	3,116	1,415	4,531
ER Special Buck	499	66%	18	2	20	288	12	300
Sand Lake NWR	114	39%	0	0	0	33	12	45
Lacreek NWR	22	55%	0	0	0	12	0	12
Waubay NWR	22	68%	0	0	0	9	6	15
Black Hills Deer	3,813	61%	73	2	75	1,777	432	2,209
Custer State Park	75	57%	0	0	0	14	28	42

Appendix C. DAU 1 – Grand River Study Area

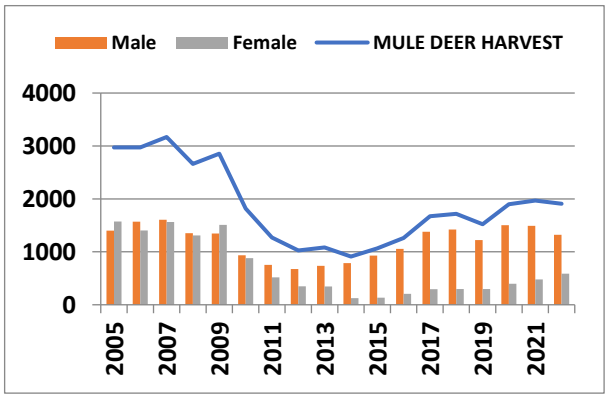


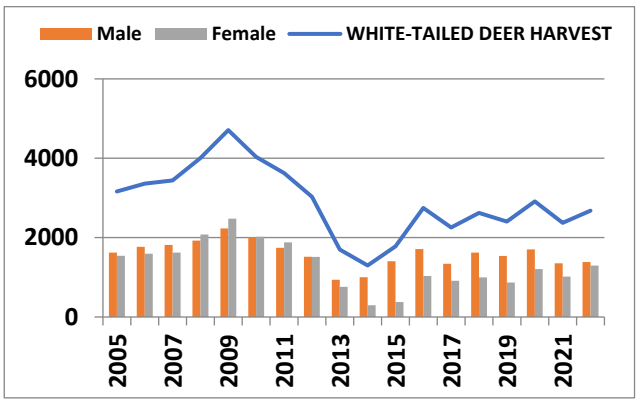
Herd Composition



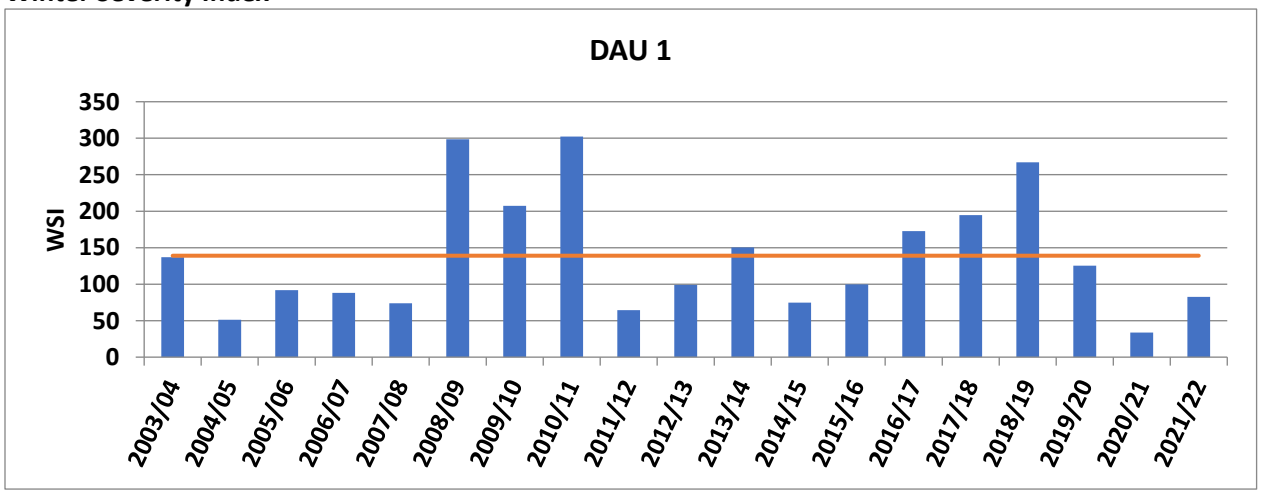


Harvest

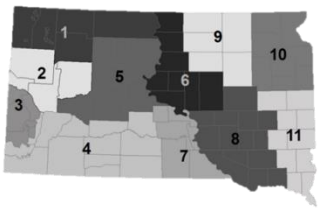




