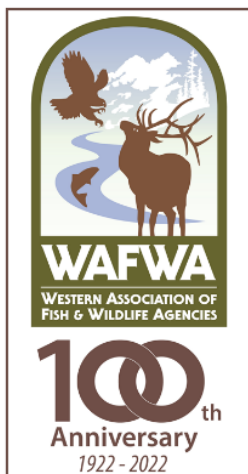


2022 RANGE-WIDE STATUS OF BLACK-TAILED AND MULE DEER

Mule Deer Working Group. Western Association of Fish and Wildlife Agencies

Abstract: The purpose of this document is to provide a general overview of the current black-tailed and mule deer (*Odocoileus hemionus*) population status and general abundance trends throughout their range in North America. The Mule Deer Working Group (MDWG) consists of representatives from the 24 state, territorial, and provincial agencies that comprise the Western Association of Fish and Wildlife Agencies (WAFWA). The purpose of the MDWG is to provide a collaborative approach to finding solutions to improve black-tailed and mule deer conservation and management. One of the most common types of information requested of the MDWG is regarding the general population status and trajectory of black-tailed and mule deer populations. Stakeholders are interested in whether mule deer are still declining or in the process of recovering. To provide a quick snapshot of the status of this species, we assembled this information by having each agency MDWG representative provide a current population status, as well as general survey and harvest information for their respective jurisdiction. All states and provinces use very different methods to survey and estimate population parameters and harvest. Some have more rigorous processes than others, based on their resources and management needs. Black-tailed and mule deer populations are below agency goals in many jurisdictions, but are stable to increasing in most over the last decade or more.



Mule Deer
Working Group



Table 1. Range-wide estimation of mule deer population size, harvest, and hunter numbers provided by member agencies of WAFWA. **Click on a state/province/territory name to go directly to that jurisdiction.**

	Estimated Population ¹	Total Harvest	% Males in Harvest	Hunter Numbers
Alberta	193,000	19,700	43%	38,000
Arizona²	80,000 – 90,000	6,869	99%	32,851
British Columbia³	100,000 - 170,000	10,515	94%	54,394
California⁴	450,000-500,000	31,986	98%	174,593
Colorado⁵	416,400	40,561	77%	91,175
Idaho	281,988	26,086	84%	79,996
Kansas	41,700	1,772	91%	18,172
Montana⁶	293,950	49,855	74%	148,393
Nebraska⁶	80,000 – 120,000	8,575	77%	31,072
Nevada	78,000	6,185	88%	16,530
New Mexico⁵	80,000 - 100,000	8,827	98%	37,182
North Dakota⁸	23,300 (Badlands)	10,688	64%	13,000
Oklahoma⁹	1,750 – 3,000	254	98%	No Estimate
Oregon	155,000 – 165,000	12,584	96%	40,603
Saskatchewan	65,000 – 85,000	11,519	46%	16,300
South Dakota^{7,10}	80,600	6,564	82%	71,596
Texas	191,000	9,658	92%	29,674
Utah	305,700	26,631	92%	70,630
Washington¹¹	90,000 - 110,000	8,277	96%	104,855
Wyoming	291,700	18,944	85%	43,506
Yukon	1,000	10	100%	12

¹ Estimated population may be presented as ranges to denote the difficulty and levels of uncertainty in gathering an estimate over a large spatial scale.

² Totals for mule deer hunting only. The number of tags issued (40,630 in 2021) is greater than hunter numbers (32,851 in 2021); participation rate is about 90%. Harvest and hunter numbers include draw hunt data and over-the-counter archery hunt data. Total mule deer and Coues white-tailed deer hunters in 2021 was 63,729.

³ All data presented are from the most recent year available.

⁴ Black-tailed and mule deer combined. “Hunter Numbers” is “number of tags issued,” actual number of hunters will be less.

⁵ Estimated population, harvest, and hunters include mule deer and white-tailed deer. These estimates cannot be easily separated because most deer licenses are for either species (In Colorado, approximately 5% of the estimates are white-tailed deer. White-tailed deer comprise approximately 3% of the total harvest in New Mexico).

⁶ Hunter Numbers is based on the proportion of all hunters who reported hunting mule deer.

⁷ Hunter Numbers reflects total deer hunters including both mule deer and white-tailed deer hunters.

⁸ Population estimate is determined for the Badlands, total harvest includes gun and archery harvest, and number of hunters is based on mule deer licenses and any deer gun licenses within mule deer range.

⁹ Numbers are difficult to estimate as many permits allow the take of mule deer or white-tailed deer.

¹⁰ Estimates are preliminary 2020 pre-season.

¹¹ Estimate of Hunter Numbers reflects all deer hunters; WA does not estimate hunters by species or subspecies.

Table 2. Range-wide estimation of black-tailed deer population size, harvest and hunter numbers provided by WAFWA member agencies. **Click on a state/province/territory name to go directly to that jurisdiction.**

	Estimated Population ¹	Total Harvest	% Males in Harvest	Hunter Numbers
Alaska²	333,000-346,000	17,685	76%	13,559
British Columbia³	98,000 - 155,000	5,661	88%	13,129
Hawaii⁴	No Estimate	55	56%	No Estimate
Oregon	No Estimate	25,867	90%	86,819
Washington⁵	No Estimate	10,783	89%	112,369

¹ Estimated populations may be presented as ranges to denote the difficulty and levels of uncertainty in gathering an estimate over a large spatial scale.

² Deer population size in Alaska is provided from our population objectives, rounded up to the closest thousand. Objectives were derived based on a combination of habitat capability modeling and expert opinion panels. This estimate is not re-calculated from year to year, it is rather a general ball-park figure. Harvest data is for the 2021 regulatory year.

³ All data presented are from the most recent year available.

⁴ Estimates are reported for the 2017 hunting season.

⁵ Estimate of Hunter Numbers reflects all deer hunters; WA does not estimate hunters by species or subspecies.

Alaska

Sitka black-tailed (SBT) deer are native to the wet coastal rainforests of Southeast Alaska. Due to historic transplant efforts between 1916 and 1934, SBT deer also now have established populations in parts of Southcentral Alaska, where Sitka black-tailed deer are at the northern extent of their range. Between 1916 and 1923, at least 24 deer were moved from the Sitka area in Southeast Alaska to Hawkins and Hinchinbrook islands in Prince William Sound, which comprises Game Management Unit (GMU) 6 of Southcentral Alaska. This was the first big game translocation in Alaska, and one of the most successful. Since their introduction to Prince William Sound, deer have thrived and spread to inhabit most islands and the adjacent mainland area as well. In 1924, 14 deer were translocated from Sitka to Long Island in the Kodiak Archipelago (GMU 8) of Southcentral Alaska. In the 1930's, another 2 deer were translocated from Prince of Wales Island to Long Island and 9 deer were translocated from the Petersburg area to Kodiak Island. Legal hunting of deer in Region II began in GMU 6 in 1935 and in GMU 8 in 1953. Deer populations occur at lower densities in Southcentral Alaska than in Southeast Alaska, likely due to colder temperatures and less optimal winter range. While still a maritime environment, the weather patterns in Southcentral can differ substantially from that in Southeast Alaska.

In both regions, perceived deer density on the mainland has historically been lower than on the islands, presumably due to lower habitat quality. Because of island geography, varying weather patterns, different predator guilds, and differences in the extent and pattern of forest logging, deer densities can vary greatly from one GMU to another, and even within GMUs. Population size or density has been a challenge to calculate throughout Alaska, due to the difficulties of employing various techniques in the remote and densely forested habitats that characterize deer range in Alaska. As a result, population objectives were set for each GMU based on expert opinion and analyses of habitat capability. These objectives constitute our best estimate of population levels in each GMU, but they are imprecise, and cannot be used to monitor changes

in abundance. Based on these objectives, the deer population in Alaska as a whole likely range from 333,000-346,000.

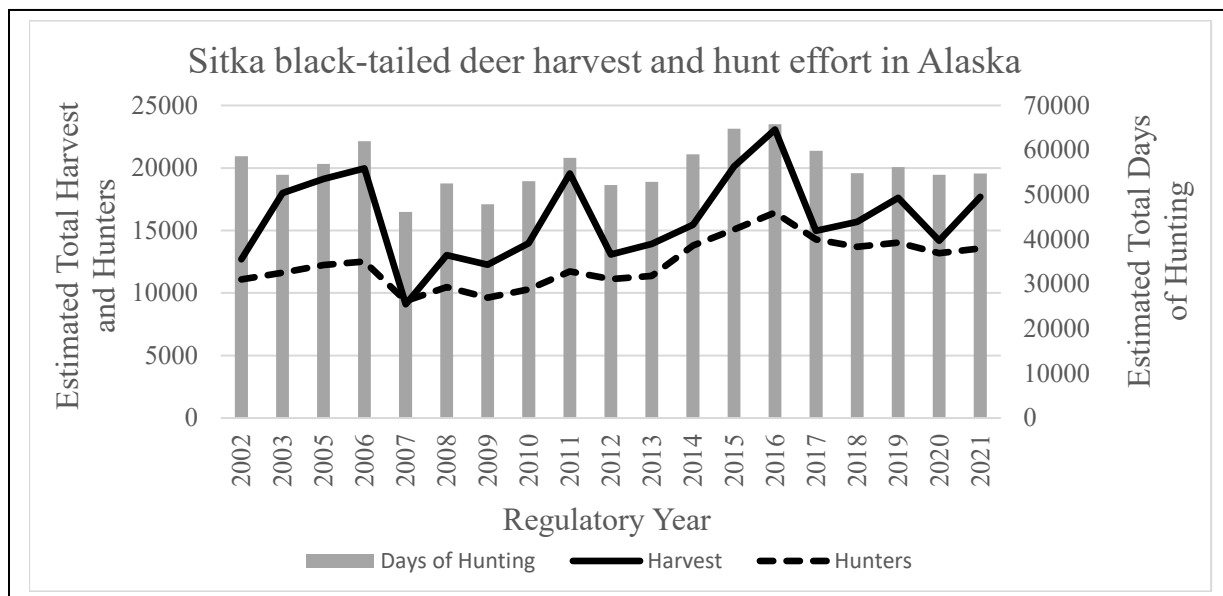
Due to the difficulty of measuring actual population size or density, in the 1980's Alaska Fish and Game (ADF&G) began work to index changes in deer abundance by using pellet count surveys to look at multi-year trends within various watersheds. More recently, ADF&G has used fecal DNA to conduct mark-recapture population and/or density estimation in specific watersheds and is evaluating the efficacy of this technique for long-term use at broader scales. Lastly, annual harvest and hunter effort data provides information across multiple geographic scales. Prior to 2011, information was collected through a voluntary mail-out survey of ~30% of deer hunters, with an expansion factor applied to estimate total harvest. Approximately 65% of those surveyed responded each year. Since 2011, a deer harvest ticket system with mandatory reporting has been in place, but response rates have remained similar. Both state and federal deer harvest regulations are in place, with federally qualified subsistence hunters receiving additional benefits such as longer seasons or higher bag limits. The combined deer hunting season varies in length by GMU with the longest lasting 6+ months from July 24th to January 31st. Hunters are given several months in which to report, then the harvest data is tabulated, and new statistics are made available by late July.

In Alaska, winter severity is the primary factor that regulates populations - increasing during a series of mild winters and sometimes declining dramatically after one or more severe winters. High mortality events seem to occur periodically in conjunction with very severe winters, once every decade or so. Habitat change resulting from timber harvest affects deer by increasing summer browse (and browse available in mild winters with little snow) for about 30 years, before forests enter a stem-exclusion phase. Where deer become overpopulated with regard to the remaining primary winter range available to them, populations can plummet quickly when deep snow returns, and may remain at lower densities if winter range is damaged from over-browsing. Predation by bears and wolves can slow recovery of deer after these events. Harvest by deer hunters is generally perceived to not have a substantial effect on most populations in Alaska due to the remoteness of most deer range and lack of extensive road networks. However, harvest can have a substantial impact in areas adjacent to communities. For example, in years with a lack of substantial snowfall, hunters have prolonged access to deer range via logging roads, which can lead to site-specific higher hunter harvest. In contrast, heavy snowfall can concentrate deer at low elevations or on beaches, which can lead to higher harvests in areas easily accessible by boat. When conditions seem to warrant, management actions have included closing specific areas to hunting, lowering bag limits, and temporary restrictions the harvest of females.

In the regions where they occur, SBT deer are common, and the most frequently pursued big game species. In Alaska, weather patterns and snowfall have strong effects on both hunting success and winter survival. Both Southeast and Southcentral Alaska experienced 2 severe and 1 above average winter between 2006 and 2009, which led to a very high harvest of deer in regulatory year 2006 when deer were concentrated on the beaches, to a very low harvest the following years. Some of this lower harvest was a result of lower effort on the part of hunters, who indicated they wanted to allow populations time to recover, but mortality and pellet group surveys indicated that deer had likely sustained substantial population declines as well. As a result of perceived reductions to the deer population, management actions such as doe harvest closures were implemented in parts of Southeast and Southcentral Alaska. Both areas had one winter to recover, then during the 2011-2012 winter Alaska was hit another severe winter. Snowfall in

Southeast Alaska was well above average while Southcentral Alaska was hit with the heaviest snowfall seen in over 30 years. Deer congregating on beaches due to early and heavy snowfall increased hunter success in winter 2011-2012 to a record high in Southcentral Alaska, but subsequent effects of this harvest combined with winter mortality estimates of 50-70% precipitated management actions to allow deer to recover. During regulatory years 2012 and 2013, harvest numbers decreased approximately 80% in Prince William Sound and 40% in the Kodiak Archipelago. In contrast, mortality was not believed to be as high in most areas of Southeast Alaska. However, due to a failure to meet harvest objectives and decreased pellet-group survey counts, concerns were raised for deer in GMUs 1A and 3Z of Southeast Alaska. Deer pellet surveys conducted since the early 1980's indicate deer occur at a lower abundance in these GMUs, likely due to lower habitat quality and wolf predation, which can slow population recovery after severe winters. Intensive management plans were developed in 2013 and increased monitoring and population assessments have been conducted since. Population estimates based on DNA mark-recapture as well as pellet-group survey results indicate deer abundance has been increasing.

Both Southeast and Southcentral experienced average to below average winter severity from 2012-2019. The winter 2015-2016 was one of the mildest on record, resulting in increased hunter effort and harvest. These milder winters allowed deer populations to flourish, and hunters reported deer to be in good body condition. Pellet-group survey trends through 2019 were generally stable to increasing. Because winter severity was average to below average, the drop in deer harvest in 2017 is thought to be due in part to reduced hunter effort, perhaps because of difficult boating conditions. Inclement weather also likely made hunts more challenging. The 2019-2020 winter was average in Southeast Alaska, but severe in Southcentral Alaska, where managers estimated 60-70% mortality in some areas of the Kodiak Archipelago and Prince William Sound. Those populations have started to rebound, but likely have not fully recovered.



Winter snowfall in 2020-2021 varied by location but overall was below average to average across both Southeast and Southcentral Alaska. The winter of 2021-2022 was somewhat above average in most locations. Deer pellet-group surveys were only conducted in a few areas in 2020-2021 due to Covid-19 constraints and prioritization of other activities, but most populations are believed

to be still recovering, stable or increasing in all but a few areas. Spring 2022 beach surveys in northern Southeast Alaska indicated winter mortality was somewhat elevated compared to prior years, but not concerning, and that body condition appeared good and similar to the last two years. Hunter effort and harvest peaked in 2016, dropped in 2017, and have been generally stable near or slightly above average since. Deer populations in Alaska are doing relatively well overall, but may have decreased in a couple isolated areas, potentially due to higher wolf predation.

-Karin McCoy, Alaska Department of Fish and Game

Alberta

The 2021 pre-hunting season population estimate of mule deer in Alberta was 193,000. This represents a slight increase from the 2020 estimate of 188,000. For 2022, the pre-hunting season population estimate for mule deer decreased to just over 190,000, demonstrating stable population estimates over the past 3 years (between 188,00 and 192,000). The population goal for mule deer in Alberta's current management plan (1989) is 97,000. However, a new provincial management plan for mule deer is currently in development, including input from a special appointed committee of representative stakeholders, and the next iteration will see a change in the provincial population goal that reflects the current state of mule deer management including habitat availability, population trends, hunter preferences, and considers the management of chronic wasting disease.

The number of antlered mule deer special license applicants has been fairly stable over the last 5 years, ranging from 97,000 to 102,000. Antlerless mule deer special license applicants were stable around 43,000 from 2017 to 2020, and then jumped to 53,000 in 2021. Based on voluntary hunter harvest surveys for the 2021 hunting season 38,000 mule deer hunters in Alberta directed an estimated 232,000 days hunting mule deer, producing an estimated harvest of 19,700 mule deer (~43% antlered deer), representing a similar number of hunters and hunting days, with an increase harvest, comprised primarily of additional antlerless harvest.

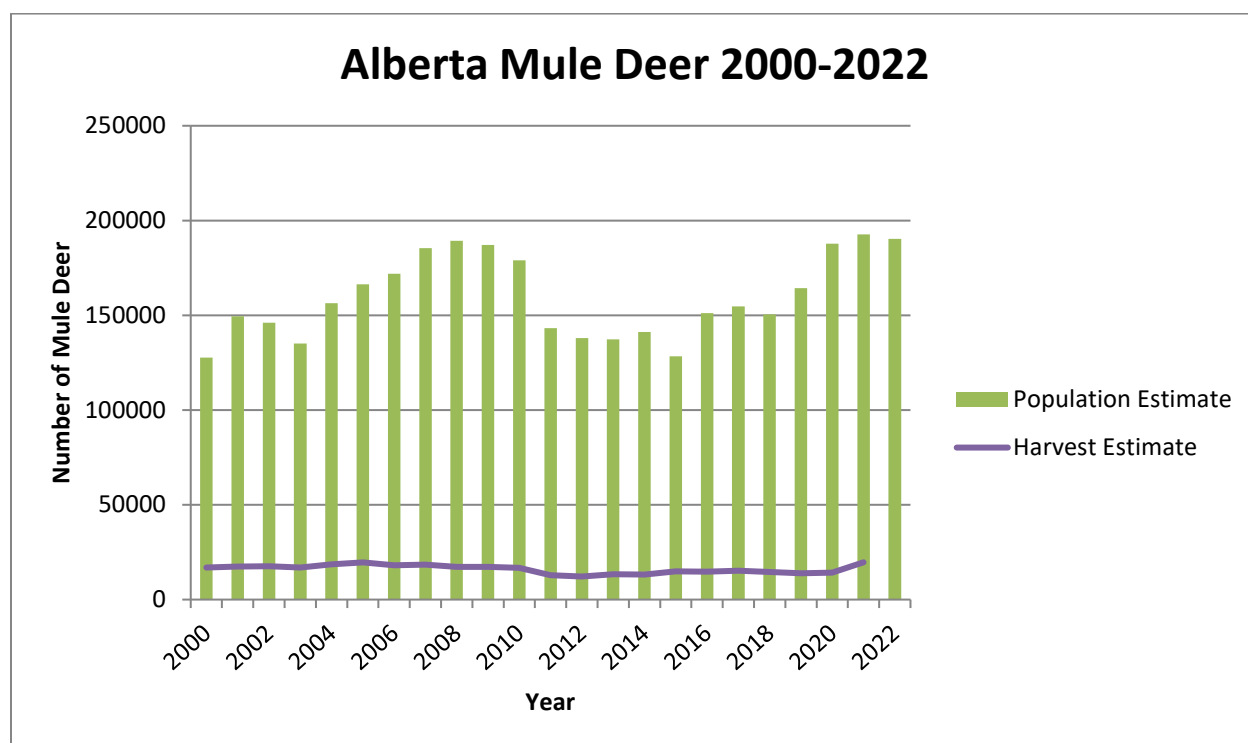
At the time of writing, Alberta big game managers are determining the mule deer special license numbers for the 2022 hunting season in consideration of stakeholder values and disease management concerns. Additionally, certain Wildlife Management Units (WMUs) provide unlimited licenses to harvest mule deer where participation, success, and overall harvest is typically low (i.e. remote units and/or low-density mule deer units). Alberta also supports a healthy commercial hunting industry, with approximately 1,500 antlered mule deer licenses available for non-residents through outfitter-guide allocations. There is an unknown number of rights-based hunters in Alberta that do not require a license to hunt for sustenance and thus information on effort and harvest by these groups are unknown.

Alberta implements a big game population monitoring program that aims to survey ungulates on five-year intervals at the WMU scale, although many WMUs undergo longer survey intervals based on funding availability, habitat, and prioritization. There are no long-term intensive monitoring programs for mule deer in Alberta (i.e. collaring programs).

Based on a 2021 provincial assessment, average buck to doe and fawn to doe ratios were calculated from surveys flown roughly in Alberta's Great Plains Ecoregion (2015-2020, excluding 2016; n=23). This includes those units in which surveys and estimates for mule deer are prioritized. The five year average is 50:100 bucks to does (min. 16:100, max. 106:100) and 68:100 fawns to does (min. 42:100, max. 105:100).

Alberta mule deer management objectives currently implement density goals at the WMU scale. These are used in combination with allocation percentages by population and estimated harvest rates from online voluntary hunter harvest surveys to determine special license numbers (i.e. draw quotas).

