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# South Dakota SURVEY REPORT

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## Deer Population Status Update

### *2025 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



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

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## 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 61,400 residents and 8,200 non-residents hunted deer in 2024, 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 GFP serves to connect people and families to the outdoors through effective management of our State's parks, fisheries, and wildlife resources. 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 management objectives and strategies in the state can be found in the South Dakota Deer Action Plan at [https://gfp.sd.gov/UserDocs/nav/Deer\\_Action\\_Plan\\_2024-2028.pdf](https://gfp.sd.gov/UserDocs/nav/Deer_Action_Plan_2024-2028.pdf), while additional information regarding deer management, research, and history can be found in the South Dakota White-tailed Deer and Mule Deer Management Plan at <https://gfp.sd.gov/UserDocs/nav/deer-mgmt.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).

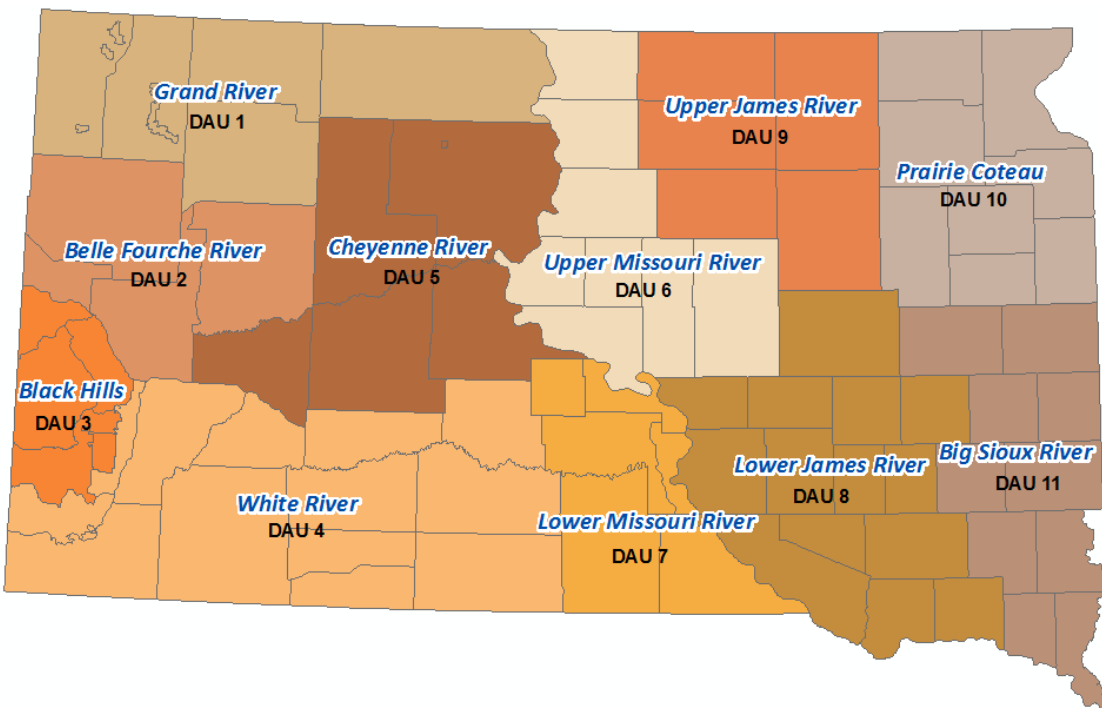


Figure 1. Data Analysis Units (DAUs) for deer management in South Dakota.

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).

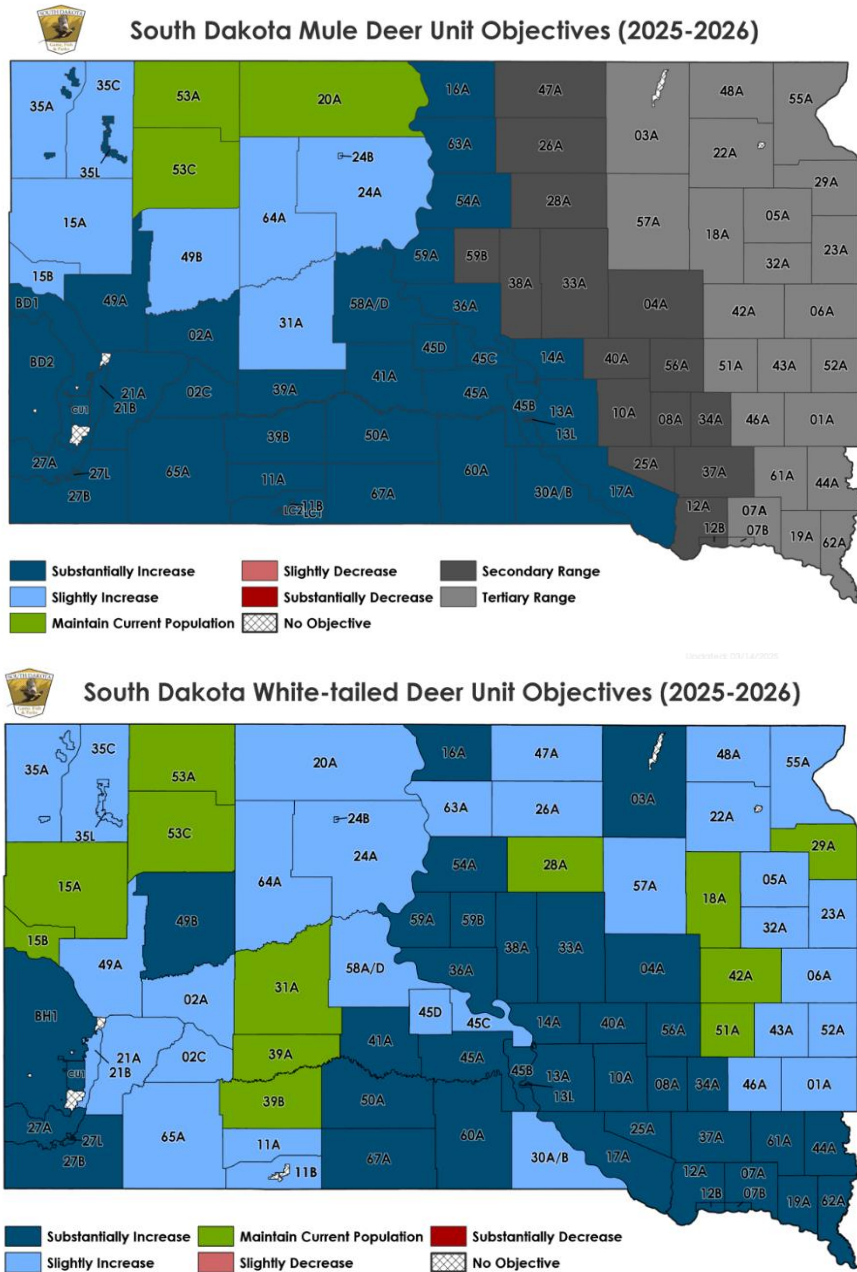


Figure 2. Population objectives for mule deer and white-tailed deer, 2025-26. Areas in gray are outside the primary range of the species and have limited suitable habitat.

## 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 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 decreased from about 51,600 deer in 2020 to 40,700 in 2024, primarily in response to hemorrhagic disease and overwinter mortalities documented in many herds of the state (Figure 3). GFP has reduced statewide white-tailed deer doe harvest to approximately 16,000 over the past couple of years to allow many herds in the state to increase to more desirable levels while maintaining harvest in other areas that are closer to the population objective. Statewide mule deer harvest has slowly decreased as well, from a low of about 7,400 in 2020 to 6,400 in 2024, mostly due to decreased doe harvest in youth/mentor seasons and reduced firearm hunting opportunities (Figure 3). A consistently low mule deer doe harvest of approximately 1,100 the past few years should allow deer herds in many parts of the state to grow to more desirable levels, although many areas are still substantially below objective (Figure 2 and Figure 3).

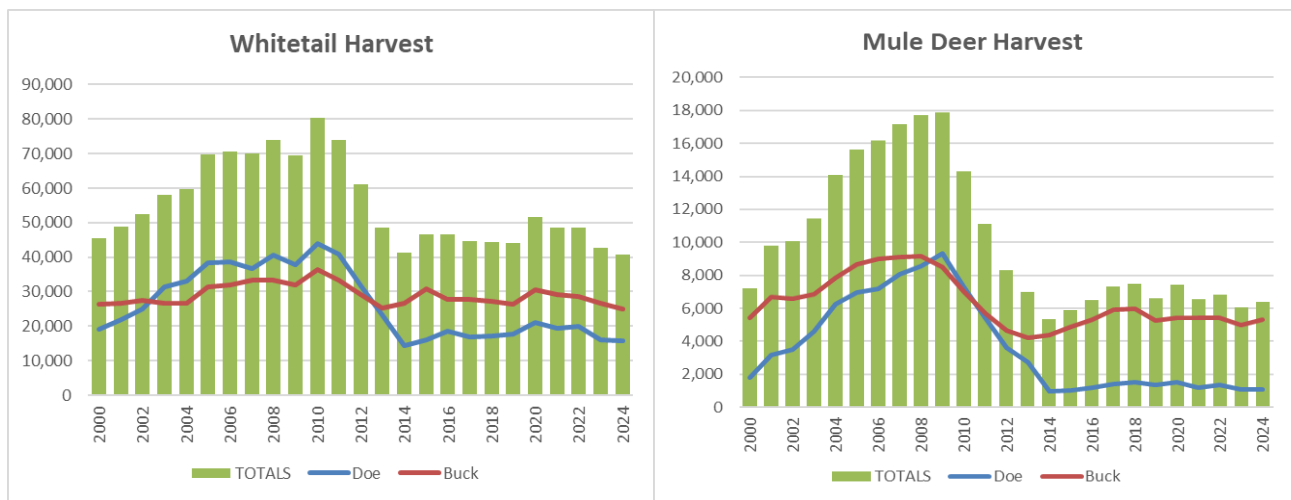


Figure 3. Estimated white-tailed deer and mule deer harvest trends, 2000-2024.

License sales for all deer seasons combined were 111,352 in 2023 and 110,102 in 2024. In 2024, there were about 69,553 unique deer hunters that collectively spent around 592,887 days participating in deer hunting. Harvest by weapon type for all firearm seasons in 2024 was about 37,900 deer, while archery and muzzleloader hunters harvested approximately 8,400 and 800 deer, respectively (Table 1). License sales and harvest information for each hunting season for 2024 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 Huxoll (2025) for more harvest information at the unit level.

Table 1. Deer harvest in 2024 by weapon type in South Dakota.

|              | White-tailed Deer | Mule Deer | Total  |
|--------------|-------------------|-----------|--------|
| Firearm      | 32,930            | 4,958     | 37,888 |
| Archery      | 7,115             | 1,289     | 8,404  |
| Muzzleloader | 648               | 146       | 794    |
| TOTAL        | 40,693            | 6,393     | 47,086 |

### Disease Monitoring

#### Chronic Wasting Disease

Since 2001, chronic wasting disease (CWD) has been found in 316 elk, 168 mule deer, and 346 white-tailed deer in numerous areas of South Dakota. In the past 2 hunting seasons, GFP has detected CWD in 49 white-tailed deer and 26 mule deer (Figure 4). There were 2 positive white-tailed deer and 1 positive mule deer detected over the last 2 years within the boundaries of Wind Cave National Park, and 1 positive white-tailed deer detected within the boundaries of Custer State Park. Four CWD positive white-tailed deer and 1 mule deer were detected within the Black Hills firearm units, 41 white-tailed deer and 22 mule deer within West River firearm units, and 2 mule deer and 1 white-tailed deer within East River firearm units. Figure 4 shows the documentation of CWD within South Dakota over the past 2 years. Prior to 2023, CWD had been documented in 17 counties in West River and 3 counties in East River. During the 2024 hunting seasons, CWD was documented in 1 additional county in West River, and 1 additional county in East River (Figure 4). A total of 22 counties within SD have documented CWD in at least one deer (18 West River, 4 East River).

The South Dakota Chronic Wasting Disease Action Plan was approved by the GFP Commission in June of 2019 and updated in 2023

([https://gfp.sd.gov/userdocs/docs/sd\\_cwd\\_action\\_plan\\_south\\_dakota\\_june\\_2023.pdf](https://gfp.sd.gov/userdocs/docs/sd_cwd_action_plan_south_dakota_june_2023.pdf)).

Communication with all stakeholders within South Dakota was 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.

