

2021 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 most jurisdictions, but have been recovering to various degrees for the last decade or more. Of the 24 WAFWA member agencies, black-tailed and mule deer populations are increasing in 6, stable in 10, and declining in 7 jurisdictions.



Mule Deer
Working Group

Black-tailed and
Mule Deer Distribution

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	188,000	14,250	55%	36,000
Arizona ²	85,000 - 100,000	10,356	98%	67,399
British Columbia ³	100,000 - 170,000	10,682	92%	57,885
California ⁴	460,420	26,325	98%	176,438
Colorado ⁵	427,500	38,899	78%	87,536
Idaho	249,691	24,809	78%	85,982
Kansas	53,400	1,732	94%	16,691
Montana ⁶	328,313	54,741	74%	150,343
Nebraska ⁶	90,000 – 130,000	9,438	77%	31,079
Nevada	84,000	6,928	87%	17,659
New Mexico ⁵	80,000 - 100,000	11,356	98%	33,254
North Dakota ⁸	21,000 (Badlands)	8,471	62%	10,000
Oklahoma ⁹	1,750 – 3,000	>250	99%	No Estimate
Oregon	170,000 - 190,000	12,999	95%	50,847
Saskatchewan	65,000 – 85,000	11,015	46%	16,685
South Dakota ^{7,10}	80,600	7,400	80%	70,469
Texas	227,392	10,530	93%	31,037
Utah	314,850	25,343	89%	76,958
Washington ¹¹	90,000 - 110,000	10,282	94%	112,369
Wyoming	330,700	21,370	85%	47,637
Yukon	1,000	7	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 Total number of tags issued is greater than hunter numbers; participation rate is about 90%. Harvest and hunter numbers include draw hunt data and over-the-counter archery hunt data.

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

⁴ Black-tailed and mule deer numbers 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	17,571	83%	13,209
British Columbia³	98,000 - 155,000	6,331	84%	13,796
Hawaii⁴	950-1,050	55	56%	No Estimate
Oregon	No Estimate	25,248	91%	85,697
Washington⁵	No Estimate	11,057	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 2019 regulatory year.

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

⁴ Estimates are reported for the 2017 hunting season. Population estimate includes only public hunting areas, not private land.

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.

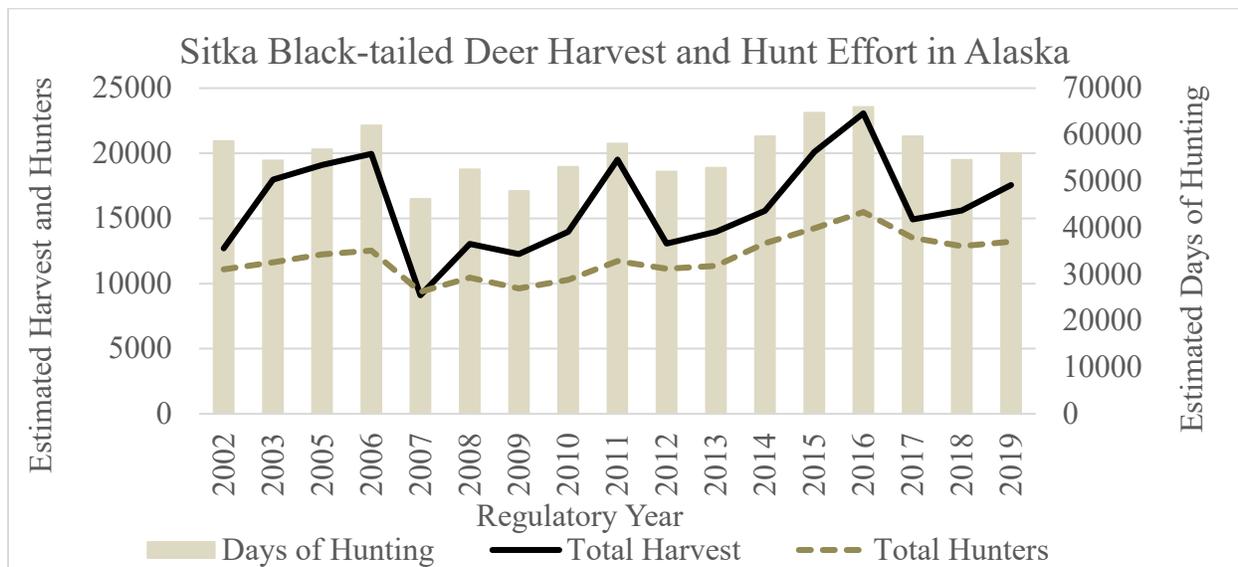
Due to the difficulty of measuring actual population size or density, in the 1980's Alaska Fish and Game (ADF&G) began work to index changes in deer abundance by using pellet count surveys to look at multi-year trends within various watersheds. More recently, ADF&G has used fecal DNA to conduct mark-recapture 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. While deer pellet surveys conducted since the early 1980’s indicated deer tend to occur at a lower abundance in these GMUs due to lower habitat quality, managers suspected that predation may have been hindering deer population recovery following 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, which resulted in increased hunter effort and harvest. These series of mild to average winters allowed deer populations to recover 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 to reduced hunter effort, perhaps because of difficult boating conditions. The 2019-2020 winter severity was average in Southeast Alaska, but high in Southcentral Alaska, where managers estimated 60-70% mortality in some areas of the Kodiak Archipelago. Winter severity in 2020-2021 was average across both Southeast and Southcentral Alaska, allowing deer to recover. Deer pellet-group surveys were only conducted in a few areas in 2020 and 2021 due to Covid-19 constraints and prioritization of other activities, but most populations are believed to be recovering or generally stable. Harvest statistics for regulatory year 2020 will be available July 2021.



-Karin McCoy, Alaska Department of Fish and Game

Alberta

The 2020 pre-hunting season population estimate of mule deer in Alberta was 188,000. This represents an increase from the 2019 estimate of 164,000. For 2021, the pre-hunting season population estimate for mule deer increased to over 190,000. 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 being written and this 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.

Interest in mule deer hunting has increased in recent years in Alberta. The number of antlered mule deer special license applicants has increased in the past five years. There were 81,000 applicants in 2016, 102,000 in 2017, 99,000 in 2018, and 98,000 in 2019, and 2020. Antlerless mule deer special license applicants have also risen in the past five years with 37,000 applicants in 2016, and over 43,000 in 2017, 2018, 2019, and 2020. Based on voluntary hunter harvest surveys for the 2020 hunting season 36,000 mule deer hunters in Alberta directed an estimated 235,000 days hunting mule deer, producing an estimated harvest of 14,250 mule deer (~55% antlered deer), very similar to the 2019 season estimates.

At the time of writing, Alberta big game managers are determining the mule deer special license numbers for the 2021 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, although the international border was essentially closed to non-resident aliens for the 2020 hunting season due to the global Covid-19 pandemic. 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.

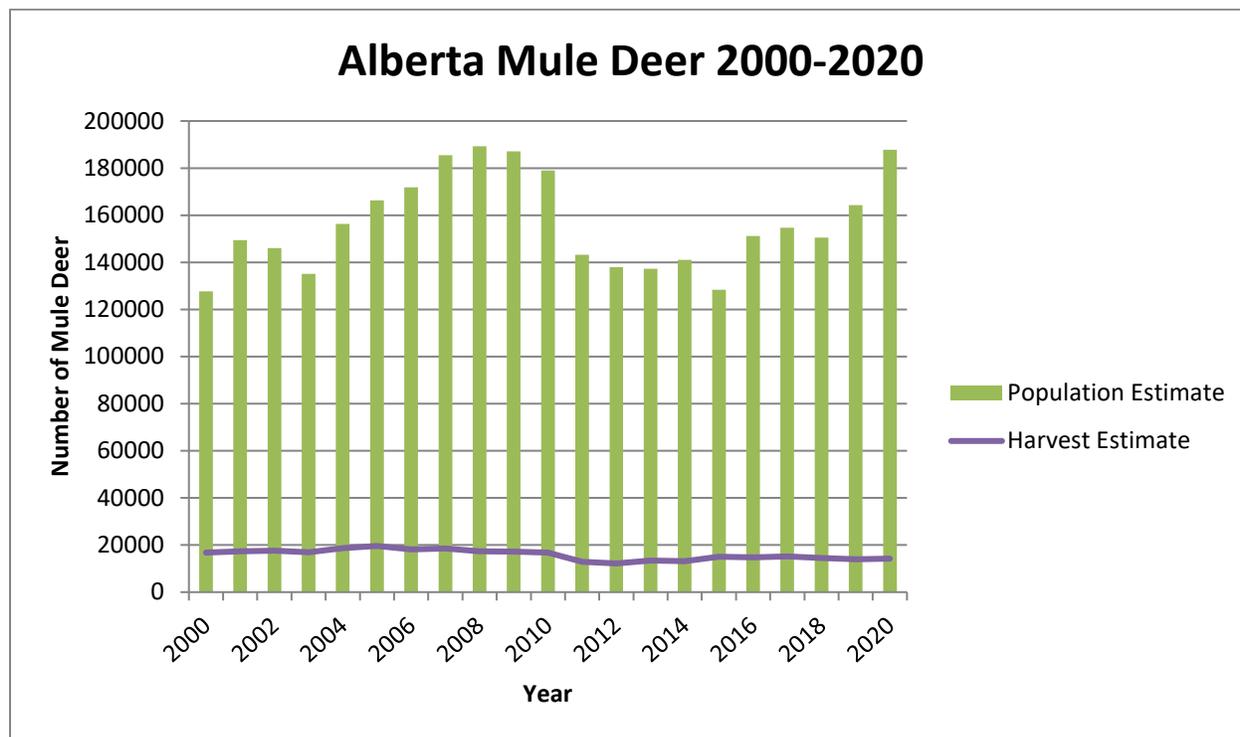
Alberta implements a big game population monitoring program that aims to survey ungulates on five-year intervals at the WMU scale, although many WMUs undergo longer survey intervals based on funding availability, habitat, and prioritization. There are no long-term intensive monitoring programs for mule deer in Alberta (i.e. collaring programs). As a result of public health considerations in response to the Covid-19 pandemic, aerial surveys in 2020/21 were carefully considered. In several situations, such as in WMUs where chronic wasting disease (CWD) has not been detected, or where local populations appear stable, surveys were delayed a year.

Average buck to doe and fawn to doe ratios have been 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 2020/21 was 10.4% (n=8905 deer heads tested), a change in

sampling design occurred making it incomparable to previous surveillance years. In 2020/21, CWD was detected in 12 additional WMUs where CWD was not known to occur prior, including certain foothills units that overlap with the Northern Forest 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