Chronic wasting disease is present in Alberta, primarily in eastern Alberta along the Saskatchewan border. Prevalence in 2021/22 was 10.4% ($n=11,078$ deer heads tested), a change in sampling design occurred in 2020/21 making the last two year's results incomparable to years prior. In 2021/22, CWD was detected in 10 additional WMUs where CWD was not known to occur prior, including certain units that overlap with the Northern Forest Ecoregion to the north and west of the Great Plains ecoregion. In Alberta CWD occurs primarily in mule deer and males. More information on CWD in Alberta is found at <http://alberta.ca/cwd>



-Justin Gilligan, Alberta Environment and Parks

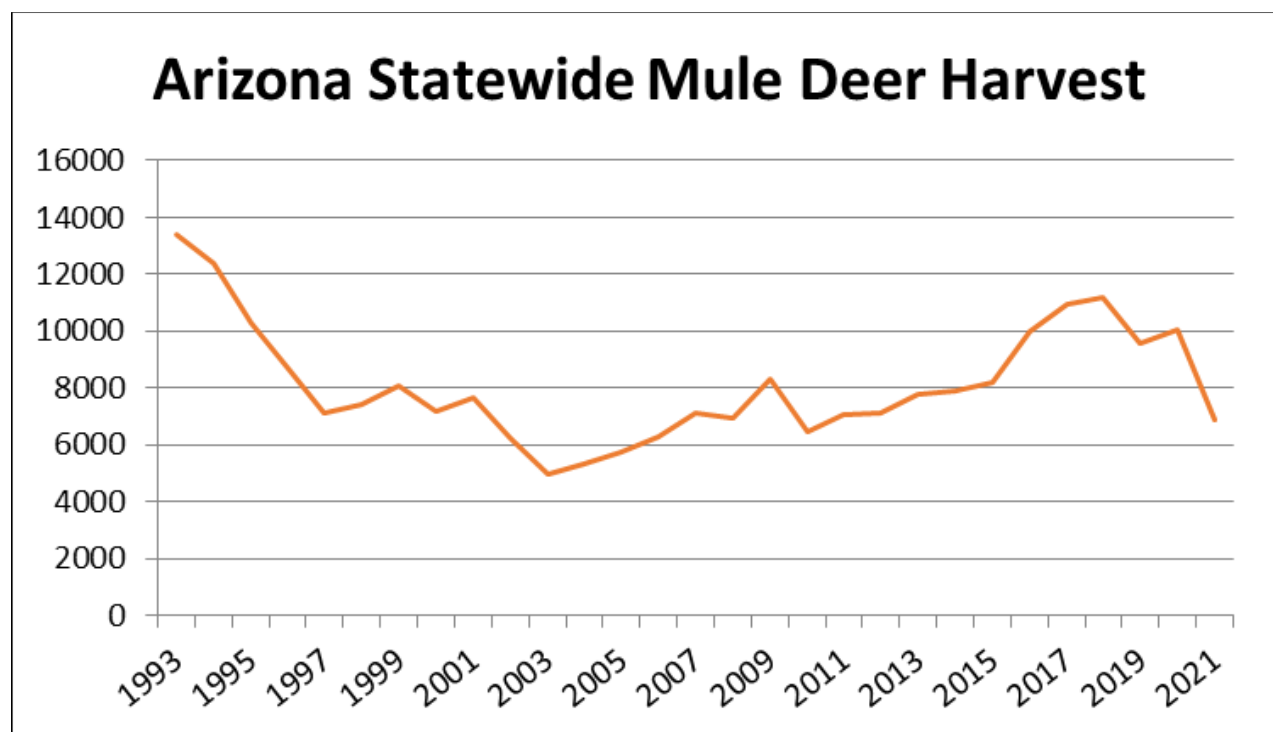
Arizona

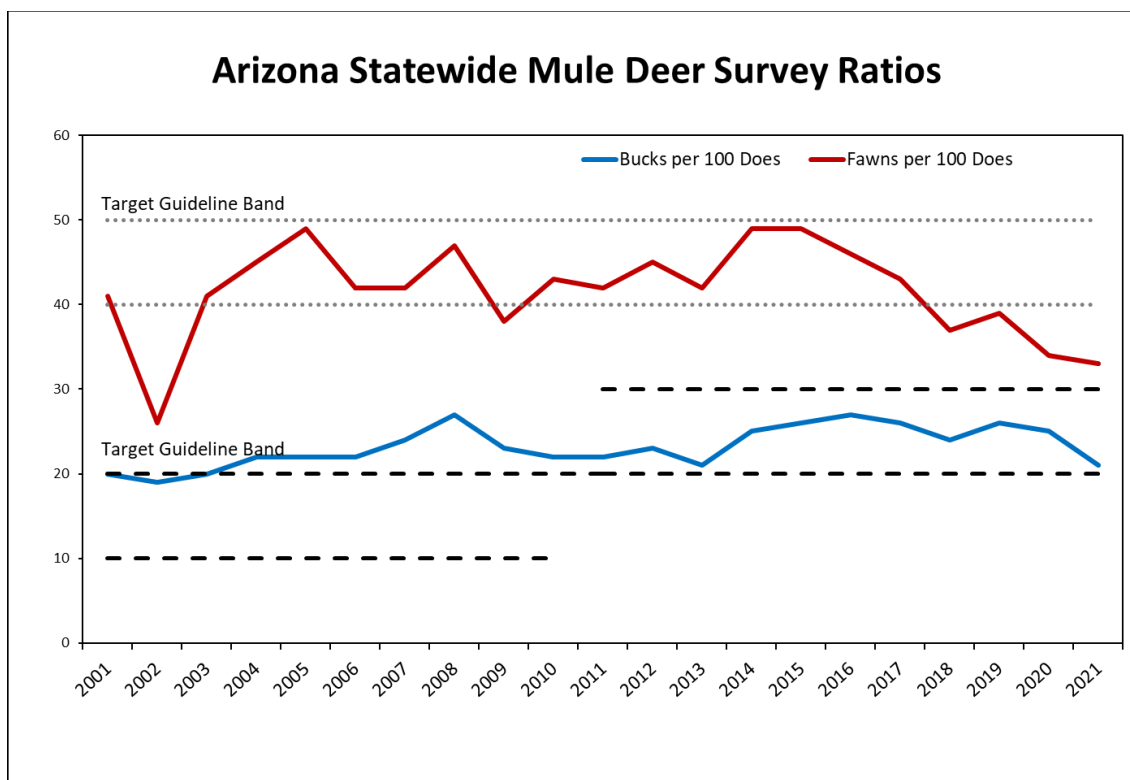
In 2021, 6,869 mule deer were harvested (all methods of take). Population parameters indicate the statewide populations are declining in most game management units; drought conditions are impacting recruitment. Most deer populations within the state are surveyed every other year using helicopter or fixed-wing aircraft; however, due to the severe environmental conditions that Arizona is experiencing, supplemental ground aerial surveys are being conducted in off years to monitor population ratios and general population health. Mule deer are surveyed during the breeding season to estimate buck:doe and fawn:doe ratios.

The Arizona Hunter Harvest Questionnaire is back on track after experiencing declining response rates from 2016-2018 when the questionnaire changed to an online only response option. In 2018, the questionnaire was provided on the back of the hunt permit-tag and response rates dropped from a historic 40-45% voluntary response to less than 5% response. The 2018 mule deer harvest data was unusable because of wide confidence intervals. For 2021, hunter response rates were at 42.5%, and hunter harvest was estimated using the voluntary mail questionnaire that provided for an online response option or a mail in option. Hunters that provided an email address also received a reminder email to submit their questionnaire. The Arizona Game and Fish Department is working towards employing text messaging starting with the 2022 hunts as another approach to increasing hunter response rates.

Buck:doe ratios for mule deer were managed at 20–30 per 100 and currently the statewide average is 21. Alternative management units were managed at higher buck:doe ratios with added guidelines regarding the age structure of the harvest or hunter density. These units equal about 5% of the opportunity offered annually. The statewide number of fawns per 100 does is 33 which is below management guidelines (40-50) and has been trending down since 2016.

Significant harvest reductions were recommended for the 2021 and 2022 deer hunts; limited draw permits were reduced by 7,285 across the state, a 17% reduction over 2 years. Over-the-counter archery deer hunt opportunity is also changing with the establishment of harvest limits by unit and species for the 2022 season.





-Amber Munig, Arizona Game and Fish Department

British Columbia

Mule deer abundance varies throughout the province due to localized differences in habitat quality, predation, winter conditions, and historical and contemporary land use. Extensive wildfires throughout central British Columbia in 2017, 2018 and 2021 had both positive and negative impacts on mule deer; forage availability increased in many areas especially on summer ranges, but the removal of forest canopies reduced the quality of some winter ranges due to the loss of snow interception and thermal cover. There are concerns that high road densities in some burned areas could also facilitate increased hunter harvest and disturbance. Mule deer buck harvest had been dropping since a fifteen-year high in 2015. The province continues to manage buck harvest through general open seasons using a combination of antler point restrictions (i.e., 4-point or greater) and any-buck seasons in most areas, while other areas have exclusive 4-point or greater seasons. There are also restricted opportunities for antlerless harvest through a draw system using limited entry seasons. Meeting the provincial management objective of 20 bucks per 100 does has become increasingly challenging with declines in fawn recruitment in some areas and recent increases in road density and hunter access. Changes to habitat quality and predator-prey dynamics might also be affecting population growth in much of the province.

A five-year research project initiated in 2018 is entering its fourth year in the southern interior of British Columbia. The project is examining mule deer response to landscape changes. There are three study areas in two regional jurisdictions (Thompson, Okanagan, and Boundary study areas) with relatively large populations of mule deer that exist under different ecological

conditions. Mule deer survival over the past three years has been highest in the Thompson and Okanagan study areas, which are characterized by the highest proportions of burned areas due to wildfire; adult doe survival estimates were ~85%, and overwinter fawn survival estimates of ~60% for the respective study areas over the three years. The Boundary study area has experienced the least amount of wildfire and also has the greatest number and diversity of ungulates and predators (e.g., cougar, wolves, black bears, grizzly bears, coyotes). In 2018/19, the survival rate of both adult does (65%) and ~7-month-old fawns (30%) was low but increased considerably in the following years and was collectively >75% in 2020 and 2021 for adult does.

The winters of 2019, 2020 and 2021 were considered relatively mild with average snow depths and temperatures and likely contributed to improved winter survival for all age classes of mule deer observed during these years. Data in northern British Columbia suggest that fawn survival in the spring of 2021 was lower than previous years. Recent composition surveys also indicate that buck to doe ratios are generally close to provincial objective of 20 bucks per 100 does post hunt. Continued monitoring of mule deer survival relative to habitat selection, relative competition, and risk of predation is intended to provide evidence of landscape-scale issues limiting mule deer populations in British Columbia.

Trends in the provincial abundance of black-tailed deer vary regionally with increases in the southern portions of Vancouver Island and stable to decreasing populations elsewhere. Predation from wolves and cougars on black-tailed deer continues to be a concern in many areas as well as the need for effective measures to conserve high quality habitat. Columbian black-tailed deer buck harvest has dropped by approximately 50% since the early 1990s despite a >30% increase in hunter effort. There is some opportunity for antlerless harvest, which is mostly limited to agricultural areas. In general, Columbian black-tailed deer numbers are thought to be most impacted by increased predation and reduced habitat quality. Areas of intensive forestry activity have increased road densities and young successional forests. These are assumed to result in increased mortality rates on deer due to the creation of travel corridors for predators (including hunters) and fragmenting or removing important habitat. Maintaining or increasing deer populations will remain challenging given current predator densities and lack of measures available to mitigate disturbance and improve seasonal ranges.

Sitka black-tailed deer were introduced to Haida Gwaii, an archipelago off British Columbia's west coast, in the late 1800's and early 1900's as a source of sustenance and sport. The islands are remote and immigration and emigration of deer with the mainland does not occur. The only terrestrial predators are black bears and the density of deer is high, relative to most Columbian black-tailed deer populations in British Columbia. This has reduced both the biomass of understory plants and diversity of vegetation on parts of the islands. Hunters living on the islands or that are willing to travel to the islands are offered liberal bag limits and long seasons for bucks and antlerless deer to help manage the population.

British Columbia uses a harvest questionnaire to determine combined general open season, limited entry harvest and hunter effort for mule deer and black-tailed deer. Estimates of harvest and effort are generated for each Wildlife Management Unit.

Range-wide Status of Black-tailed Deer and Mule Deer ~ 2022

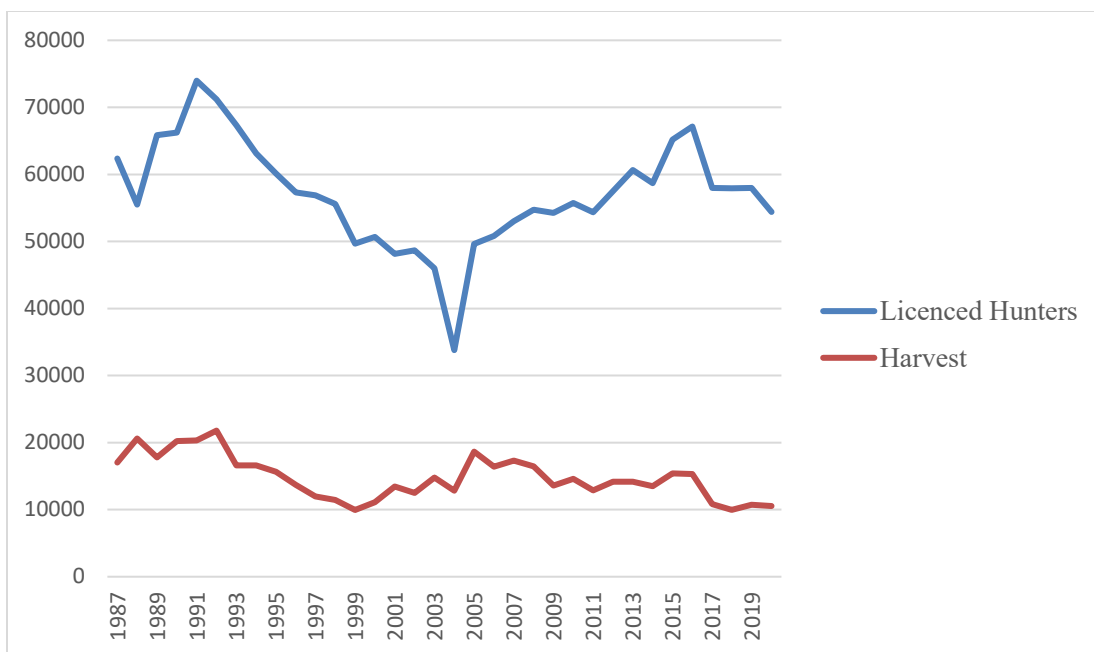


Figure 1. Mule deer hunter and harvest estimates in British Columbia from 1987-2020.

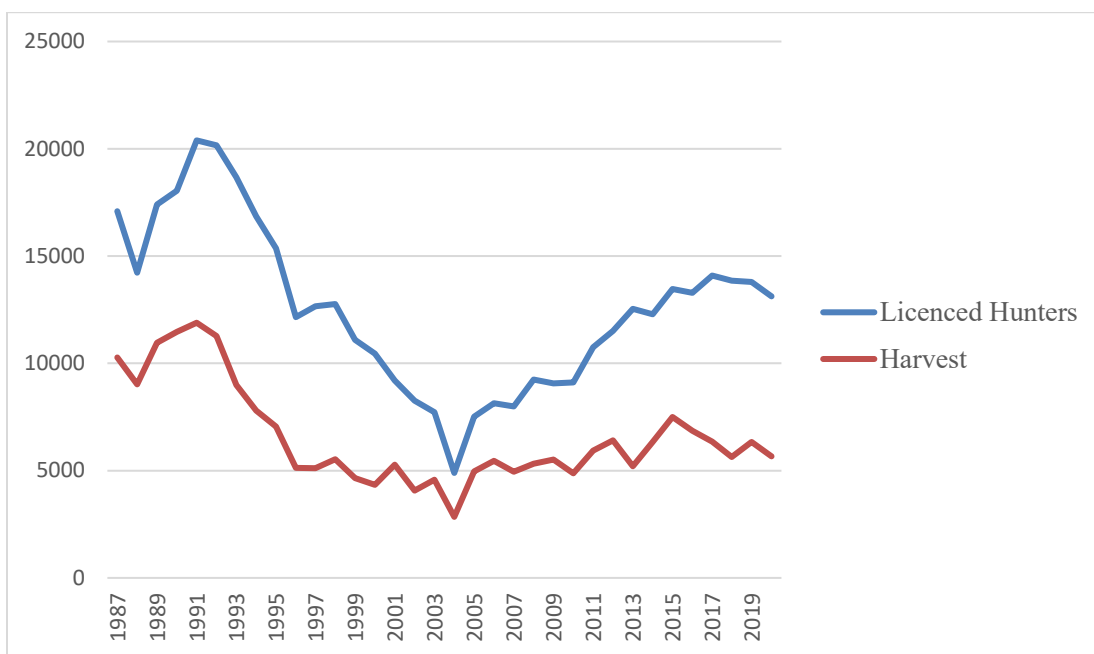


Figure 2. Black-tailed deer hunter and harvest estimates in British Columbia from 1987-2020.

- Andrew Walker, British Columbia Ministry of Forests

California

California's deer population appears to be relatively stable following the declines of the 1990s. This generalized trend may not apply to individual populations subject to unique conditions within the diversity of deer ranges in California. The California Department of Fish and Wildlife (CDFW) continues to reevaluate and update deer survey methods and schedules to provide ongoing short- and long-term estimates of deer populations within the state.

The modeled 2022 pre-season deer population estimate for the hunted segment in California increased from the previous year to roughly 500,000 animals. This estimate has fluctuated between approximately 400,000 and 700,000 over the past 30 years. These estimates are only for the hunted portion of the total deer population, which excludes most suburban deer. Suburban areas typically support high deer densities; therefore, the number of deer statewide is greater than the estimate for the hunted segment. However, this does not imply that all populations are stable. In some areas, deer are likely decreasing, such as the migratory populations in the Sierra Nevada, and the black-tailed deer populations in northwest California. In other areas deer are increasing, particularly non-migratory populations associated with suburbs and agricultural areas.

For the past several decades, CDFW has used a deterministic spreadsheet model to estimate deer population sizes by hunt zone. Input data for this model include previous year population estimates, current year harvest mortality from hunter harvest reports, estimated crippling loss, and demographic ratios (fawns per doe and bucks per doe) from fecal DNA mark-recapture, camera trapping, road surveys, and helicopter-based aerial surveys.

To improve the accuracy of deer population estimates and monitoring, CDFW is transitioning to integrated population modeling approaches that combine data from a variety of sources to generate population estimates. CDFW is also currently developing long term monitoring plans that leverage limited personnel resources by combining intensive surveys on a three to five-year rotation, with less-intensive surveys for key demographic parameters (e.g., survival, recruitment, sex and age composition) in intervening years. Models will be validated by comparing population projections to empirical estimates from intensive surveys, enabling adjustments to the frequency of surveys, as well as adjustments of effort in interim years.

CDFW uses harvest reports submitted by deer hunting tag holders to estimate statewide trends in deer harvest. Prior to 2015, CDFW required only successful hunters to submit the report card portion of their tag, and only a small proportion did so. As of 2016, any person who is issued a deer tag must submit a harvest report regardless of success or receive a non-reporting penalty applied to their next year's tag purchase. The resulting reporting rate increased from an average of 23% (2012 – 2015) to an average of 77% (2016 – 2020).

The estimated statewide deer harvest in California has ranged from roughly 26,000 – 40,000 since 2001 (Figure 1). Variations between years is attributed to variable hunter success, which is affected by actual changes in the deer population, weather conditions leading up to and during the deer season (e.g., early snowstorms that force migrants out of the high country, arid conditions that concentrates deer at water sources), wildfires leading up to and during the deer season limiting access, and the inherent variation in estimating populations.

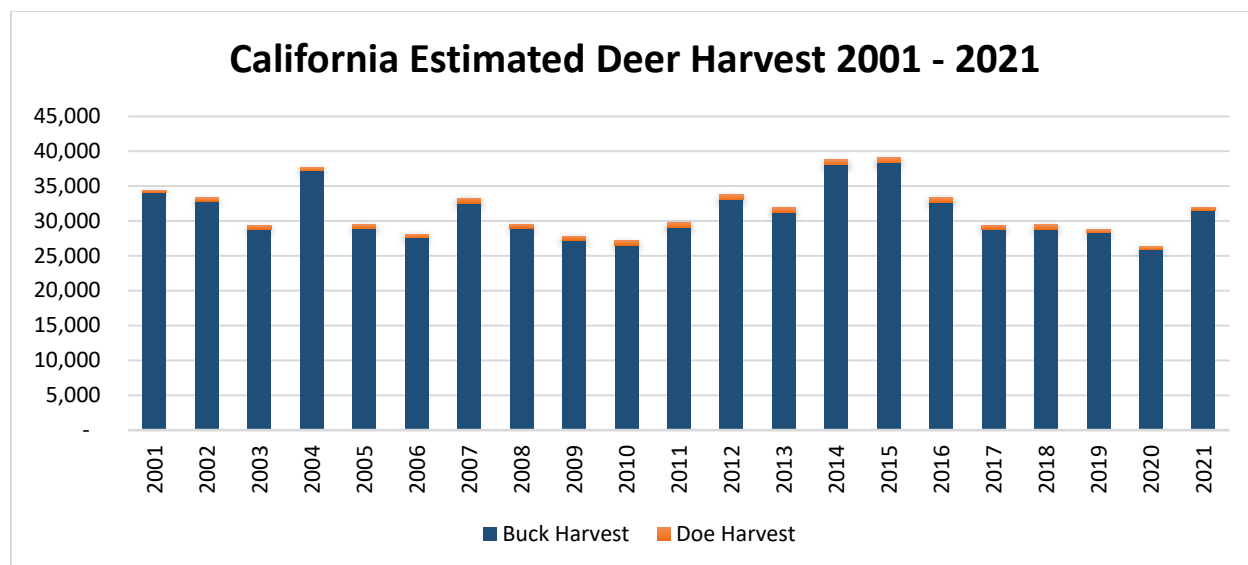


Figure 1. Harvest estimates of California deer 2001 – 2021.