## Chronic Wasting Disease Positives in South Dakota

July 1, 2023 - April 2025

Total Positives: 75 | 2023-2024: 45 | 2024-Apr 2025: 30

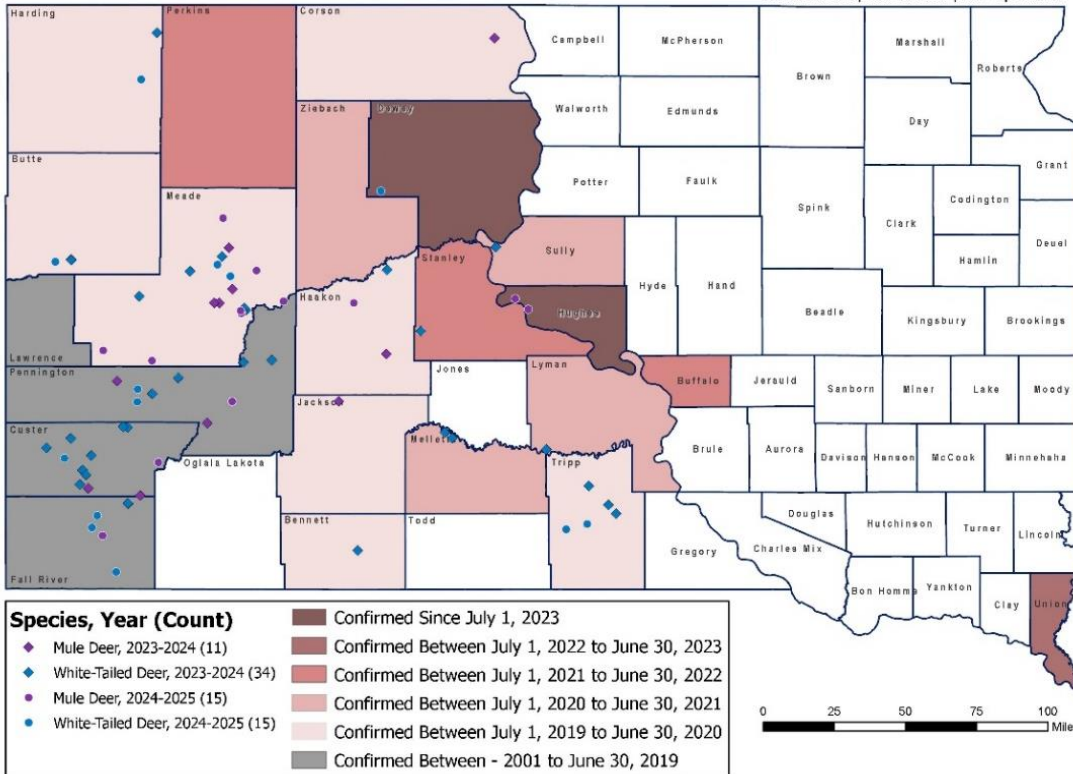


Figure 4. Chronic wasting disease positive wild white-tailed and mule deer in South Dakota, July 2023-April 2025.

### Hemorrhagic Disease

The State of South Dakota experienced a disease mortality event of white-tailed deer during September-November of 2023 and 2024 due to Epizootic Hemorrhagic Disease (EHDV) and Blue Tongue (BTV) (Figure 5). During both years, GFP received reports of sick and deceased white-tailed deer, mule deer, and pronghorn. As in previous years, with mortality in the summer or late 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 22 white-tailed deer in 2023. (Figure 5). Additionally, through laboratory testing in 2024, confirmation was received that EHDV or BTV was present in 25 white-tailed deer and 1 pronghorn (Figure 5). During both years of documentation, GFP investigated many sick and dead ungulates that were associated with EHDV/BTV.

Nineteen counties in 2023 and 29 counties in 2024 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 203 dead or sick white-tailed deer were recorded in 2023. In 2024, a total of 401 dead or sick animals were recorded, which included 398 white-tailed deer, 2 mule deer, and 1 pronghorn. Figure 6 shows annual mortality recorded from reported hemorrhagic deaths in South Dakota.

Reported losses from hemorrhagic disease in 2023 did not affect populations to the extent that leftover tags or selected unit refunds were offered to hunters. In 2024, hemorrhagic losses affected populations to the extent that hunters were advised that they could return tags for East River deer seasons due to the disease. 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. A total of 372 East River Deer firearm licenses were voluntarily returned.

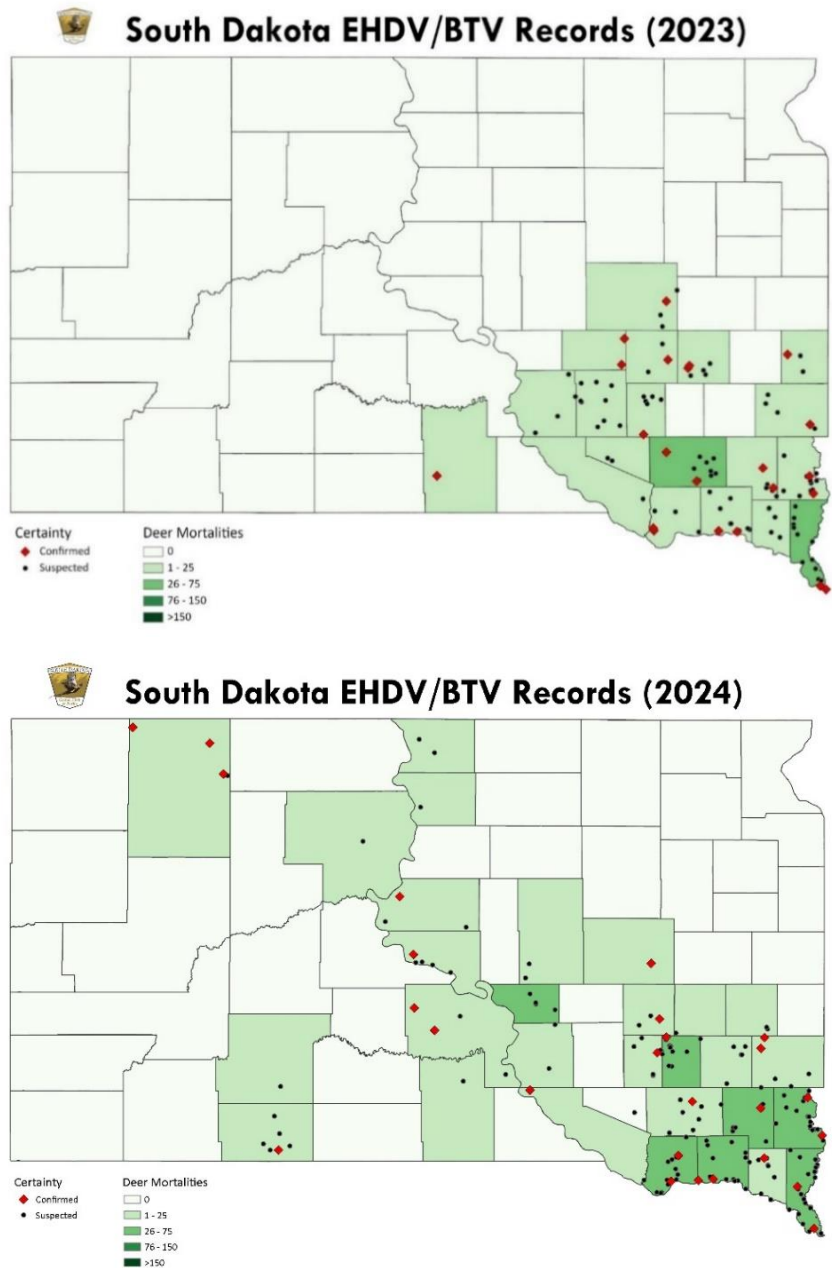


Figure 5. Locations of reported deer and pronghorn mortalities presumably caused by Hemorrhagic disease in South Dakota in 2023 (top) and 2024 (bottom). Red locations indicate positive results from laboratory testing.

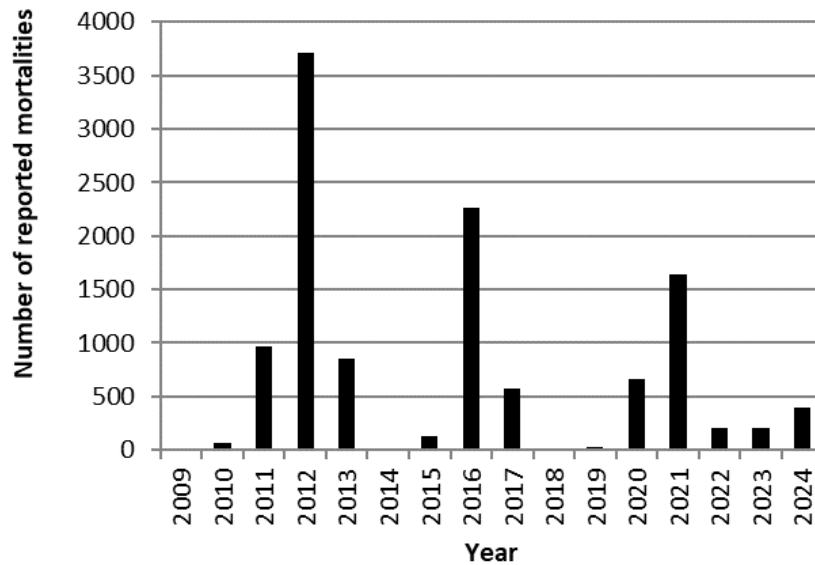


Figure 6. Annual reported hemorrhagic disease mortalities of deer, elk, pronghorn, and bighorn sheep in South Dakota, 2009-2024.

### 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 by the number of fawns, does, and bucks. Spatial data are also recorded for each observation 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 2024, GFP staff counted and classified 15,944 deer (5,745 mule deer; 10,199 white-tailed deer) to estimate herd composition across the state. Statewide sex ratios were 22 bucks:100 does (95% CI: 21-23) for white-tailed deer and 38 (35-40) for mule deer. Statewide recruitment of white-tailed deer is consistently higher than that observed in mule deer populations (Figure 7). In 2024, mule deer recruitment was 74 fawns:100 does (95% CI: 70-78) statewide but varied from a high of 93 (66-130) in DAU 7 to a low of 44 (29-64) in DAU 8. For white-tailed deer, recruitment varied from 55 (47-66) in DAU 6 to 104 (91-119) in DAUs 9 and 10 but averaged 81 (77-84) 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.

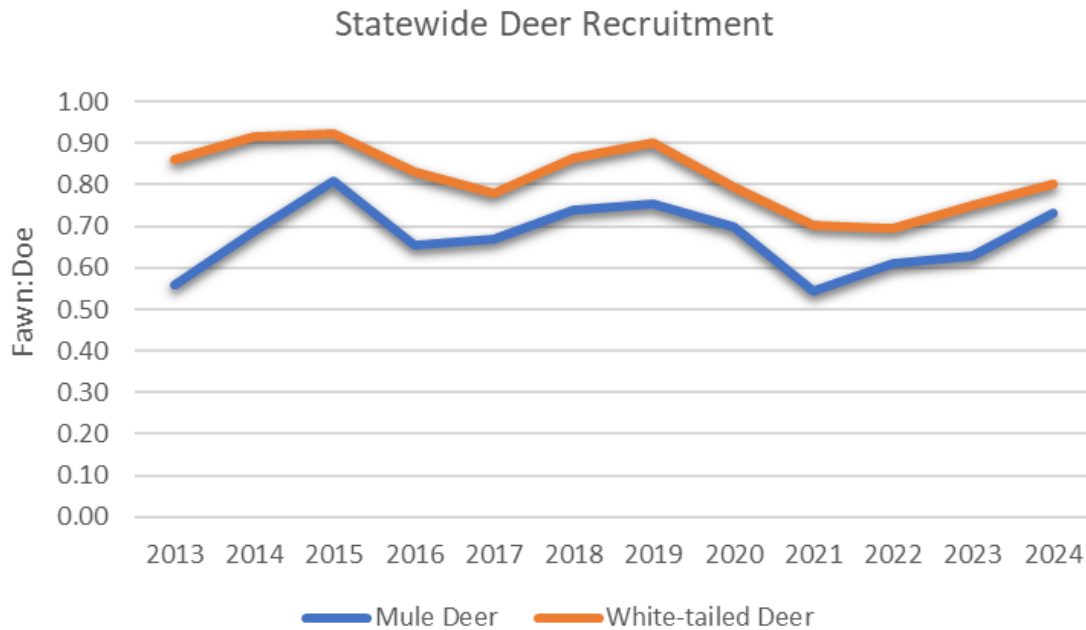


Figure 7. Statewide fawn:doe ratios observed during herd composition surveys to estimate recruitment for white-tailed deer and mule deer in South Dakota, 2013 – 2024.

### 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 once a 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. Sample size goals of 105 adult and 110 juvenile radio-collared deer have been set to obtain statistically valid survival estimates within a defined data analysis unit. 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). Routine capture and collaring efforts have currently been suspended, however, monitoring continues of GPS collared mule and white-tailed deer in DAU 1 (northwest South Dakota; approximately 159 adults with active collars) following the recent completion of a deer research project (Moeller 2022). Future efforts towards survival monitoring will be determined by budget and funding priorities.

Preliminary survival estimates are available in DAU 1 for white-tailed deer and mule deer in 2023 and 2024 (Tables 2 and 3). Annual survival of adult does last year was near or slightly better than expected with average survival rates of 84% (95% CI: 76-94%) for mule deer and 86% (95% CI: 77-96%) for white-

tailed deer. Survival of white-tailed deer adult does in the northwest has been lower than average the past few years (bio-years 2021-2023), possibly due to a combination of hemorrhagic disease, winter mortality, and drought conditions (Figure 9). Mule deer doe survival appeared slightly lower than average in bio-years 2022 and 2023. Currently, sample sizes for male mule and white-tailed deer with GPS collars are too low to accurately estimate survival with any precision.