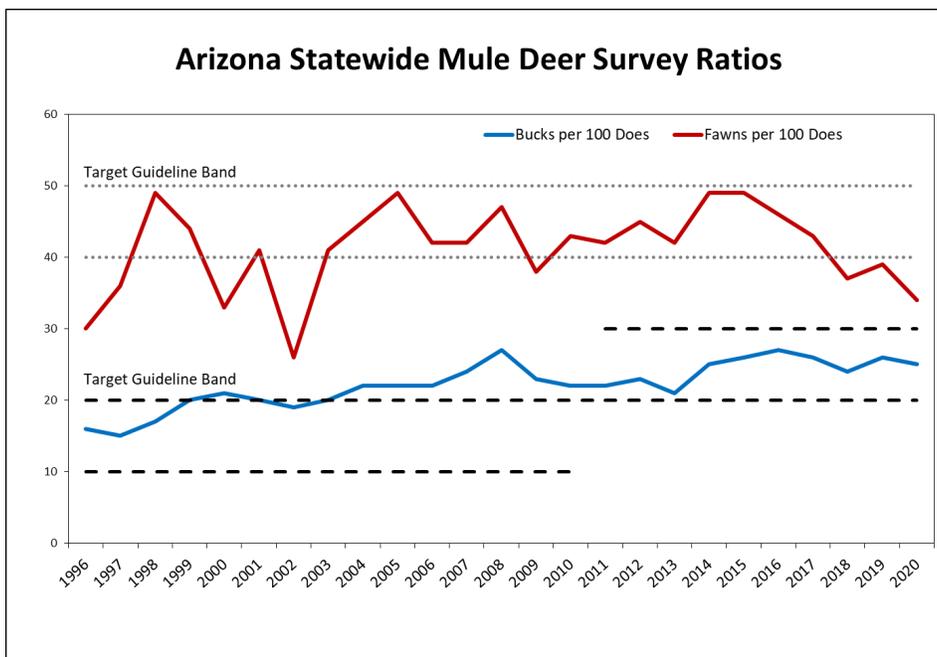
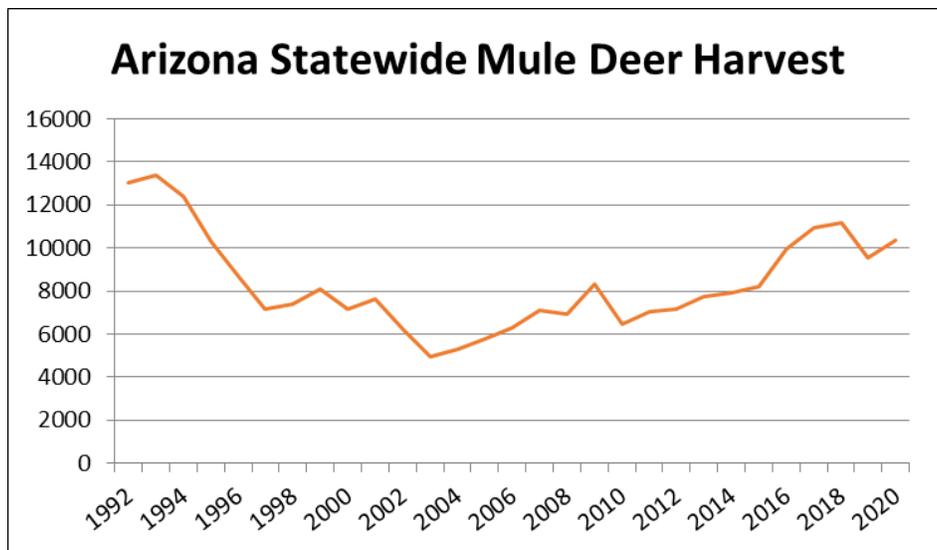
Arizona

In 2020, 10,356 mule deer were harvested (all methods of take). Population parameters indicate the statewide populations are stable to 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. Supplemental ground surveys may be 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 2019, hunter response rates were nearly back to historic rates at 38.7%, 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. In 2020, the questionnaire response rate increased to 42%.

Buck:doe ratios for mule deer were managed at 20–30 per 100 and currently the statewide average is 25. 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 34 which is just below management guidelines (40-50) and has been trending down since 2016.

Significant harvest reductions were recommended for the 2021 deer hunts. Limited draw permits were reduced by 2,715 across the state and numerous over-the-counter units were closed during December and January, with two hunt areas shifting to the limited draw.



-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 and 2018 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 but estimates indicate harvest has been stable since 2018. 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 third year in the southern interior of British Columbia. The project is examining mule deer response to landscape changes. There are four study areas in three regional jurisdictions (Thompson, Okanagan, Boundary, and Kootenay 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 and 61% for the respective study areas over the three years. The Boundary and Kootenay study areas have experienced the least amount of wildfire and have 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 the lowest in the Boundary, followed closely by the Kootenays. Survival increased considerably in the following years and was collectively >75% in both study areas both years for adult does.

The winters of 2019 and 2020 were considered wet with average snow depths and temperatures; these conditions likely contributed to improved winter survival for all age classes of mule deer observed in 2019/2020 and 2020/2021, especially in the Kootenay and Boundary study areas. 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.

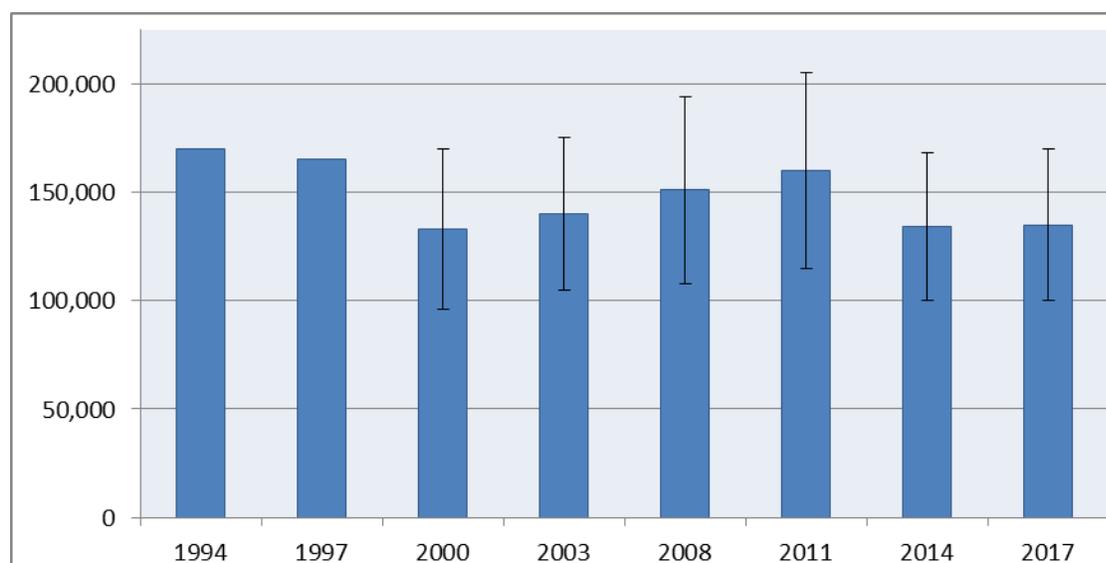


Figure 1. Mule deer population estimates (\pm 90% confidence intervals) in British Columbia over three-year intervals from 1994-2017.

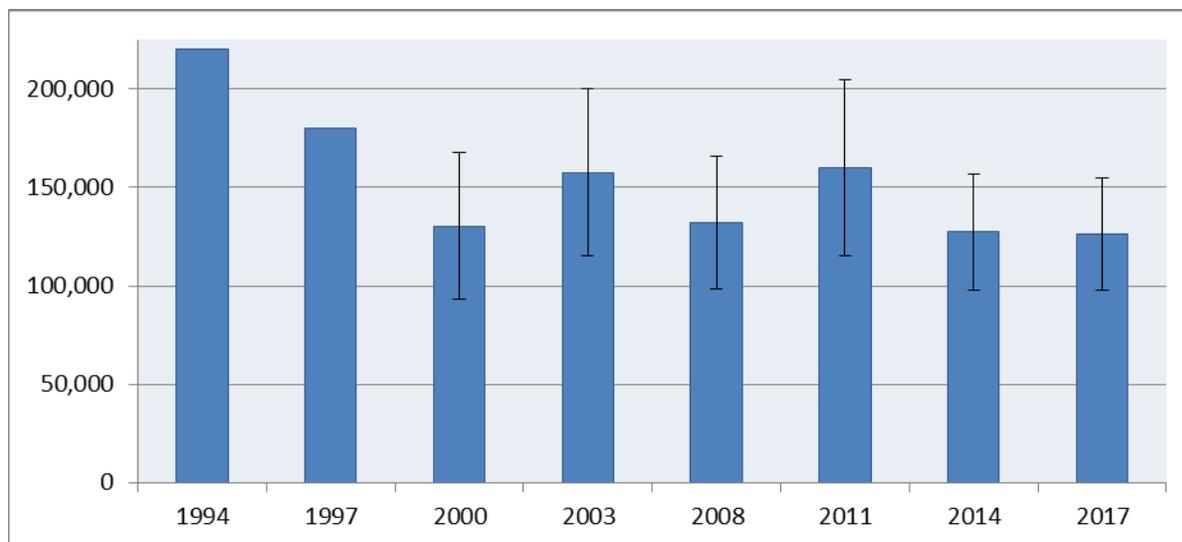


Figure 2. Black-tailed deer population estimates (\pm 90% confidence intervals) in British Columbia over three-year intervals from 1994-2017.

- Andrew Walker, British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development

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 2021 pre-season deer population estimate for the hunted segment in California is roughly 460,000 animals. This estimate has fluctuated between approximately 400,000 and 700,000 over the past 30 years (Figure 1). 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.

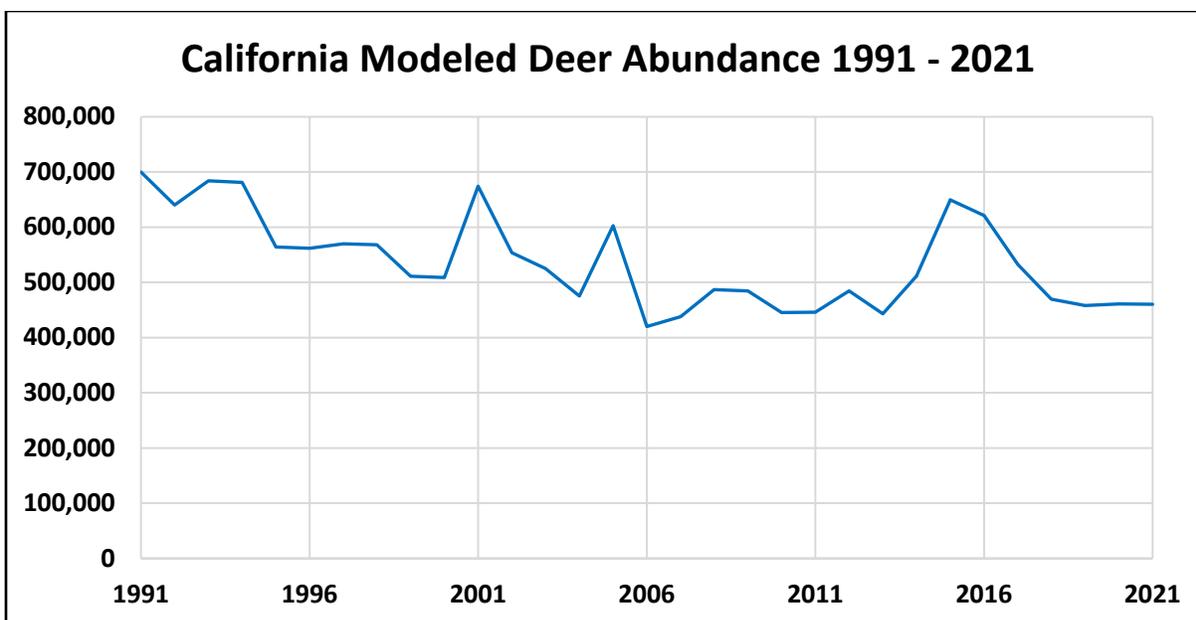


Figure 1. Modeled abundance estimates of California deer 1991 – 2021.

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 2000 (Figure 2). 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.

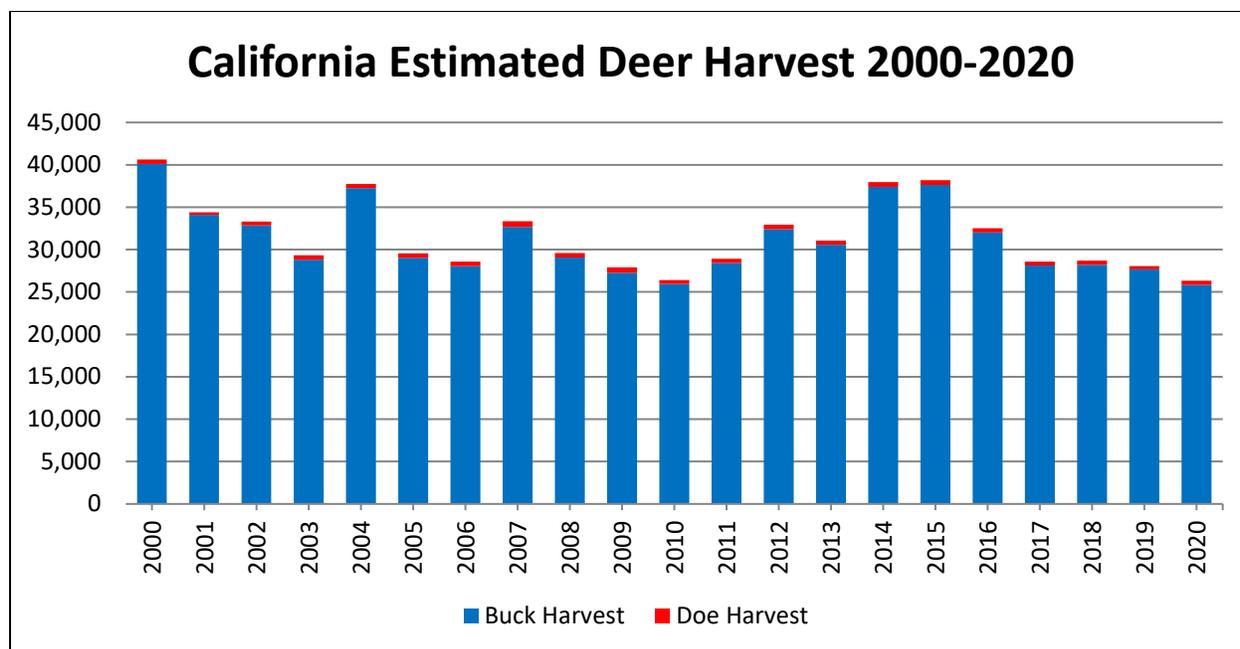


Figure 2. Harvest estimates of California deer 2000 – 2020.