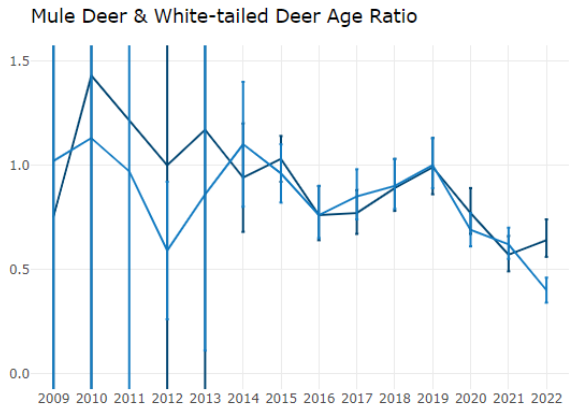
Winter Severity Index

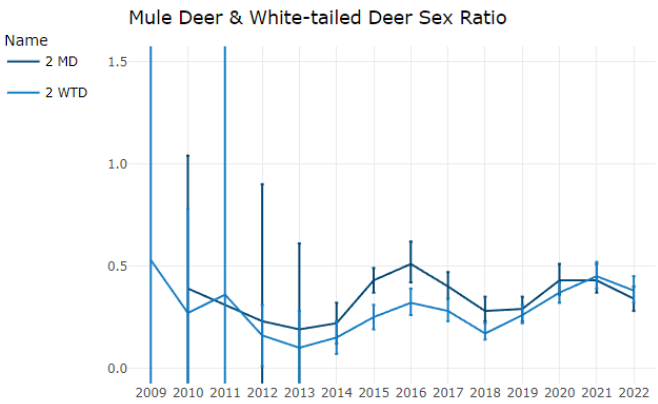


Appendix D. DAU 2 – Belle Fourche River Study Area

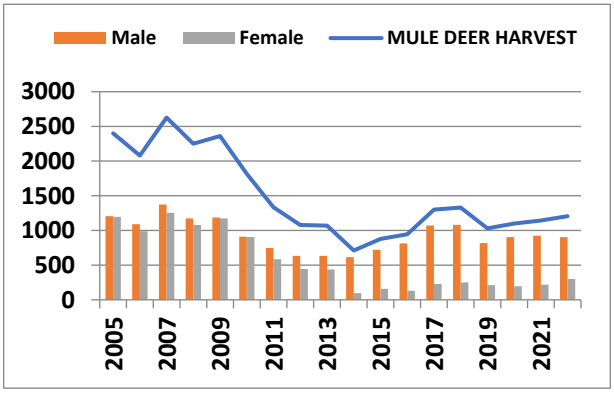


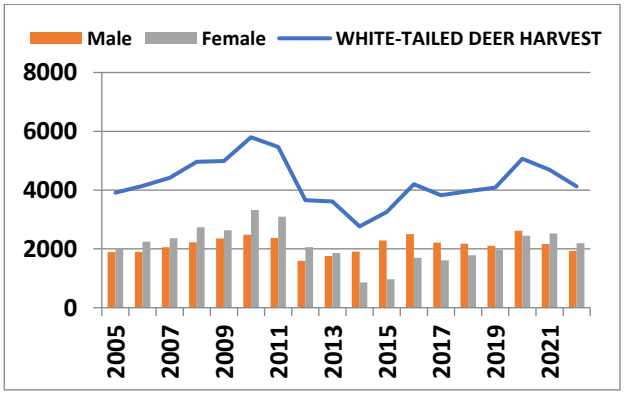
Herd Composition



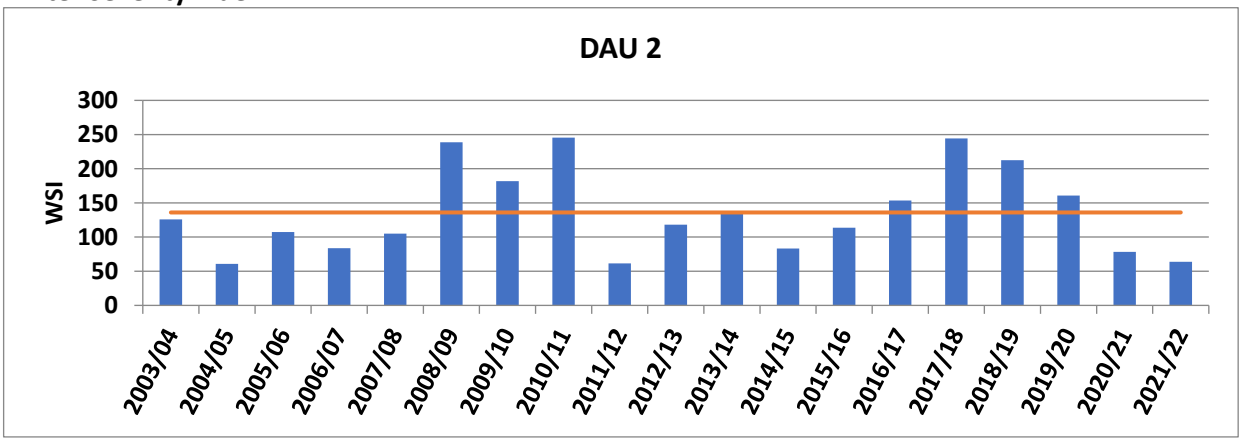


Harvest

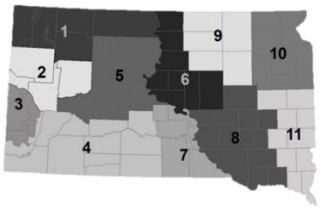




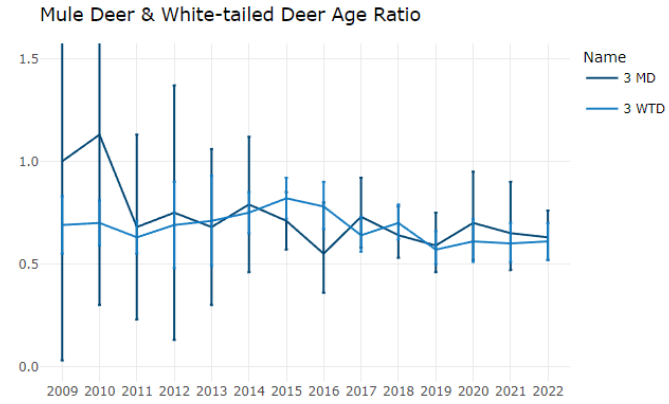
Winter Severity Index

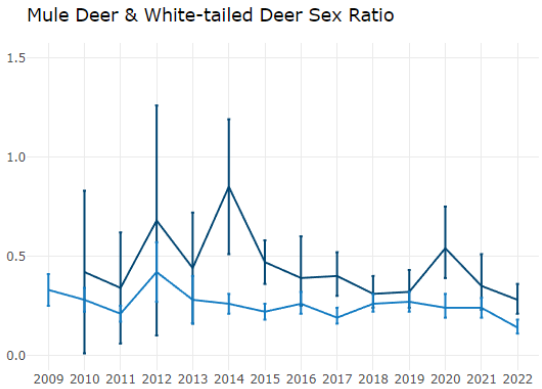