All Deer Capture Locations (4,601 deer)

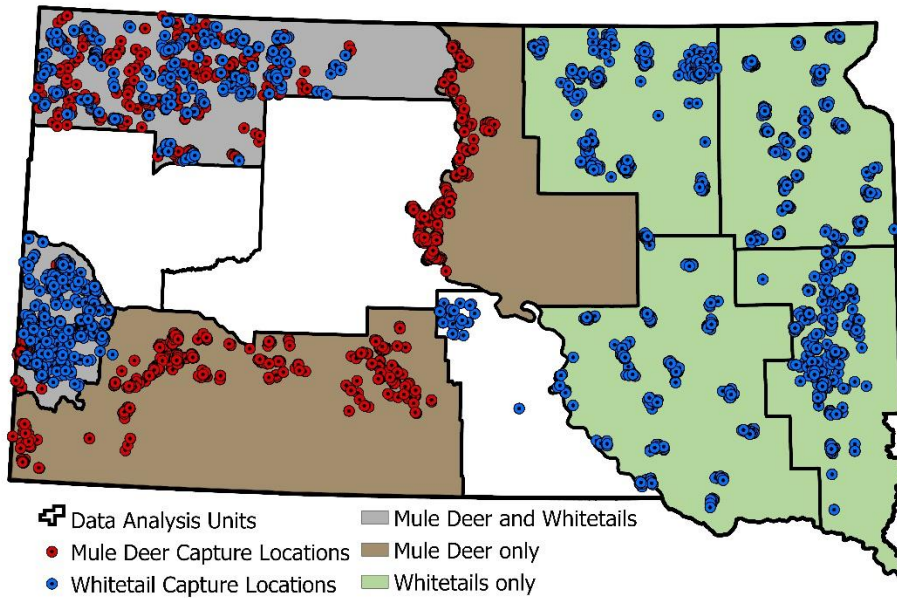


Figure 8 . Winter capture locations of radio-collared mule deer and white-tailed deer in South Dakota, 2013-2021.

Table 2. Preliminary annual survival rates of white-tailed deer in DAU 1 in 2023 and 2024.

| White-tailed Deer Survival (Sep 1-Aug 31) |            |          |        |          |
|---|------------|----------|--------|----------|
| Adult Bucks                               |            |          |        |          |
| Year                                      | Study Area | Survival | 95% CI | <i>n</i> |
| 2023                                      | DAU 1      | 83%      | 71-96  | 39       |
| 2024                                      | DAU 1      | *        | *      | *        |
| Adult Does                                |            |          |        |          |
| Year                                      | Study Area | Survival | 95% CI | <i>n</i> |
| 2023                                      | DAU 1      | 70%      | 61-80  | 96       |
| 2024                                      | DAU 1      | 86%      | 77-96  | 56       |

\*Sample size is too low for accurate estimates.

Table 3. Preliminary annual survival rates of mule deer by DAU in 2023 and 2024.

| Mule Deer Survival (Sep 1-Aug 31) |            |          |        |          |
|-----------------------------------|------------|----------|--------|----------|
| Adult Bucks                       |            |          |        |          |
| Year                              | Study Area | Survival | 95% CI | <i>n</i> |
| 2023                              | DAU 1      | 90%      | 80-100 | 32       |
| 2024                              | DAU 1      | *        | *      | *        |
| Adult Does                        |            |          |        |          |
| Year                              | Study Area | Survival | 95% CI | <i>n</i> |
| 2023                              | DAU 1      | 78%      | 70-87  | 108      |
| 2024                              | DAU 1      | 84%      | 76-94  | 65       |

\*Sample size is too low for accurate estimates.

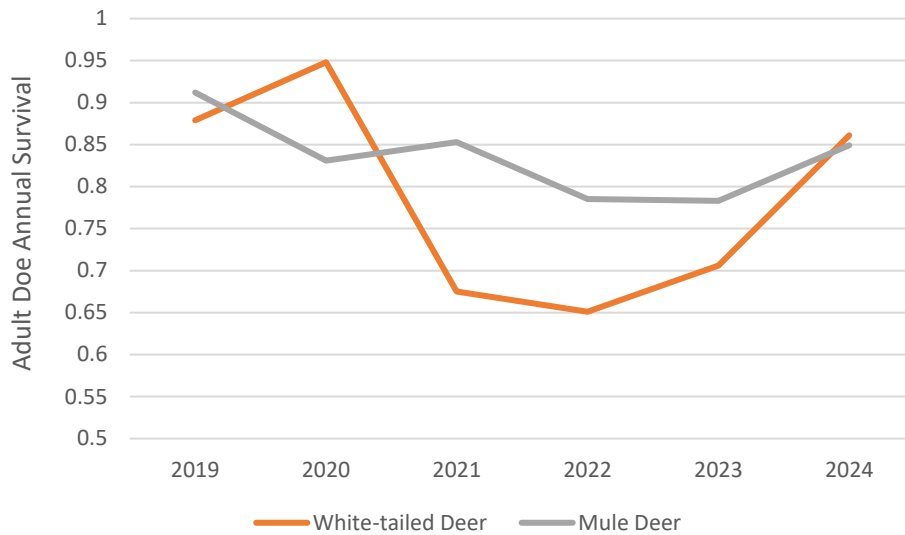


Figure 9 . Annual survival of adult does for mule and white-tailed deer in DAU 1 of northwestern South Dakota, bio-years 2019-2024. Bio-year example for 2024 = 1 Sep 2023 – 31 Aug 2024.

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.

## 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) applies to DAU 9 and DAU 10 with a detection rate of 84.4% and visibility significantly influenced by group size and canopy cover.

Aerial survey methods involve using a fixed-wing aircraft flown at speeds <100 miles per hour, and altitudes between 100 to 200 feet above ground level. Two observers, not including the pilot, record and classify all deer observed  $\leq 0.25$  miles of each side of the aircraft. Transects of  $\frac{1}{2}$  mile width are established over the entire area, and a systematic 50% of those are surveyed.

The last aerial deer surveys were flown in the winter of 2022-23, and both DAUs 9 and 10 were surveyed during 100% snow cover conditions. The estimate for white-tailed deer in DAU 9 and DAU 10 was 37,357 (95% CI: 35,312 - 39,706) and 27,471 (95% CI: 25,513 - 29,791), respectively. The next aerial deer survey is scheduled to occur during the winter of 2028 or 2029, pending adequate snow conditions.

### 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 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 10). Surveys are conducted during the last two weeks of August, beginning  $\frac{1}{2}$  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.

Distance sampling surveys from 2019 to 2023 suggested a relatively stable population of white-tailed deer in the Black Hills of approximately 35,000 – 40,000 deer. In 2024, the white-tailed deer population estimate of 54,558 ( $\pm 6,769$  SE) was substantially higher than previous years, suggesting deer in the Black Hills are increasing (Figure 11). 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.

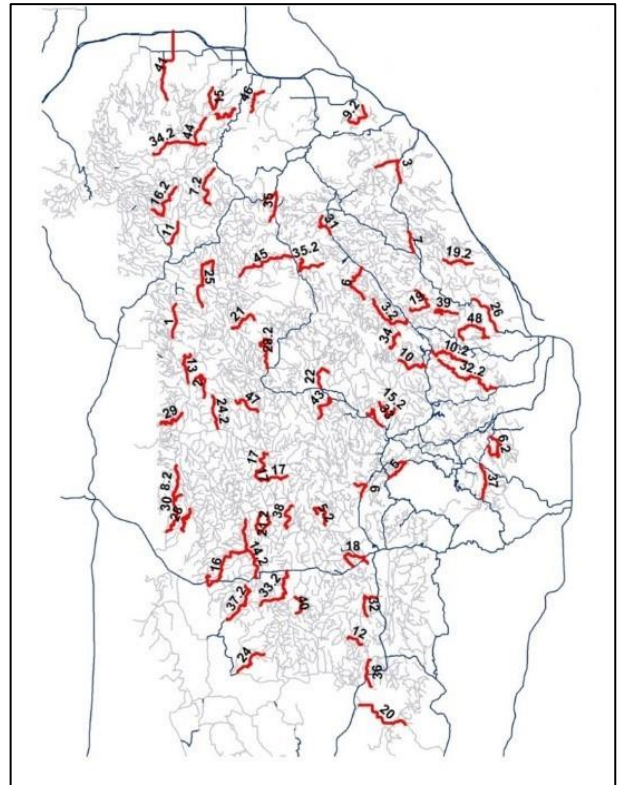


Figure 10. Road transects used for spotlight deer survey in the Black Hills.

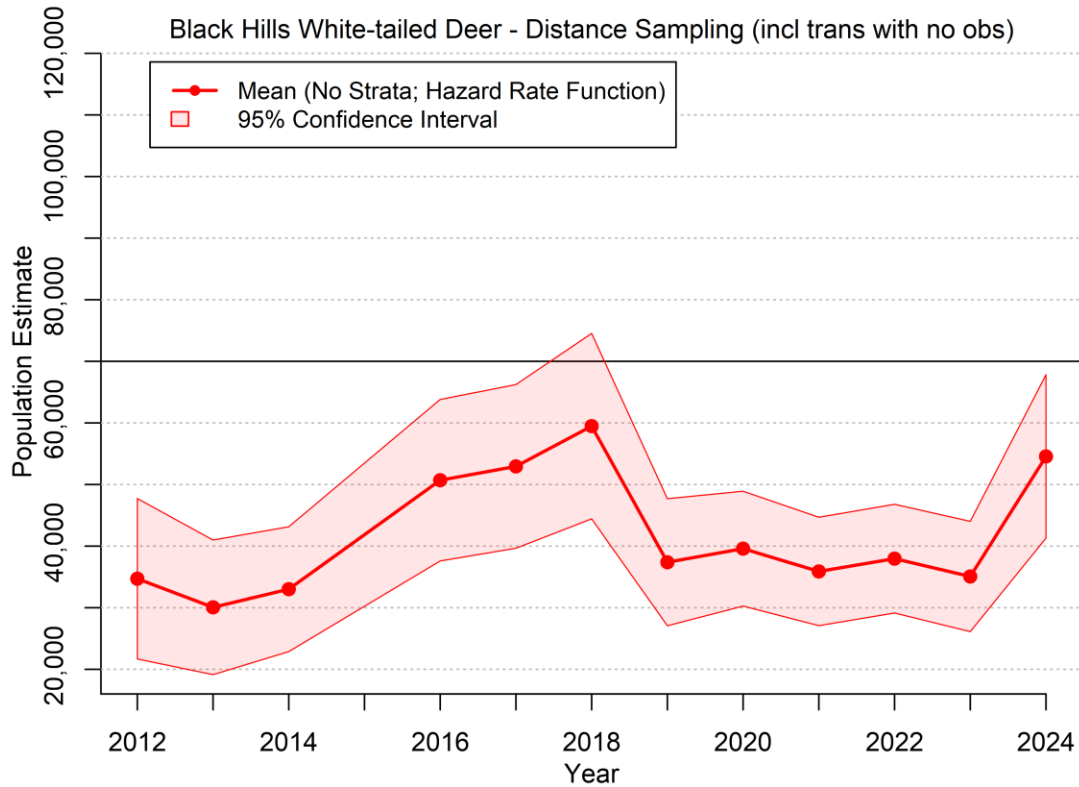


Figure 11. Estimates of white-tailed deer in the Black Hills from distance sampling transects, 2012 – 2024.

### 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/satisfaction/deer opinion 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:  $0.1456 (\text{DAU Objective}) + 0.5631 = \text{Lambda Objective}$ .

Table 4. Categorical objective values based on qualitative objective.

| <b>Qualitative Objective</b> | <b>Unit Objective</b> | <b>DAU Objective</b> | <b>Lambda Objective</b> |
|------------------------------|-----------------------|----------------------|-------------------------|
| 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's 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 2024, harvest reconstruction estimates resulted in ~392,761 white-tailed deer and ~114,938 mule deer in South Dakota.

### **Winter Severity Index**

Winter severity is an important metric affecting 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 affects

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 2023/24 to 2024/25 were relatively mild compared with normal 25-year average winter data, and little if any deer losses were expected (Figure 12 and 13).

The winter of 2024-25 was milder than average in much of South Dakota, and suspected mortalities were minimal. 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, the last severe winter documented, approximately 155 reports were recorded of deer that died presumably due 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.