- Julie Garcia, California Department of Fish and Wildlife

Colorado

The statewide post-hunt 2020 deer population estimate is 428,000, up from 418,000 last year. The sum of statewide population objective ranges is 445,000-527,000 for all 54 deer herds combined. In 2020, 18 of 54 (32%) deer herds are within their Herd Management Plan population objective ranges. After significant deer population declines from several severe winters, the total deer population has averaged 420,000 over the last 11 years (Figure 1). Population objectives that are appreciably higher than population estimates reflect Colorado Parks and Wildlife's (CPW) desire to stabilize, sustain, and increase 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.

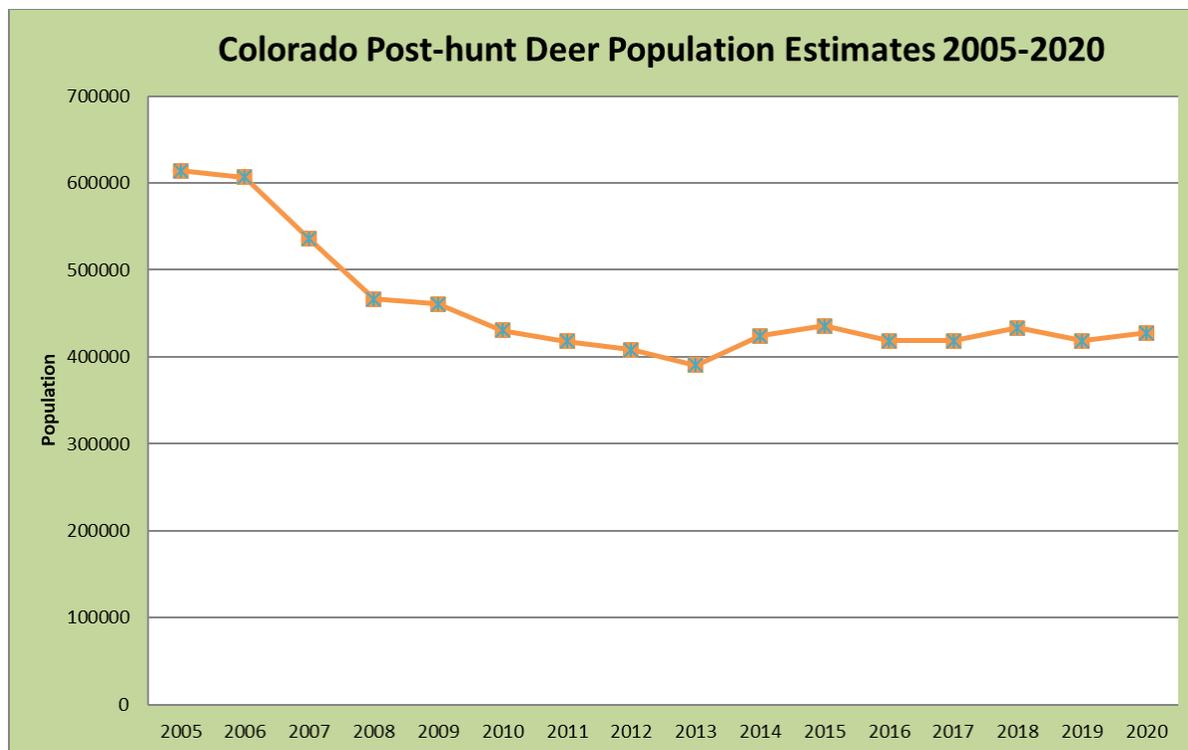


Figure 1. Colorado post-hunt deer population estimates from 2005-2020.

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 68%. Since 2008, annual buck survival in two of the five monitoring areas has averaged 79%. Average annual doe survival for 2019-2020 was the highest average ever recorded at 87%. This past winter of 2020-2021, survival is at or above average as well.

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 2020, CPW staff classified 70,000 deer and observed an average sex ratio of 32 bucks/100 does weighted by population size (Figure 2), which is the same as 2019. Reproduction and fawn survival to December was higher in 2020 compared with the previous year, the statewide average observed age ratio from helicopter inventory was 59 fawns/100 does compared with 58 fawns/100 does in 2019 (Figure 3).

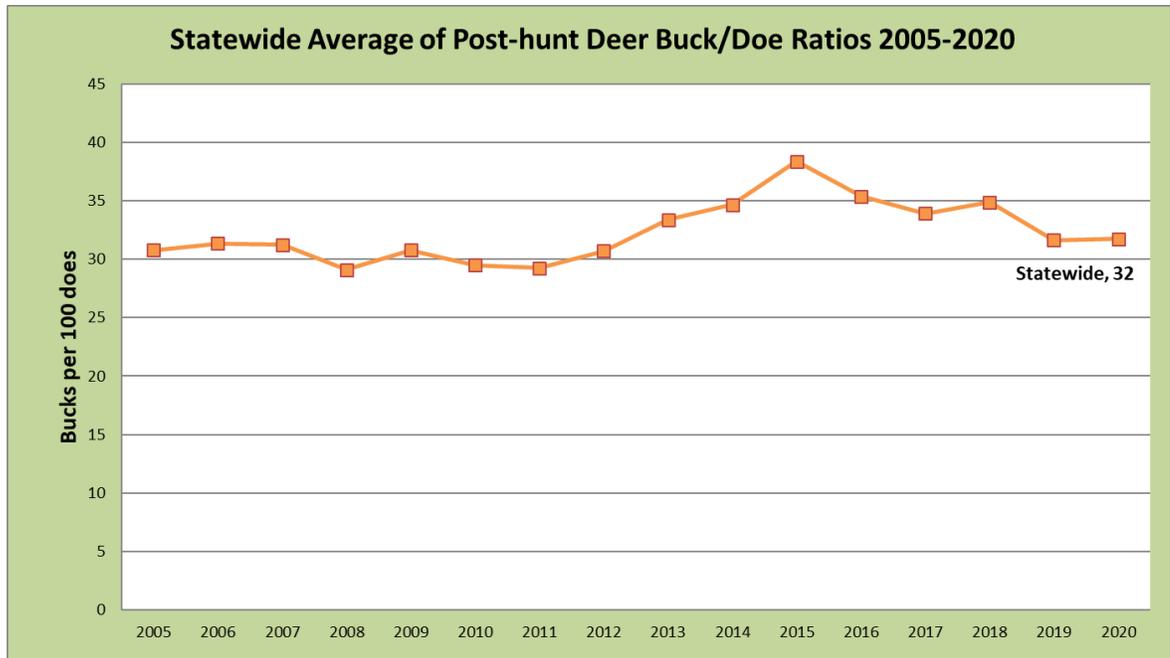


Figure 2. Colorado statewide average of observed post-hunt bucks/100 does for 2005-2020 weighted by herd population size.

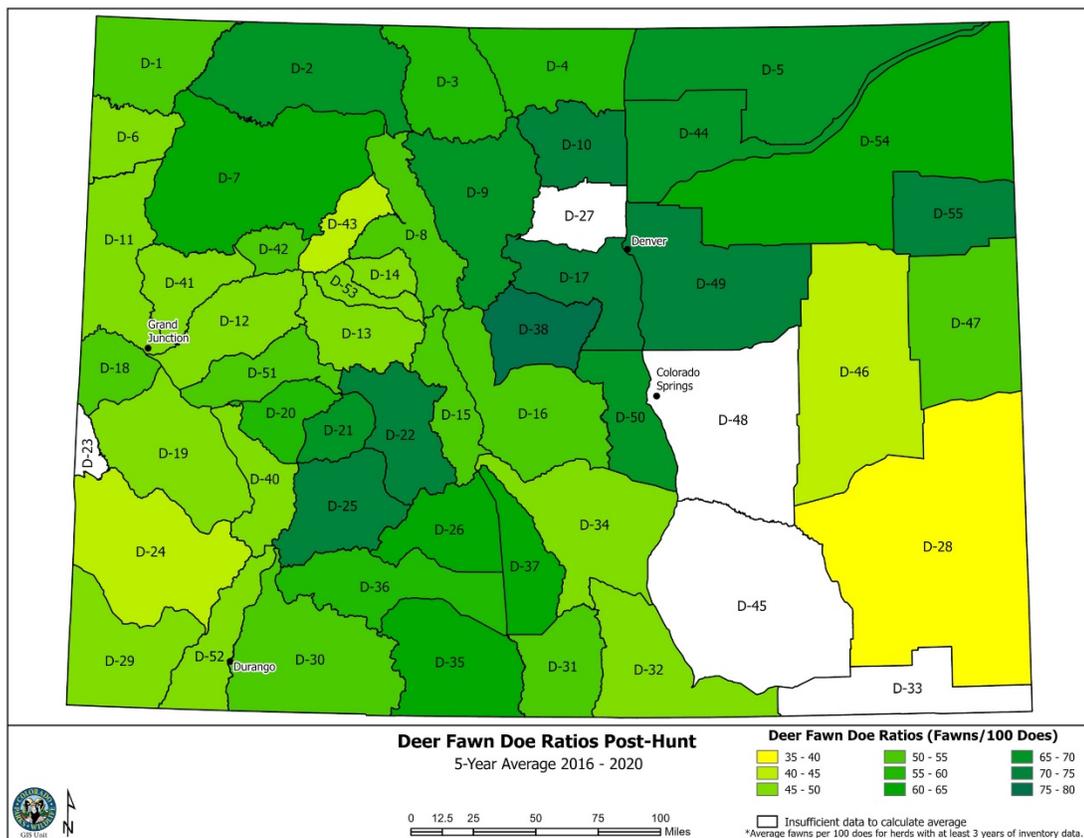


Figure 3. Colorado 5-year average fawns/100 does by herd.