- Julie Garcia, California Department of Fish and Wildlife

Colorado

The Colorado statewide post-hunt 2021 deer population estimate is 416,000, down from 428,000 last year (Figure 1). The statewide deer population has averaged 420,000 over the last 11 years. The decade prior to that was marked by significant declines in the some of the large westernmost herds in the state. The sum of statewide population objective ranges is 438,000-520,000 for all 54 deer herds combined. In 2021, 26 of 54 (48%) deer DAUs are within their population objective ranges. Population objectives that are appreciably higher than population estimates reflect Colorado Parks and Wildlife's (CPW) desire to stabilize, sustain, and increase mule deer populations.

Diverse habitat types and environmental conditions around the state create considerable geographic variability in population performance. Many deer herds on the plains and central mountains are performing well. There is still reason for concern about declines, particularly in many of the large westernmost herds in Colorado.

CPW uses spreadsheet models to estimate population size. These models rely on data from age and sex classification, harvest surveys, and survival monitoring. Annual population and sex ratio estimates are compared to long-term Herd Management Plan population and sex ratio objectives for each herd to establish harvest quota recommendations for the next hunting season.

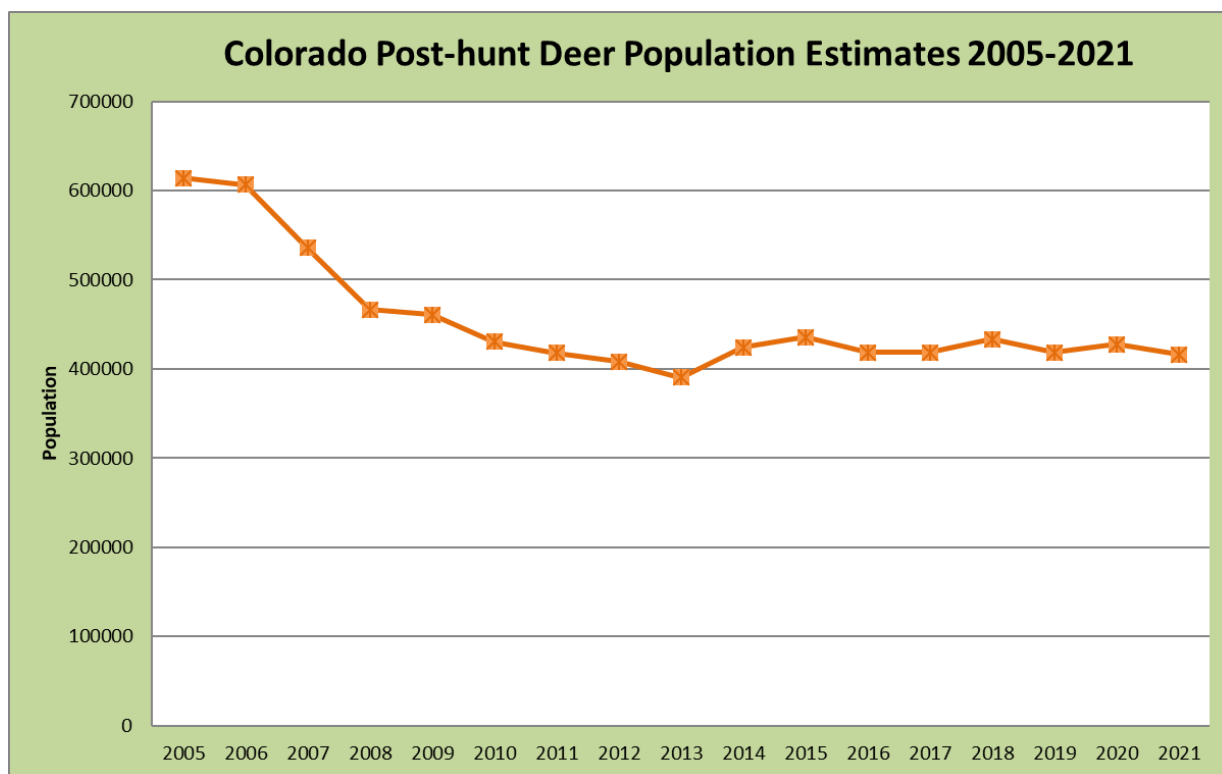


Figure 1. Colorado post-hunt deer population estimates from 2005-2021.

CPW intensively monitors annual adult doe survival and winter fawn survival in five mule deer sentinel herds. We also monitor buck survival in two of these herds. These herds were selected to ecologically and geographically represent mule deer west of Interstate I-25. CPW annually monitors well over 1,000 radio-collared mule deer in the five intensive monitoring areas and other herds. Survival rates from these sentinel herds are used in deer population models for the rest of the herds west of I-25. Since 1997, annual adult doe survival has averaged 83% and over-winter fawn survival has averaged 69%. Since 2008, annual buck survival in two of the five monitoring areas has averaged 79%. Survival has generally been high because winters have been mild for several years.

CPW conducts post-hunt herd inventories primarily with helicopters to estimate the sex ratios of males/100 females and the age ratios of young/100 females. In addition to survival rates, these ratios are necessary to estimate population size using population models.

The average of Herd Management Plan sex ratio objectives for deer herds statewide is approximately 30 bucks/100 does. During the post-hunt herd inventories in 2021, CPW staff classified 78,160 deer and observed an average sex ratio of 29 bucks/100 does weighted by population size (Figure 2), compared to 32 bucks/100 does in 2020. Buck/doe ratios have responded to our management actions (Figure 2). The statewide average observed age ratio from helicopter inventory was 59 fawns/100 does, the same as observed in 2020. Figure 3 shows 5-year average fawns/100 does mapped by herd.

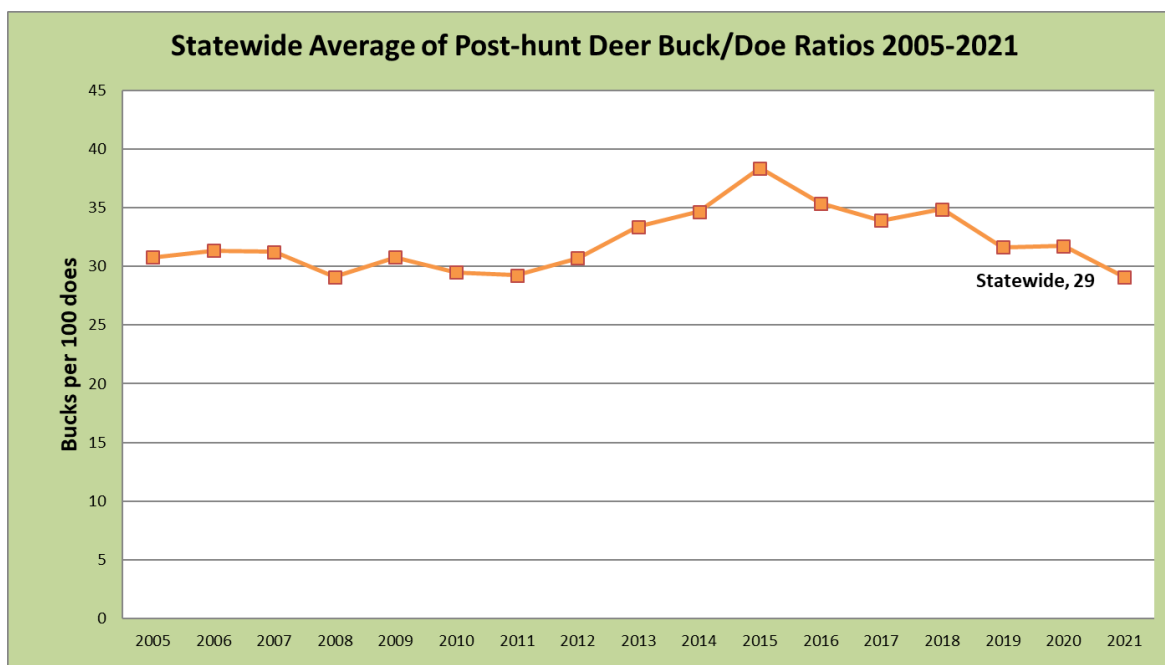


Figure 2. Colorado statewide average of observed post-hunt bucks/100 does for 2005-2021 weighted by herd population size.

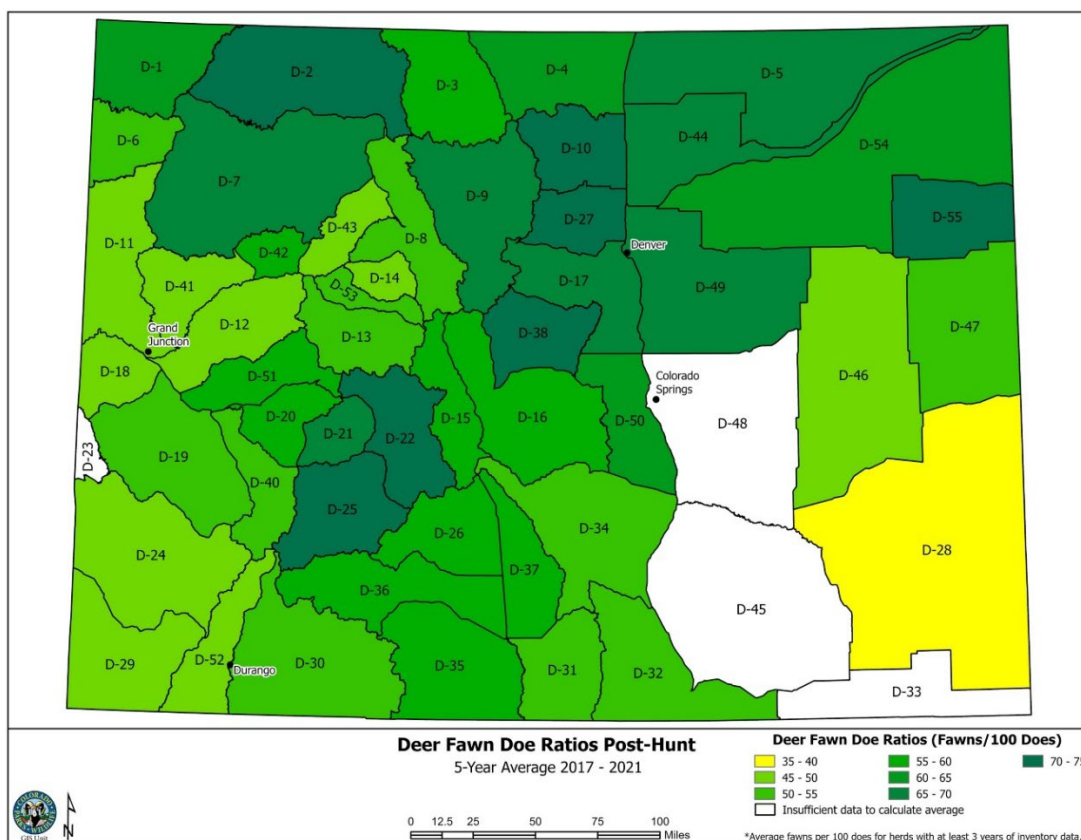


Figure 3. Colorado 5-year average fawns/100 does by herd.

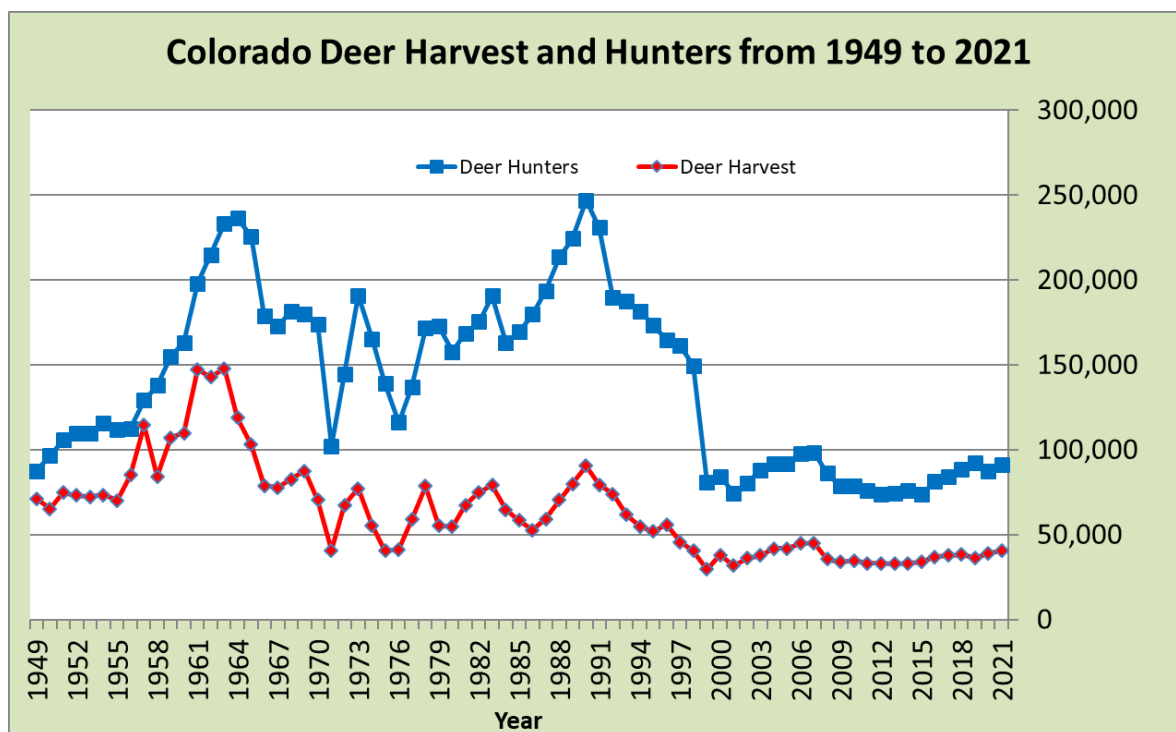


Figure 4. Colorado statewide hunters and harvest from 1949-2021.

Since 1999, all mule deer hunting in Colorado is by limited license only. In 2021, the estimated harvest from 91,175 deer hunters was 40,561 (Figure 4). Based on observed post-hunt sex ratios and an average hunter success rate of 50% for all rifle seasons in 2021, deer hunting continues to be good and Colorado remains a premier destination for mule deer hunters.

-Andy Holland, Colorado Parks and Wildlife

Hawaii (Kauai Island: Introduced Black-tailed Deer)

Since the introduction of the Oregon black-tailed deer to west Kauai in 1961, its range has expanded to the south and east sections of the island. The deer population on Kauai's public hunting areas is estimated to be between 950 to 1050 animals. Population estimates on private lands are not known at this time. Kauai uses the Aldous (1944) browse survey method which was modified to better fit Hawaiian environments.

Kauai experienced 2 major wildfires in 2012, the Kokee forest fires consumed just over 1000 acres of State Forest Reserves and severely impacted much of the deer hunting range. The 2013 deer hunting season was restricted to portions of the range not impacted by the wildfires. In 2014, all black-tailed deer hunting units were re-opened.

In July 2015, two hunting units underwent changes to include year-round hunting and increased bag limits. The changes were needed to address ungulate damage to native forest watershed and to protect threatened and endangered plants. Six deer hunting units remain seasonal during the fall months.

In 2003, the U.S. Fish and Wildlife Service designated Critical Habitat for over 80 species of endangered plant species on Kauai. Between 2007 and 2016, three large watershed ungulate exclusion fences were constructed totaling thousands of acres of the Alakai Wilderness Preserve, Hono O Na Pali Natural Area, and Kuia Natural Area to protect endangered Hawaiian plant species from ungulate damage. Animals within the fences including feral pigs, feral goats, and black-tailed deer were removed through intensive hunting, trapping, and snaring.

Trends in harvest of black-tailed deer from 2003 to 2019 on Kauai public hunting areas.

Year	Buck	Doe	Total
2003	45	19	64
2004	39	12	51
2005	32	8	40
2006	32	2	34
2007	32	4	36
2008	51	2	53
2009	29	0	29
2010	26	0	26
2011	30	0	30
2012 ¹	4	0	4
2013 ¹	5	0	5
2014 ²	36	0	36
2015 ³	36	15	51
2016	37	33	70
2017	31	24	55
2018	25	7	32
2019	22	15	37

¹ Two units closed to deer hunting due to wildfires

² All units reopened to deer hunting

³ Two units open to year-round deer hunting

-Thomas Ka'iakapu, Hawaii Division of Forestry and Wildlife

Idaho

Mule deer populations in Idaho have reflected variable winter severity over the last several years. Mild winters from 2013-2017 resulted in population increases and increased hunter participation and success, while the winters of 2017-2019 saw statewide winter deer survival at or below long-term averages, resulting in decreased populations. Reductions in antlerless hunting opportunity beginning in 2017 were made across several regions in southern Idaho. Mild conditions over the last two winters have resulted in improved overwinter fawn survival. Mule deer survival for the 2021-2022 winter is above the long-term average.

The state continues the process of converting population monitoring techniques to allow total population estimates through a combination of sightability, survival estimates, composition surveys, and modeling. Annual mule deer abundance is estimated using an integrated population model that is capable of incorporating data from different population monitoring techniques. Winter 2019-2020 population levels declined to approximately 239,000 mule deer south of the Salmon River drainage, but have rebounded to an estimated 281,988 as of January 1, 2022.

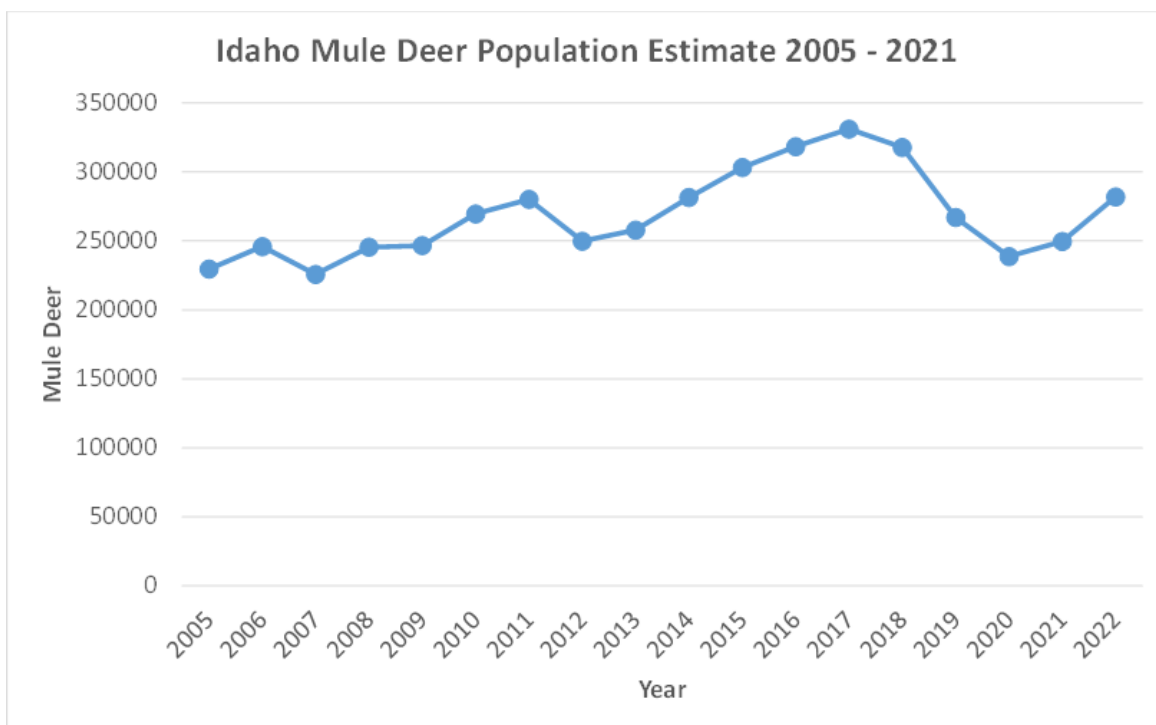


Figure 1. Mule deer population estimates from the Salmon River drainage south. Estimates are midpoint of confidence limits based on an integrated population model.

Short- and long-term objectives are to increase mule deer numbers. Post-season buck ratios in most areas exceed 15:100 does. Over the last several years, December fawn:doe ratios have generally shown increases over the typical mid-50s to mid-60s. Herd composition flights resumed in 2021 due after the pandemic, fawn:doe ratios in all areas surveyed were above average and well above average in some areas.