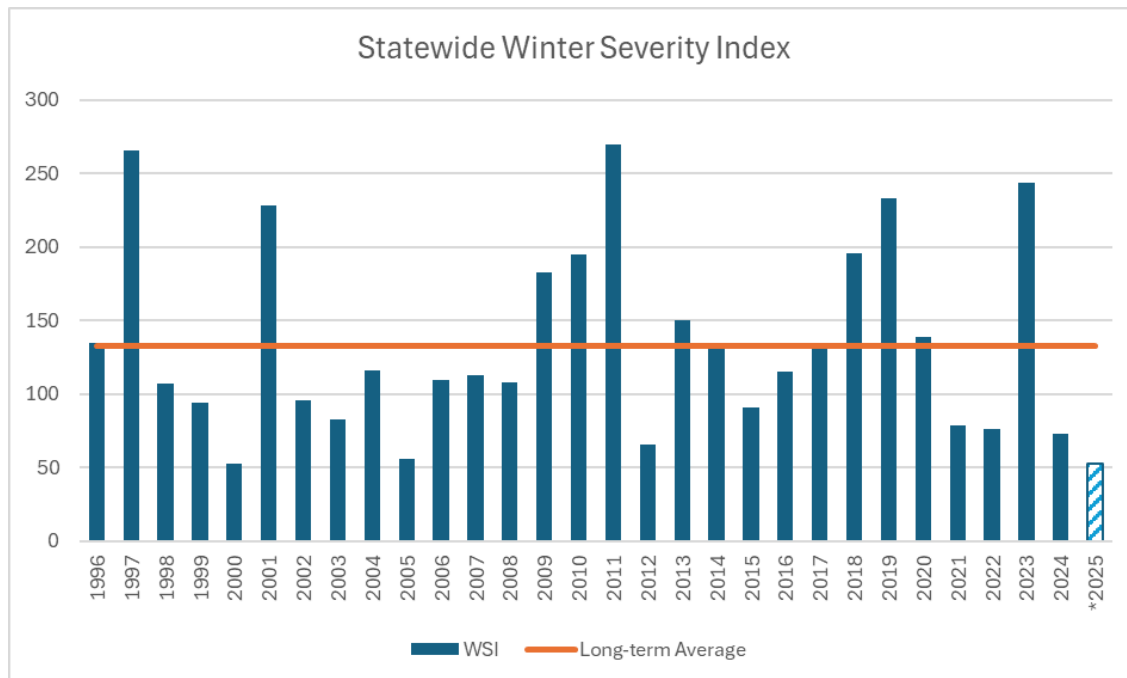
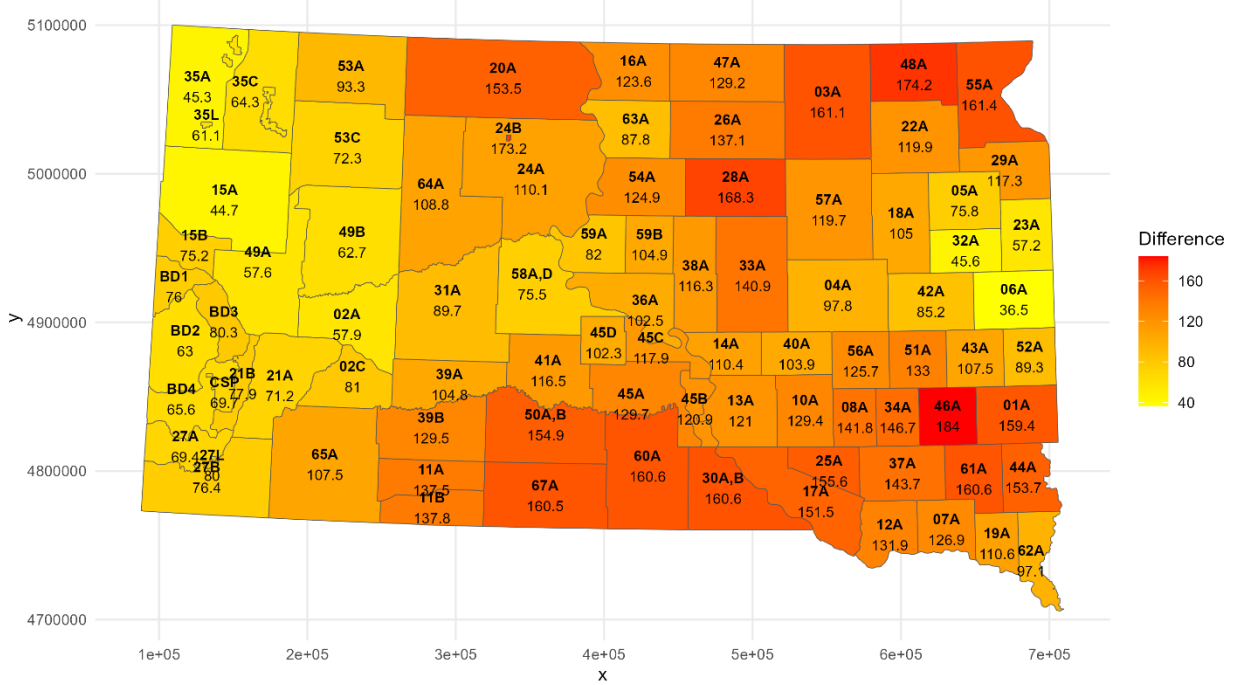


Figure 12. Yearly statewide winter severity indices in South Dakota compared with 25-year average, 2003-04 to 2023-24. \*WSI data for 2024/25 are preliminary and incomplete.

2023 WSI Difference from Avg



2024 WSI Difference from Avg

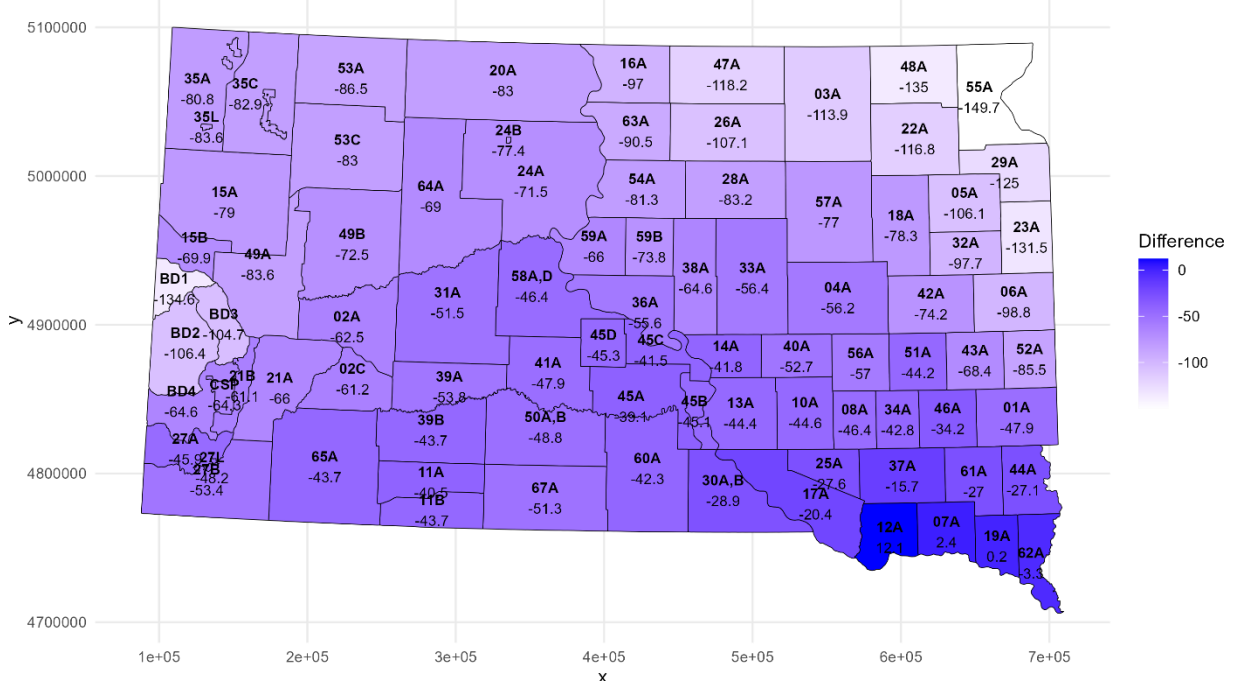


Figure 13 . Winter severity index values compared with 25-30 year normal in South Dakota for the winters of 2022-23 and 2023-2024.

Data analyses to evaluate how varying degrees of winter severity values impact deer population performance are ongoing. 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 69,553 unique deer hunters spending well over half a million days hunting in 2024. 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 increasing, 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 2024 was about 40,700 white-tailed deer and 6,400 mule deer, slightly lower than 2023. Survival rates of both mule and white-tailed deer are currently monitored in northwestern South Dakota, with adult doe survival in 2024 at or above normal rates. Aerial deer surveys are conducted approximately every 6 years and were last conducted in 2022/23 in the northeast part of the state. Distance sampling road transects in the Black Hills were conducted and suggesting white-tailed deer populations are increasing. 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 of the state over the past 2 years; however, southeastern South Dakota experienced significant hemorrhagic disease losses in 2023 and 2024 that substantially affected local deer herds. Winter severity varies by area of the state, but statewide, the winters were mostly mild in 2023/24 and 2024/25. The winter of 2024/25 has just concluded, but substantial losses of deer due to over-winter mortality have not been observed in any management units in 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.
- Huxoll, C. 2025. 2024 Big game harvest projections. *In progress*. South Dakota Game, Fish and Parks, Pierre, South Dakota, USA.
- Moeller, A. K. 2022. Making “habitat quality” meaningful: quantifying demographic effects of habitat in two sympatric species. Dissertation, University of Montana, Missoula, Montana, 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.
- South Dakota Department of Game, Fish and Parks. 2024. South Dakota white-tailed and mule deer action plan, 2024-2028. Wildlife Division Report 2024-01. 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

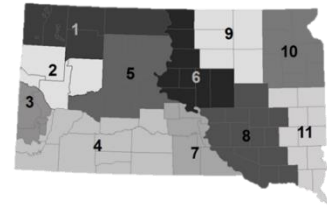
**Appendix A.** The 2024 South Dakota Deer Action Plan objective 2 strategies to manage hunting opportunity fairly and equitably among various user groups and interests within South Dakota.

- a) Modify and adopt future hunting season structure as needed to maximize hunting opportunity for unique hunters and minimize regulation complexity.
- b) In Custer State Park, “Any whitetail” licenses will be set at 1% of the current CSP white-tailed deer population estimate (calculated as CSP acreage x Black Hills white-tailed deer density). No more than 50 “any whitetail” licenses will be issued in any year. “Any deer” licenses will be set at 1% of the current Black Hills Type 01 license allocation.
- c) Manage Limited Access Units (27L and 35L) and CSP for a quality hunting experience by using the following established thresholds:
  - Maintain a minimum 1<sup>st</sup> tag harvest success of 75% (3-year average) for licenses containing “any deer” or “any whitetail” firearm tags; or
  - 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.
- d) Manage for a minimum 1<sup>st</sup> tag harvest success (3-year average) for licenses containing “any deer” or “any whitetail” as follows:
  - 60% in the Black Hills firearm deer season
  - 60% in each West River firearm deer season unit
  - 50% in each East River and National Wildlife Refuge firearm deer season unit
  - 40% (3-year average) for muzzleloader licenses containing “any deer” or “any whitetail” tags in each National Wildlife Refuge deer hunting unit.
- e) Archery and muzzleloader antlerless harvest opportunities will be managed as follows:
  - If 0-50 firearm antlerless tags are offered – the management unit may or may not be open to archery and muzzleloader antlerless-only white-tailed deer hunting.
  - If >50 firearm antlerless tags are offered – the management unit will be open to archery and muzzleloader antlerless-only white-tailed deer hunting.
- f) Other antlerless harvest opportunities will be managed as follows:
  - Antlerless-only firearm tags may be used during late seasons in units with > 0 firearm antlerless licenses offered.
  - Landowner free antlerless-only tags available in units with > 0 firearm antlerless licenses offered.
  - Youth/Mentor/Apprentice antlerless-only tags – always available, but unit boundaries for any deer and white-tailed deer only tags may be changed based on population growth objectives.
- g) Manage mule deer populations according to habitat available and range designation (see Figure 2 objectives map for delineation):
  - Primary range – Population objectives established, continuous population monitoring, and all license types available to meet management needs.
  - Secondary range – No established objectives, no population monitoring (except harvest), and antlerless license types limited to Type 13 (antlerless-only whitetail). No restrictions on antlered license types.
  - Tertiary range – No established objectives, no population monitoring (except harvest), and license types limited to Type 13 (antlerless-only whitetail) and Type 01 (any deer) for antlered any deer.

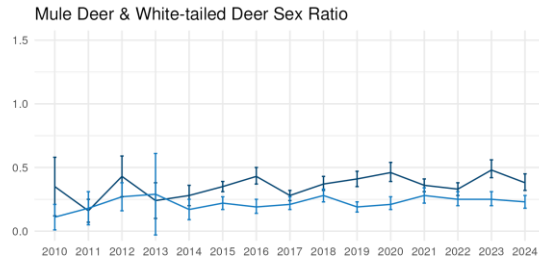
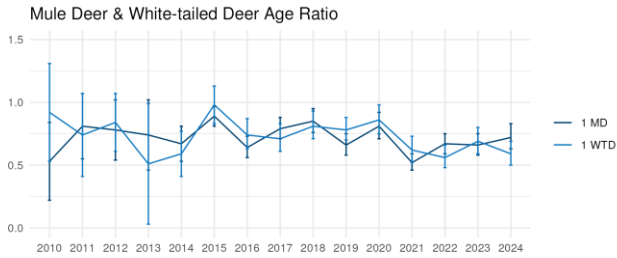
**Appendix B.** Harvest information for mule deer and white-tailed deer hunting season in 2024 in South Dakota.