Appendix E. DAU 3 – Black Hills Study Area

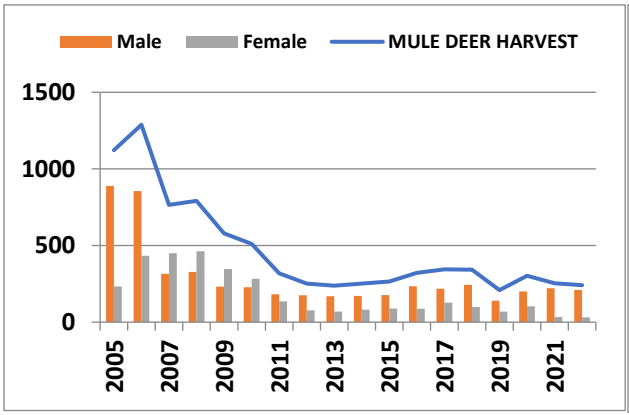


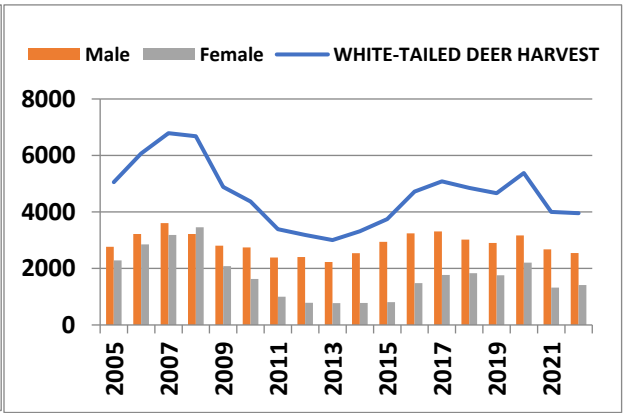
Herd Composition



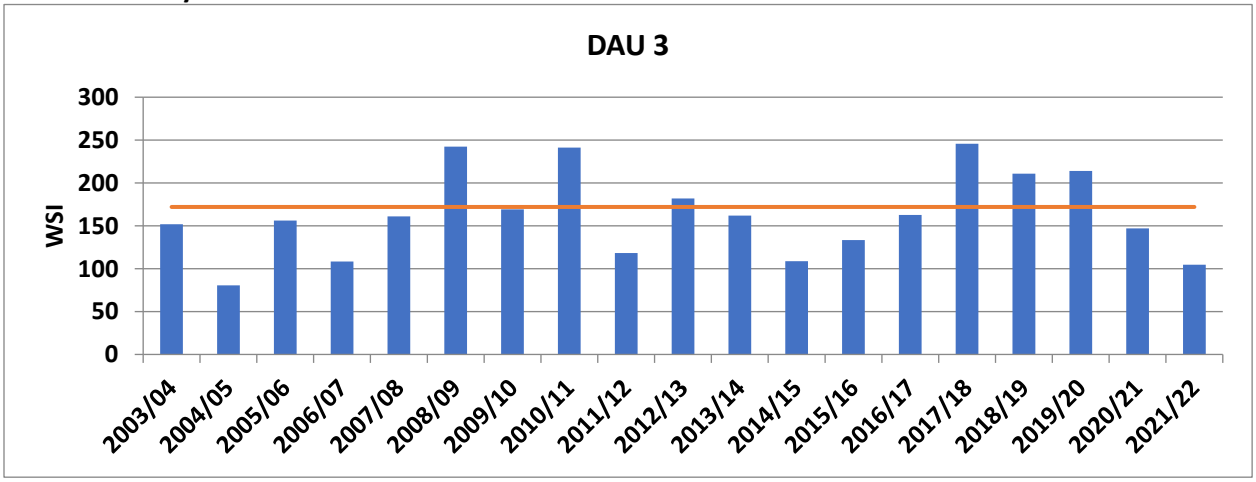


Harvest

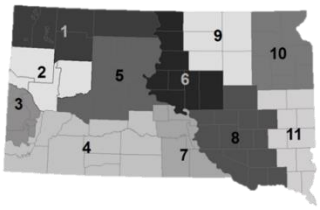




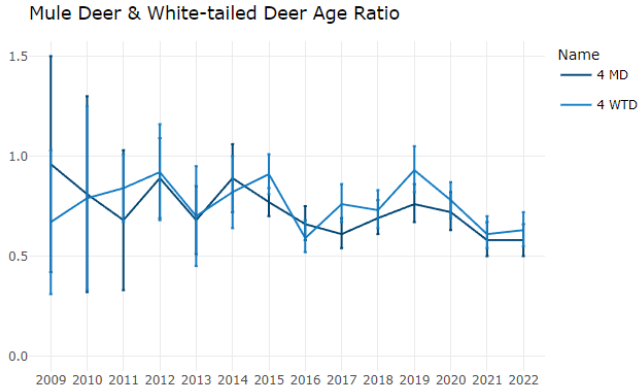
Winter Severity Index

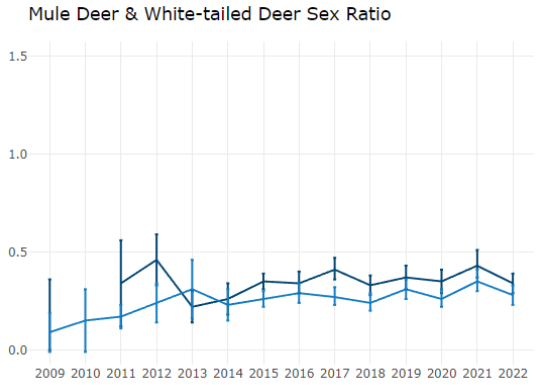


Appendix F. DAU 4 – White River Study Area

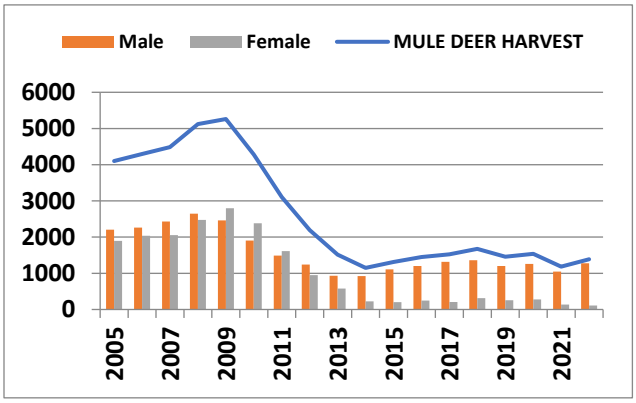


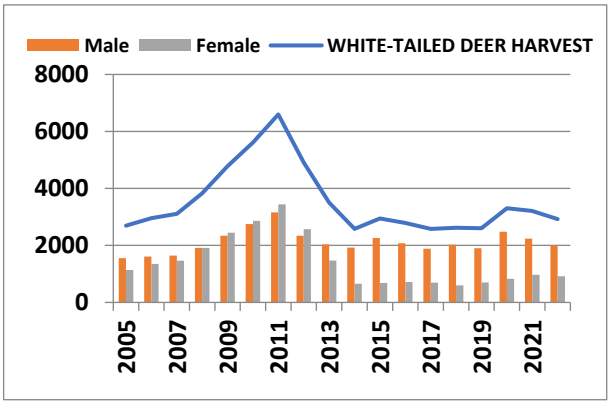
Herd Composition