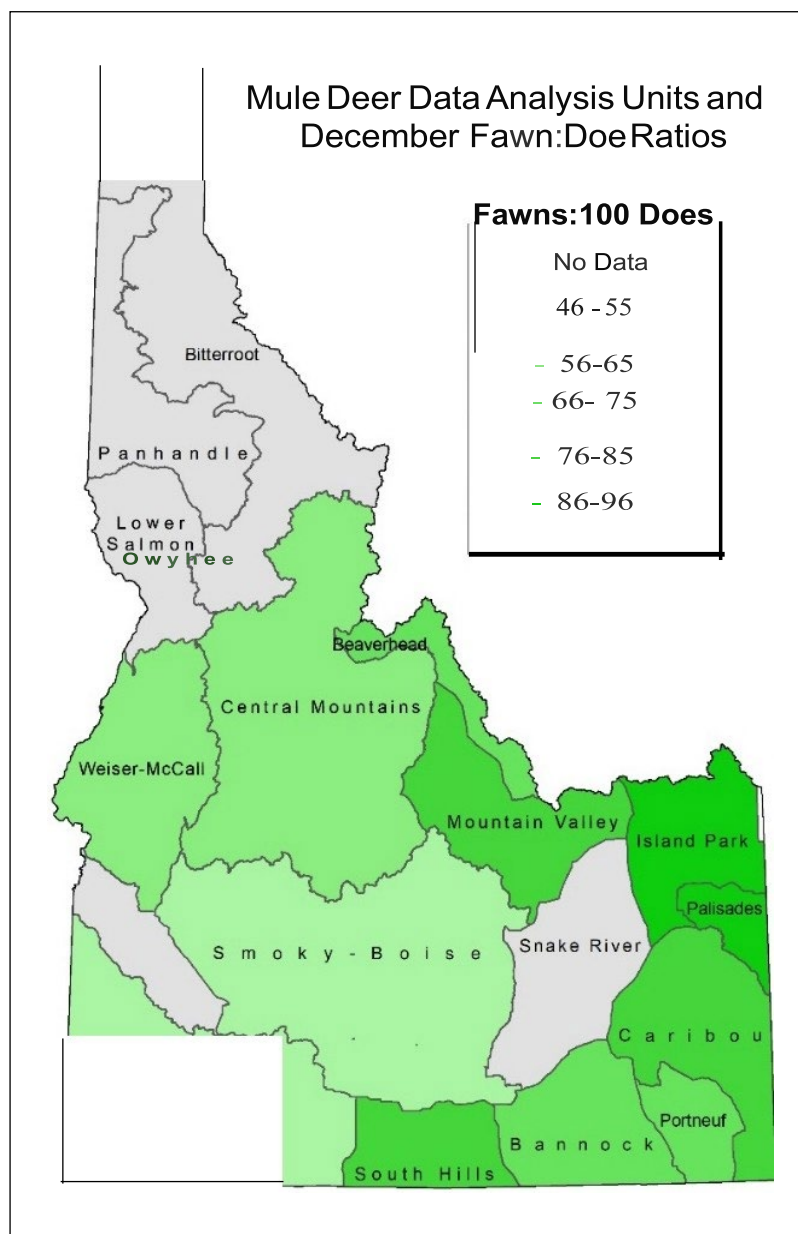


Figure 2. Most recent fawns:100 does by mule deer data analysis unit (2019-2021)

Mule deer harvest in Idaho has been stable to increasing since the mid-1990s following a steep decline in harvest in the early 1990s. Recent sales data indicate increased demand for mule deer tags from nonresident hunters coming to Idaho. Percent bucks with 4-point-or-better antlers harvested in the rifle-controlled hunts have remained at or above 40% since 2010, and were 60% in 2021.

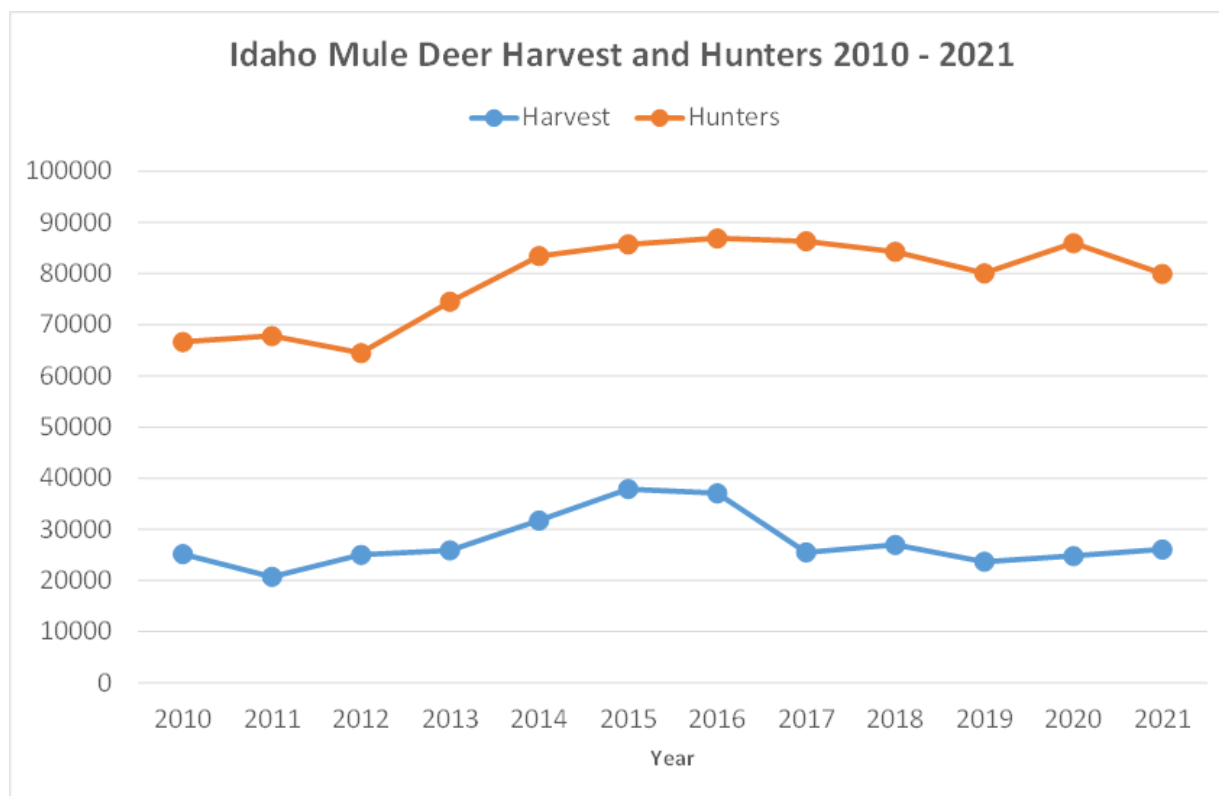


Figure 3. Total Idaho Mule Deer Harvest and Mule Deer Hunters, 2010 – 2021.

Idaho detected their first CWD positive during the 2021 hunting season. The detection was made near Riggins Idaho in 2 mule deer bucks. The CWD response strategy was activated and additional samples were collected from hunters, including additional emergency hunts created by the commission. Subsequent sampling detected an additional 4 positive including three white-tailed deer and 1 elk sample collected in the same general area. Prevalence measured after the 2021 harvest are below 2% for all three species sampled in the area. The first detection was a result of rotating sampling efforts outside the annually sampled panhandle, eastern and southeastern portions of Idaho due CWD-positive ungulates in neighboring Montana, Wyoming and Utah. The Commission has approved increased tag numbers and mandatory sampling in the vicinity of the positive detections to bolster sampling and assess the spatial extent of CWD in the area surrounding the detection. 2021 statewide sampling of hunter harvest, roadkills and suspect animals was 1705 total ungulates, which was up from the 1095 sampled in 2020.

In conjunction with the University of Idaho, a four-year survey assessing hunter congestion issues among deer and elk hunters is currently being conducted. Results from the 2019, 2020 and 2021 hunting seasons are currently being analyzed. The final survey in this series will be in 2023 to cover the 2022 hunting seasons. The survey questions will be developed for the next set of surveys of 2023 and 2024 hunters to examine preferences for potential future changes in hunting opportunity.

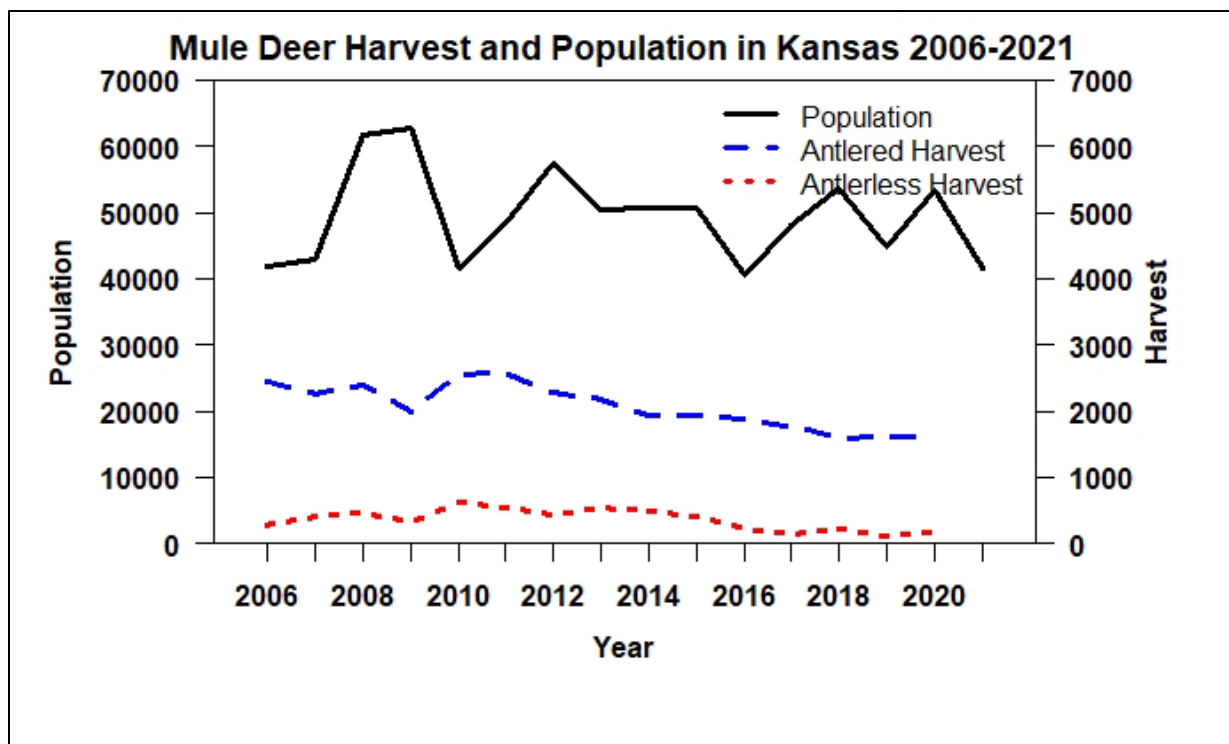
-Toby Boudreau, Idaho Department of Fish and Game

Kansas

Mule deer populations continue to decline along the eastern tier of counties where mule deer occur in Kansas. A spotlight distance sampling survey was implemented in October - November to estimate density and population size of mule deer in the east and west mule deer hunting zones. The mule deer population in the west zone of Kansas in 2021 was estimated to be 1.5 mule deer/mile² (95% CI: 0.9 – 4.7) while the density in the eastern zone was estimated to be only 0.17/mile² (95% CI: 0.06 – 0.51) resulting in a pre-firearm season total population estimate of 41,700 mule deer. In the west zone, the mule deer buck:doe ratio was 21.4B:100D. In the east zone the buck:doe ratio was 31.25, although the reliability of the estimate is questionable due a small sample size. Fawn:doe ratio in the west zone was 14.9F:100D; in the east zone 6.25F:100D, again the east zone sample size was small and reduces confidence in the accuracy of the estimate. The low reproduction rate of mule deer in Kansas is a concerning trend.

The major goal of deer management in Kansas is to maintain herd size at socially acceptable levels. This largely means minimizing landowner damage complaints and deer/vehicle accidents, while maintaining quality hunting opportunities in regard to hunter observations of deer and harvest opportunities. Currently, both hunters and landowners are expressing concern about the declining mule deer population in the eastern zone, thus the current management goal is “more” mule deer and current population levels are below the goal.

Management for mule deer receives enthusiastic support from deer hunters. Hunters want more mule deer and fewer hunters competing for permits and hunting locations. Hunting regulations in Kansas have been liberal for white-tailed deer while being restrictive for mule deer. Mule deer could be taken on 16.5% of the either sex deer permits issued in Kansas last year. Landowners received 47.1% of those permits. Each of those permits allowed only one deer to be taken but it could be either a mule deer or a white-tailed deer. By allowing either species to be taken, the permit system generally takes hunters out of the field earlier in the season as compared to a mule deer only permit system and takes pressure off mule deer while allowing approximately 17,000 people on average to have the potential to pursue mule deer each year while keeping these hunters' satisfaction higher. Hunters have taken an average of 2,406 mule deer/year during the last 10 years. In an effort to expand and increase the mule deer population, reductions in the permit quotas have been made in recent years. In 2021, for the fifth consecutive year, no antlerless permits allowing the take of mule deer were issued. In 2020, Kansas had the first year over year increase in estimated total harvest (1,772 - an increase of 40) of mule deer since 2013, harvest data from 2021 is not yet available.



Little information is available on survival, reproductive rates and habitat use of mule deer in Kansas, and much has been inferred from studies conducted in other locales. In February 2018, Kansas Department of Wildlife and Parks initiated a three-year study to investigate adult and fawn survival rates, reproductive rates, home range size, habitat use, harvest vulnerability, and inter-species interactions of mule deer and white-tailed deer in western Kansas. This study was completed in 2021. Adult male annual survival was 0.54 ± 0.05 and firearms hunting was the main source of mortality. Adult female survival was 0.78 ± 0.03 . Mule deer fawn 10 week survival was 0.28 ± 0.06 with predation and exposure being the leading mortality factors. Habitat use preferences indicate that mule deer rely heavily on Conservation Reserve Program (CRP) grasslands in all life stages and that higher than average landscape roughness and elevation were preferred. In the absence of the ability to increase landscape roughness and elevation conservation of mule deer will likely focus on providing high quality grasslands. Additional genetic analysis indicated that mule deer in western Kansas suffer from low genetic diversity and that there is some hybridization between mule deer and white-tail deer occurring.

Public interest and concern about chronic wasting disease (CWD) has been renewed recently. CWD prevalence is highest in the western portion of Kansas where mule deer are endemic. Kansas has no regulations in place for CWD management, but strongly recommends that hunters harvesting deer in areas with CWD use the photo check process that allows deer to be deboned so the carcass can be left in the field and to have CWD testing completed before consumption. In 2020, KDWPT began increasing communication efforts to educate constituents about CWD and best practices hunters can follow to slow or prevent CWD spread. To reduce CWD prevalence, KDWPT has maintained elevated white-tailed deer antlerless only permits in deer management units (DMUs) around core CWD areas. Mule deer populations in these DMUs

may be indirectly affected by increase whitetail deer harvest pressure or directly through accidental harvest of mule deer.

-Levi Jaster, Kansas Department of Wildlife, Parks and Tourism

Montana

Montana Fish, Wildlife & Parks (FWP) relies on harvest and population survey data for making mule deer management recommendations and decisions. Harvest data is collected through annual post hunting season phone surveys that randomly survey a sample of deer hunters that self-report success and effort. The survey provides an estimate of harvest within an 80% confidence interval. Population trend data are collected through aerial surveys of 76 trend survey areas across the state that represent deer across a diversity of habitat types. Additionally, FWP estimates the statewide mule deer population annually because of a statutory requirement. However, the estimate is based on a crude model and is not used for making management recommendations.

Mule deer hunting regulations for many years have included one antlered deer per resident hunter and approximately 25,000 non-resident opportunities valid across most of the state during a 6-week archery season followed by a 5-week rifle season. Therefore, antlered mule deer harvest has been viewed as an index of population size and trend. Statewide antlered mule deer harvest increased annually from 2010 through 2016 to a 22 year high of 45,564. In 2021, the statewide mule deer buck harvest estimate was 36,911; this was below the 1960-2020 average of 44,910 (Figure 1).

The antlered mule deer harvest (Figure 1) and statewide population estimate (Figure 2) suggest that the statewide mule deer population experienced a modern low within years 2010–2012. This low was influenced by severe conditions (extended cold temperatures and deep snow) across the eastern half of the state during winter periods 2009-2010 and 2010-2011. From 2011 through 2017, the statewide population estimate increased from 211,361 to 386,175 (Figure 2) and statewide antlered mule deer harvest increased from 28,985 to 42,851 (Figure 1), suggesting a population increase during that period. Survey and harvest data suggest a slight decline in mule deer statewide since 2017. This decline was likely the result of severe winter conditions across the state during 2018-19. Following the 2021 hunting season, the statewide average buck:doe and fawn:doe ratios were 27:100 and 43:100, respectively. The fawn:doe ratio of 43:100 is lower than the ratio of 58:100 observed following the hunting season of 2020. This may be attributed to severe widespread drought conditions during 2021.

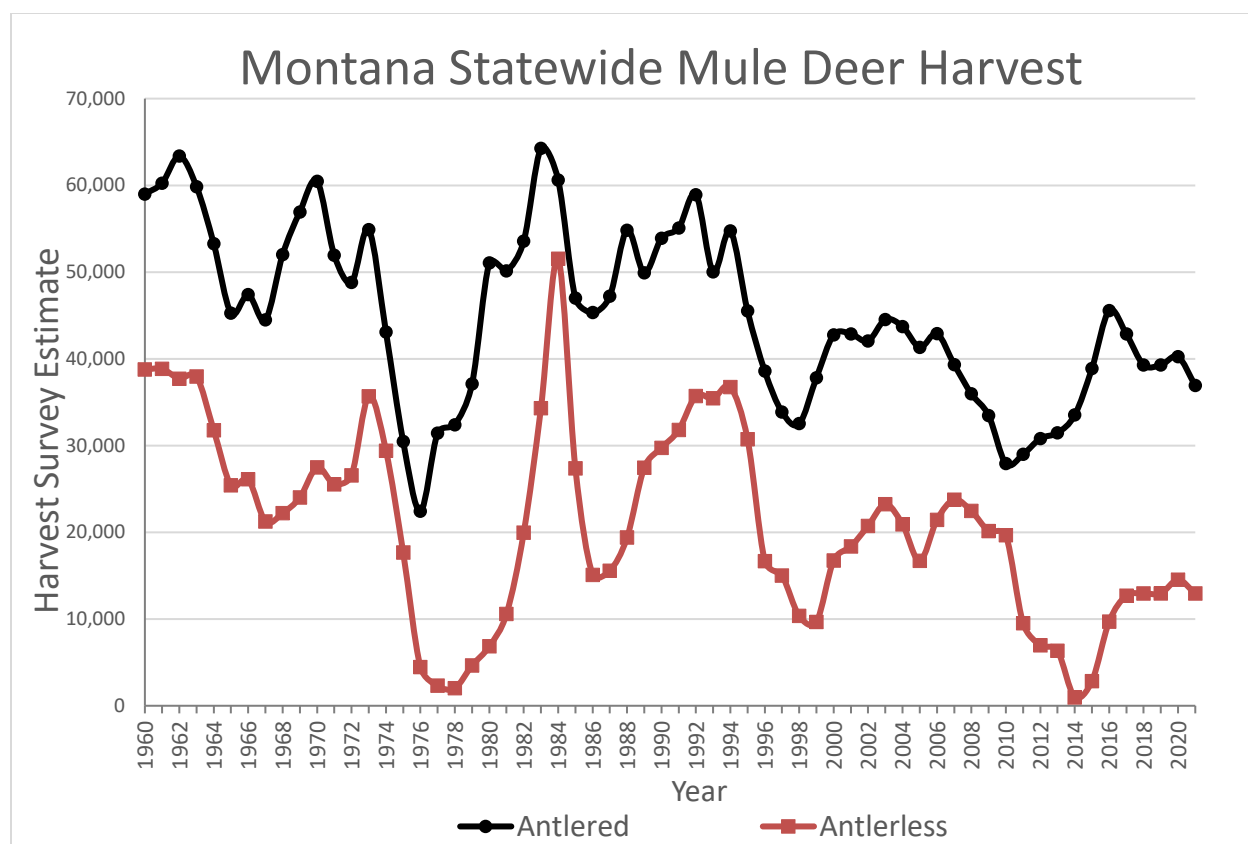


Figure 1. Montana statewide mule deer harvest, 1960-2021.

Within the state, long-term mule deer populations have varied. Those across the western 1/3 of the state, in the mountain/foothill environments, have generally trended down and remain below historic highs and averages. Habitat changes facilitated by conifer forest succession, over-utilization of browse resources by mule deer, and increased resource competition from growing populations of elk and white-tailed deer are thought to be primary influencers of mule deer trend across the mountain/foothill environments. On the contrary, populations across the eastern 2/3 of the state, in the prairie/breaks environments, have generally remained stable or increased.

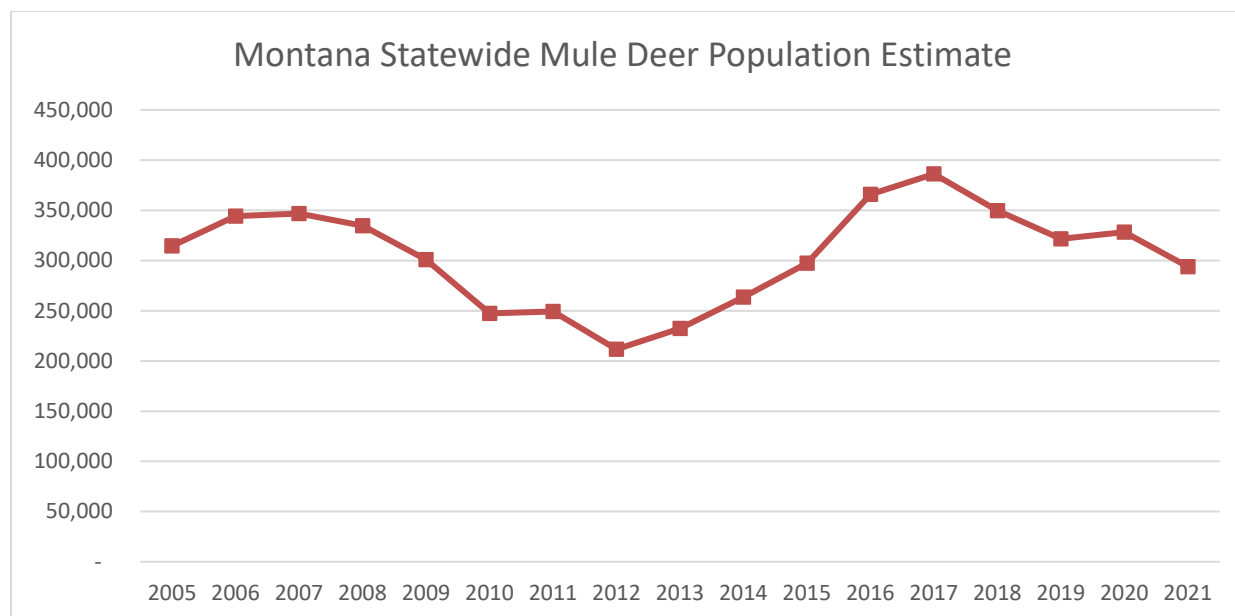


Figure 2. Montana statewide mule deer population estimate, 2006-2021.