| Season              | tags sold | tag success | mule deer harvest |     |       | white-tailed deer harvest |       |        |
|---------------------|-----------|-------------|-------------------|-----|-------|---------------------------|-------|--------|
|                     |           |             | buck              | doe | total | buck                      | doe   | total  |
| Archery             | 34,554    | 24%         | 1,152             | 137 | 1,289 | 5,257                     | 1,858 | 7,115  |
| Apprentice          | 567       | 52%         | 6                 | 12  | 18    | 25                        | 276   | 301    |
| Mentored            | 7,003     | 58%         | 18                | 252 | 270   | 303                       | 2,825 | 3,128  |
| Muzzleloader        | 3,111     | 28%         | 134               | 12  | 146   | 202                       | 446   | 648    |
| LOL Free Antlerless | 809       | 23%         | 0                 | 0   | 0     | 17                        | 219   | 236    |
| WR Deer             | 23,809    | 55%         | 2,792             | 333 | 3,125 | 5,802                     | 3,577 | 9,379  |
| WR Deer LOL         | 4,206     | 50%         | 416               | 171 | 587   | 813                       | 329   | 1,142  |
| WR Special Buck     | 1,997     | 72%         | 455               | 5   | 460   | 966                       | 11    | 977    |
| ER Deer             | 24,651    | 77%         | 170               | 12  | 182   | 6,904                     | 3,547 | 10,451 |
| ER Deer LOL         | 12,685    | 38%         | 65                | 31  | 96    | 2,407                     | 1,251 | 3,658  |
| ER Special Buck     | 491       | 54%         | 21                | 2   | 23    | 235                       | 6     | 241    |
| Sand Lake NWR       | 110       | 27%         | 0                 | 0   | 0     | 28                        | 3     | 31     |
| Lacreek NWR         | 22        | 56%         | 0                 | 0   | 0     | 11                        | 1     | 12     |
| Waubay NWR          | 21        | 47%         | 0                 | 0   | 0     | 7                         | 4     | 11     |
| Black Hills Deer    | 3,216     | 63%         | 84                | 0   | 84    | 1,701                     | 255   | 1,956  |
| Custer State Park   | 20        | 83%         | 0                 | 0   | 0     | 17                        | 0     | 17     |

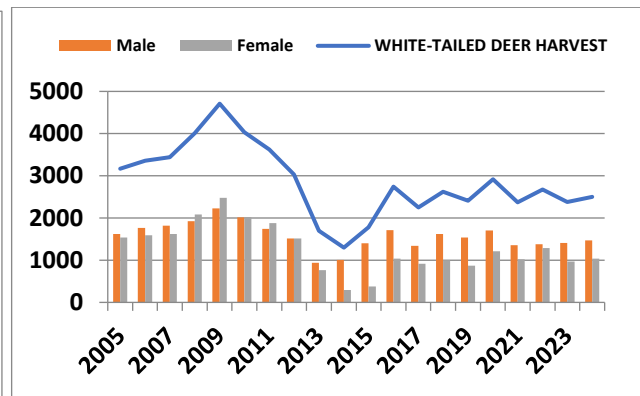
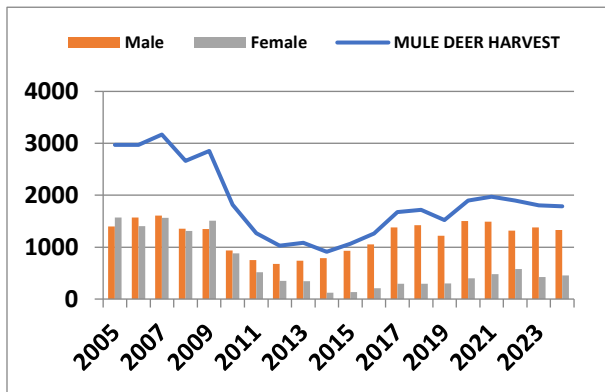
Appendix C. DAU 1 – Grand River Study Area



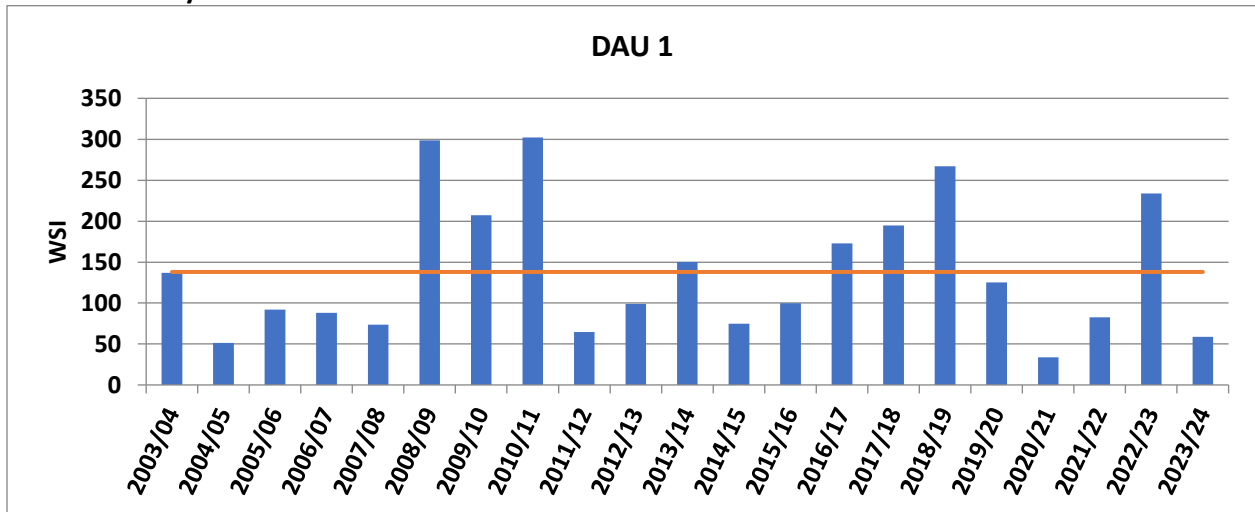
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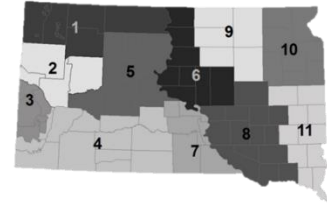
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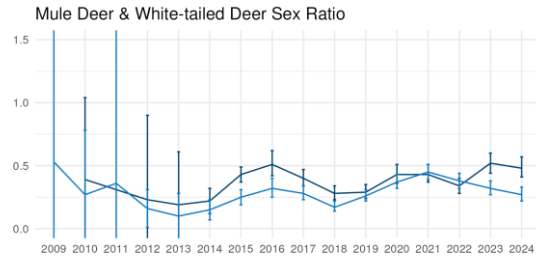
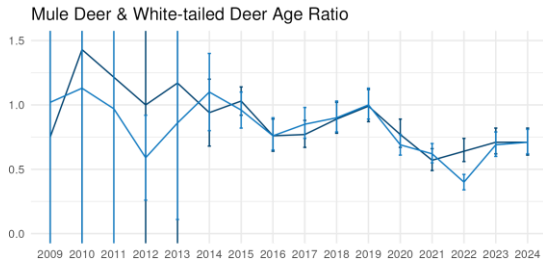
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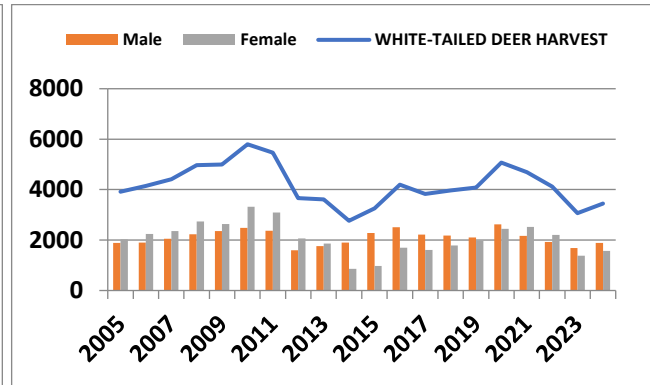
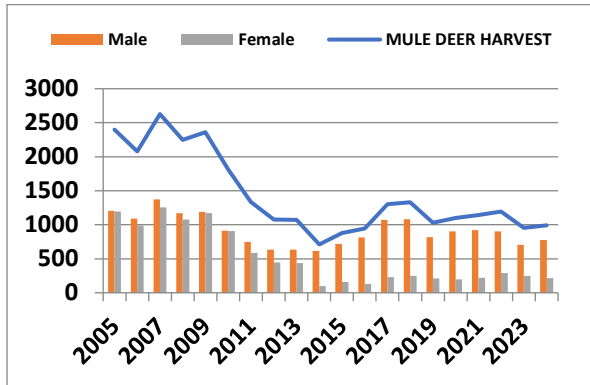
Appendix D. DAU 2 – Belle Fourche River Study Area



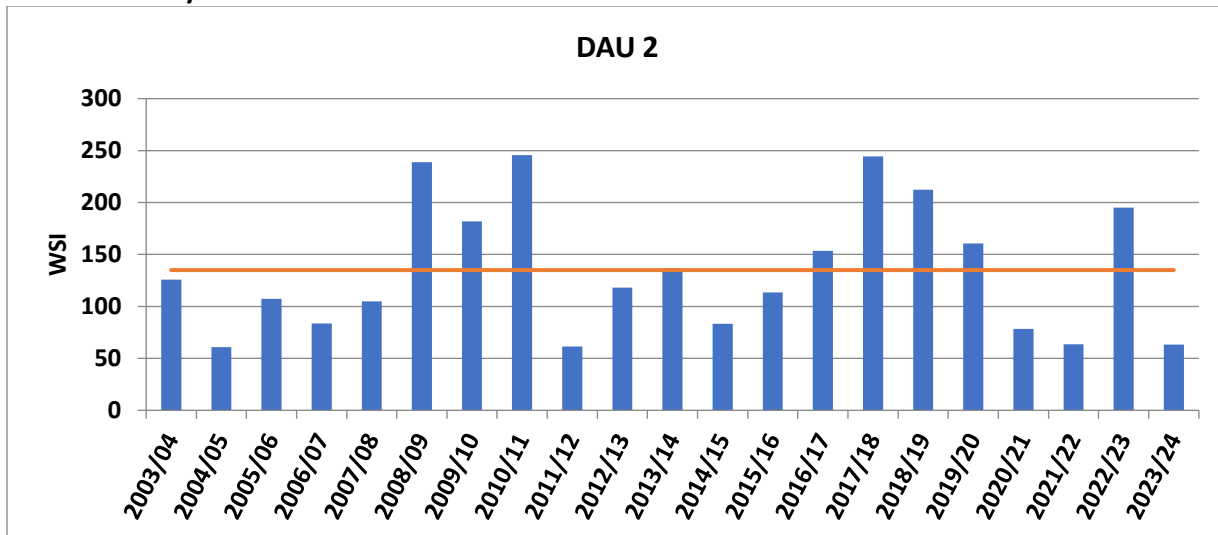
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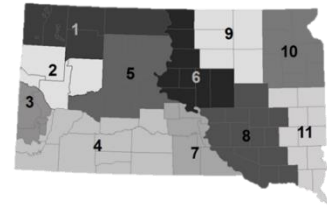
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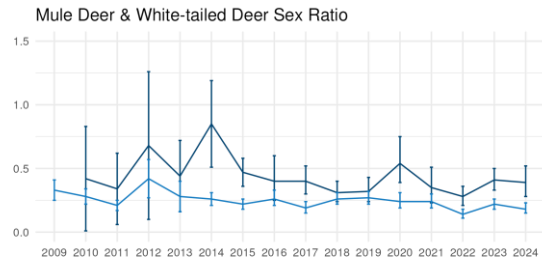
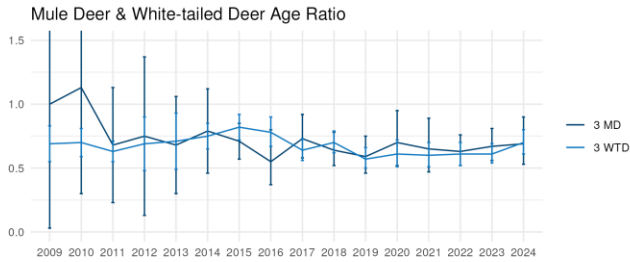
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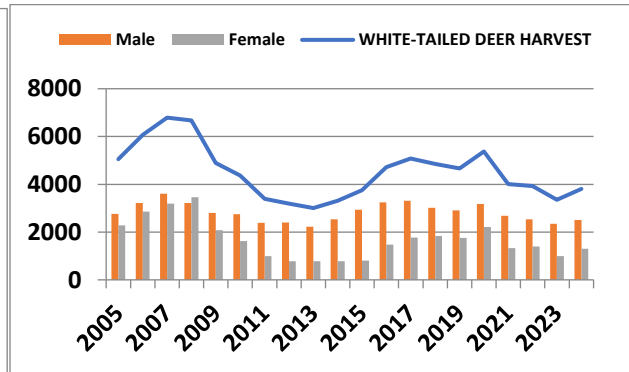
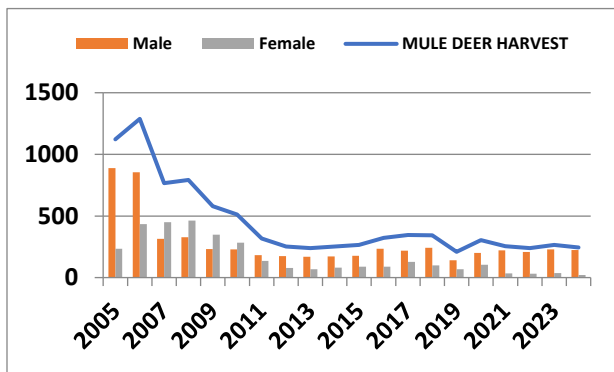
Appendix E. DAU 3 – Black Hills Study Area