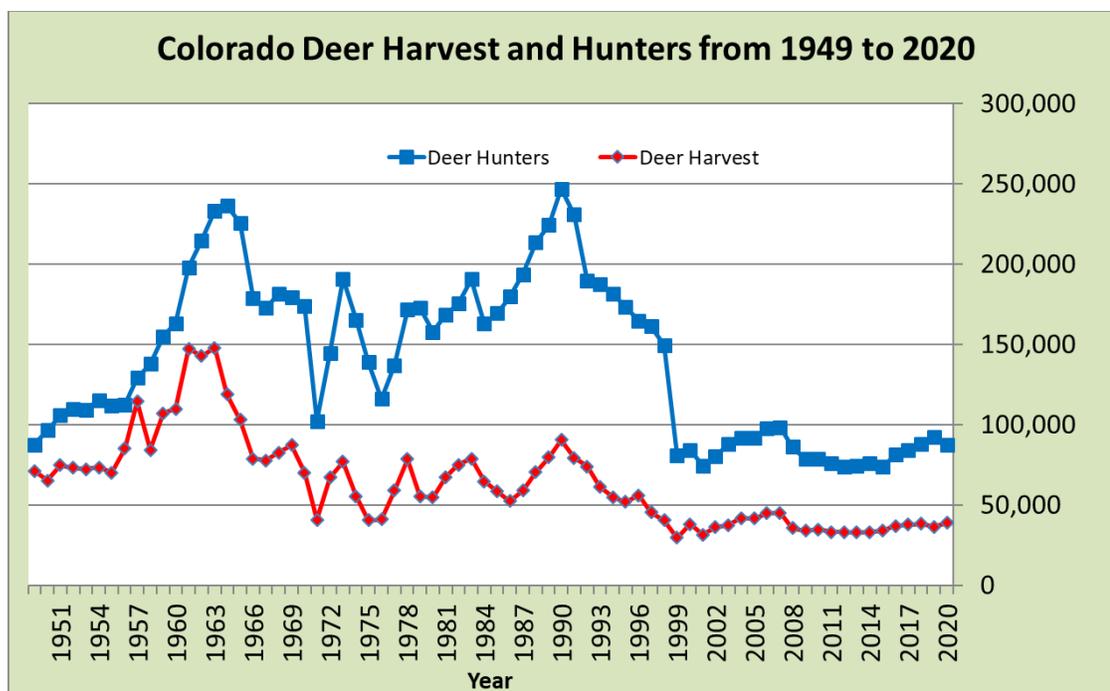


Figure 4. Colorado statewide hunters and harvest from 1949-2020.

Since 1999, all mule deer hunting in Colorado is by limited license only. In 2020, the estimated harvest from 87,536 deer hunters was 38,899 (Figure 4). Based on high observed post-hunt sex ratios and a high average hunter success rate of 49% for all rifle seasons in 2020, deer hunting continues to be good. Buck/doe ratios have shown a response to our management actions, and Colorado remains a premier destination for 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 2019-2020 winter was above the long-term average and similar overwinter survival rates have been seen thus far for the 2020-2021 winter.

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 rebounded slightly to an estimated 249,691 as of January 1, 2021.

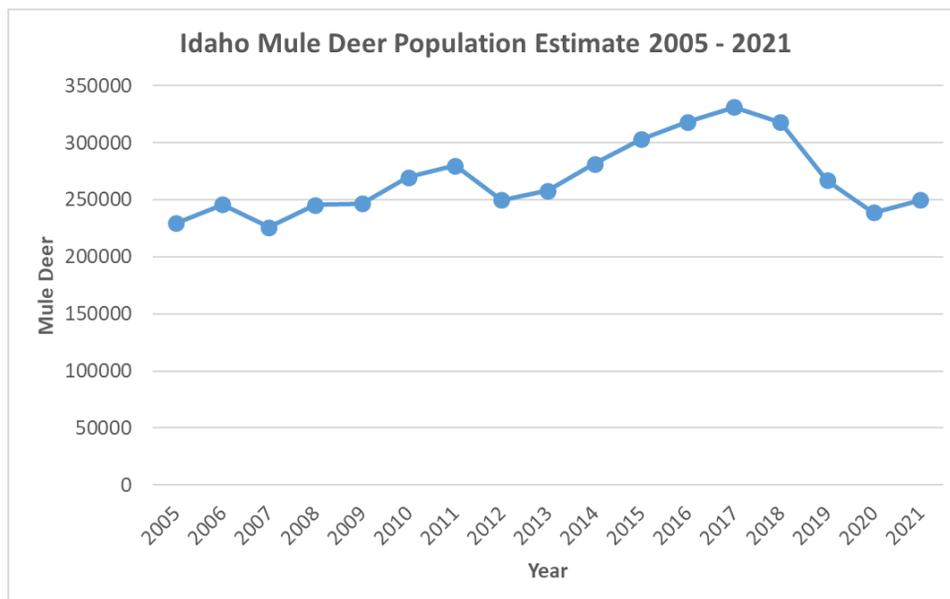
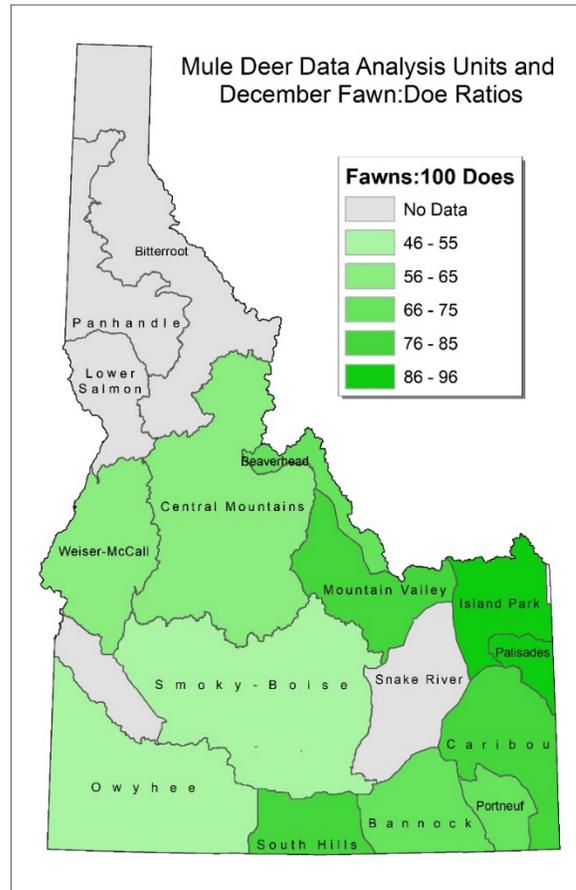


Figure 1. Mule deer population estimates from the Salmon River drainage south. Estimates are midpoint of confidence limits based on an integrated population model.

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 were limited to eastern Idaho in 2020 due to the pandemic, but 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 (2019-2020)

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 61% in 2020.

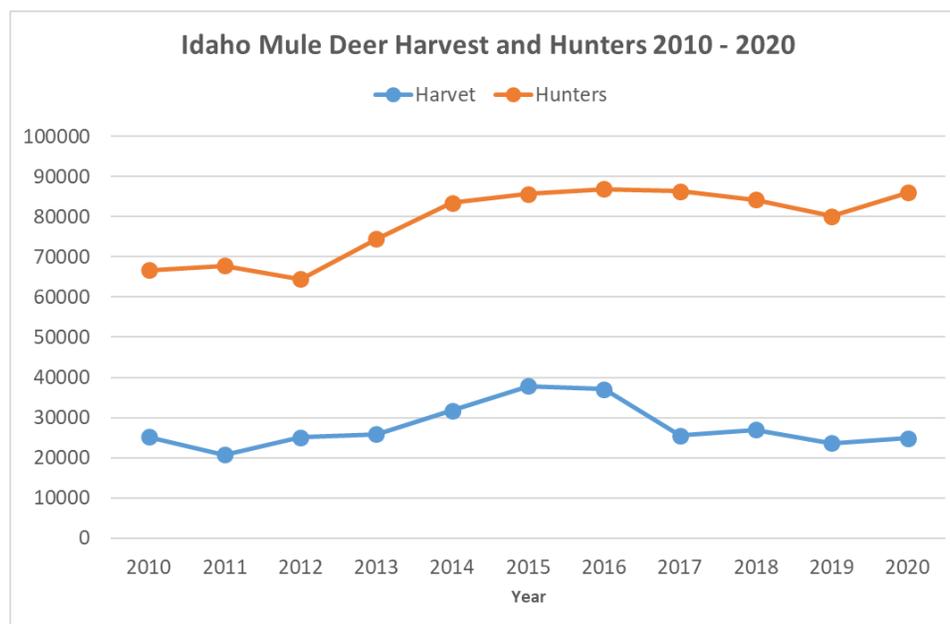


Figure 3. Total Idaho Mule Deer Harvest and Mule Deer Hunters, 2010 – 2020

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 and 2020 hunting seasons are currently being analyzed. Surveys will continue in 2022 and 2023 to cover the 2021 and 2022 hunting seasons.

Idaho continues to sample several hundred mule deer annually for chronic wasting disease (CWD). Sampling effort is disproportionately weighted to eastern and southeastern Idaho due to CWD-positive ungulates in neighboring Wyoming and Utah. Additional ungulate species and geographic areas in Idaho are sampled annually. Since July 1, 2020, 1,095 total CWD samples were taken statewide. Idaho has yet to detect CWD in any resident wildlife.

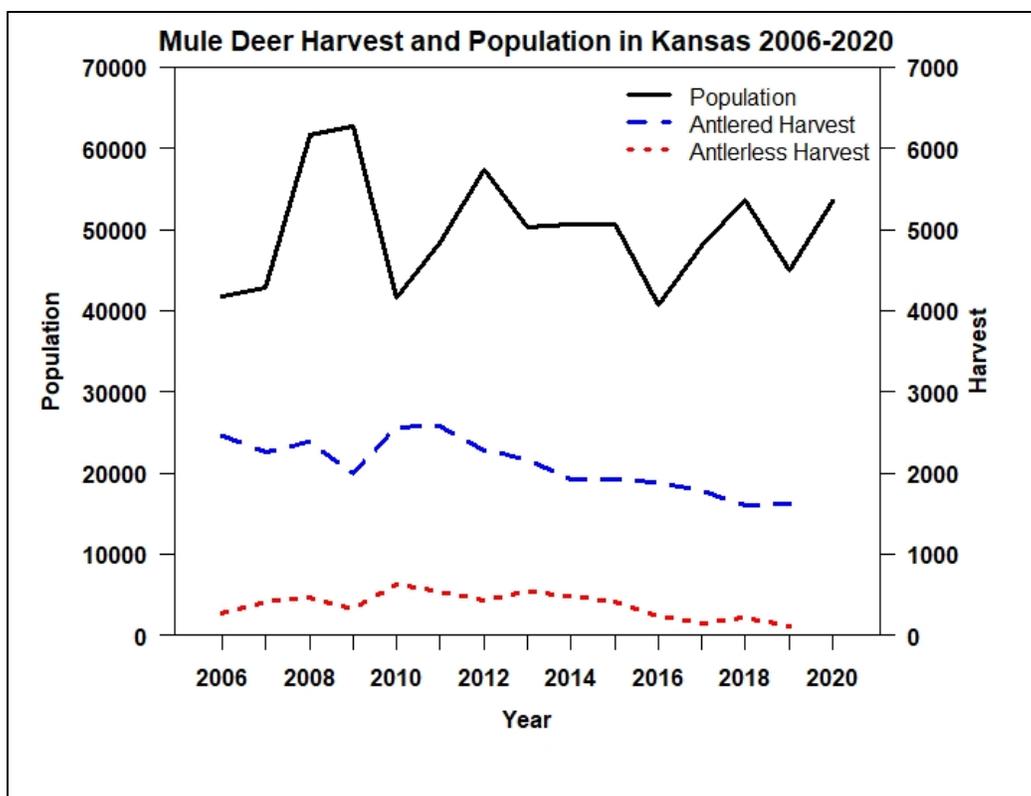
-Rick Ward, Idaho Department of Fish and Game

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 2020 was estimated to be 2.0 mule deer/mile² (95% CI: 1.3 – 3.0) while the density in the eastern zone was estimated to be only 0.11/mile² (95% CI: 0.02 – 0.46) resulting in a pre-firearm season total population estimate of 53,400 mule deer. In the west zone, the mule deer buck:doe ratio was 33.7B:100D. In the east zone the sample size was too small to estimate a reliable buck:doe ratio. In the east zone, where population declines and range retraction are occurring at the greatest rates, only 8 mule deer were observed over 519.9 miles of private land spotlight transects in 2020. Fawn:doe ratio in the west zone was 18.7F:100D; in the east zone no mule deer fawns were observed, likely a result of the overall low sample size.

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. In the west zone, hunters and landowners are concerned about mule deer numbers, but strong increases in mule deer numbers in certain areas has led to a growing number of landowner complaints due to crop damage attributed to mule deer.

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 16.0% of the either sex deer permits issued in Kansas last year. Landowners received 53.7% 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 to have the potential to pursue mule deer 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 2020, for the fifth consecutive year, no antlerless permits allowing the take of mule deer were issued. In 2019, Kansas had the lowest estimated total harvest (1,732) of mule deer since 1983 (1,412), harvest data from 2020 is not yet available.