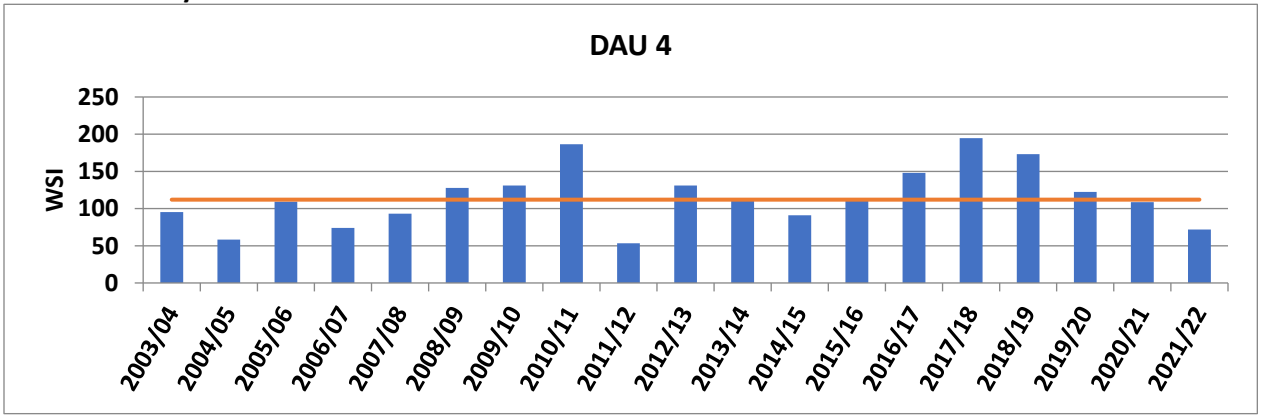


Harvest

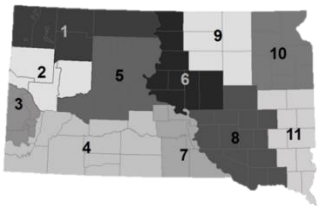




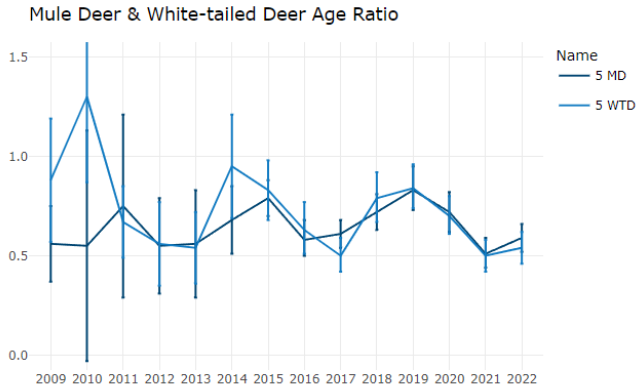
Winter Severity Index

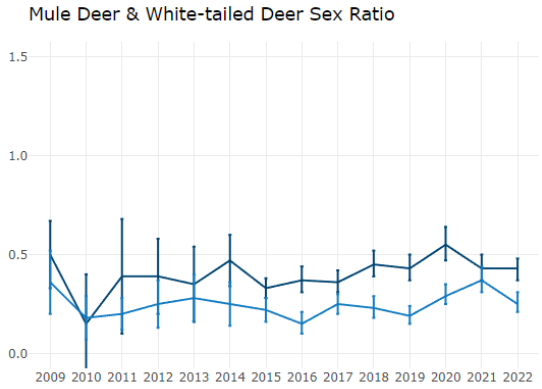


Appendix G. DAU 5 – Cheyenne River Study Area

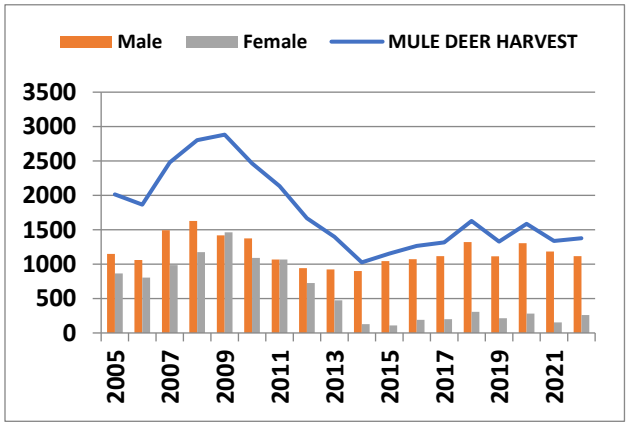


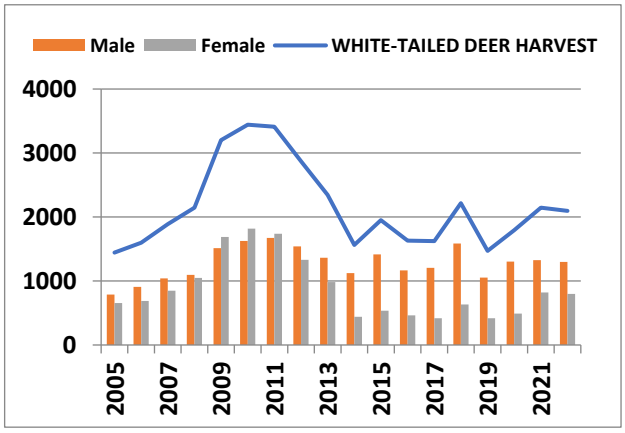
Herd Composition



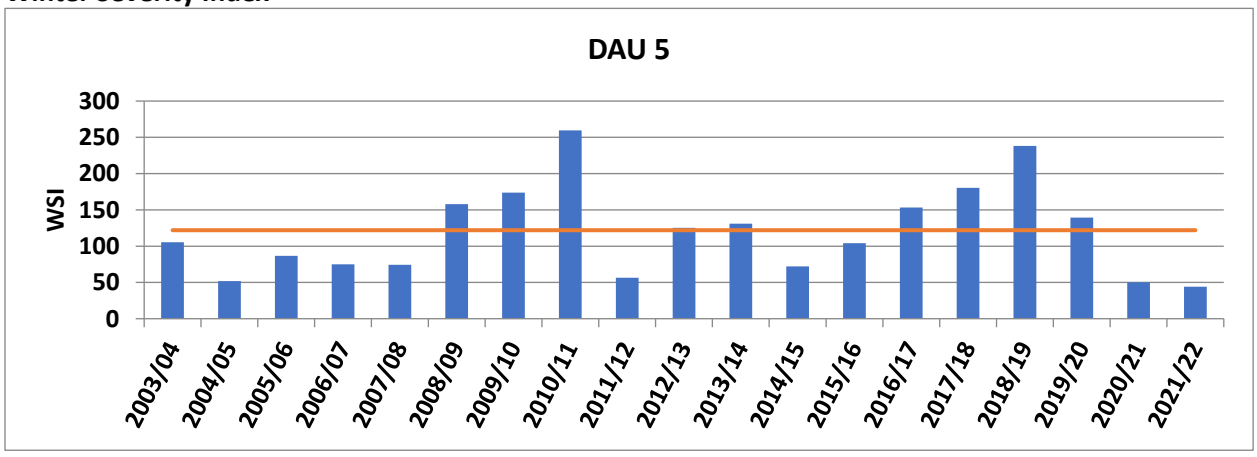


Harvest

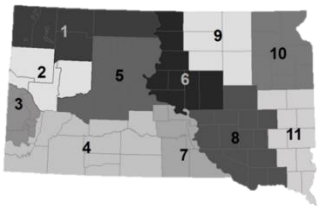




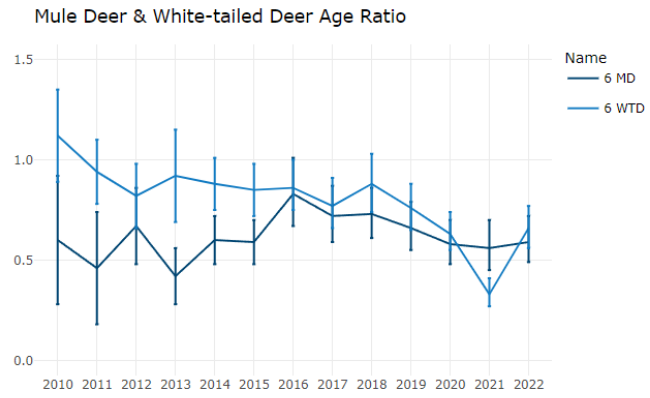