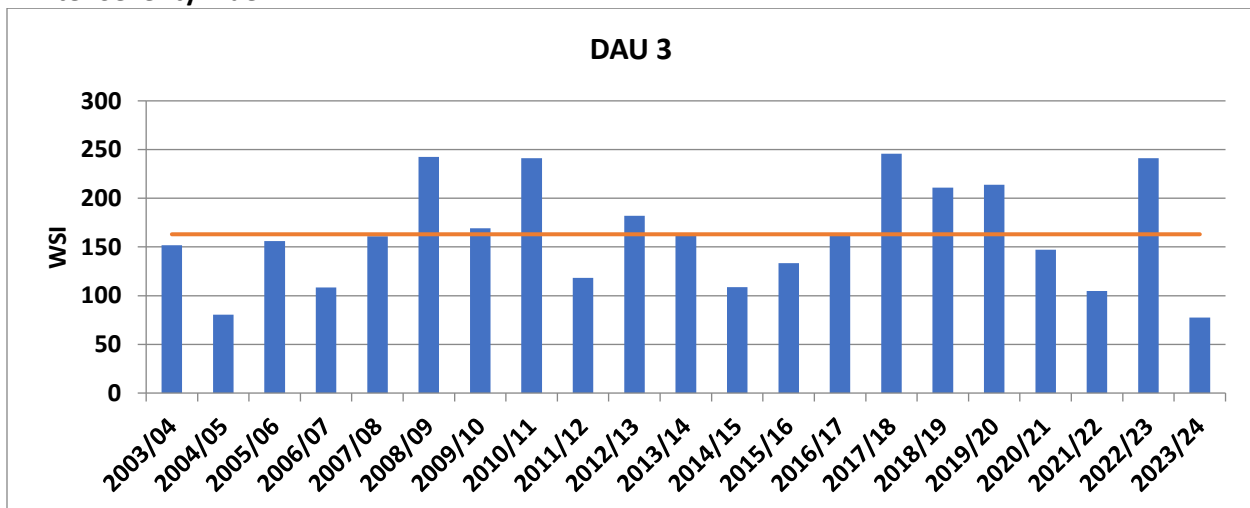
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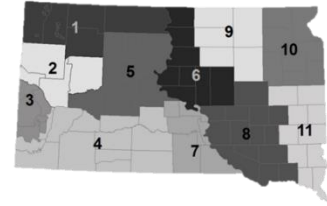
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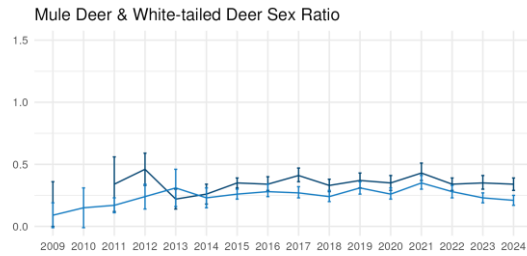
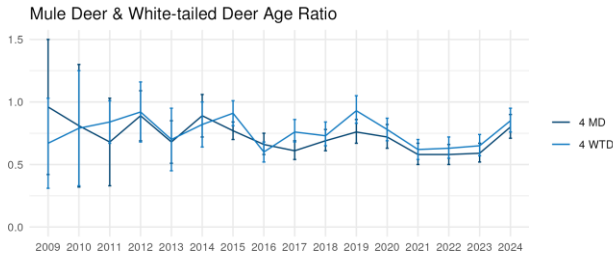
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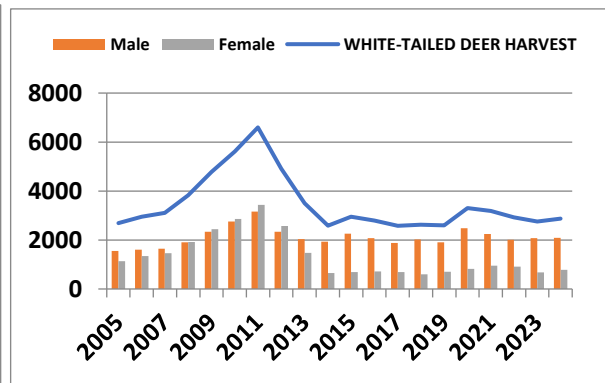
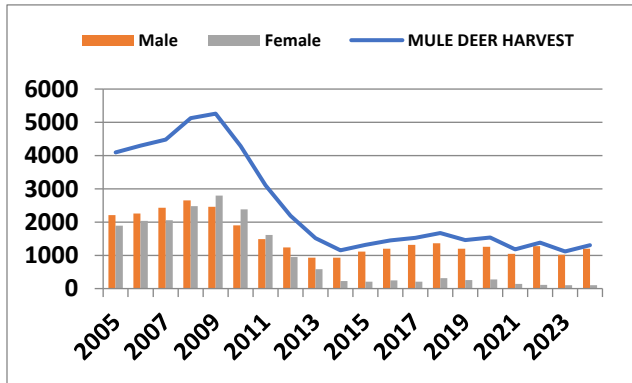
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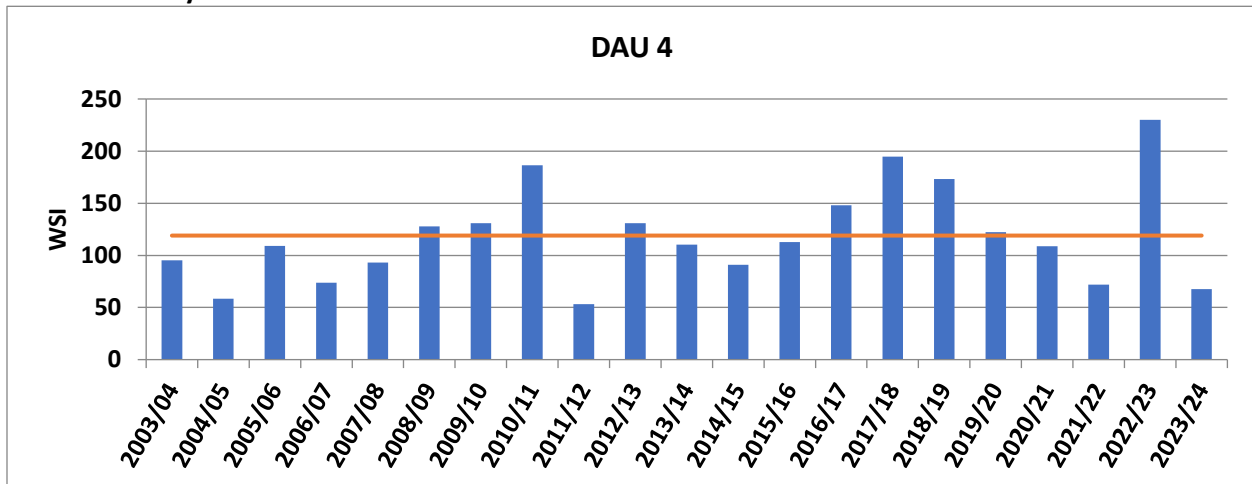
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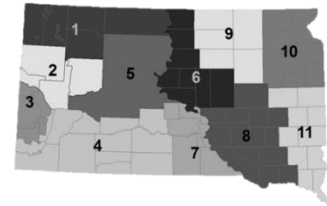
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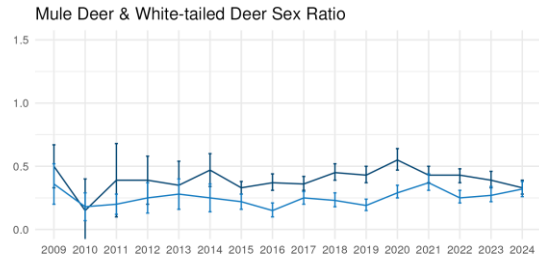
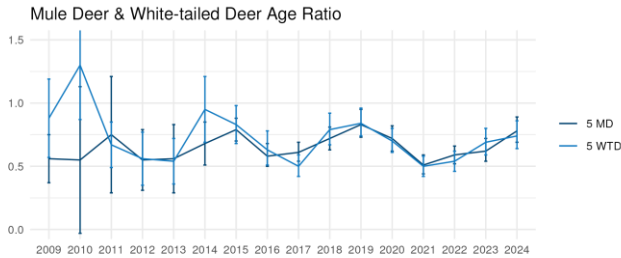
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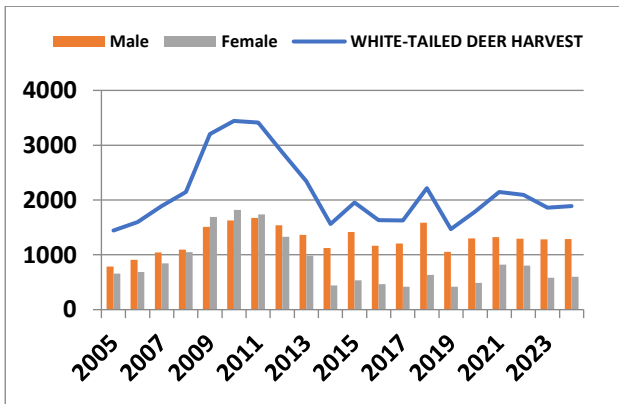
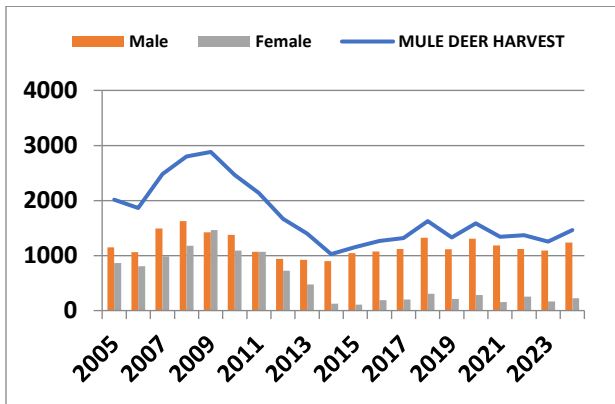
Appendix G. DAU 5 – Cheyenne River Study Area



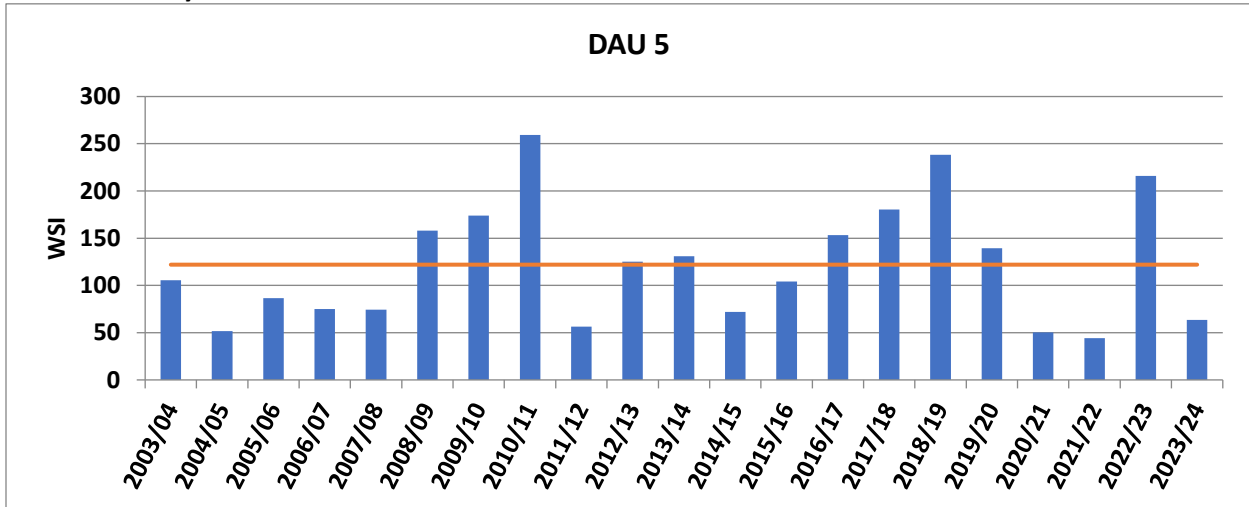
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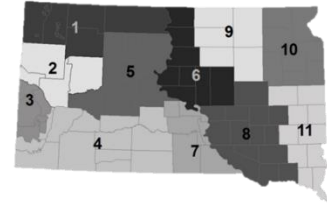
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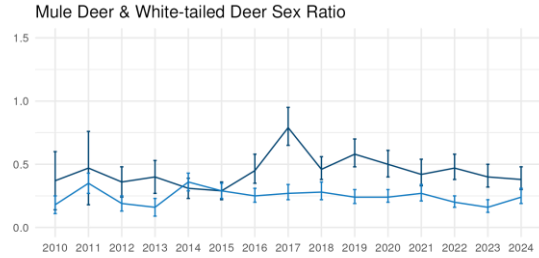
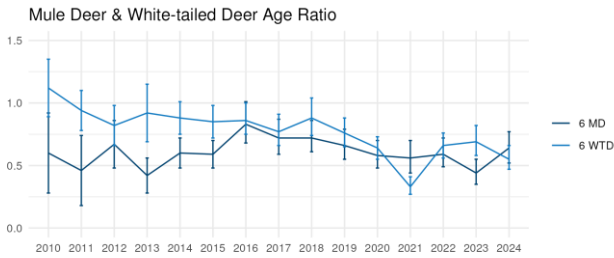
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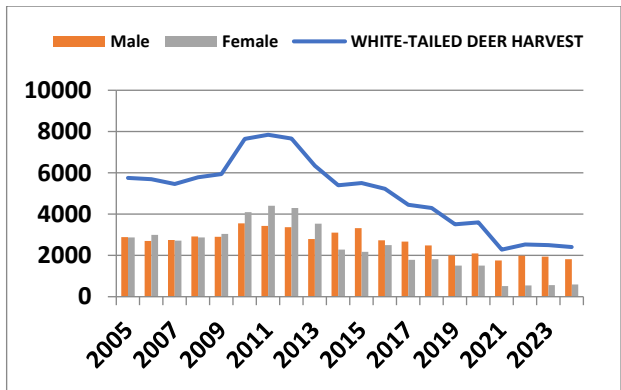
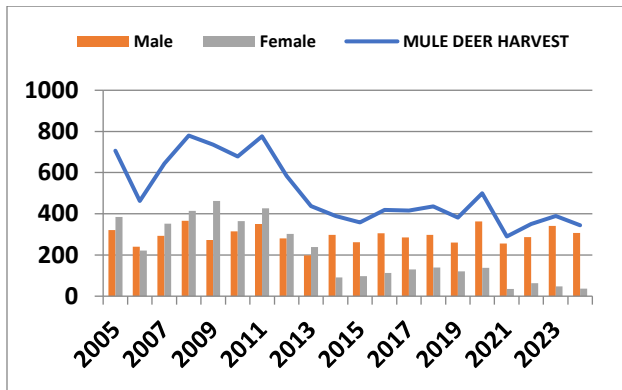
Appendix H. DAU 6 – Upper Missouri River Study Area