Little information is available on survival or reproductive rates 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. In 2018, 133 total deer were captured. GPS collars were attached to 120 deer total, 15 collars per each sex of each species at two study sites. During 2019-2020, 60 new does and enough bucks to replace mortalities were marked each year. Each marked doe also received a vaginal implant transmitter (VIT), was measured for body condition and had disease samples collected for testing. A total of 100 fawns, 53 mule deer and 47 white-tailed deer, were marked with expanding VHF collars during spring in 2018 and 2019. On the northern study site, for both species in each of the last two years, approximately four does had to be captured to get three pregnant does. Potentially low pregnancy rates of mule deer may warrant further investigation in the future. Preliminary results indicate low fawn survival to 10 weeks (whitetail deer 0.41 ± 0.08 ; mule deer 0.25 ± 0.07) in western Kansas.

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 publicly accessible 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.

Antlered mule deer hunting regulations for many years have included one 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 2020, the statewide mule deer buck harvest estimate was 40,258; this was below the 1960-2019 average of 45,121. The statewide population estimate (Figure 1) and antlered mule deer harvest (Figure 2) suggest that the statewide mule deer population experienced a modern low within years 2010–2012. This low was strongly 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 386,075 (Figure 1) and statewide antlered mule deer harvest increased from 28,985 to 42,851 (Figure 2), suggesting a population increase during that period. Survey and harvest data suggest a slight decline in mule deer since 2016. This decline was likely the result of severe winter conditions across the state during 2018-19. Following the 2020 hunting season, the statewide average buck:doe and fawn:doe ratios were 28:100 and 58:100, respectively.

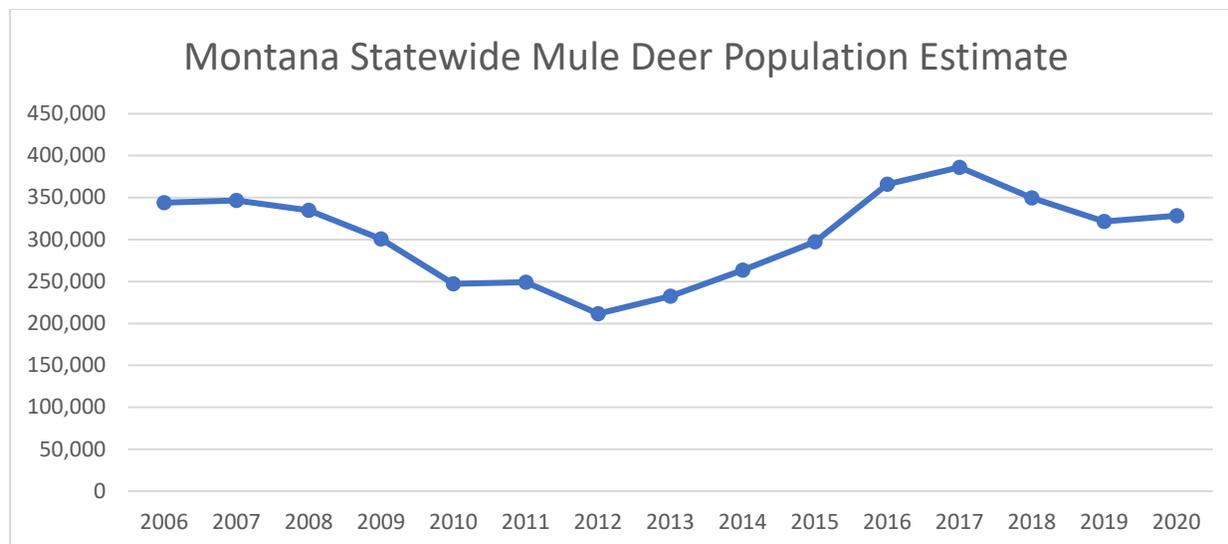


Figure 1. Montana statewide mule deer population estimate, 2006-2020.

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.

The statewide estimate for deer (mule and white-tailed) hunters was 150,343 in 2020, compared to 148,358 in 2019 and a 1986–2019 average of 163,264. The number of deer hunters in Montana peaked at 201,576 in 1994, decreased to 148,736 in 1998, 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 2). 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.

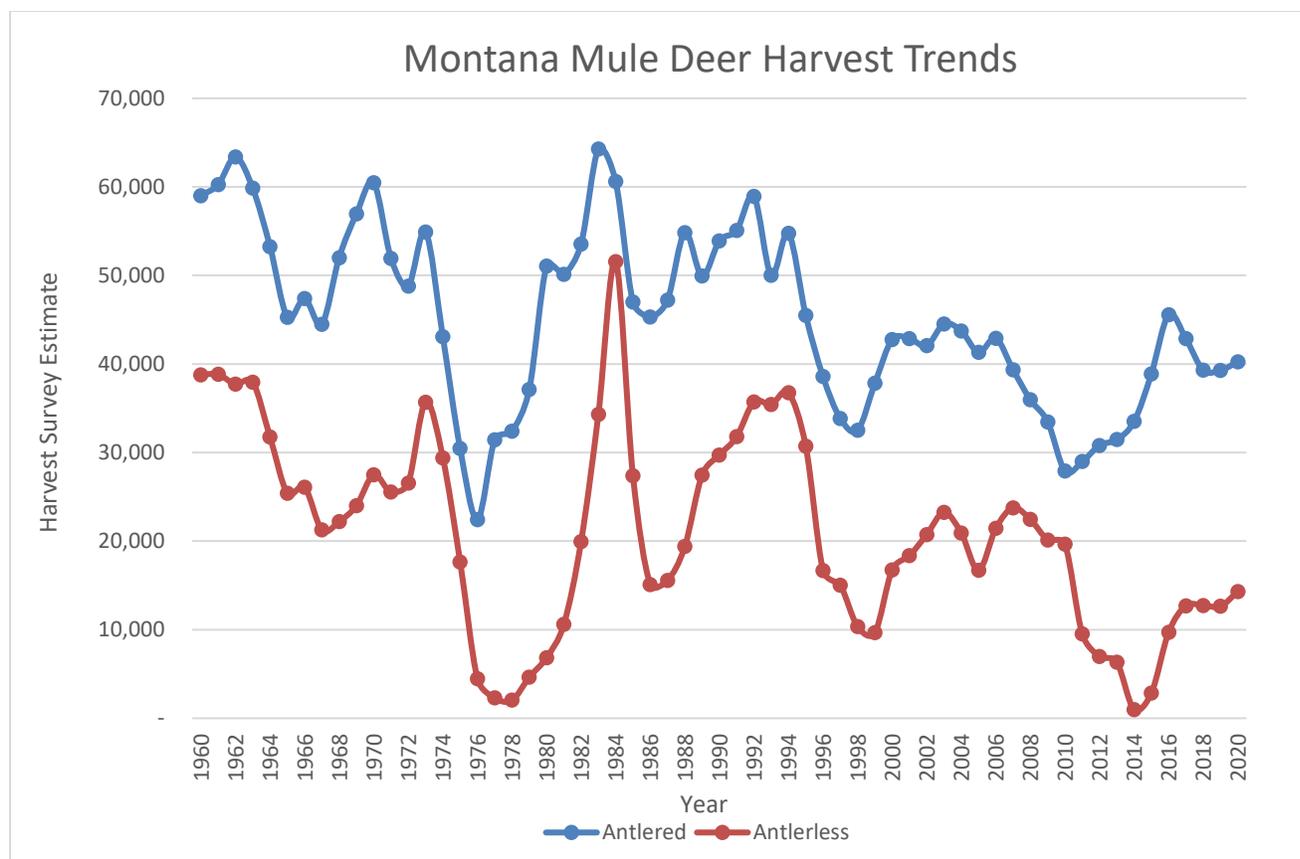


Figure 2. Montana statewide mule deer harvest, 1960-2020.

-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 agricultural 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 years. We suspect that this is partially due to habitat loss and partially due to impacts of meningeal brain worm (*P. tenuis*). Our goal is “To manage big game populations at levels consistent with social and biological carrying capacities, and provide opportunities for aesthetic enjoyment and hunting.” 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.

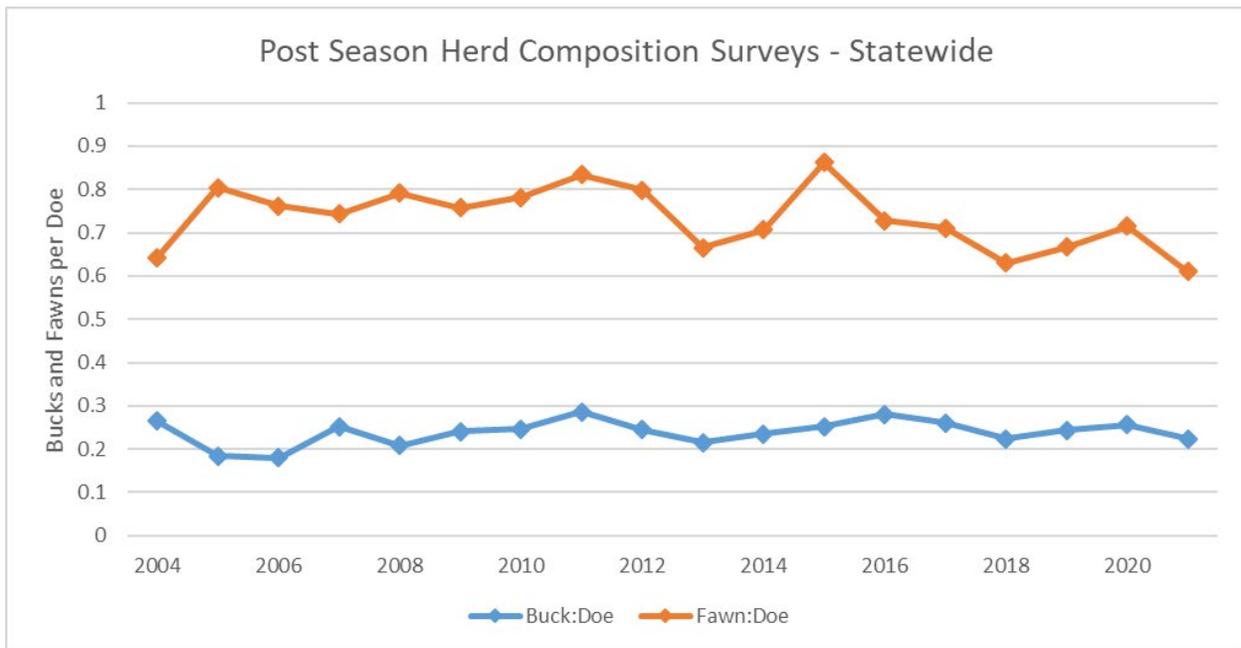
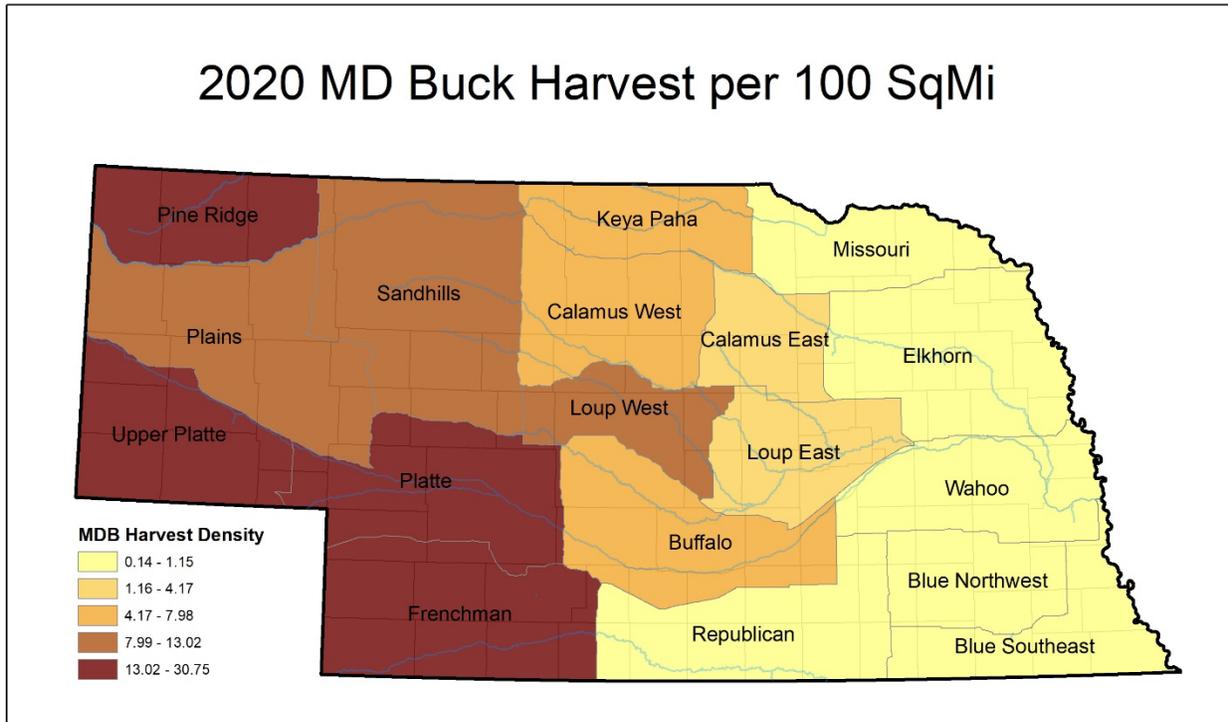
Staff bases management objectives and recommendations for each DMU on population trends, agricultural damage complaints, age of harvested bucks, buck harvest, permit demand, deer vehicle collisions, and public input. Mandatory check of all harvested deer is required. We typically collect age data on more than 4,500 mule deer annually, however due to COVID-19 concerns our in person check stations were not operated and age data via tooth wear and replacement was not collected. We did get yearling buck age data based on main beam +/- 11" criteria. 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. In 2019 and 2020, staff documented numerous meningeal brain worm 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.