Winter Severity Index

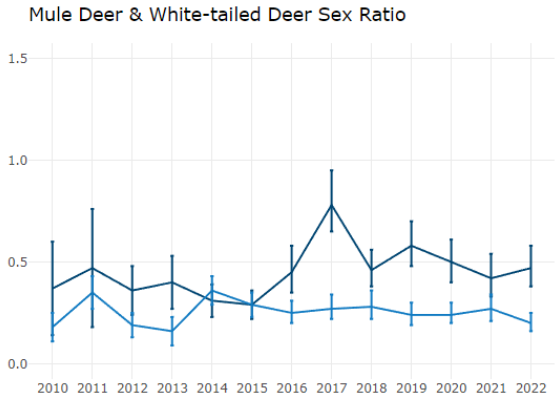


Appendix H. DAU 6 – Upper Missouri River Study Area

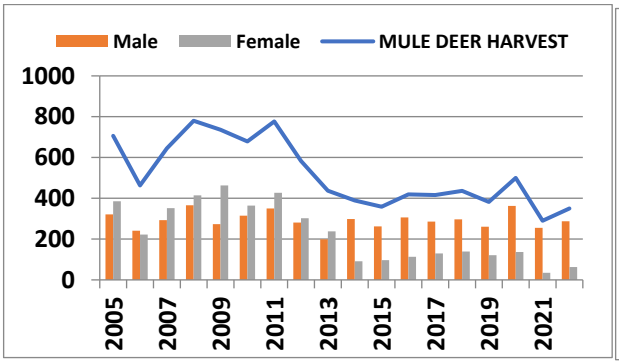


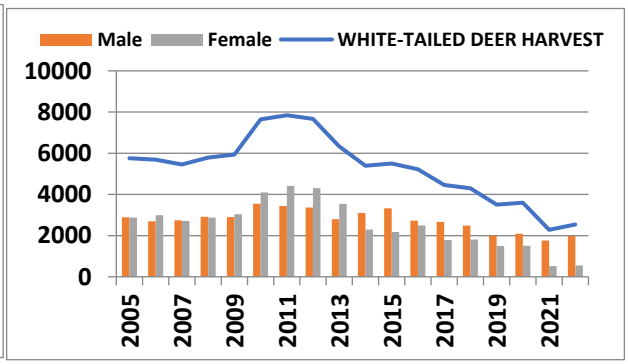
Herd Composition



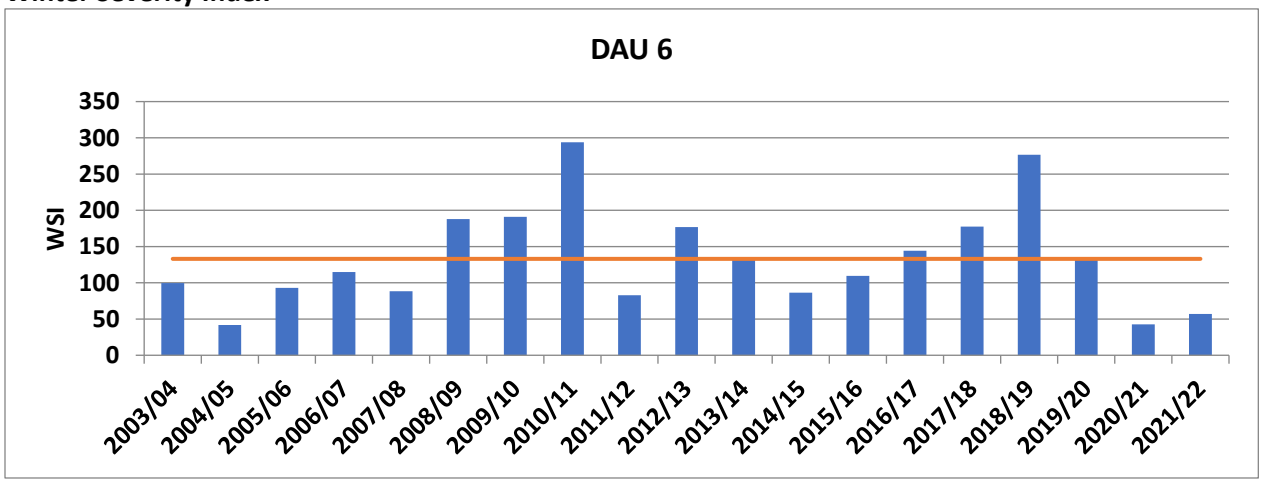


Harvest

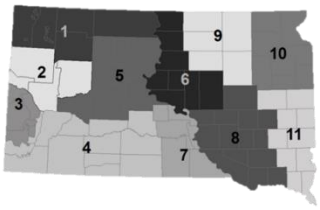




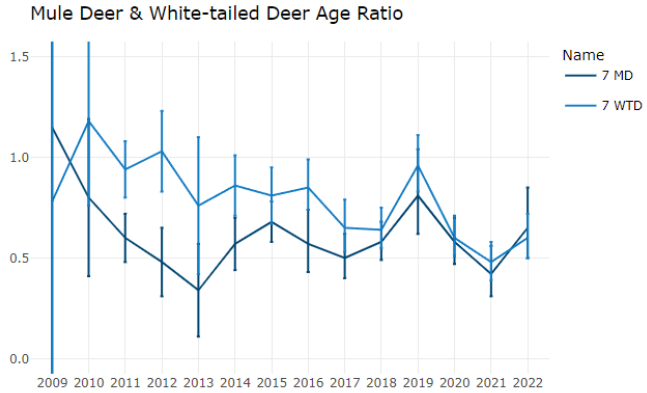
Winter Severity Index

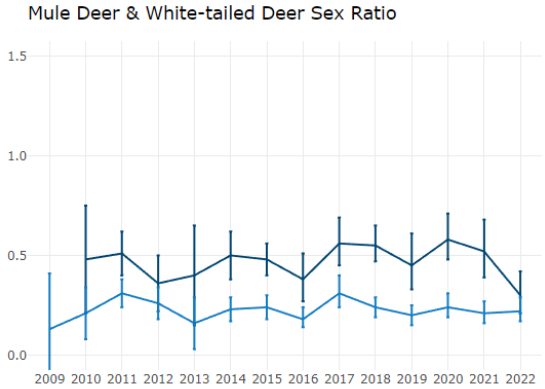


Appendix I. DAU 7 – Lower Missouri River Study Area