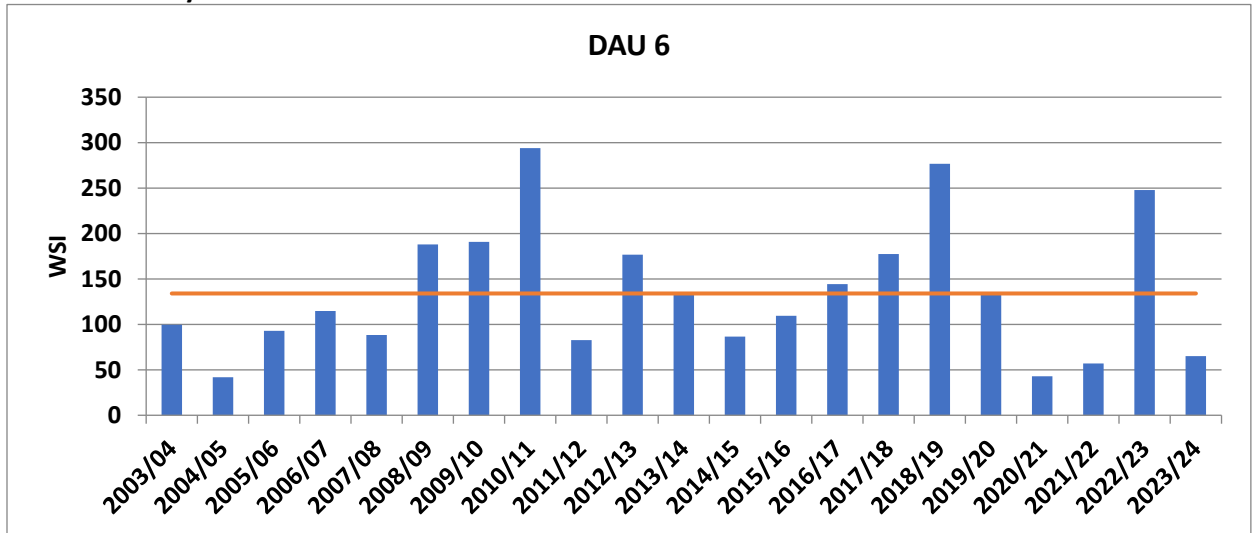
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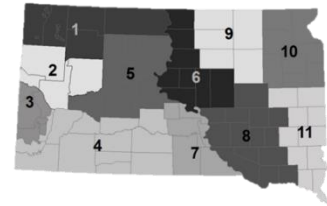
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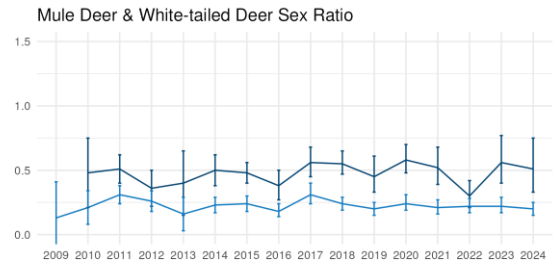
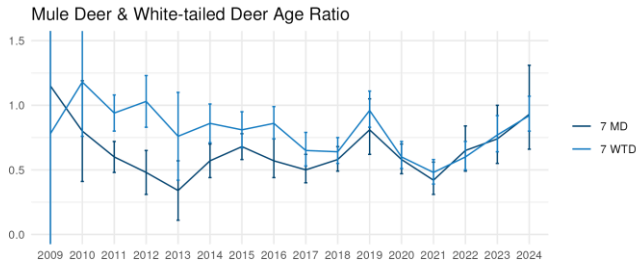
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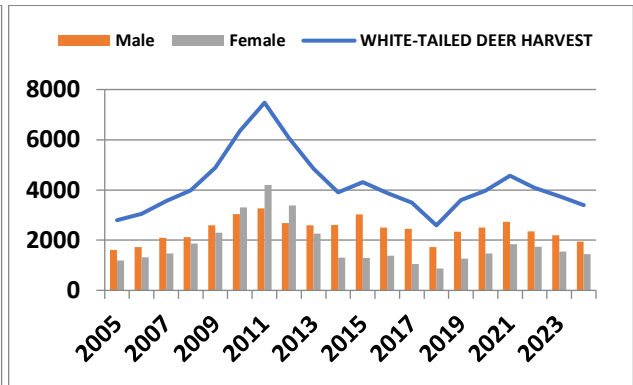
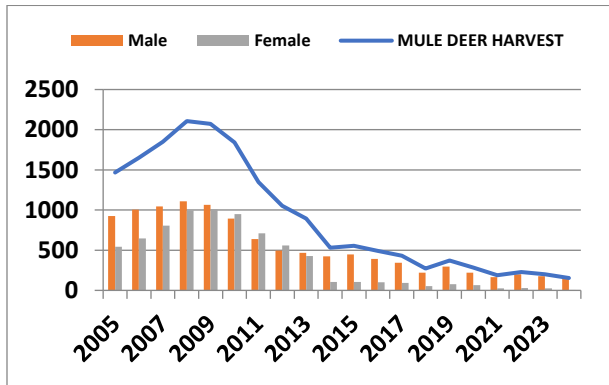
Appendix I. DAU 7 – Lower Missouri River Study Area



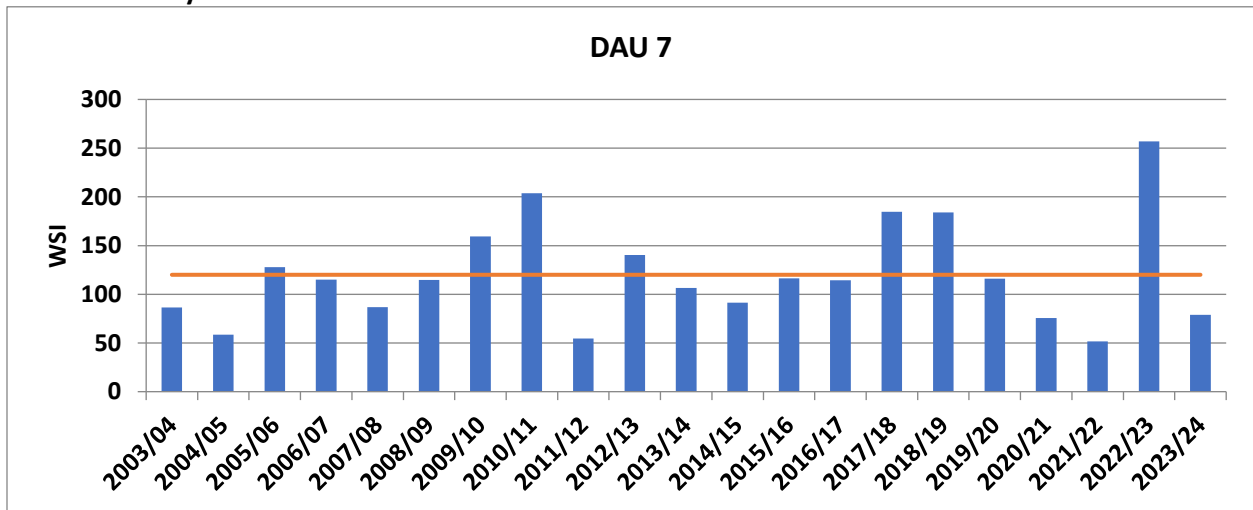
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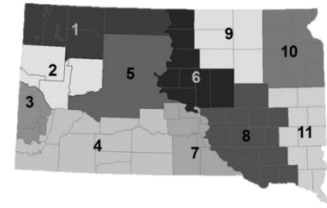
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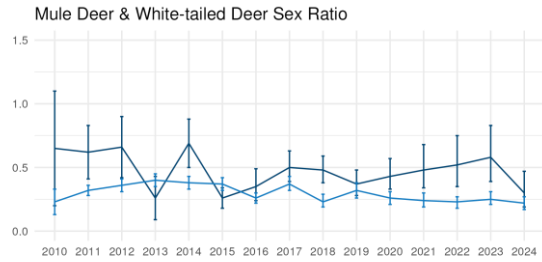
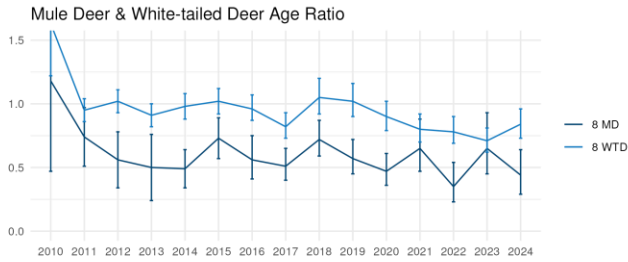
Winter Severity Index



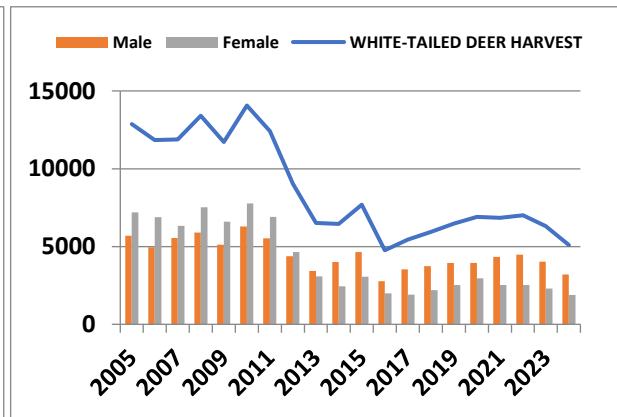
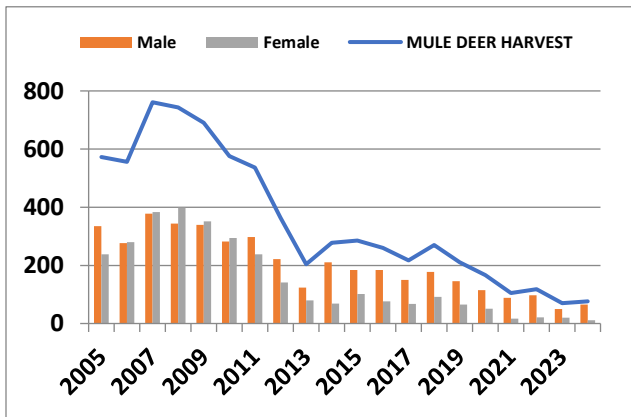
## Appendix J. DAU 8 – Lower James River Study Area



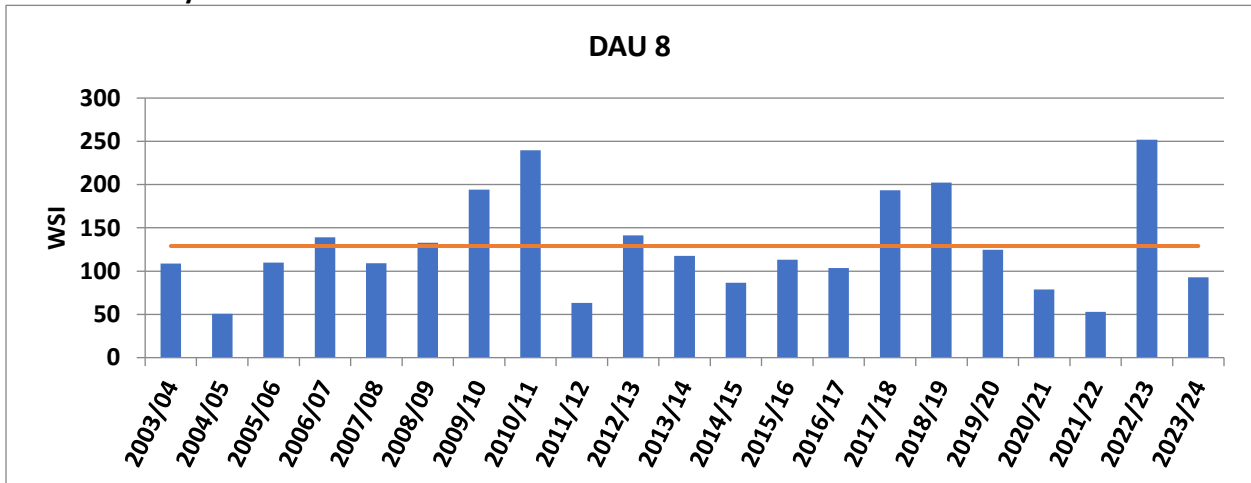
### Herd Composition



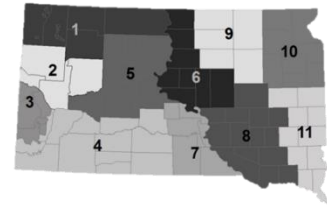
### Harvest



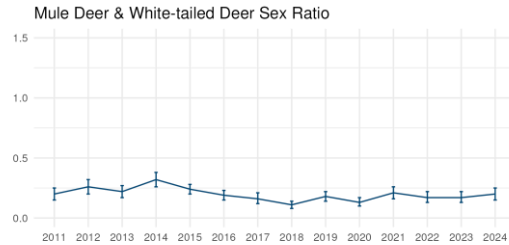
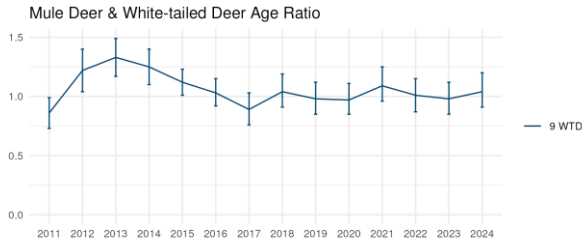
### Winter Severity Index