The statewide estimate for deer (mule and white-tailed) hunters was 148,393 in 2021, which is lower than the 150,342 in 2020 and a 1986–2020 average of 162,895. The number of deer hunters in Montana peaked at 201,576 in 1994, decreased to 148,461 in 1999, and has remained relatively stable since that time.

Since 2001, mule deer harvest regulations across Montana have been determined by following guidelines outlined by the state’s Adaptive Harvest Management (AHM) plan. This plan provides harvest regulation guidelines for antlered and antlerless mule deer based on recruitment, population surveys, and hunter harvest data for five population management units which were developed based on ecotype. Working within these guidelines, biologists have reduced antlerless harvest opportunity as modern populations have trended down (Figure 1). Beginning in 2016, a portion of southwest Montana has allowed liberal antlerless mule deer opportunities, outside of AHM plan guidelines, with the hypothesis that declining populations are being influenced more by habitat limitations than by hunter harvest. This effort is currently being implemented and monitored with an experimental approach that may inform future AHM guidelines for southwest Montana.

-Lindsey Parsons, Montana Fish, Wildlife & Parks

Nebraska

Mule deer habitat across Nebraska can loosely be considered as a gradient, with the most suitable habitats occurring in the western third to half of Nebraska, the least favorable being found in eastern Nebraska, and transitional habitats arising in the central band of counties. The highest quality mule deer habitats are the relatively intact native grasslands and pine forests in Western Nebraska, plus some of the lightly agriculture diversified grasslands in central and southwest

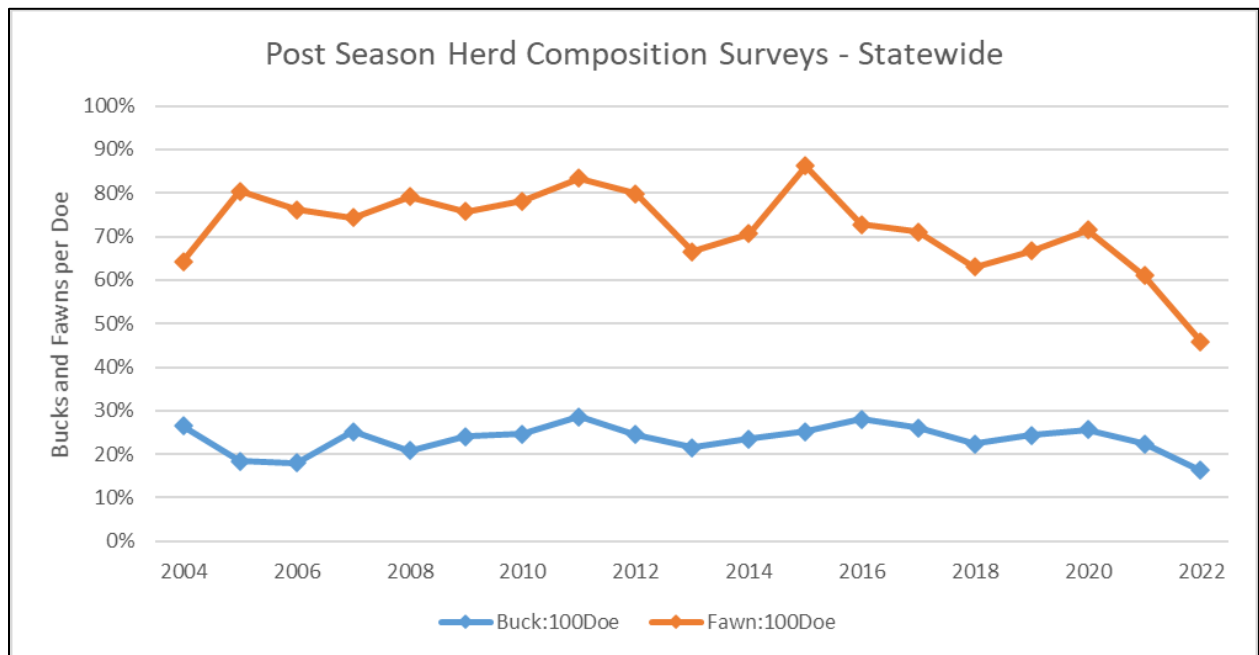
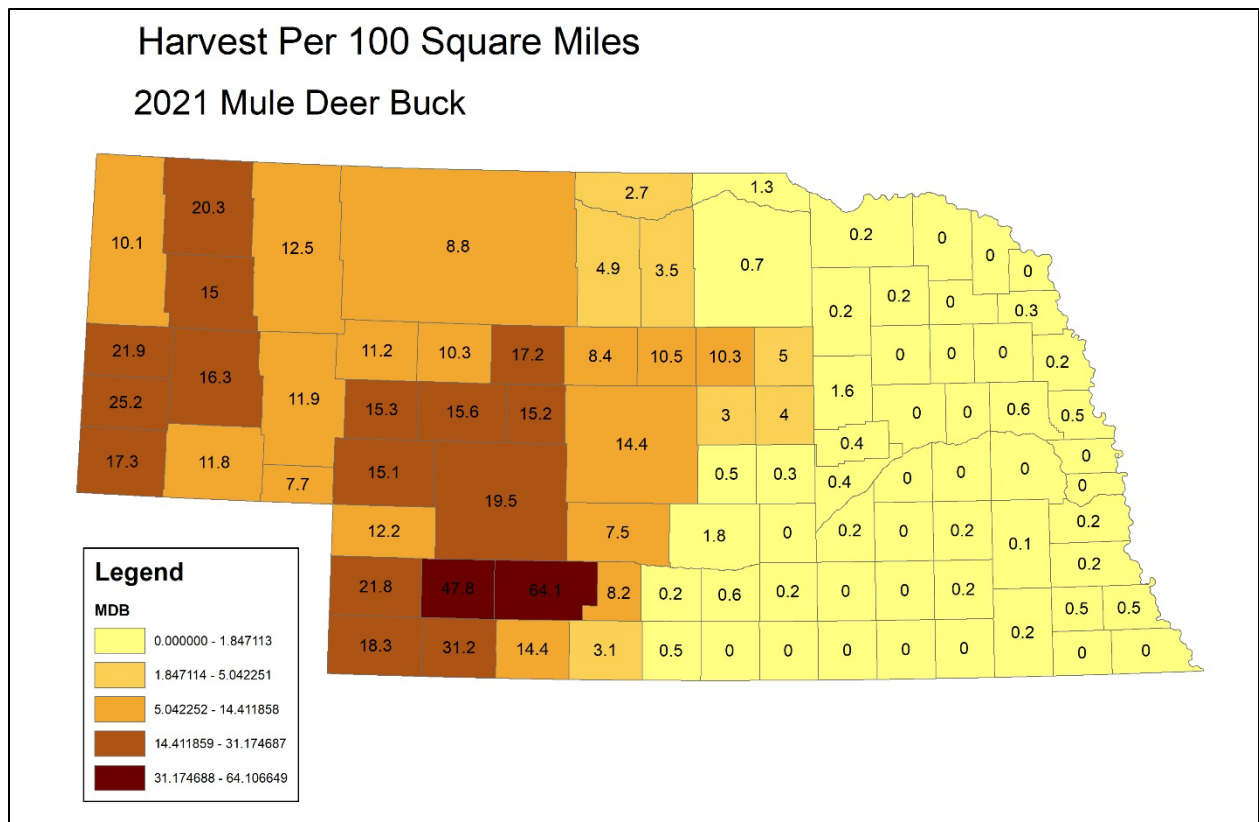
counties of the state. Intermediate habitat are fragmented grasslands interspersed with croplands and are characterized as the swath of east-central portion of the state. The least favorable mule deer habitat occurs in the compromised tallgrass prairie ecosystem, which is now mostly entirely converted to row-crops. Compromised poor quality habitat conditions are responsible for low relative abundance of mule deer in eastern Nebraska. Eastern Nebraska mule deer populations will likely remain low unless landscape conditions change. Mule deer populations in Nebraska generally reflect the quality of habitat. The eastern range of mule deer has receded westward in the last 15-20 years. We suspect that this is due to increasing habitat loss/conversion and partially due to impacts of meningeal brain worm (*P. tenuis*). In 2019 and 2020, staff documented numerous MBW cases which likely led to a decline in mule deer populations in the central and southern parts of the state. Those declines are likely responsible for the declines in overall harvest as well. Population estimates are not calculated or used at the Deer Management Unit (DMU) level. Staff has little confidence in the statewide estimate, which is generated via a basic model including buck harvest, buck survival and herd composition dynamics. Staff bases management objectives and recommendations for each DMU on population trends, agricultural damage complaints, age of harvested bucks, buck harvest, permit demand, deer vehicle collisions, and public input. Mandatory check of all harvested deer is required. We typically collect age data on more than 4,500 mule deer annually, population trends are based on total adult buck harvest at DMU level. Barring significant change in buck permit allocations these indices provide consistent indicators of annual population and age structure change at DMU level.

Harvest of mule deer bucks was 6,626 in 2021, an 8% decline from 2020 and 32% down from the high in 2017. Antlerless mule deer harvest was 1,949 in 2021. Total deer harvest in 2021 was 52,938 in Nebraska, of which 16% were mule deer. Mule deer harvest is greater than white-tailed deer harvest in 3 of 18 DMUs, and mule deer are abundant in 10 of 18 DMUs across Nebraska.

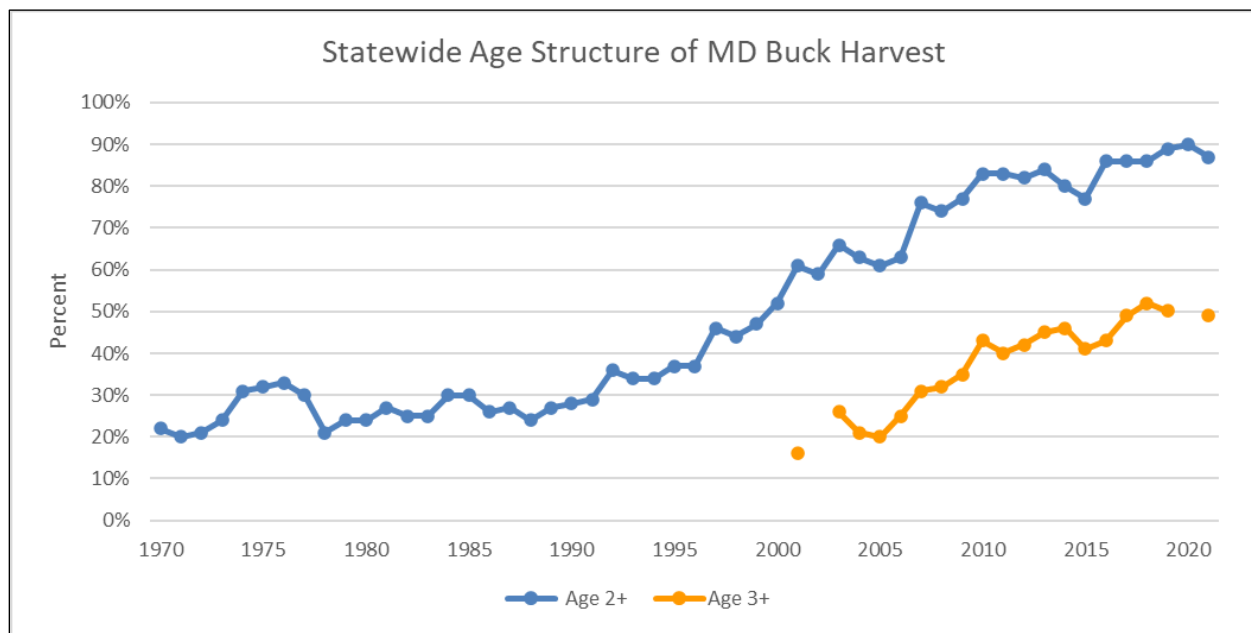
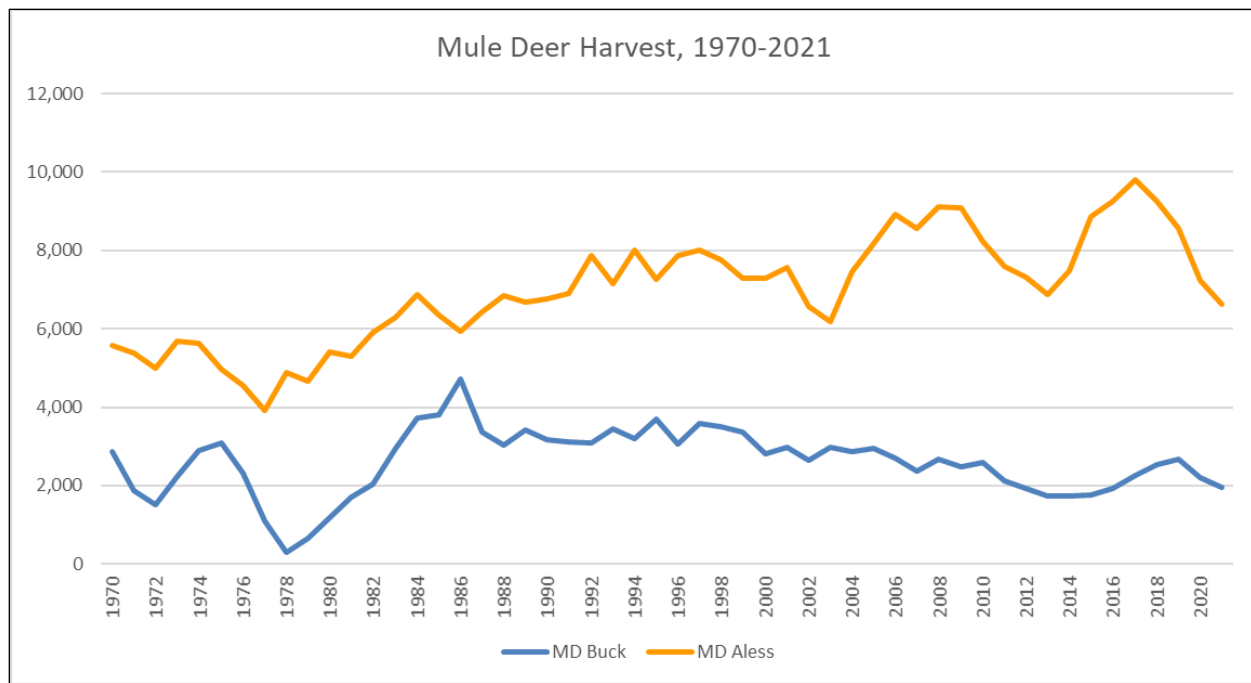
Historically, buck to doe ratios have remained within desired ranges (20-30 per 100) and fawn production has remained at or above the target of 60%. However, fawn rates have declined over the past 5 years and the buck ratio dropped below 20 this past year.

Chronic Wasting Disease was first discovered in a mule deer in Nebraska in 2000. Since then, CWD has been found in 49 of 93 counties in mule deer, whitetail deer and elk. Since 1997, NGPC has tested more than 55,000 deer for CWD. NGPC currently surveys about ¼ of DMUs on a rotating basis, sampling 1,000-1,500 deer for CWD annually. Bucks 2.5 and older are targeted for sampling at November Firearm check stations. However, CWD was not sampled systemically due to checkstations not being operated.

In February 2018, 2019 and 2020, the University of Nebraska and NGPC collared 240 mule deer does and subsequently caught their fawns to study mule deer doe and fawn survival rates, mortality factors and habitat use in southwest and northwest Nebraska. Preliminary results have shown poorer than expected doe (58%) and fawn (~25%) survival.



Range-wide Status of Black-tailed Deer and Mule Deer ~ 2022



-Luke Meduna, Nebraska Game and Parks Commission.

Nevada

The Nevada Department of Wildlife (NDOW) issued approximately 16,530 mule deer tags for the 2021 hunting season. The number of tags has steadily decreased over the past 10 years and was the lowest number of tags issued since 2011. The overall success rate for Any Legal Weapon seasons was 40% statewide, which is slightly below the previous 3-year average success rate of 44%. Muzzleloader and archery hunt success rates were 36% and 17% respectively, which were both below the 3-year averages of 40% and 19% for those weapon categories. Junior hunters also realized a slightly lower success rate of 58%, compared to the previous year's hunt success rate of 61%. Overall, about 5,390 bucks and 750 does were harvested by all hunters and 39% of the bucks were 4-point or greater. The statewide percentage of 4-point or greater (39%) was below the 3-year average of 43% and slightly below the 10-year average of 40%.

During 2021, biologists classified approximately 10,762 mule deer during the fall survey. Statewide fawn production was 47 fawns per 100 does observed during post-season surveys, compared to 51 fawns per 100 does during the fall 2020. The observed post-season buck ratio was 29 bucks per 100 does for 2021 which is slightly below the 5-year average of 30 bucks per 100 does. The observed spring fawn ratio of 30 fawns per 100 adults was identical to the 5-year average of 30 fawns per 100 adults, indicating a stable to slightly declining growth rate.

The primary driver of mule deer populations is the numbers of fawns recruited into the population each year, in addition to the body condition and productivity of adult females. For the second year in a row the state of Nevada experienced below average precipitation throughout most regions and drought conditions persist throughout Nevada during late spring 2022. As of April 14, 2022, 100% of Nevada was in severe drought and over 50% of the state was in extreme or exceptional drought conditions according to the U.S. Drought Monitor. The statewide population estimate for Nevada declined by approximately 20% compared to the 10-year average with an estimated 78,000 mule deer for 2021 (Figure 1).

Nevada's mule deer populations have continued to decline over the past decade largely due to lack of consistent precipitation, large-scale range fires, conversion of native shrubs to invasive grasses, and degraded range conditions from feral horses and burros. During 2021, NDOW has formed a Mule Deer Enhancement Program (MDEP) to address declining herds throughout the state. The MDEP is a committee and stakeholder-based program led by teams of biologists from NDOW and includes partners from state and local agencies and non-governmental organizations (NGO's). As of this report, there have been over 17 new habitat projects approved by the MDEP Oversight Committee for 2022 and 5 new radio-collar projects to investigate limiting factors for mule deer. The MDEP program will continue to identify projects and funding designed to improve habitat and gain better understanding of mule deer ecology including predator-prey dynamics, impacts from competition with feral equids, and migration corridors.

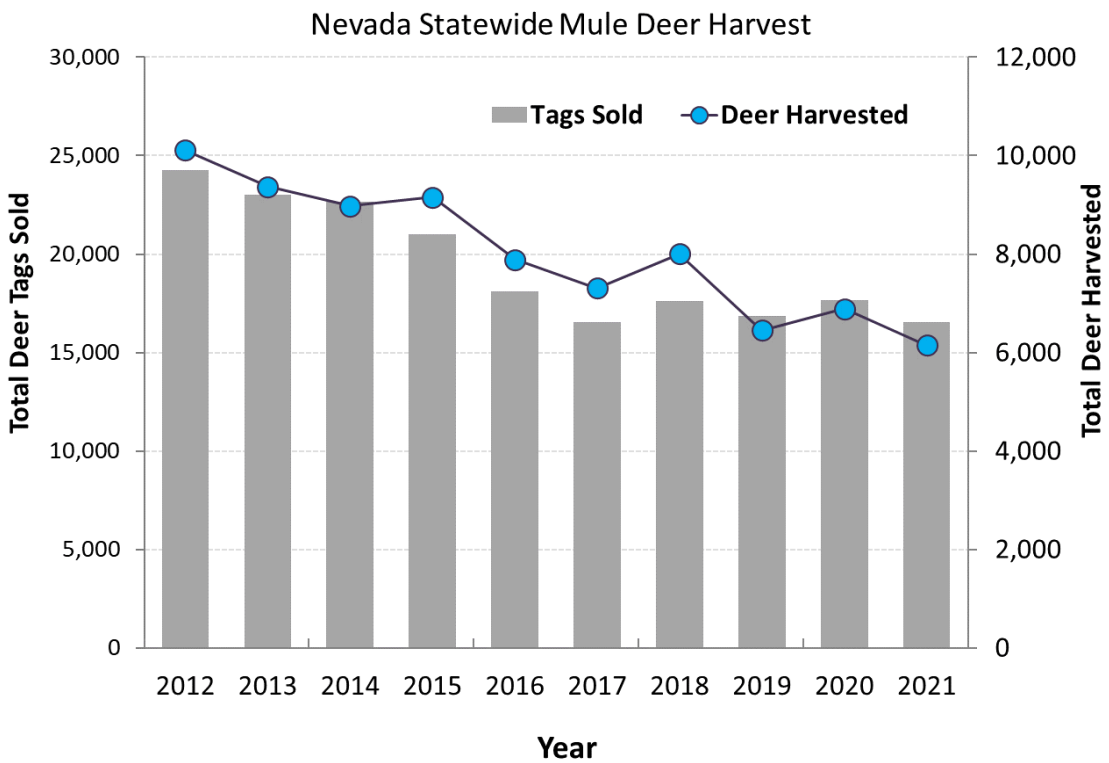
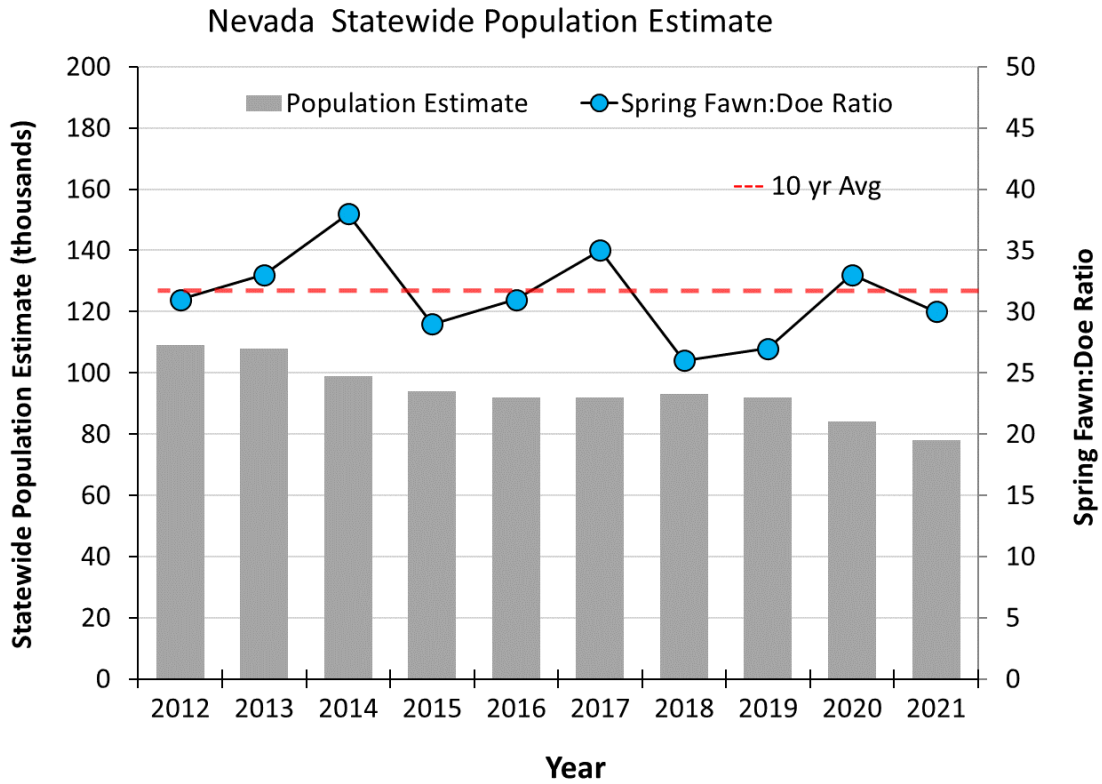


Figure 1. Trends in statewide mule deer population estimates (top panel) and observed fawn:doe ratios for Nevada, 2012 to 2021. Number of mule deer tags sold (bottom panel) and total deer harvested by year from 2012 to 2021.