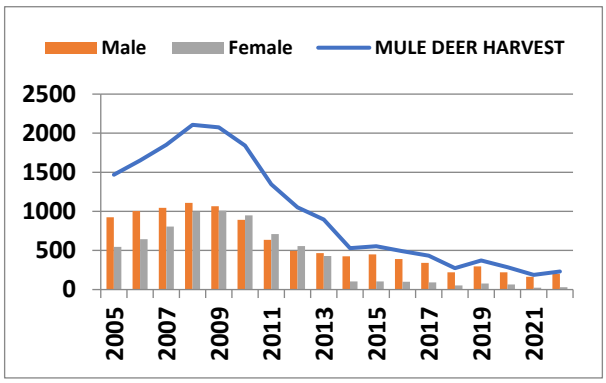


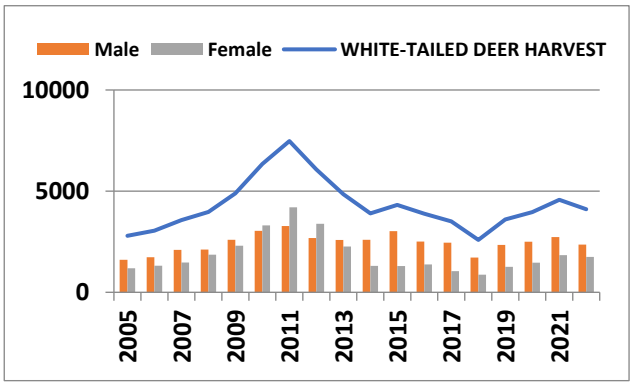
Herd Composition



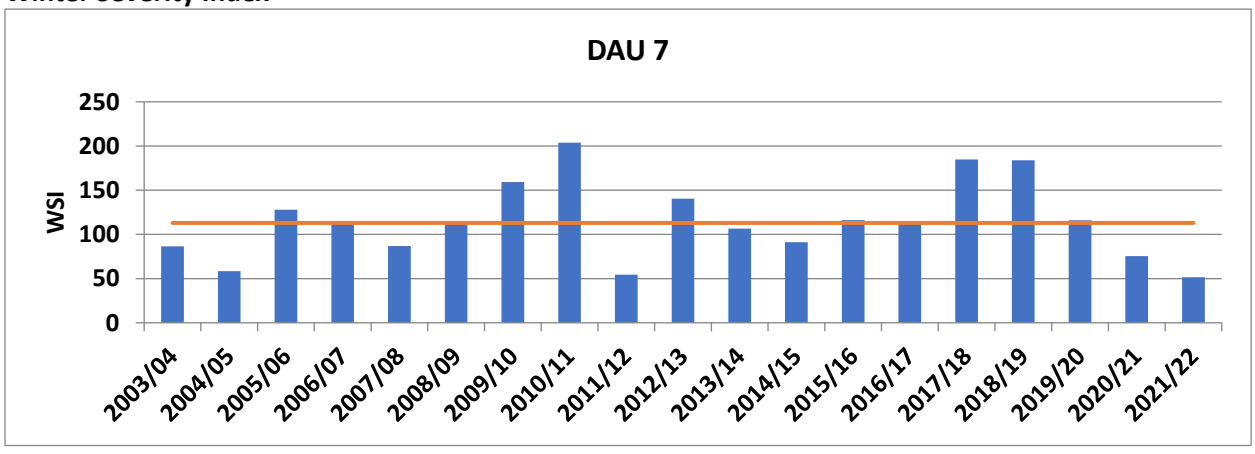


Harvest

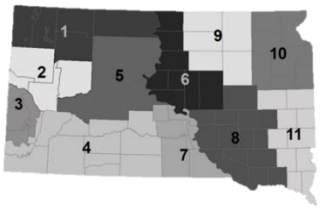




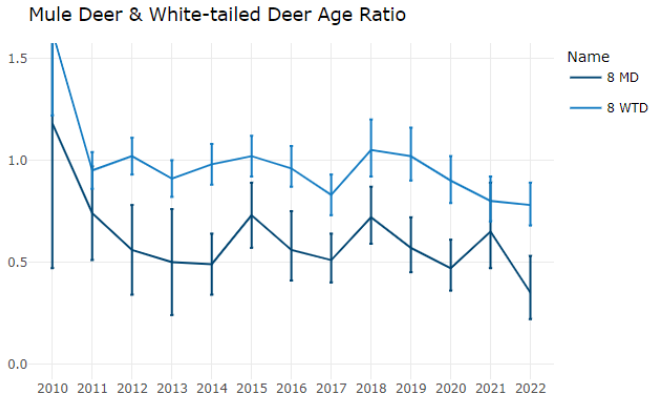
Winter Severity Index

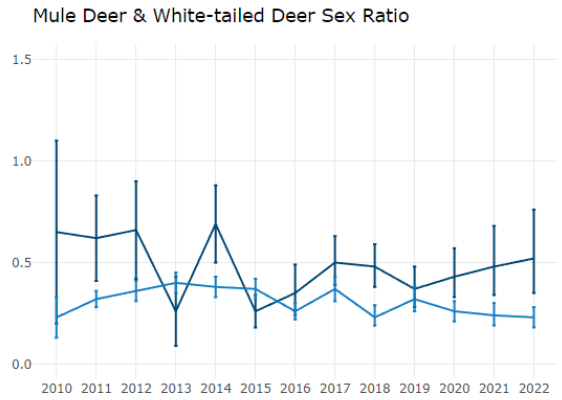


Appendix J. DAU 8 – Lower James River Study Area

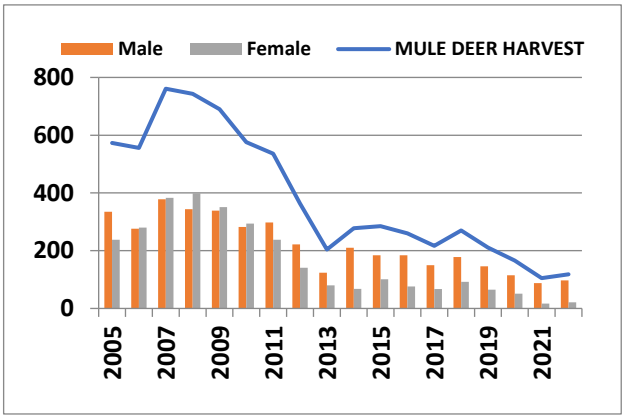


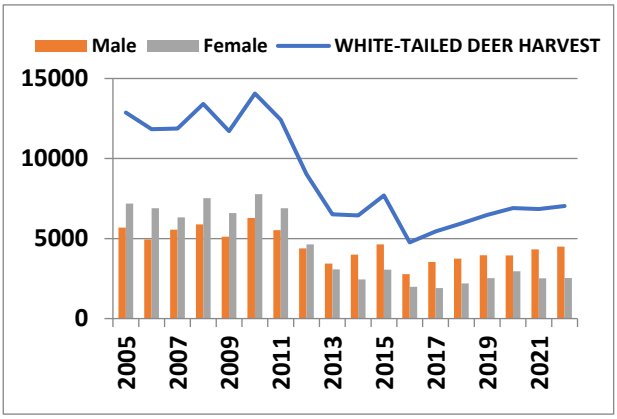
Herd Composition



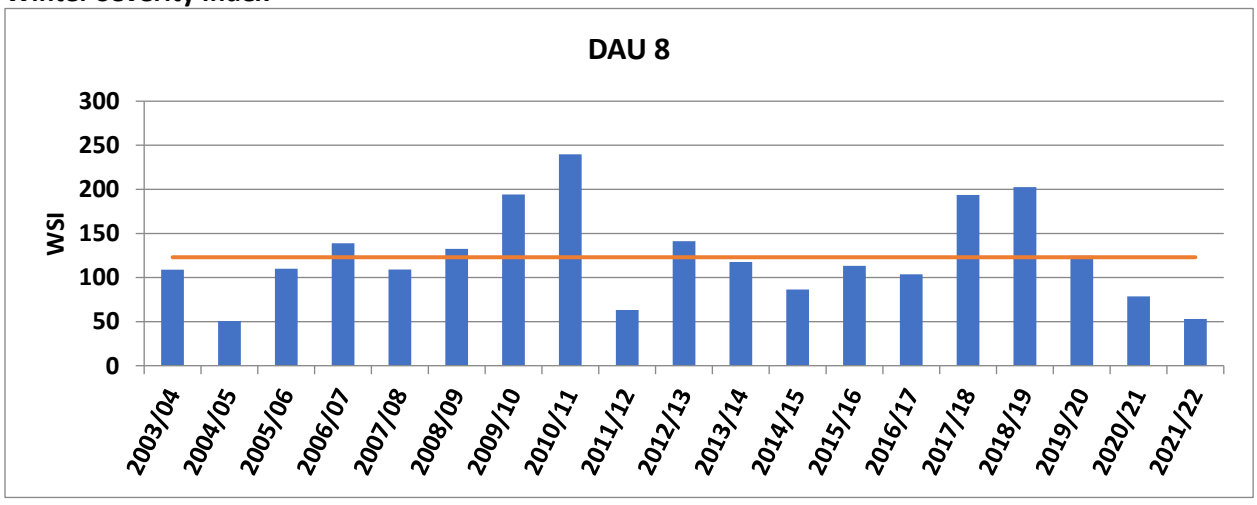