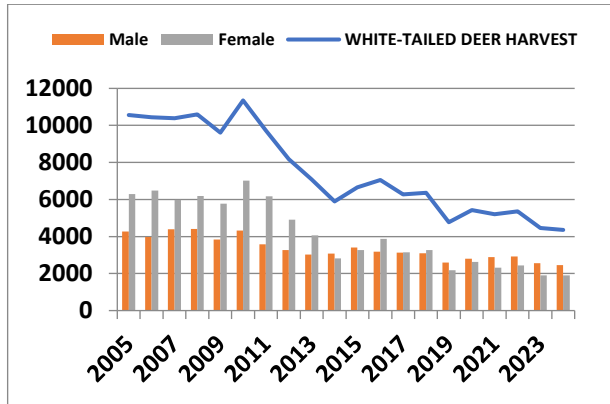
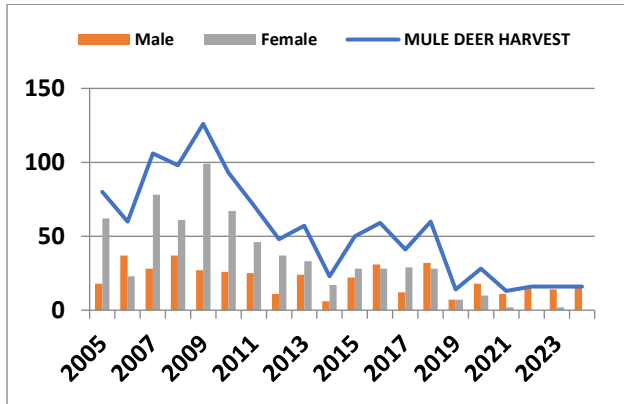
Appendix K. DAU 9 – Upper James River Study Area



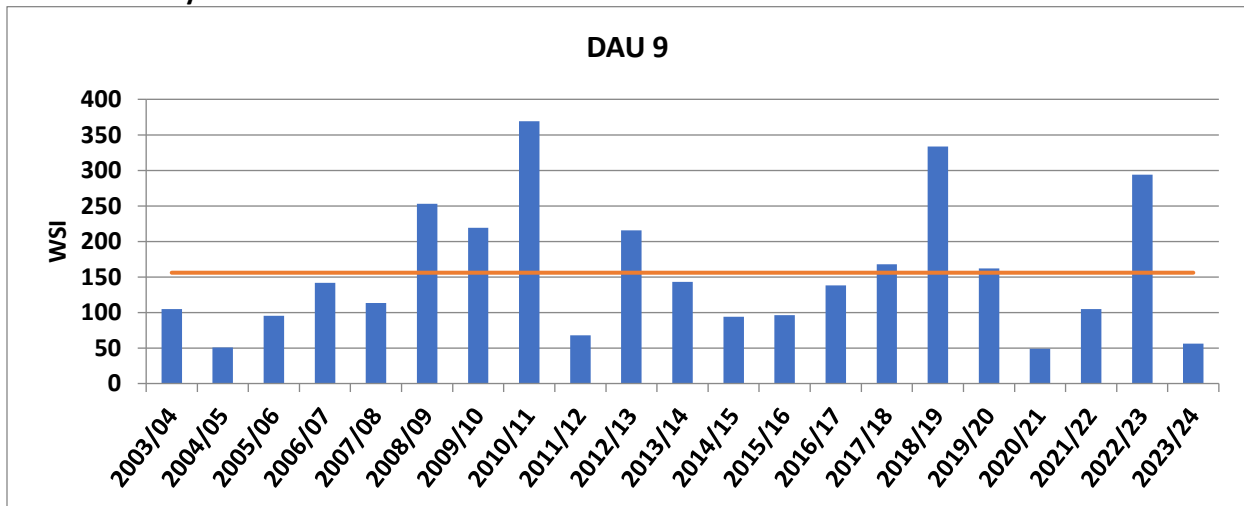
Herd Composition



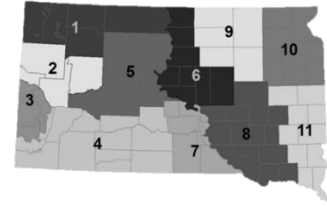
Harvest



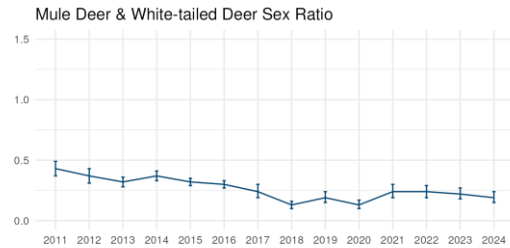
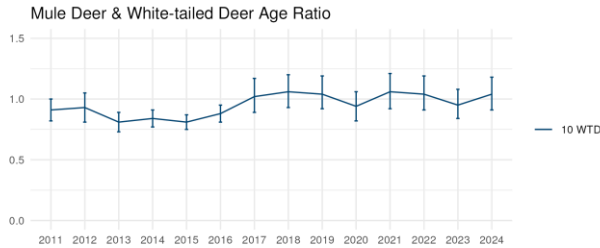
Winter Severity Index



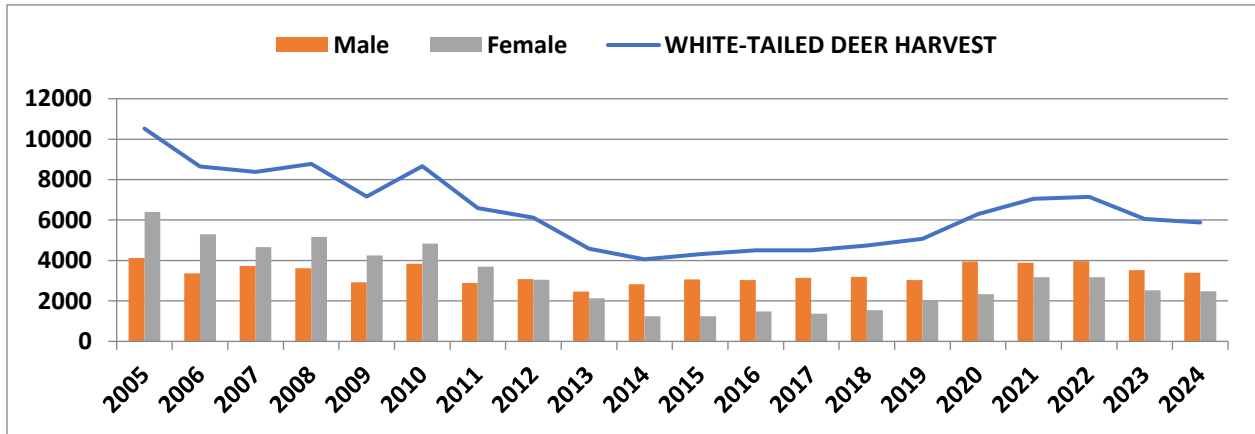
Appendix L. DAU 10 – Prairie Coteau Study Area



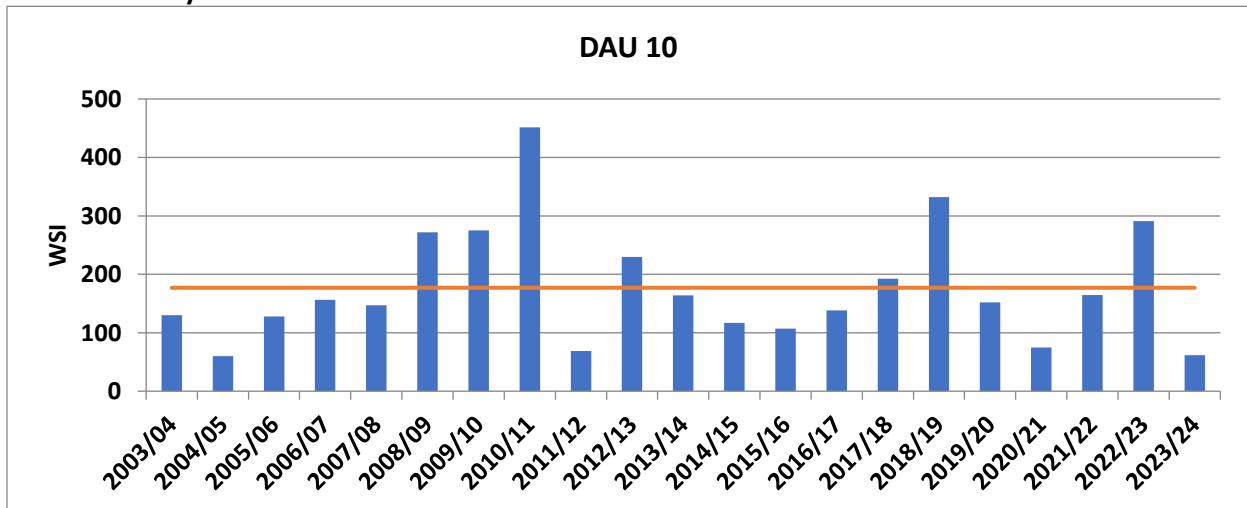
Herd Composition



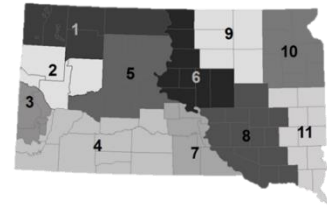
Harvest



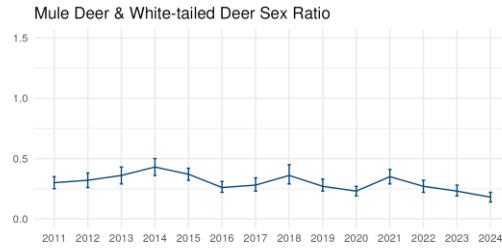
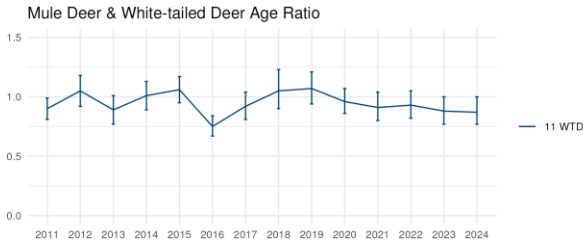
Winter Severity Index



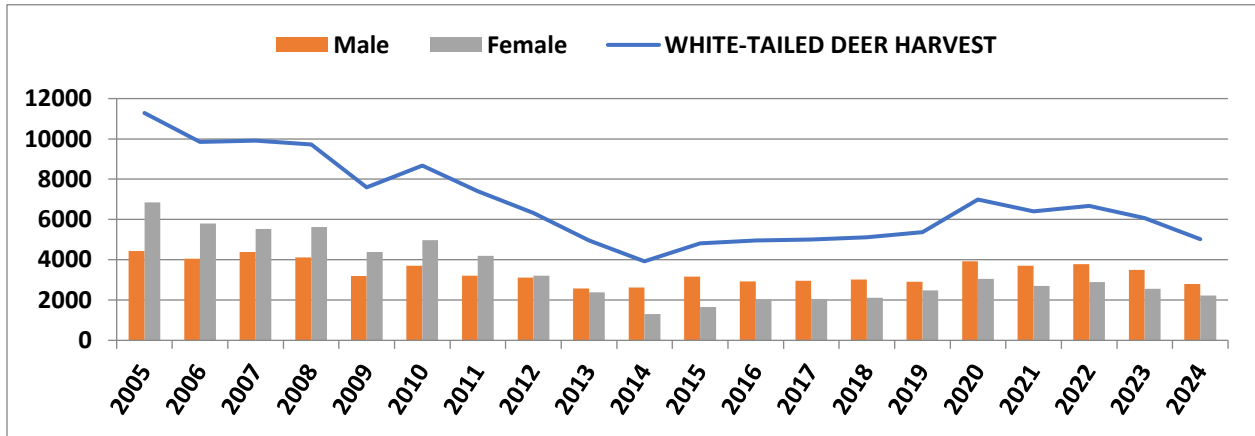
Appendix M. DAU 11 – Big Sioux River Study Area



Herd Composition



Harvest



Winter Severity Index