-Cody Schroeder, Nevada Department of Wildlife

New Mexico

Mule deer population growth in New Mexico is highly dependent on the amount and timing of precipitation. If moisture levels and timing are appropriate, fawn survival and recruitment can increase, and consecutive years of good rainfall are important to grow a deer population. During periods of drought, or if the summer monsoon rains arrive late in the summer, fawn survival may be low resulting in declining populations. New Mexico has been in a long-term drought which has resulted in reduced recruitment. Moisture and growing conditions in recent years have altered between above average moisture and drought, but there have been enough beneficial moisture years to allow the population to remain stable throughout the state with local variation. New Mexico received very good precipitation during the 2021 summer monsoons while 2020-2021 winter precipitation was average. The 2021 spring and early summer precipitation has been poor throughout the state.

In addition to precipitation, wildfires can improve habitat and lead to population growth. Beneficial wildfires that occurred within the last 10-15 years have reset mature forest stands to early successional habitat stages; these burned areas provide excellent hiding cover and nutritious forage for mule deer. As a result, deer populations in recently burned areas show continued signs of growth in recent years. It is currently unknown how the 2022 fire season will impact deer populations.

The Department conducts post-hunt aerial surveys annually in December to obtain composition ratios for select Game Management Units (GMU). During the winter 2021 post-hunt survey, the statewide buck to doe ratio was 27 bucks:100 does (Figure 1); this is slightly below the long-term average. The 2021 fawn recruitment was higher than the long-term average. The Department estimated 45 fawns:100 does which is higher than the long-term trend. With another year of improved recruitment, we could start to see an increase in some populations.

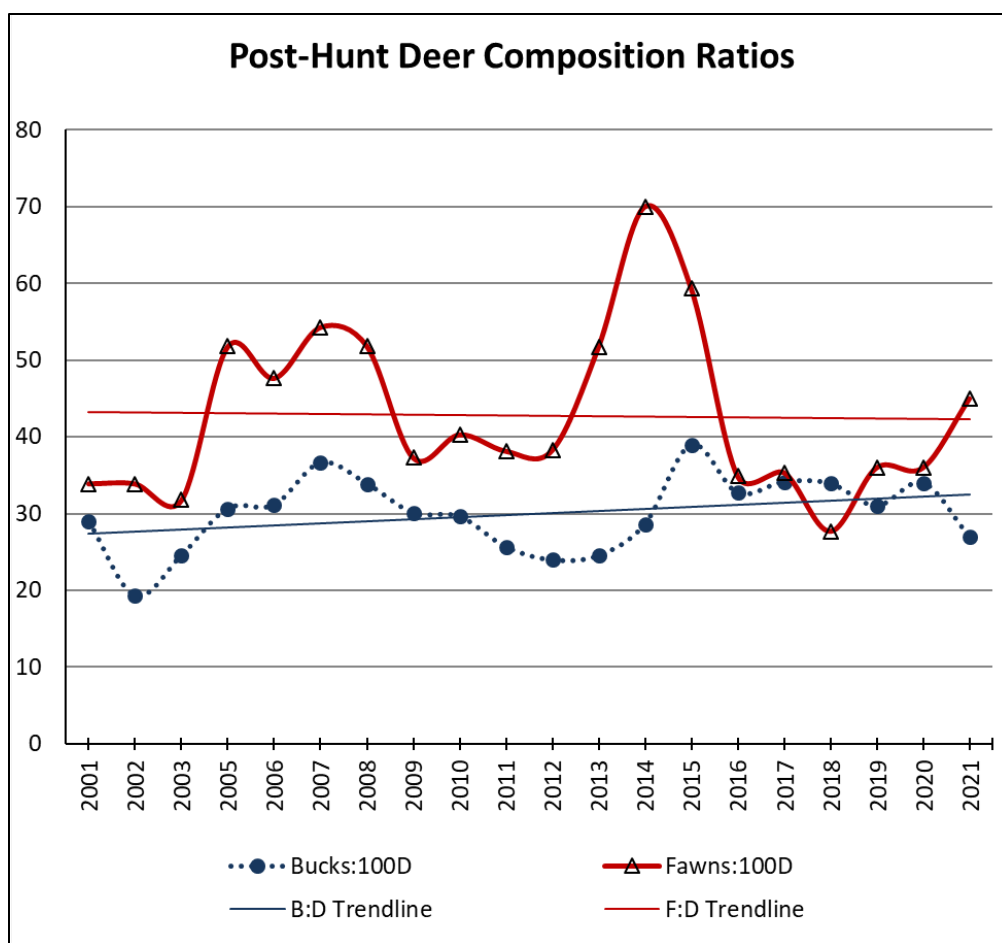


Figure 1. New Mexico statewide composition ratios obtained during post-hunt winter surveys from 2001-2020.

Deer hunting opportunities on public land are issued through the public draw; private land deer hunting opportunities are available over-the-counter with written permission in most areas of the state. Trends in composition ratios obtained from the aerial surveys are used to adjust the number of deer hunting licenses that are issued through the public draw.

Deer license holders are only permitted to harvest bucks in New Mexico except for a few specific instances where deer are overpopulated near urban areas. In these areas, New Mexico Department of Game and Fish offers youth antlerless hunts and an antlerless archery hunt to help maintain the population within the levels of social tolerance.

Harvest reporting has been mandatory since 2006. During the 2021-2022 hunting season an estimated 37,182 hunters harvested 8,827 deer in New Mexico (Figure 2). The harvest reporting system does not distinguish mule deer from white-tailed deer unless a hunt is for a specific species. The majority of deer harvested in New Mexico are mule deer with white-tailed deer comprising approximately 3% of the total harvest. Hunter success was approximately 28% during the 2021-2022 hunting season for all weapon types combined. This is slightly lower than the long-term average success rate for deer hunters in New Mexico (31%; 2006-2021).

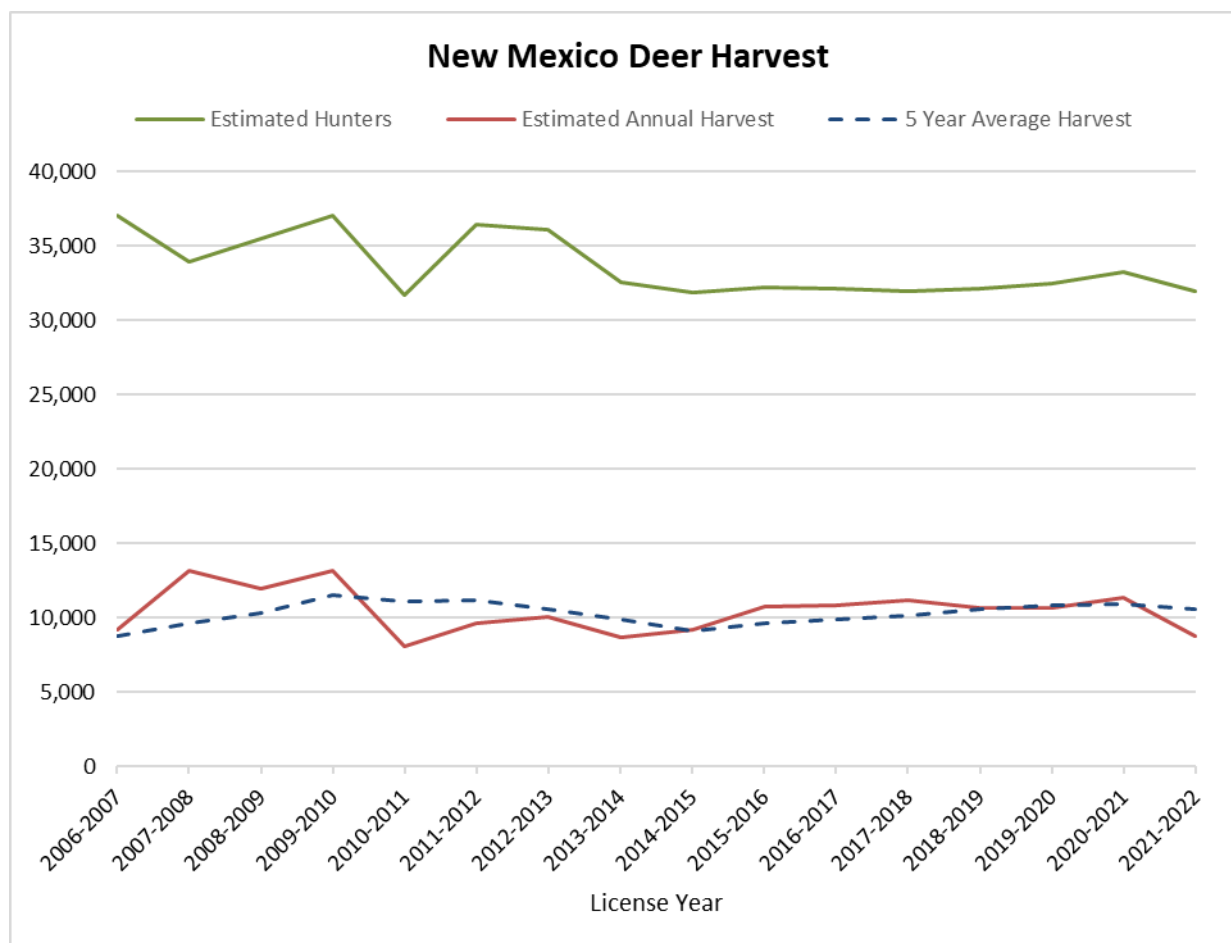


Figure 2. Estimated annual deer hunters and harvest in New Mexico 2006-2021.

-Orrin Duvuvuei, New Mexico Department of Game and Fish

North Dakota

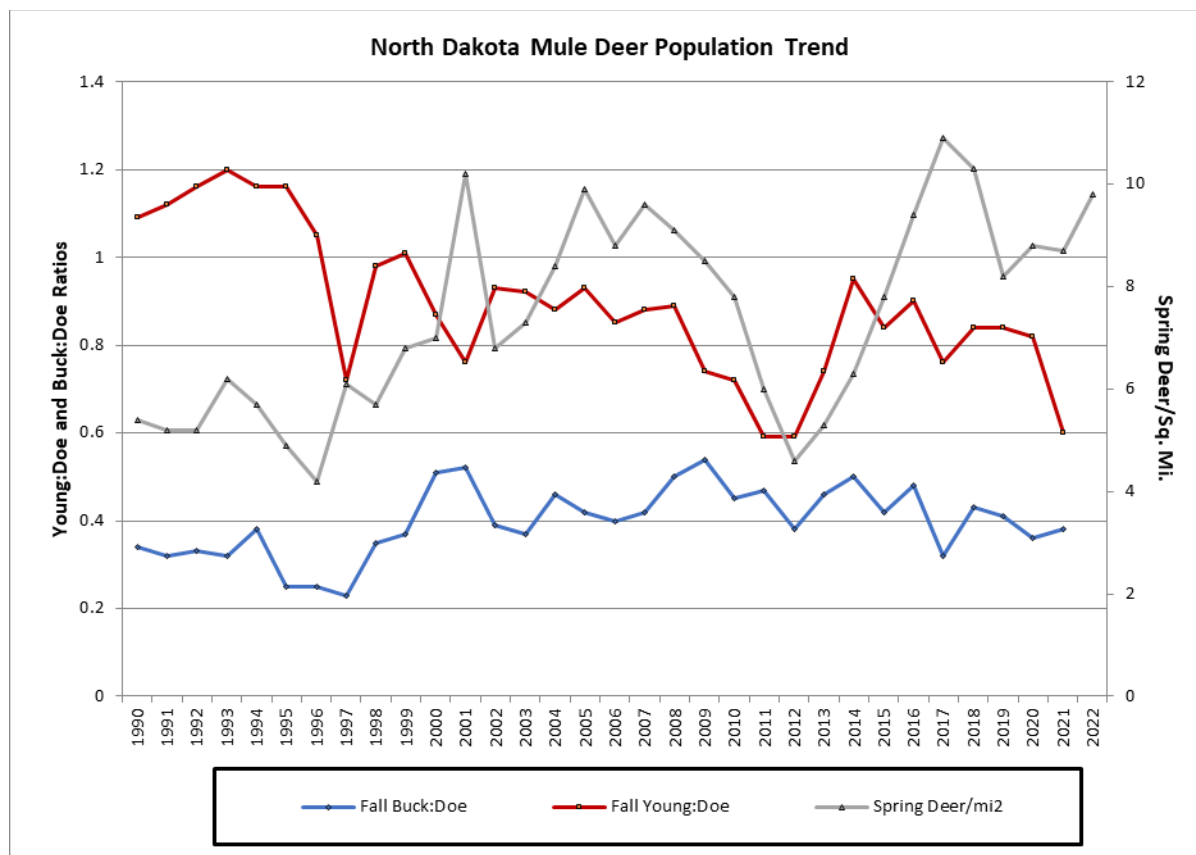
North Dakota's badlands mule deer population showed an increasing trend with high fawn production from 1990-2007. Mule deer fawn production was typically greater than 90 fawns:100 does during these years. Winter weather conditions were mild during this time period except in 1996. Mule deer numbers peaked in 2005-2007. Following this population peak, North Dakota experienced three of the most severe winters on record from 2008-2010. Consequently, mule deer abundance in the badlands decreased by 50% and reached a population low in 2012. Record low fawn:doe ratios were recorded in 2009-2012 following these winters. Winter weather conditions moderated in 2011-2019 and the mule deer population has increased since 2013. North Dakota experienced drought conditions during 2020 and 2021 resulting in near record low fawn production in 2021. Although fawn production was low due to extreme drought, habitat in the badlands was still in a condition able to provide high over-winter survival during a mild winter which led to a slight population increase in 2022. The 2022 spring index was 13% higher than the 2021 index,

and 34% higher than the long-term average. Mule deer abundance has trended upward during the last three years.

The combination of eliminating antlerless harvest and milder winter weather conditions in 2011-2015 is responsible for mule deer population growth in the badlands. North Dakota has a limited quota license system and a goal of maintaining at least 30 bucks:100 does prior to the gun season. Buck:doe ratio has trended stable to decreasing over the last three years, while fawn:doe ratio trended downward during this period.

The mule deer buck:doe ratio has remained stable and above objective since 1999. Mule deer are currently above the objective of maintaining at least six deer per square mile in the badlands. A conservative harvest strategy with a limited number of antlerless licenses is being used to encourage additional population growth of mule deer in the badlands.

We assessed female mule deer mortality risk using 203 deer fitted with global positioning system (GPS) radio-collars that were deployed from 2012 – 2016. The estimated annual adult survival probability was 85.6%, and overwinter juvenile survival probability (Dec – May) was 67.7%. Survival probabilities were lowest in the winter season for adults and juveniles. The leading cause of mortality for adults was predation (32%) and for juveniles was malnutrition (22%).



- Bruce Stillings, North Dakota Game and Fish Department

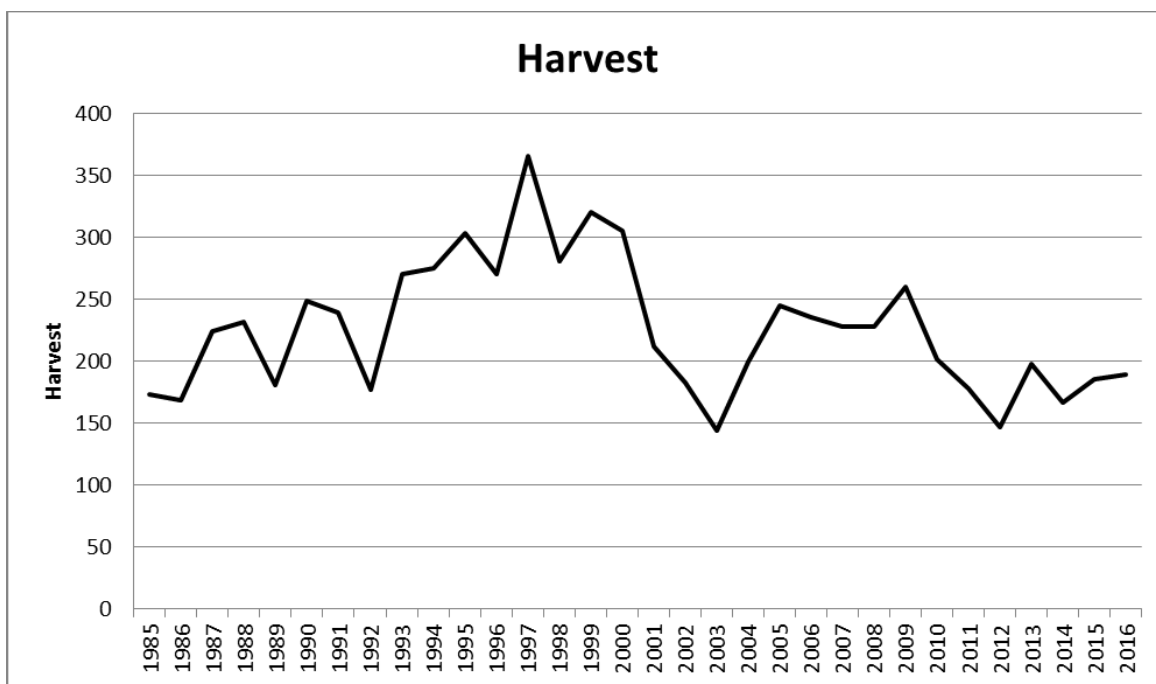
Northwest Territories

The number of mule deer in the Northwest Territories is not known, but it is believed that no viable population exists in the Northwest Territories. There have been 2 recorded sightings of mule deer in the last 4 decades and both were in the southeastern corner of the Nahanni National Park (1979 and 2003). In addition, there is 1 unrecorded sighting from a wildlife officer working for the Government of the Northwest Territories of 2 mule deer just north of the British Columbia /Northwest Territories border near the Liard River in 2018. We consider mule deer observations in the Northwest Territories as vagrants. Mule deer were occasionally observed in the Northwest Territories from the 1920s to late 1960s with white-tailed deer being the deer observed since that time. It is not clear how long mule deer existed in the Northwest Territories and their habitat is probably marginal. They have completely disappeared from their former range, except in the Nahanni-Liard area where mule deer are seldom reported. Mule deer are not hunted in the Northwest Territories and so there is no formal survey or collection of harvest data, nor active research on this species. The decline of mule deer in the Northwest Territories may be caused by a complex of factors.

- Ève Lamontagne, Department of Environment and Natural Resources, Government of the Northwest Territories

Oklahoma

With Oklahoma being the eastern edge for what is considered mule deer habitat, we estimate between 1,750 and 3,000 animals pre-hunting season in our panhandle, NW and far SW portions of the state. A slight increase from previous years. Most harvest occurs on private lands, but opportunities to harvest a mule deer does exist on some of our public hunting areas. Oklahoma does not differentiate between mule deer and white-tailed deer in our tagging system. A statewide deer permit allows the harvest of either species. In general, habitats are beginning to rebound from catastrophic drought conditions. This is aiding a slight increase in populations, with folks beginning to see mule deer in areas that have not held populations in quite some time. The 2021-22 season led to 254 mule deer being harvested across 15 of our Westernmost counties.