Harvest

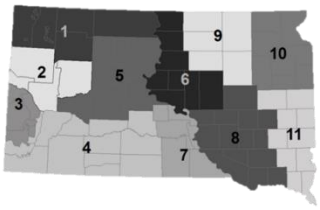




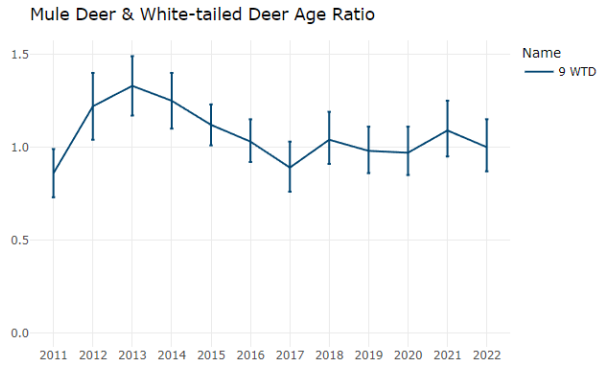
Winter Severity Index

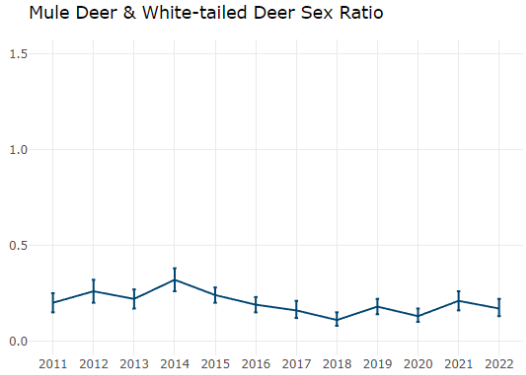


Appendix K. DAU 9 – Upper James River Study Area

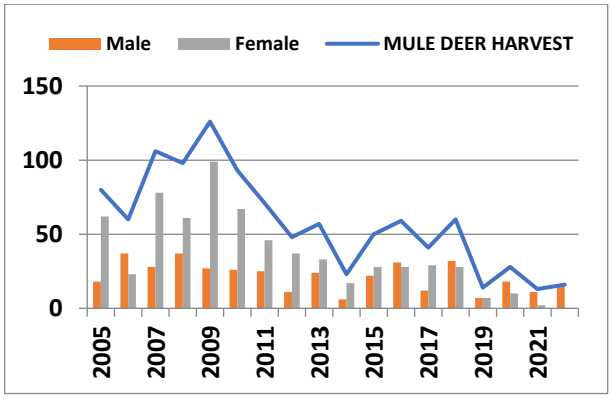


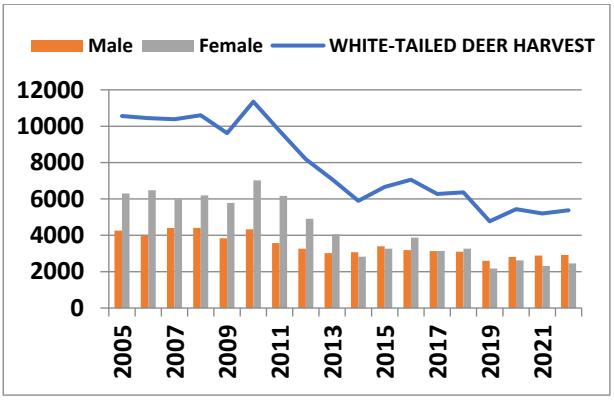
Herd Composition



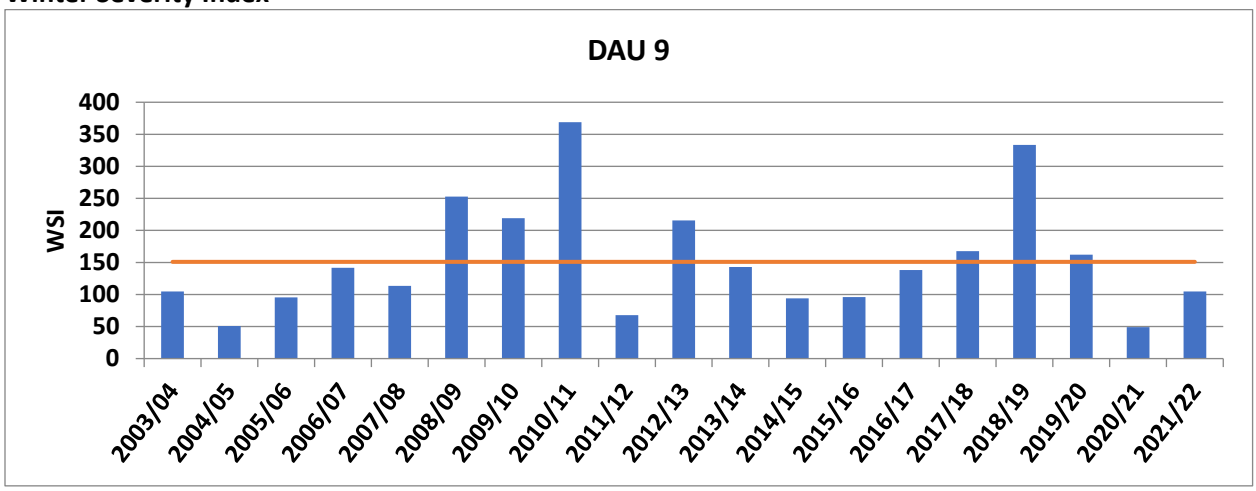


Harvest

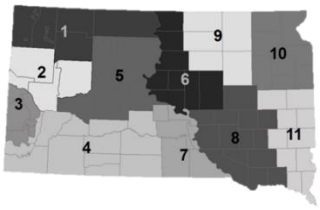




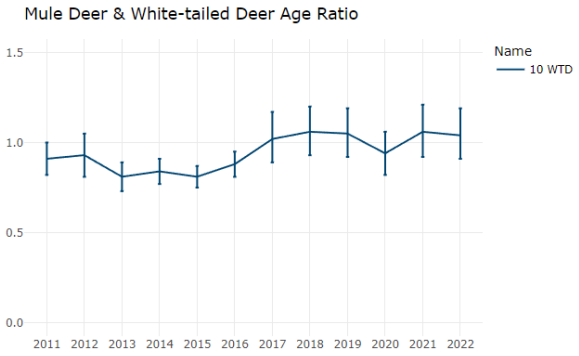
Winter Severity Index