Harvest of mule deer bucks was 7,236 in 2020, a 16% decline from 2019 and accounted for 77% of total mule deer harvest. Total deer harvest in 2020 was 60,266 in Nebraska, of which 16% were mule deer. Mule deer harvest is greater than white-tailed deer harvest in 4 of 18 DMUs, and mule deer are abundant in 10 of 18 DMUs across Nebraska. Herd growth is desired in five DMUs where antlerless mule deer restrictions are in effect. Habitat conditions remain good for healthy herds and population growth. Low antlerless harvest and normal precipitation levels have driven population growth the past five to ten years.

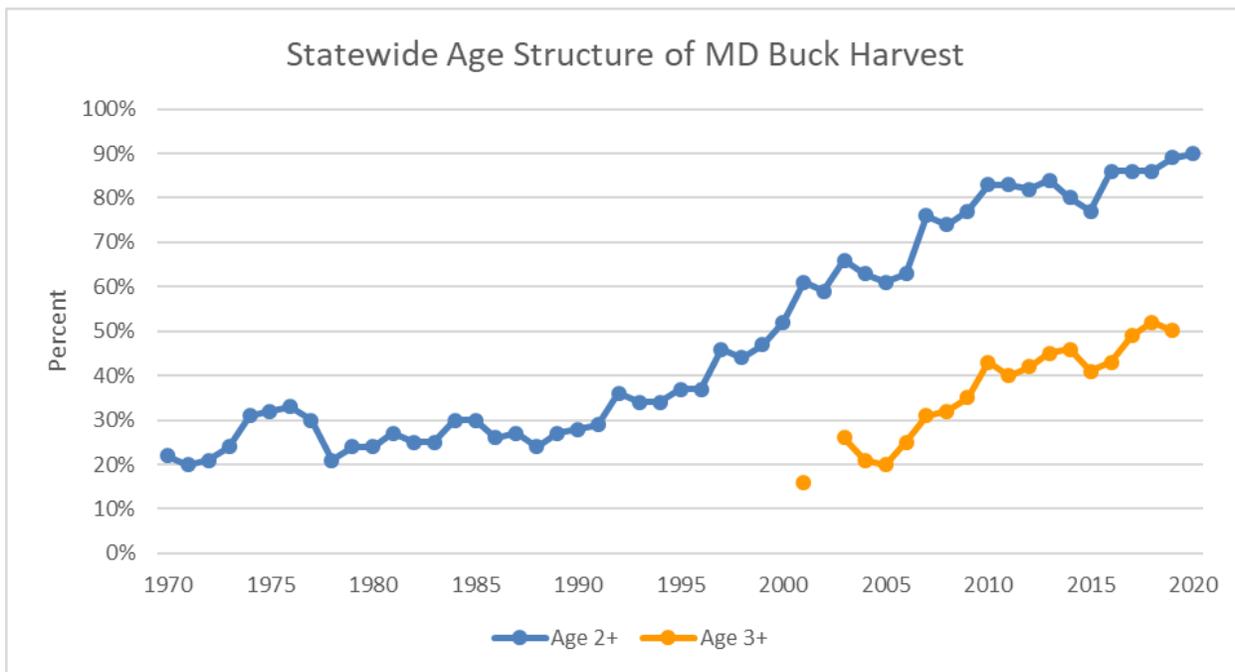
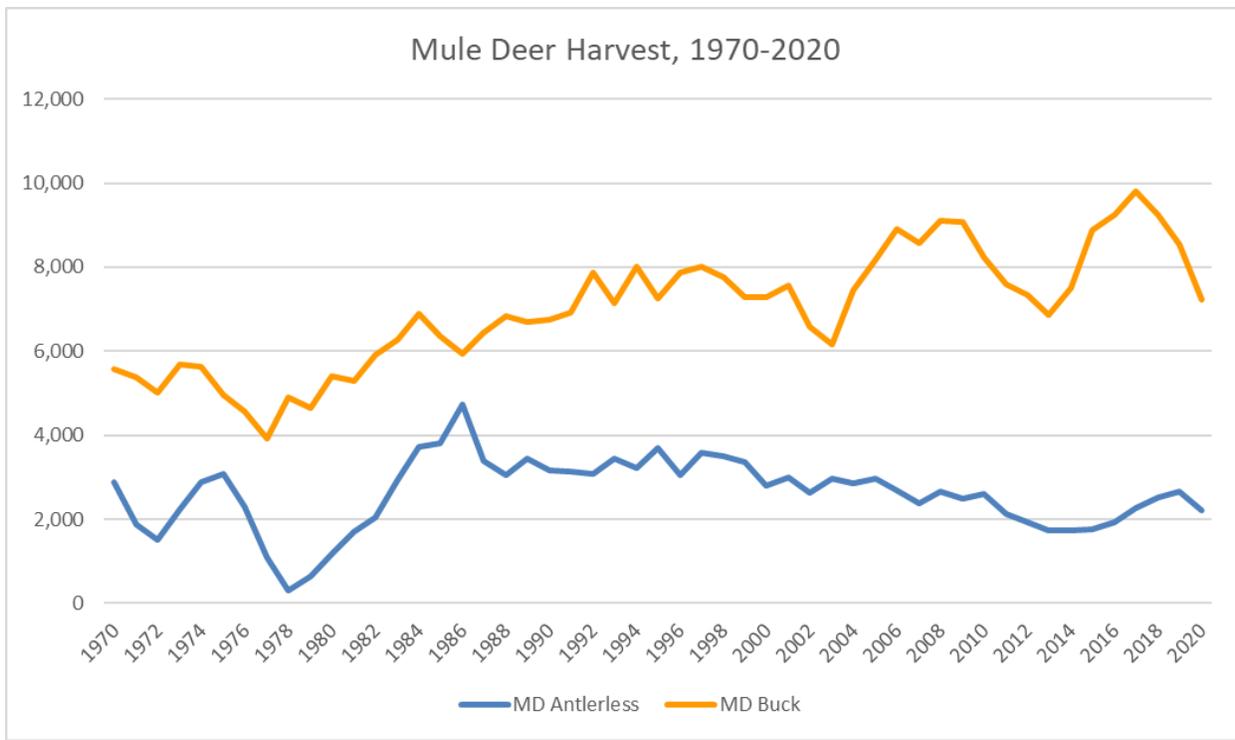
Buck to doe ratios have remained within desired ranges (20-30 per 100) and fawn production has remained at or above the target of 60%. However, fawn rates have declined over the past 5 years.

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. Researchers will continue to catch fawns in northwest Nebraska during the summer of 2020. Preliminary results have shown poorer than expected doe and fawn survival.



Range-wide Status of Black-tailed Deer and Mule Deer ~ 2021



-Luke Meduna, Nebraska Game and Parks Commission

Nevada

The Nevada Department of Wildlife (NDOW) issued approximately 17,660 mule deer tags for the 2020 hunting season. This number is an approximate 4.5% increase from the previous year. The overall success rate for resident Any Legal Weapon seasons was 36% statewide, which is well below the previous 3-year average success rate of 46%. Resident muzzleloader and archery hunt success rates were 40% and 18% respectively, which were both consistent with the 3-year averages for those weapon categories. Junior hunters enjoyed a 61% overall hunt success rate, which is equivalent to the previous 3-year average. Overall, about 5,955 bucks and 900 does were harvested by all hunters and approximately 43% were 4-point or greater. The percentage of bucks with 4-points or greater is nearly identical to the 3-year average.

During 2020, biologists classified approximately 12,360 mule deer during the fall survey. Statewide fawn production was higher during 2020 with 51 fawns per 100 does observed during post-season surveys, compared to 45 fawns per 100 does during the fall 2019. The observed post-season buck ratio was 29 bucks per 100 does for 2020 which is slightly below the 3-year average of 30 bucks per 100 does. The observed spring fawn ratio of 33 fawns per 100 adults was above the 5-year average of 27 fawns per 100 adults, indicating some potential for herd growth. The higher fawn recruitment may be attributed to mild winter conditions during 2020-2021.

The primary driver of mule deer populations is the numbers of fawns recruited into the population each year, in addition to the condition and productivity of adult females. While the higher number of fawns observed during spring surveys is promising, below average moisture and drought conditions persist throughout much of Nevada during late spring 2021. As of April 13, 2021, 100% of Nevada was in severe drought and 75% of the state was in extreme to exceptional drought conditions according to the U.S. Drought Monitor.

Nevada's mule deer populations have been on a downward trend in recent decades 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. In response to these declines, the NDOW recently chartered a Mule Deer Enhancement Program led by teams of game and habitat biologists, stakeholders, and members of the public. The overall goal of this effort is to identify factors limiting mule deer herds in all areas of the state and develop a strategic plan to address those limiting factors. The Wildlife Commission, County Advisory Boards (CABs), sportsman's organizations, and members of the public will be integral to helping the Department come up with projects and funding to improve habitat and have a positive long-term benefit for our mule deer populations.