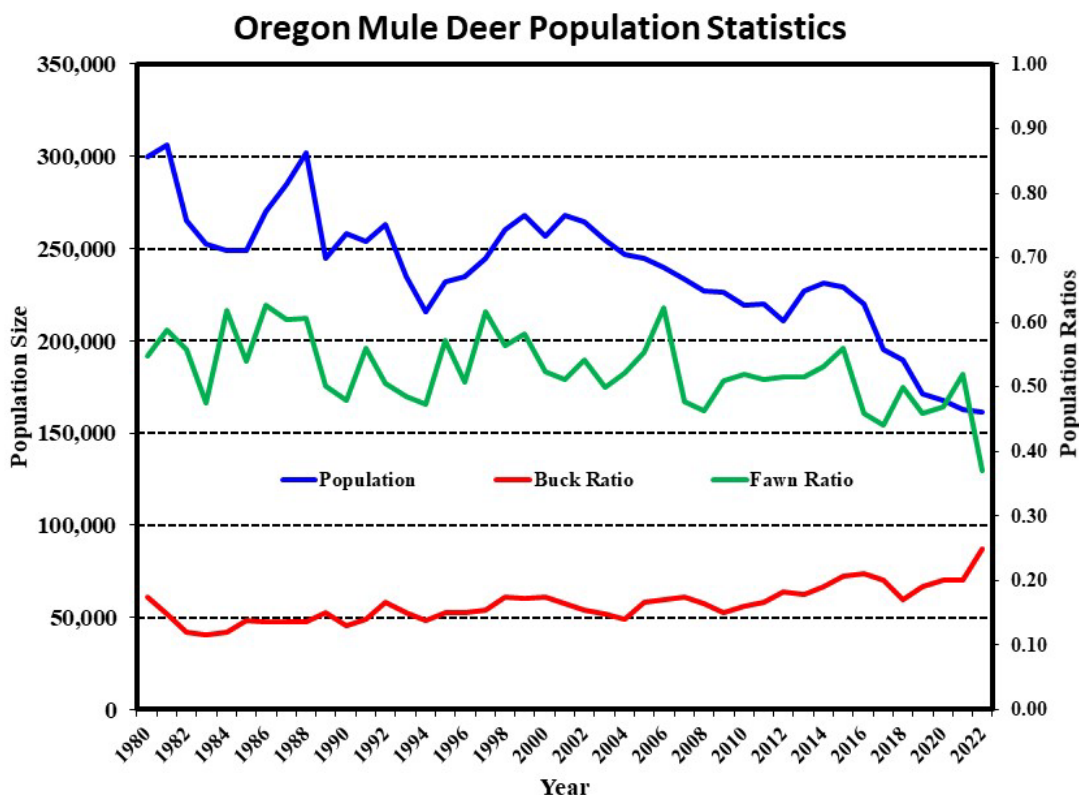
-Dallas Barber, Oklahoma Department of Wildlife Conservation

Oregon

Mule deer are substantially below the long-term statewide management objectives. Oregon's estimated mule deer population continues to decline with an estimated population between 155,000 – 165,000 in 2022. Number of hunters declined by 20% (10,244) to 40,603. Harvest, however, decline by only 3% 12,584. Survival continues to vary considerably across the landscape. Adult annual survival in areas with sufficient collars for analysis ranged from 80% to 91% for the biological year 2021–2022. Over winter survival for fawns in four monitoring areas ranged from 63% – 72% during winter 2021 – 2022.

Because of the difficulties with surveying black-tailed deer we have been unable to develop annual population estimates. However, in 1998 the black-tailed deer population was estimated at 387,000, declining to 320,000 in 2004; the population seems to have been relatively stable since that time. Density estimates and population modeling developed using non-invasive fecal DNA sampling northwestern Oregon indicate that black-tailed deer populations have stabilized or increased slightly. This effort also indicates that the ratio of bucks:100 females is much higher than indicated by our traditional survey methods. Application of these non-invasive results are being applied to additional units in western Oregon by land ownership strata and are dramatically improving Oregon's black-tailed deer management. In response to these trends, number of black-tailed deer hunters and associated harvest increased slightly to 86,819 and 25,867, respectively.

Analysis of data from nearly 2,000 GPS radio-collared mule deer since winter 2014-2015 has identified 22 mule deer herd ranges across their eastern Oregon distribution. Oregon is now in the process of transitioning management processes (e.g. data collection, population modelling, harvest management, etc.) to more closely follow herd ranges defined by animal movements. This information is being used as the foundation for revision of Oregon's Mule Deer Management Plan which began during winter 2021–2022.



Trends in Oregon's mule deer population size and structure, 1979 – 2022.

-Don Whittaker, Oregon Department of Fish and Wildlife

Saskatchewan

Mule deer populations are currently monitored in Saskatchewan using annual spotlight surveys, hunter harvest surveys, volunteer cooperative-wildlife surveys and intermittent aerial surveys. Mule deer density varies considerably in Saskatchewan, ranging from 0.05 deer / km² in the northern part of their range to > 2.0 deer / km² in the southwest portion of the province. Annual spotlight surveys indicate mule deer populations have been generally increasing across Saskatchewan over the past three years, with particularly strong population growth at the northern extent of their range in the Parkland and Boreal Forest Fringe (i.e., north-central) regions of the province. Some mule deer populations, in core mule deer range in the southwestern portion of the province, have been declining during this period likely due to high prevalence rates of chronic wasting disease. Chronic wasting disease continues to increase in prevalence and distribution across the province in an eastern bearing. In 2021, voluntary hunter surveillance sampling resulted in a province-wide prevalence rate of 36% (i.e., 314 CWD positive / 1254 testable samples) in mule deer (both sexes). A chronic wasting disease strategy remains in development, though has proved challenging given the establishment of the disease throughout most of the province. Saskatchewan is in the process of updating mule deer population estimates, monitoring initiatives and management objectives as part of the development of the ten-year mule deer management plan.

Mule deer hunting license sales and harvest has increased in Saskatchewan over the past 5 years. A total of 20,286 mule deer hunting licences (16,300 active hunters) were sold in 2021, consisting of 7,518 limited entry either-sex, 7,502 limited entry antlerless, 318 quota-limited over-the-counter antlerless licences and 3986 over-the-counter archery-only mule deer licenses. An estimated 11,519 mule deer were harvested in the province in 2021 (Figure 1). Bucks made up 46% of the total estimated harvest, with a total of 5,372 buck mule deer harvested in 2021. Saskatchewan continued to have the highest proportion of antlerless (females and young of year) mule deer reported in harvest of all western jurisdictions in 2021. Despite a high proportion of antlerless harvest, overall harvest rates (i.e., the proportion of the population harvested each year) is relatively low (e.g., < 10%) as the province primarily manages mule deer through limited entry (i.e., draw) hunting. Hunters holding limited entry either-sex licenses harvested 5,063 mule deer (4,702 bucks), with an average success rate of 70%, which was below the previous five-year (2016 – 2020) average of 81%. Limited entry antlerless mule deer hunters harvested 5,482 doe or fawn mule deer, with an average harvest success rate of 93%. Hunters holding over the counter (OTC) archery mule deer licenses harvested an estimated 796 mule deer (670 bucks), with an average harvest success rate of 16%, which was the same as the previous 5-year average (2016-2020). Starting in 2020, Saskatchewan began to phase in mandatory hunter harvest reporting for all licensed hunters, which has increased the harvest reporting response rate over 40% from previous years. Improved reporting is believed to have led to differences in hunter harvest success estimates, likely due to a reduction in sampling bias previously associated with voluntary harvest reporting.

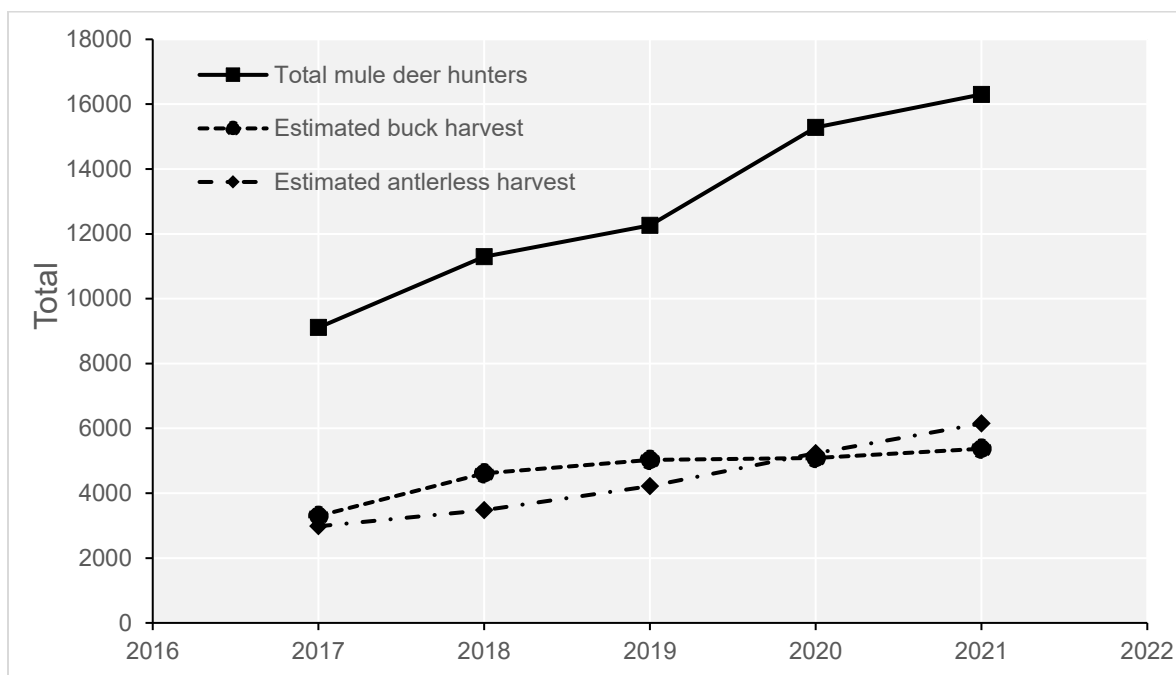


Figure 1. Estimated number of mule deer hunters and harvest in Saskatchewan, 2017-2021.

-Tom Perry, Saskatchewan Ministry of Environment

South Dakota

Mule deer populations in South Dakota are slowly responding to reduced harvest rates in recent years, and results from several surveys provide evidence that populations are increasing. Most hunting unit population objectives are set to increase or substantially increase mule deer numbers; however, several unit objectives have recently been modified as populations approach desired densities (Figure 1). Objectives will be re-evaluated in 2023 during the SDGFP Commission season setting process. Pre-season herd composition surveys documented lower recruitment in most Data Analysis Units (DAU) in 2021 with overall recruitment at 55 fawns:100 does compared to 70 fawns:100 does the previous year. The statewide pre-season sex ratio in 2021 was 42 bucks:100 does (Figure 2).

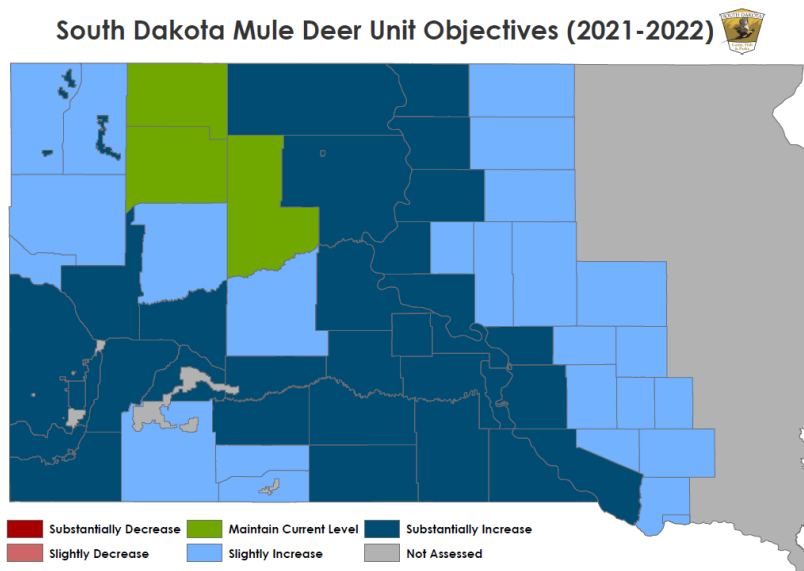


Figure 1. Mule deer population objectives for South Dakota hunting units, 2021-22.

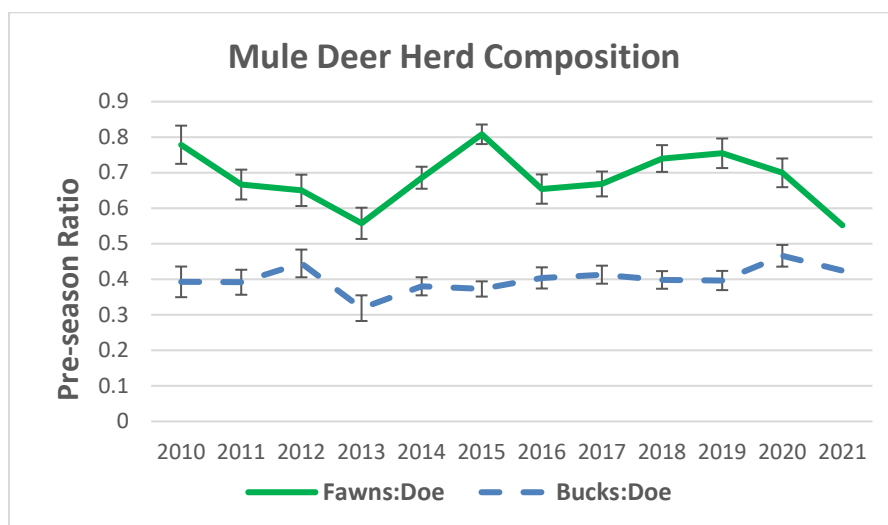


Figure 2. Statewide sex and age ratios from pre-season herd composition surveys in South Dakota, 2010-2021.

Currently all deer hunters are surveyed via email or electronic submission methods. Paper report cards are sent out to non-respondents in a final effort to increase response rate. Annual deer hunter surveys are conducted to estimate harvest at each management unit for each species and age/sex cohorts. Statewide mule deer harvest has slowly increased from a low of about 5,400 in 2014 to 6,564 in 2021, mostly due to increased buck harvest since doe harvest has been substantially restricted for the past 8 years (Figure 3). A consistently low mule deer doe harvest of approximately 1,000 – 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 1 and Figure 3). The current harvest of antlerless mule deer occurs primarily from youth deer hunters and hunters with “any deer” licenses. Hunting season regulations were modified in 2021 to further restrict youth doe harvest to improve growth rates in areas below objective.

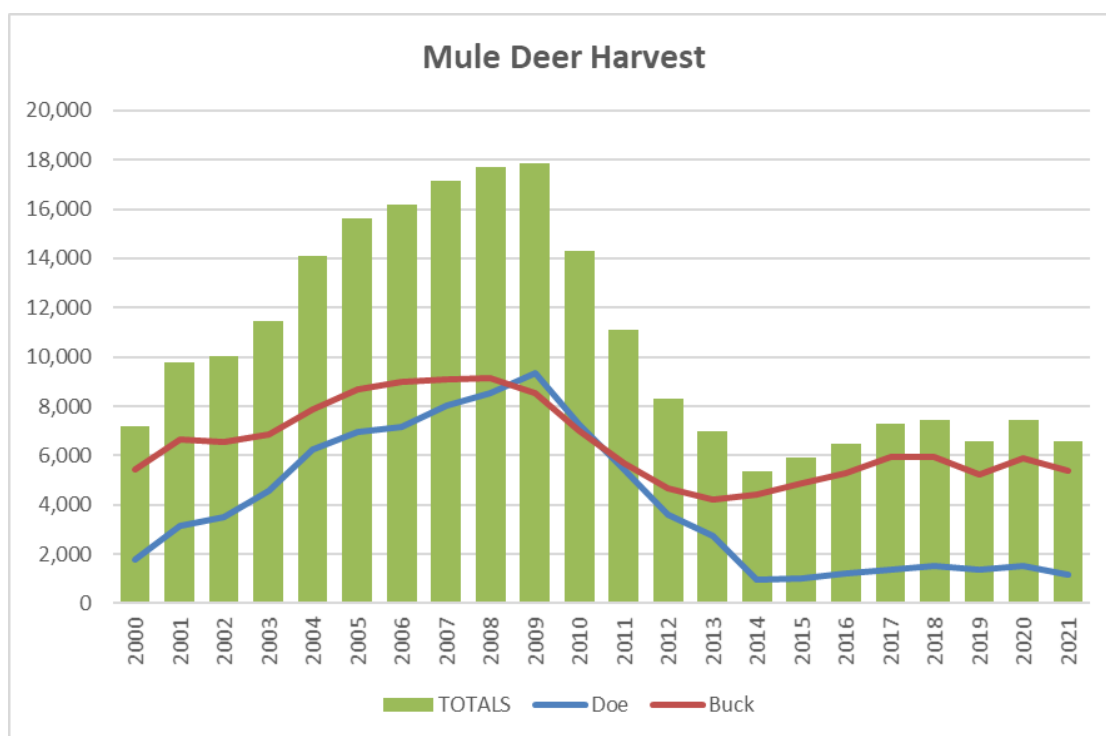


Figure 3. Mule deer harvest from all hunting seasons in South Dakota, 1990-2021.

Radio collaring and survival monitoring efforts have been discontinued in South Dakota, with the exception of one remaining research project in the northwest part of the state. Preliminary annual survival rates for mule deer does in this study area (DAU 1) in 2021 were 87% for adults, 84% for yearlings, and 40% for juveniles. These vital rates, in conjunction with other survey data, are used to model population abundance and trend at the DAU level. The statewide pre-season estimate was 80,600 in 2021 and will be re-assessed in 2023.

-Andy Lindbloom, South Dakota Game, Fish and Parks

Texas

Texas Parks and Wildlife Department (TPWD) conducts post-season helicopter surveys for mule deer using a stratified random sampling design within monitoring units. In 2011, a sightability model was initiated to improve population estimates. The data are used to determine population trends, estimate population densities, and document herd composition to evaluate the impacts of regulations and management actions on mule deer at ecoregion and monitoring unit scales.

Trans-Pecos

In general, the Trans-Pecos population has been on an increasing trend since 2012 because of good range conditions and fawn production and recruitment from 2013–2017. However, recent drought conditions have led to a decrease from 135,655 mule deer in 2019 to 119,829 in 2021. Surveys were not conducted in 2007, 2010, and 2020. The estimated 2021 fawn crop of 44 fawns:100 does was higher than 2019 (34 fawns:100 does), which is remarkable considering the extreme drought conditions. The sex ratio for 2021 was 34 bucks:100 does, one of the lowest bucks:100 does estimate since 2011.

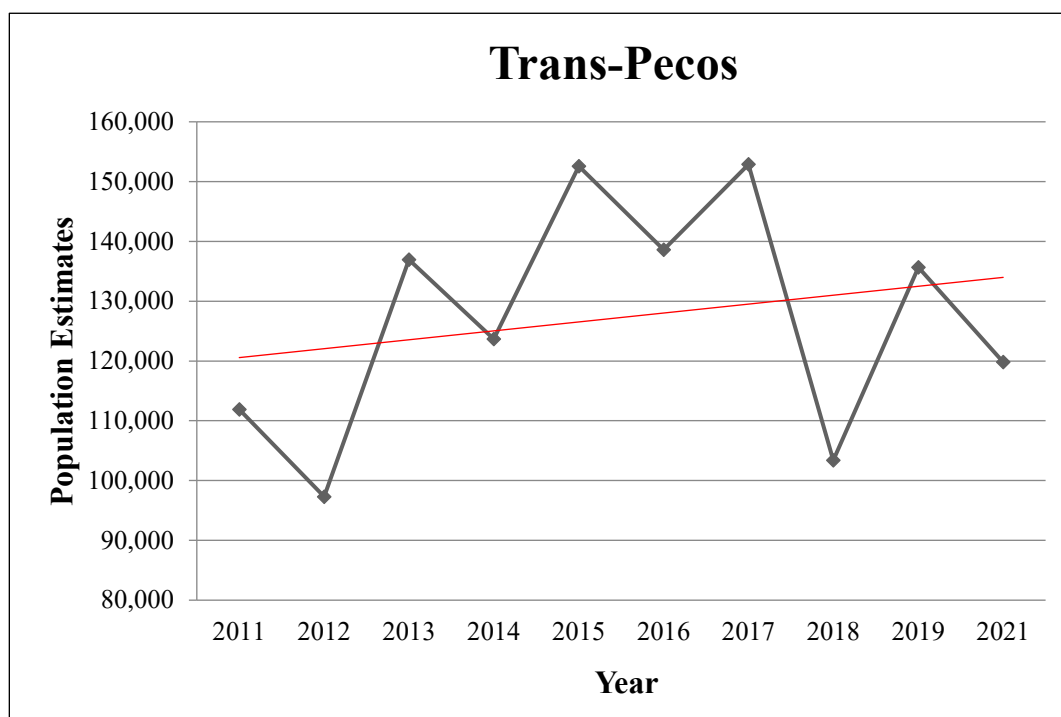


Figure 1. Trends in mule deer population estimates in Trans-Pecos, Texas, 2011–2021.

Panhandle

The Panhandle population trend has been increasing since 2011. However, mule deer numbers have been declining after the all-time high documented in 2017. Surveys were not conducted in 2015 and 2020. The 2021 population estimate of 71,171 was lower than the 2019 estimate of 91,737. Fawn production was 40 fawns:100 does in 2021, which was above the region average (37 fawns:100 does). The sex ratio for 2021 was 29 bucks:100 does. Sex ratios have varied from 21 to 36 bucks:100 does since 2011. Sex ratio data indicate a higher harvest rate of

mule deer bucks compared to the Trans-Pecos in almost every years, but the post-season sex ratio has been above 21 bucks:100 does in 8 out of 9 survey years.