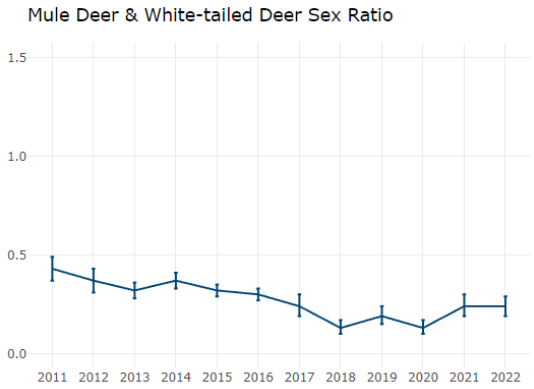


Appendix L. DAU 10 – Prairie Coteau Study Area

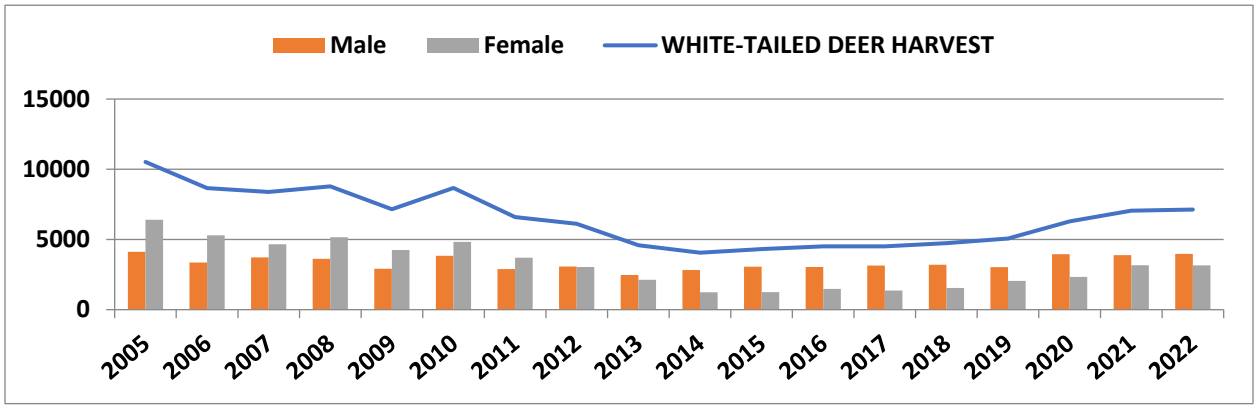


Herd Composition

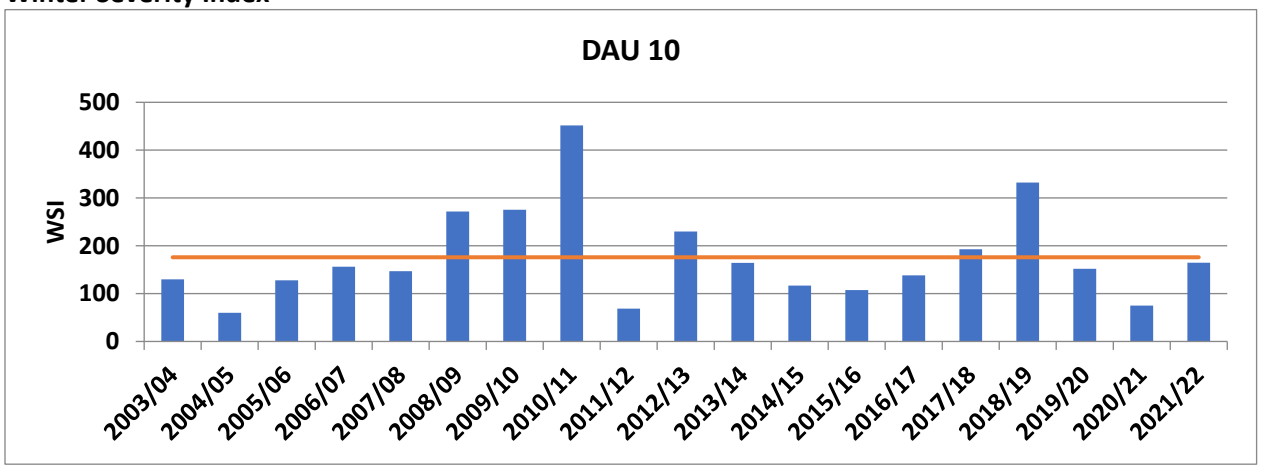




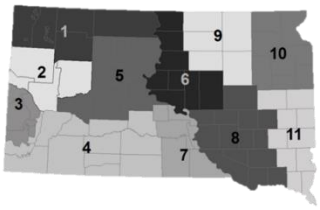
Harvest



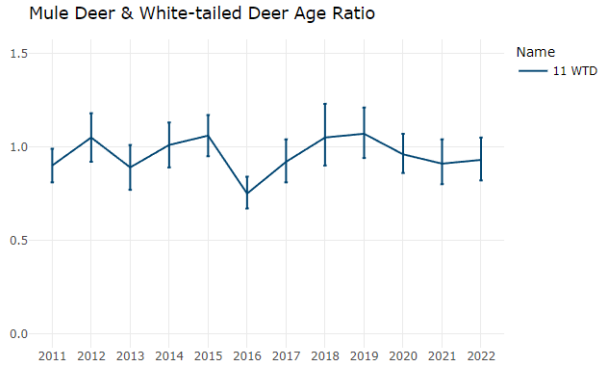
Winter Severity Index

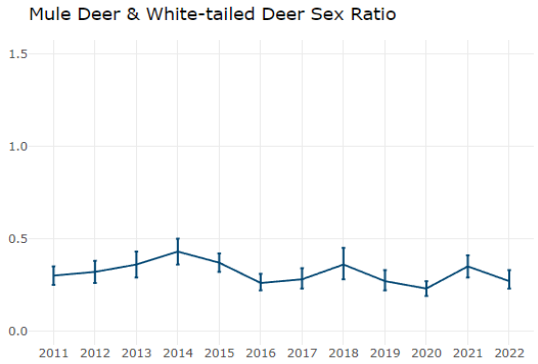


Appendix M. DAU 11 – Big Sioux River Study Area

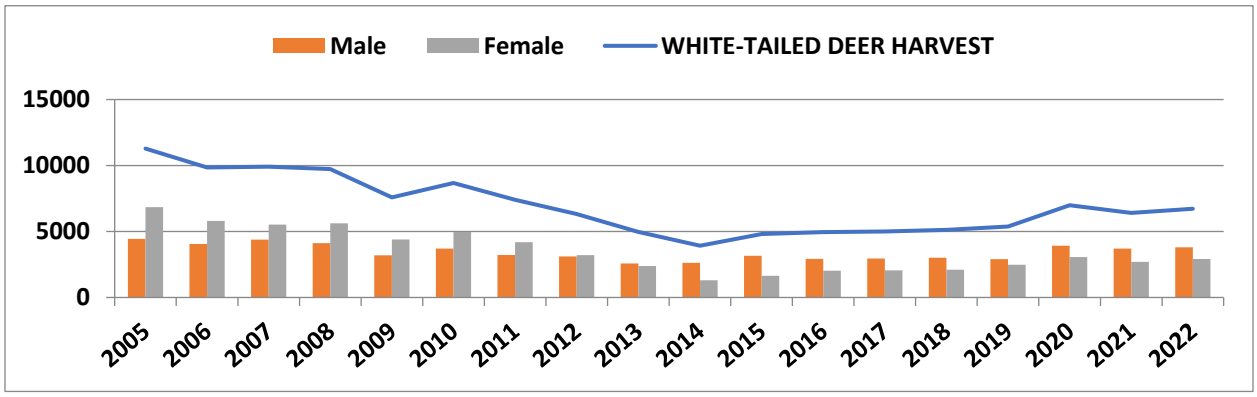


Herd Composition





Harvest



Winter Severity Index