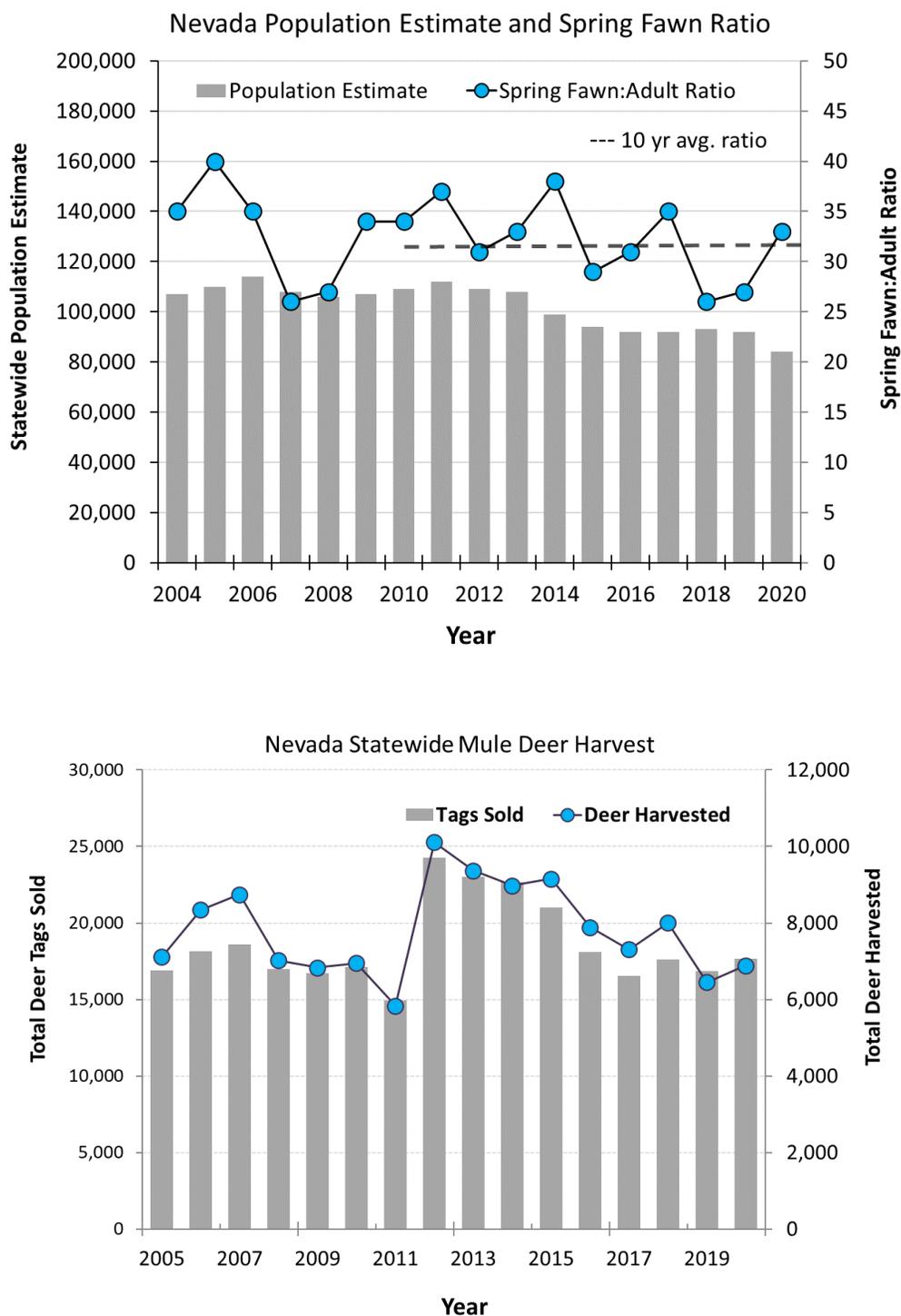


Figure 1. Trends in statewide mule deer population estimate (top panel) and observed fawn:adult ratios for Nevada, 2004 to 2020. Number of mule deer tags sold (bottom panel) and total deer harvested by year from 2005 to 2020.

-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 will 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 drought over the last couple years which has resulted in lower recruitment. Precipitation for the 2020-2021 winter and early spring was low throughout the state. 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.

In addition to precipitation, wildfires can improve habitat and lead to population growth. 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.

The Department conducts annual post-hunt aerial surveys in December to obtain composition ratios for select Game Management Units (GMU). During the winter 2020 post-hunt survey, the statewide buck to doe ratio was 34 bucks:100 does (Figure 1); this is consistent with the long-term average. The 2020 fawn to doe ratio was similar to the 2019 surveys (36 fawns:100 does). This is consistent with the long-term trend across the state. The Department continues to refine aerial survey methods to also estimate deer densities in the surveyed GMUs while continuing to obtain composition ratios.

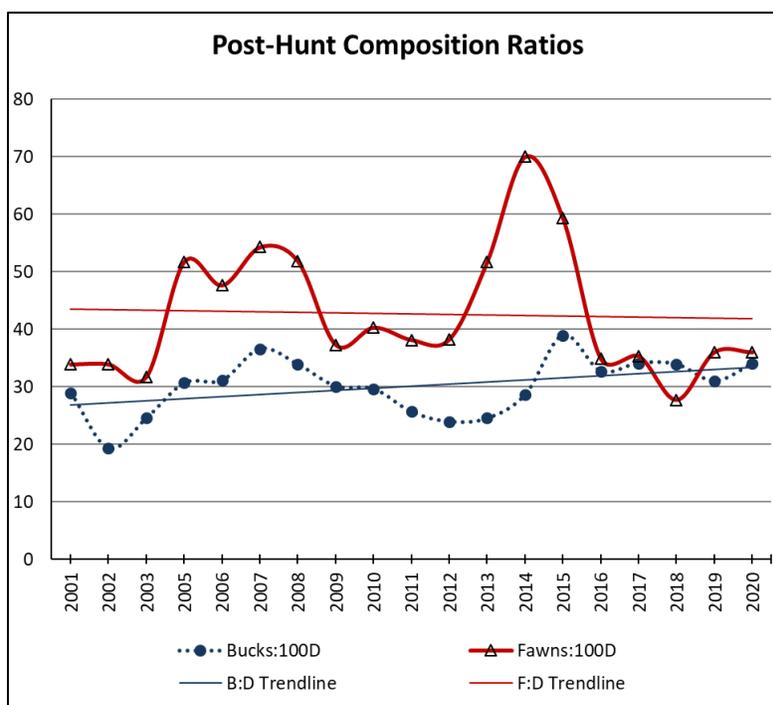


Figure 1. New Mexico statewide composition ratios obtained during post-hunt winter surveys from 2001-2020.

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 2020-2021 hunting season an estimated 33,254 hunters harvested 11,356 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 34% during the 2020-2021 hunting season for all weapon types combined. This is higher than the long-term average success rate for deer hunters in New Mexico (29%; 1953-2020).

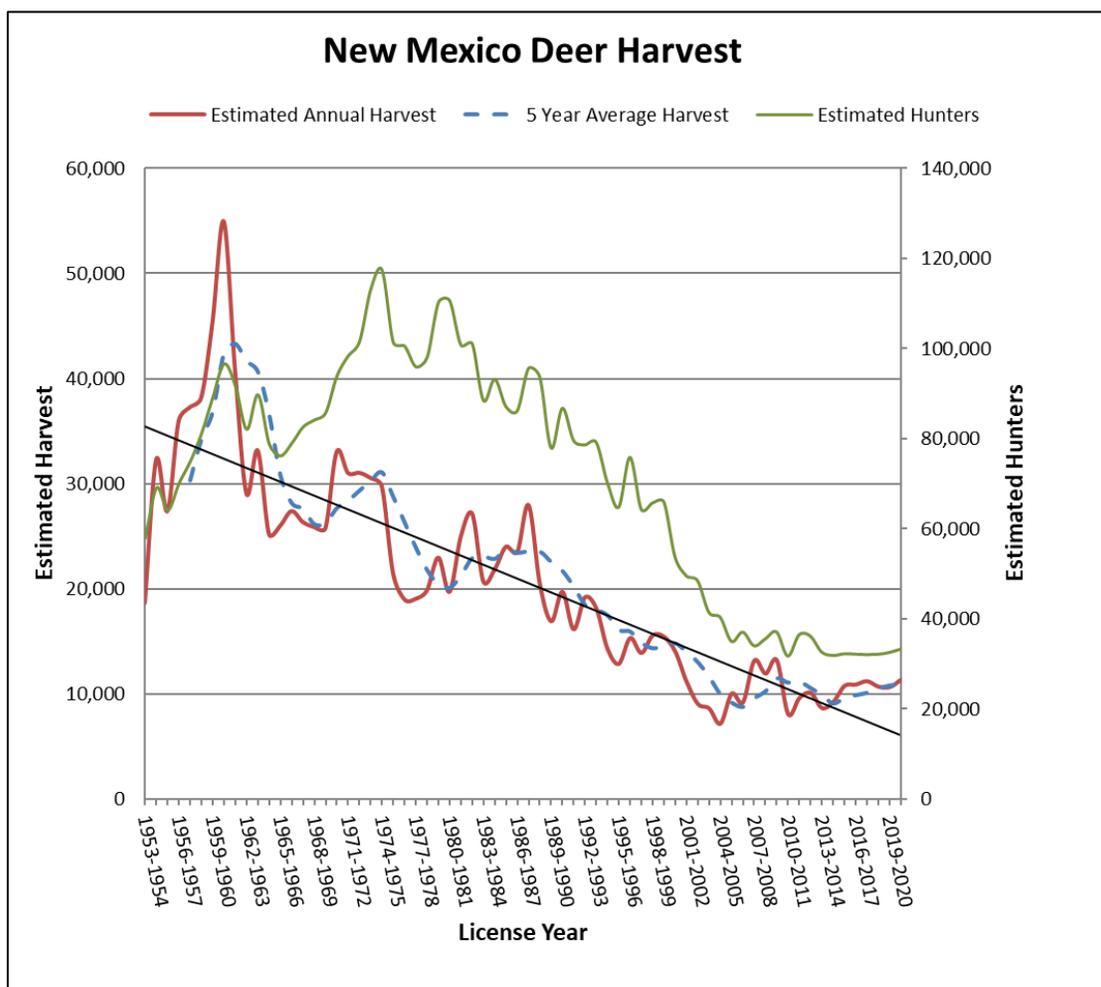


Figure 2. Estimated annual deer hunters and harvest in New Mexico 1953 – 2020.

-Orrin Duvuvuei, New Mexico Department of Game and Fish

North Dakota

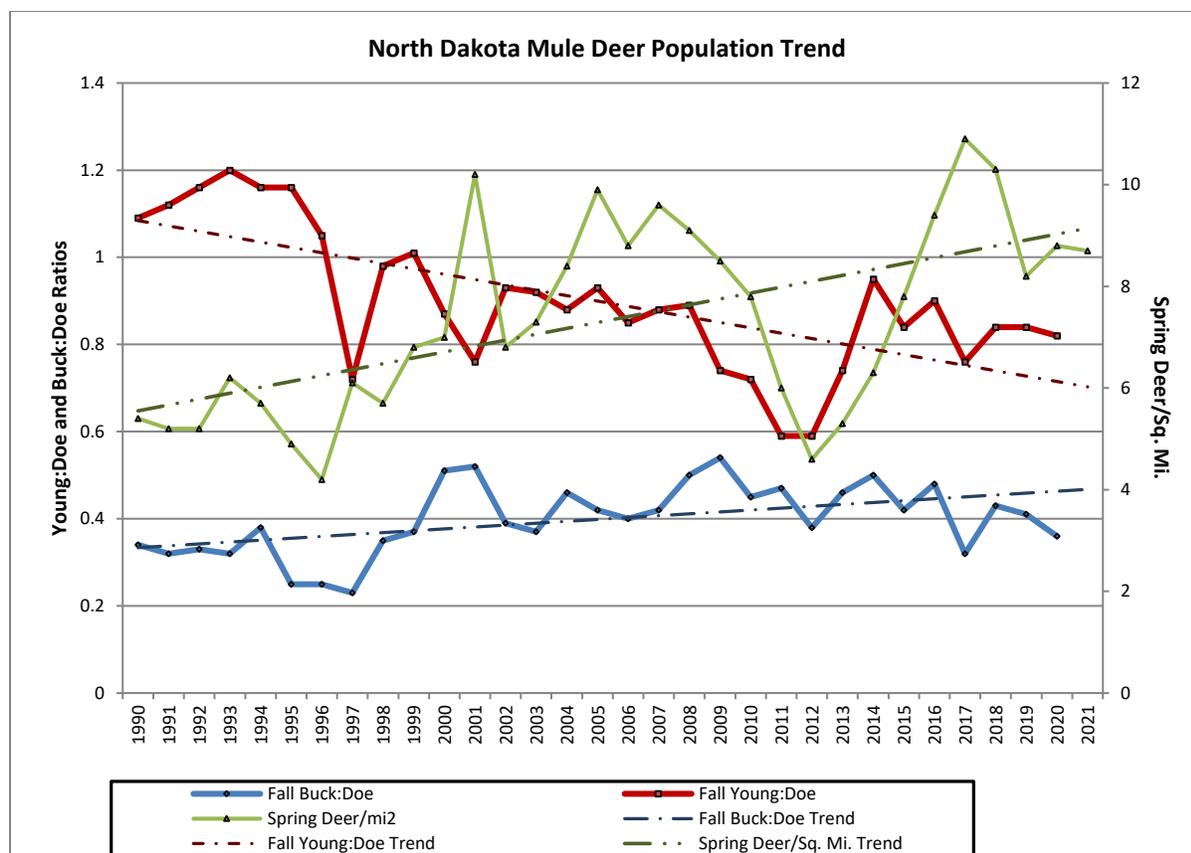
North Dakota's badlands mule deer population showed an increasing trend with high fawn production from 1990-2007. Mule deer fawn production was typically greater than 90 fawns:100 does during these years. Winter weather conditions were mild during this time period except in 1996. Mule deer numbers peaked 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 2011-2020 and the mule deer population has increased since 2012. The 2021 spring index was same as 2020, and 21% higher than the long-term average. Fawn production has trended upward since the population low in 2012.