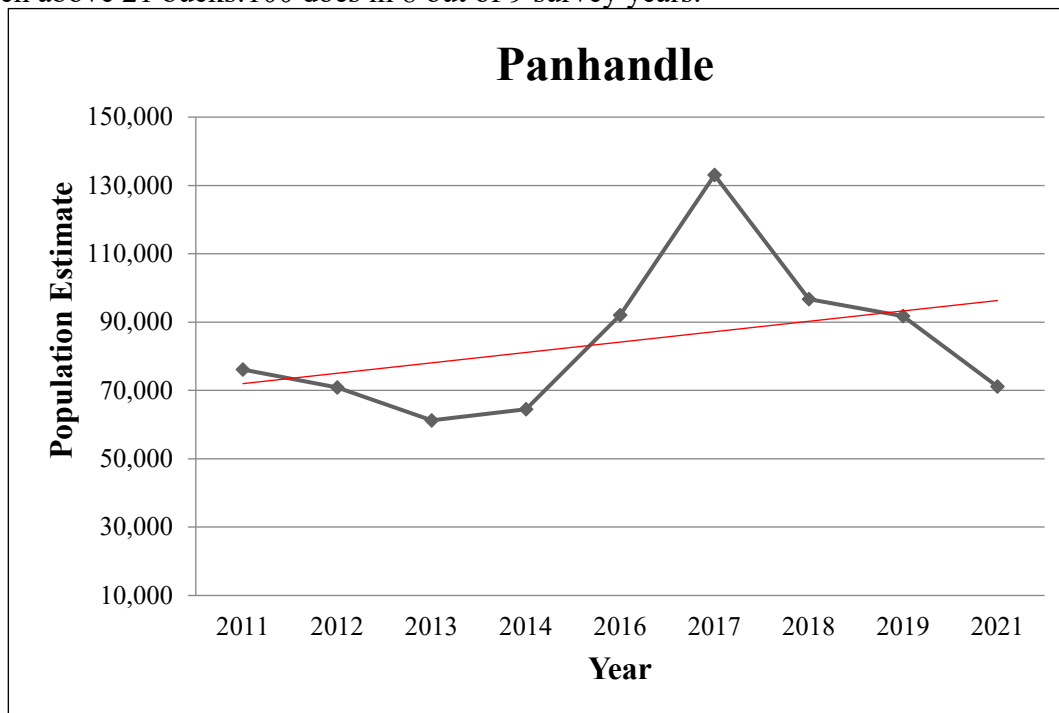


Figure 2. Trends in mule deer population estimates in the Texas Panhandle, 2011–2021.

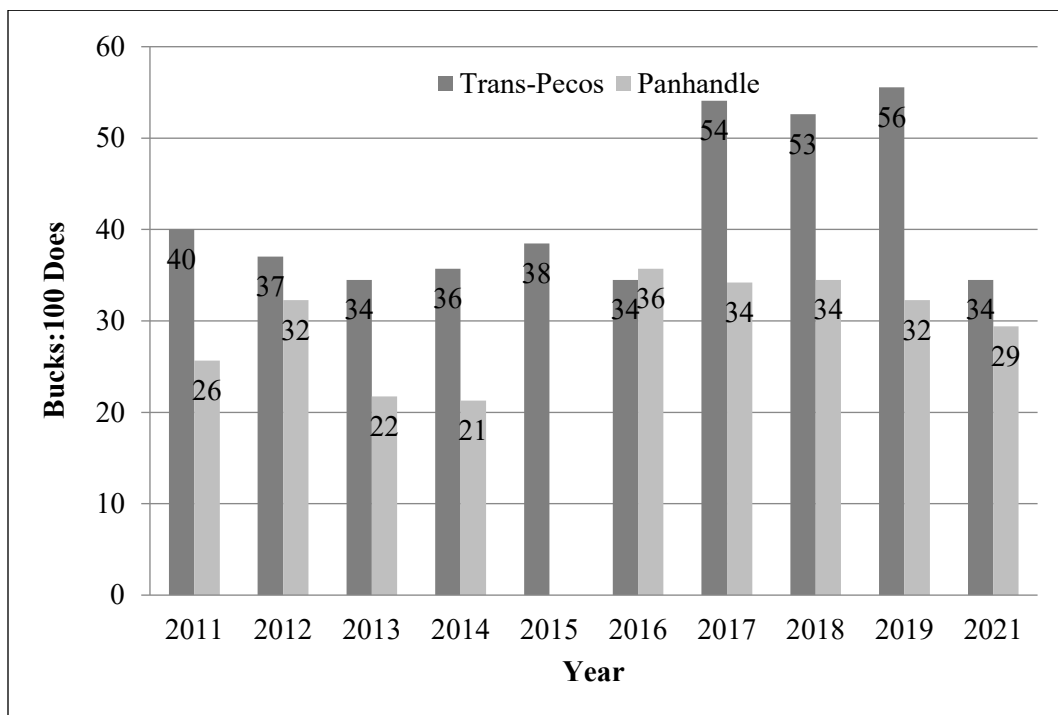


Figure 3. Trends in the number of mule deer bucks per 100 does in the Texas Panhandle and Trans-Pecos areas, 2011–2021.

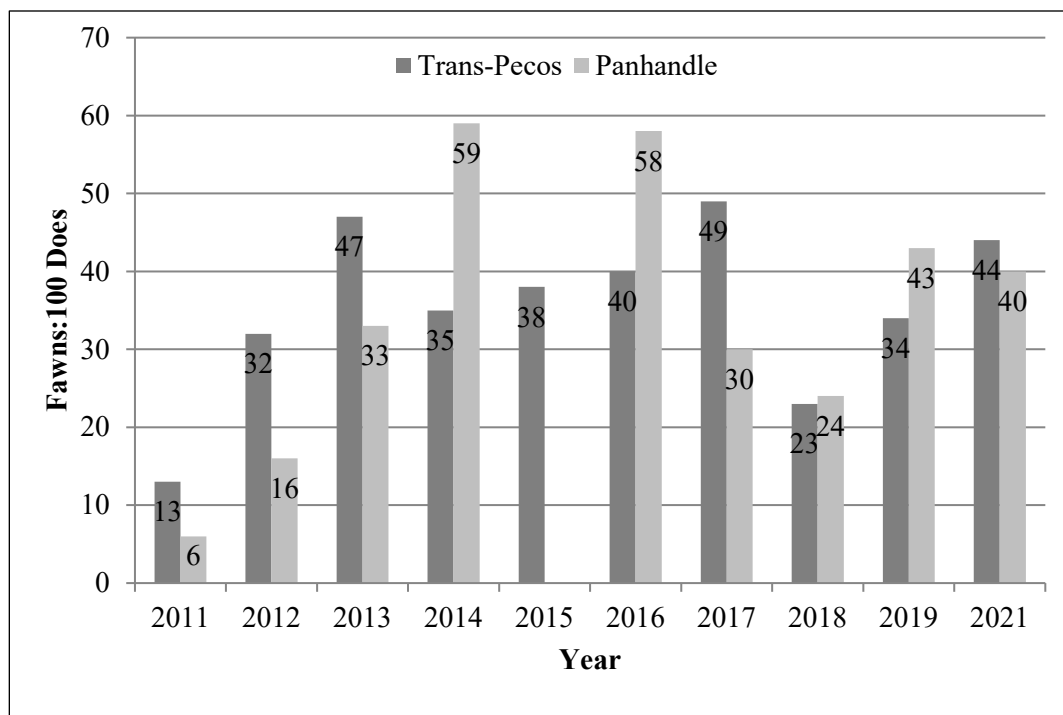


Figure 4. Trends in the number of mule deer fawns per 100 does in the Texas Panhandle and Trans-Pecos areas, 2011–2021.

-Shawn Gray, Texas Parks and Wildlife Department

Utah

Utah's current statewide mule deer population estimate is 305,700 with a total population objective of 404,900 (Figure 1). This is a decrease of 7,200 deer from the previous year, largely due to two years of severe drought. Fawn-to-doe ratios in 2021 remained unchanged at 56 fawns per 100 does. Adult and fawn survival is estimated annually by radio-collaring approximately 500 deer on 7 representative units throughout the state. In 2020 and 2021, severe drought led to reduced adult and fawn survival resulting in population reductions across much of the state. Our statewide estimate of adult doe survival for this year was 79%, while fawn survival was 39%—the lowest observed in the last 7 years.

Utah manages for diverse hunting opportunities and attempts to balance quality and opportunity. We have 29 general-season units that are managed for hunter opportunity with a goal of 15-17 or 18-20 bucks per 100 does following the fall hunts. Utah also has limited-entry units that are managed for increased quality at 25-35 bucks per 100 does. In addition, we have 2 premium limited-entry units that are managed for 40-55 bucks per 100 does with $\geq 40\%$ harvested bucks 5 years of age or older.

In 1994, roughly 97,000 public draw permits were issued for general-season units, and the postseason buck-to-doe ratio was 8 bucks per 100 does. Since that time, buck-to-doe ratios have increased as a result of growing populations and decreased buck permits, peaking at 23 bucks per 100 does in 2015 (Figure 2). Buck-to-doe ratios were up in 2021 from the previous two years, at 19 bucks per 100 does with 74,025 public draw permits issued last year. For the

2022 hunting season, Utah has recommended a slight decrease in general-season deer permits (73,075) in order to manage buck-to-doe ratios consistent with our management plan.

STATEWIDE DEER POPULATION 1992-2021

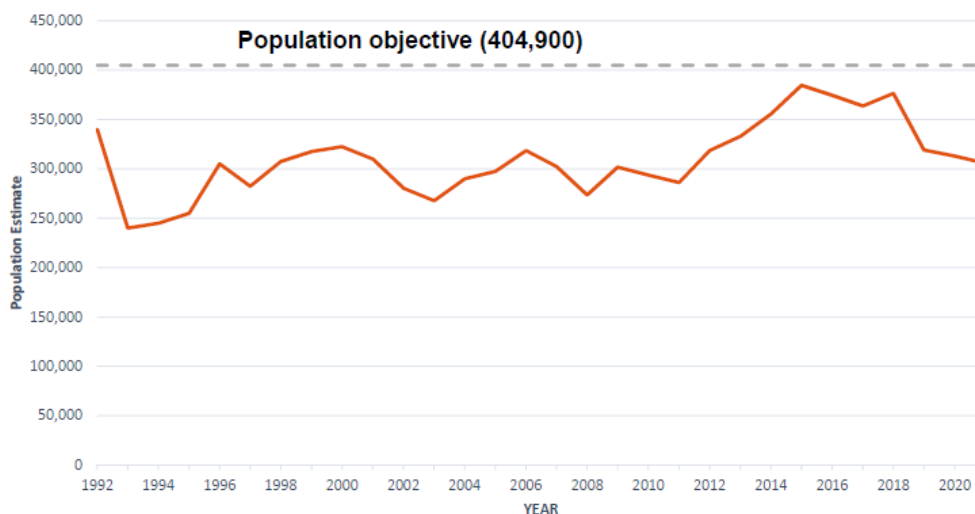


Figure 1. Mule deer population estimates from 1992-2021.

BUCK-TO-DOE RATIO TRENDS (1994-2021)

These classification surveys took place on general-season public land units.

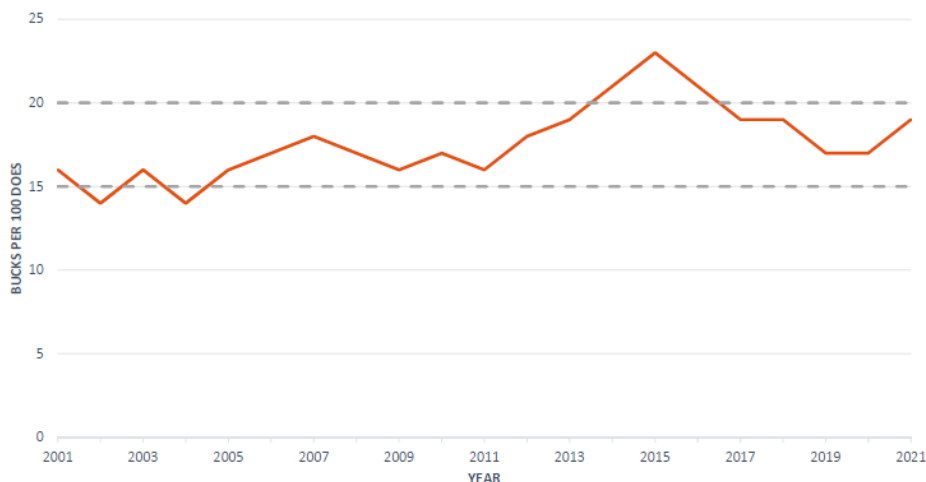
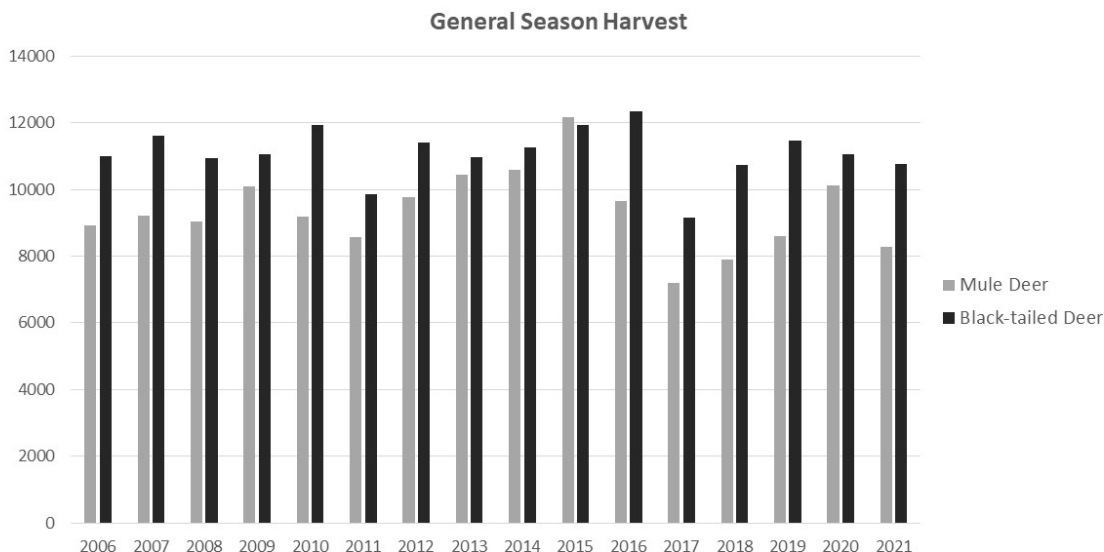


Figure 2. General season buck to doe ratios from 1993-2021.

-Heather Hill Bernales & Covy Jones, Utah Division of Wildlife Resources

Washington

The statewide deer harvest estimate (all species, general and permit seasons combined) for 2021 was 24,318 deer, down ~17% from 29,435 harvested deer in 2020. The reduction in harvest is attributed to hemorrhagic disease outbreaks that reduced abundance and likely depressed hunter participation (i.e., fewer hunters in 2021). Populations within most of Washington's 7 mule deer management zones are generally stable but status varies by region and zone. In late summer of 2021, outbreaks of epizootic hemorrhagic disease and bluetongue in eastern Washington caused major and widespread deer mortality. This outbreak primarily affected white-tailed deer, but mule deer were also impacted in many areas. The Washington Department of Fish and Wildlife is still assessing the impacts of this outbreak. Similarly, an outbreak of adenovirus hemorrhagic disease occurred in the San Juan Islands of northwest Washington. However, the impacts of AHD outbreaks were highly localized and trends among 5 black-tailed deer management zones are stable to increasing. Black-tailed deer abundance, indexed via harvest, generally fluctuates in response to timber harvest rotation/frequency. Black-tailed deer abundance may be increased by increasing early successional forest acreage, especially on public forest land. Loss of black-tailed deer habitat due to encroaching human development continues to be a concern. WDFW managers have adjusted mule deer special permit opportunity for 2022 to maximize adult female survival by reducing antlerless special permit opportunity. Habitat management and restoration activities for mule deer are ongoing or in preparation in association with implementation of Secretarial Order 3362. Projects include restoration of areas impacted by unauthorized vehicle use, weed control, and restoration of native vegetation on both public and private lands. Related work is planned to address deer vehicle collisions, enhance gene flow among mule deer populations, improve crossing structures for irrigation canals (a source of deer mortality), and post-fire restoration of shrub steppe habitat. WDFW and partners are considering project proposals to benefit mule deer and other species through NFWF "America the Beautiful Challenge" grants.

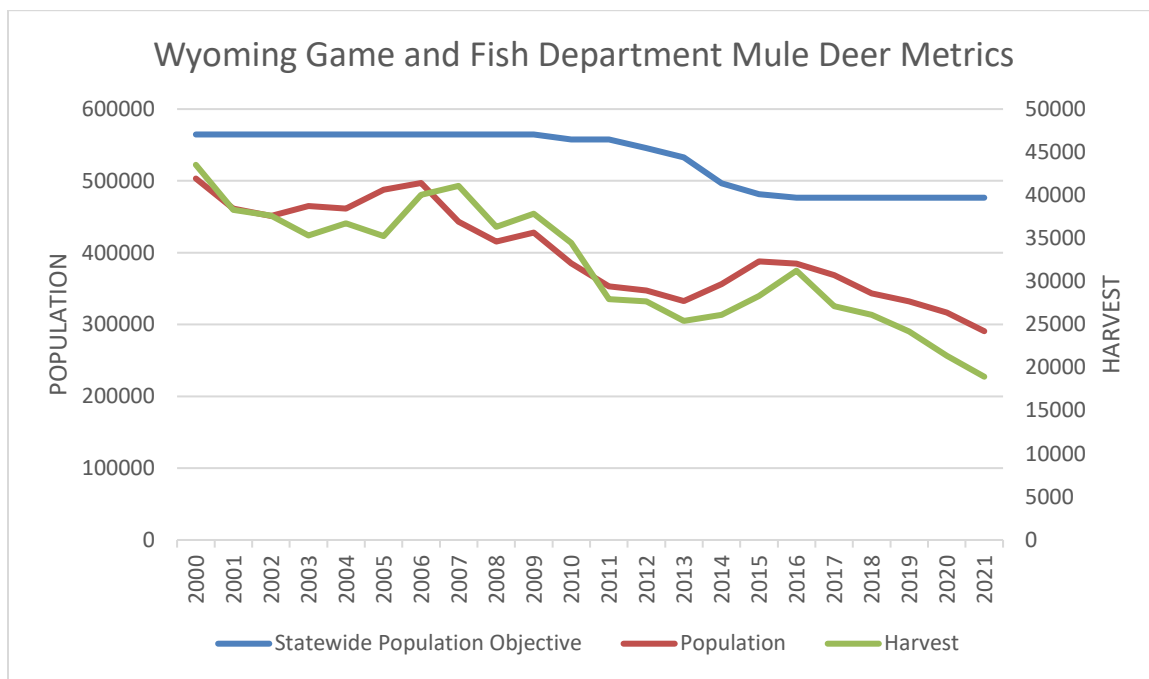


-Kyle Garrison, Washington Department of Fish and Wildlife

Wyoming

Mule deer populations throughout Wyoming have declined since the early 1990s. It is apparent, given declining production of mule deer fawns starting in the late 1980s, populations are responding in a density-dependent fashion to decreasing habitat availability and/or quality. Since 2000, fawn productivity has decreased statewide and has been below the objective of 66 fawns:100 does 17 times. Postseason buck:doe ratios have trended upward, ranging from 26 to 38 and averaging 32:100 since 2000. Throughout Wyoming, populations have declined by an estimated 212,600 (42%) mule deer since 2000. Due to the decrease in total population numbers, mule deer harvest has declined 56% since 2000. After the 2021 hunting season, the Wyoming Game and Fish Department estimates a total population of 291,700 mule deer in the state. This is 39% below the statewide objective of 476,600 mule deer. Within Wyoming’s 37 mule deer herd units, four herds were at objective (10.8%), 33 herds were below objective (89.2%) and no herds were above objective (0%). Population estimates are derived using post-season classifications in concert with

measured harvest. This data is synthesized in a spreadsheet based population model. Harvest has been largely limited to bucks the past several years in response to declining deer numbers.



- Ian Tator, Wyoming Game and Fish Department

Yukon

There has been no formal inventory work on mule deer in Yukon to date. However, funding has been secured to initiate a pilot study in the Whitehorse area in 2022. Trends in abundance and distribution are monitored primarily through sightings and motor vehicle collision reports. Numbers and distribution have generally been on the upswing since first reports in the early 1920's. The current population estimate of 1,000 territory-wide is a guess based on observations in agricultural areas and from aerial surveys for other species.

The first deer hunting season was implemented in 2006. Licensed hunters in Yukon must apply for a male-only permit through a lottery system. Interest in the deer hunt continues to be high with 400 to 500 hunters applying for 10 permits issued each year. As of 2010, two additional permits have been available annually to young hunters. First Nation beneficiaries are entitled to harvest deer under their subsistence rights as of the effective date of their settled final agreements. No records of First Nation harvest are available. The licensed harvest for the 2021 hunting season was 10 deer and 27 were killed in vehicle collisions. Generally, the annual licensed harvest ranges between 4 and 9 deer.

-Sophie Czetwertynski, Yukon Department of Environment

Acknowledgements

Information in this report was provided by MDWG members from the 24 Western Association of Fish and Wildlife Agencies (WAFWA) and compiled by Luke Meduna. Contributors are listed after their respective state, province, or territorial report. We would also like to thank WAFWA Director Sponsors Mike Fowlks and Ed Schriever and also Miles Moretti and Joel Pedersen of the Mule Deer Foundation for their support.

Mule Deer
Working Group