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.

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

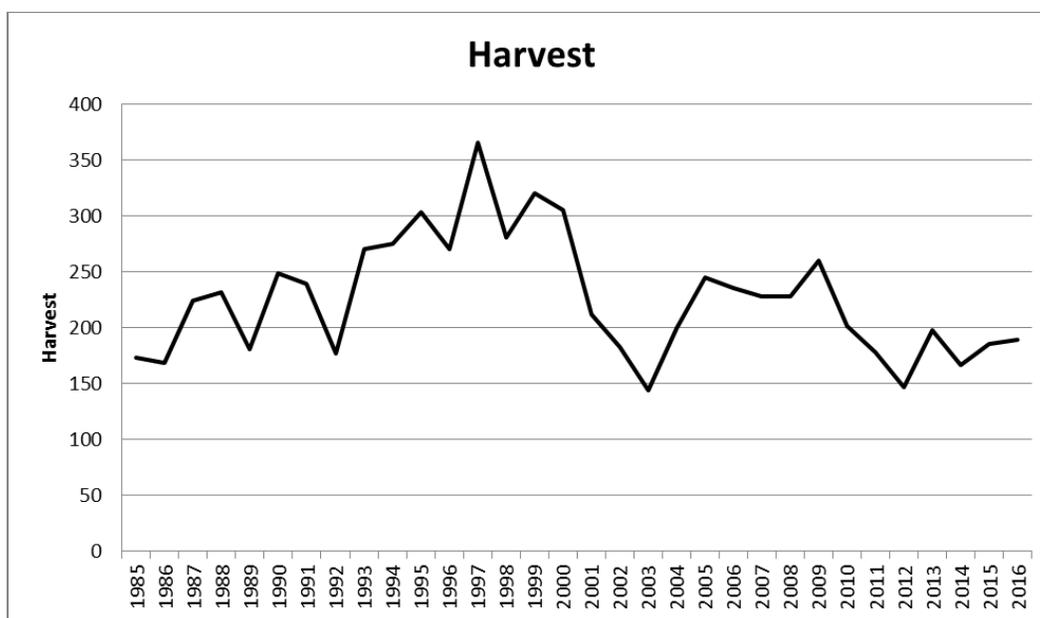
Northwest Territories

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 a 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. Mule deer harvest was up slightly for the 2019-2020 season (252) compared to the 2018-2019 hunting season (222) mule deer. In general, habitats are beginning to rebound. 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. Unfortunately harvest estimates from the 2020-21 season are unavailable due to issues with a new e-check system. However following population trends, and previous harvest trends, it can be estimated that slightly more than 250 mule deer were harvested during the 2020-21 season.



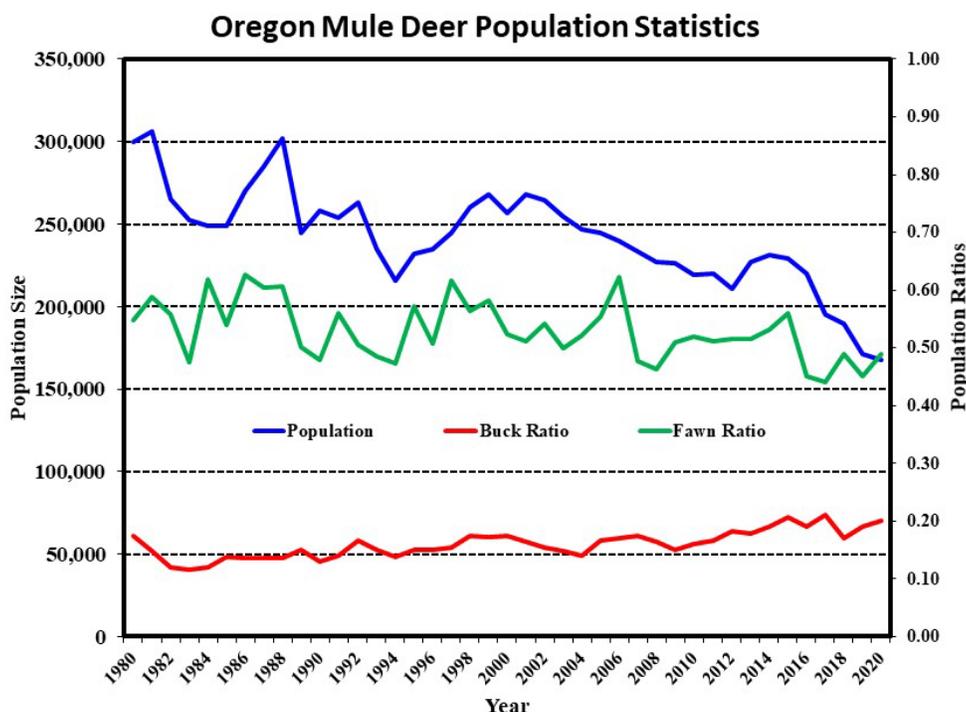
-Dallas Barber, Oklahoma Department of Wildlife Conservation

Oregon

Both mule deer and black-tailed deer are substantially below the long-term statewide management objectives and benchmarks. Oregon's estimated mule deer population continues to decline with an estimated population of 170,000–190,000 in 2020. 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 over the last 10-12 years. 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.

Analysis of data from nearly 2,000 GPS radio-collared mule deer since winter 2014-2015 has identified 13 primary mule populations 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 the populations. Survival continues to vary considerably across the landscape but has improved over the very low levels observed during winter 2016–2017. Adult annual survival in areas with sufficient collars for analysis ranged from 88% to 98% for the biological year 2020–2021. Over winter survival for fawns in four monitoring areas ranged from 45%–69% during winter 2020 – 2021.



Trends in Oregon's mule deer population size and structure, 1979 – 2020.

-Don Whittaker, Oregon Department of Fish and Wildlife

Saskatchewan

Mule deer populations are monitored in Saskatchewan using annual spotlight surveys, hunter harvest surveys, volunteer cooperative-wildlife surveys and intermittent aerial surveys. The province-wide 2020 mule deer population estimate is 72,000 (Figure 1), which is a general estimate derived from recent ground-based spotlight surveys and aerial survey results. 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. Following a series of severe winters from 2011 to 2013, mule deer populations have been generally increasing across Saskatchewan, with particularly strong population growth across the Parkland and Boreal Forest Fringe region of the province. Some mule deer populations in the southwestern portion of the province have been declining during this time period, possibly due to high levels of chronic

wasting disease infection. Saskatchewan is in the process of updating population management objectives as part of the development of a long-term mule deer management plan.

A total of 16,685 limited entry either-sex, limited entry antlerless, and over the counter archery-only mule deer licenses were sold in 2020, resulting in an estimated 11,015 mule deer harvested throughout the province in 2020 (Figure 1). Bucks made up 46% of the total harvest, with a total of 5,090 buck mule deer harvested in 2020. Saskatchewan had the highest proportion of antlerless (females and young of year) mule deer reported in harvest of all western jurisdictions in 2019 and this is expected to be the same for 2020. Despite high rates of antlerless harvest, mule deer populations remain stable or growing in most parts of the province, with the exception of some regions of Saskatchewan where CWD prevalence is extremely high (e.g., > 30%). Hunters holding draw (i.e., limited entry), either-sex licenses harvested 4,504 mule deer (4,170 bucks), with an average success rate of 66%, which was below the previous five-year (2015 – 2019) average of 79%. Draw antlerless mule deer hunters harvested 5,072 doe or fawn mule deer, with an average harvest success rate of 97%. Hunters holding over-the-counter (OTC) archery mule deer licenses harvested an estimated 1,098 mule deer (920 bucks), with an average harvest success rate of 22%, which was above the previous 5-year average (2015-2019) of 15%. In 2020, Saskatchewan began to phase in mandatory hunter harvest reporting for all licensed hunters, which increased the harvest reporting response rate to an average of 60% for all mule deer licenses, which was a 41% increase in reporting compared to 2019 (i.e., 29% response rate). Improved reporting is believed to have largely contributed to the lower limited entry hunter harvest success rates observed in 2020 compared to previous years, likely due to previous bias with successful harvest reporting associated with voluntary harvest reporting.

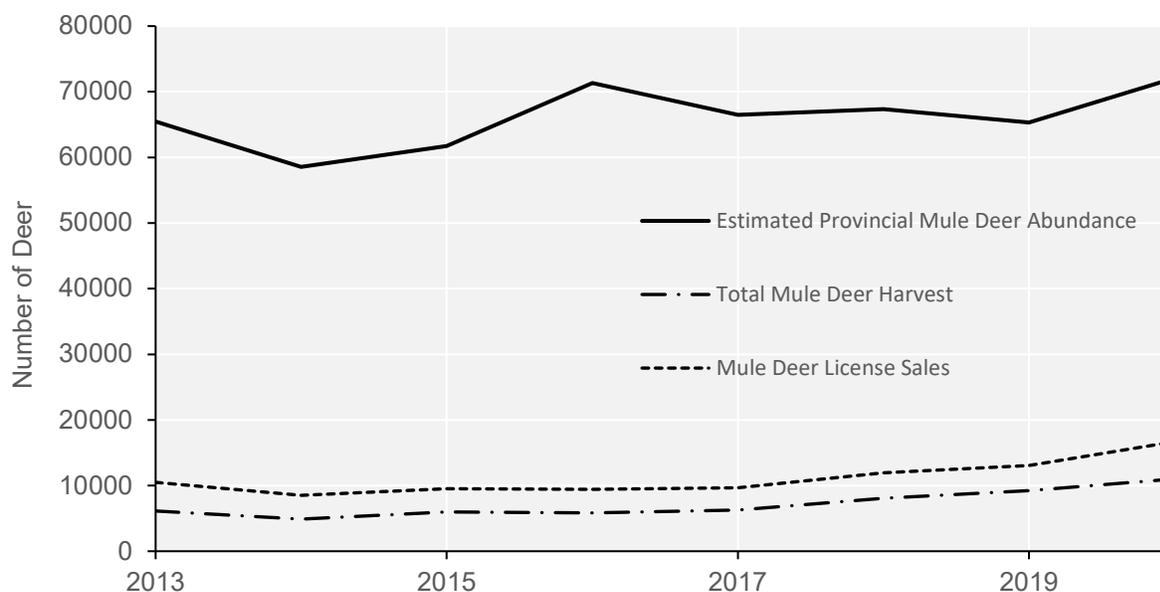


Figure 1. Estimated mule deer abundance and estimated mule deer harvest in Saskatchewan, Canada, 2013-2020.

Chronic wasting disease continues to increase in prevalence and distribution across Saskatchewan. In 2020, voluntary hunter surveillance sampling resulted in a province-wide prevalence rate in mule deer estimated at 45% (i.e., 314 CWD positive / 695 CWD negative), with a province-wide estimated prevalence rate of 49% based on 2019 and 2020 hunter collected

samples (i.e., 755 CWD positive/ 1549 CWD negative total in 2019 & 2020). Saskatchewan is in the process of developing a long term mule deer management plan which will outline a framework to improve monitoring effort, construct population management objectives, and develop harvest management strategies that attempt to mitigate the effects of chronic wasting disease in the future.

-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 biological 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). Pre-season herd composition surveys documented decent recruitment in most Data Analysis Units (DAU) in 2020 with overall recruitment at 70 fawns:100 does. The statewide pre-season sex ratio in 2020 was 47 bucks:100 does (Figure 2).

South Dakota Mule Deer Unit Objectives (2021-2022)

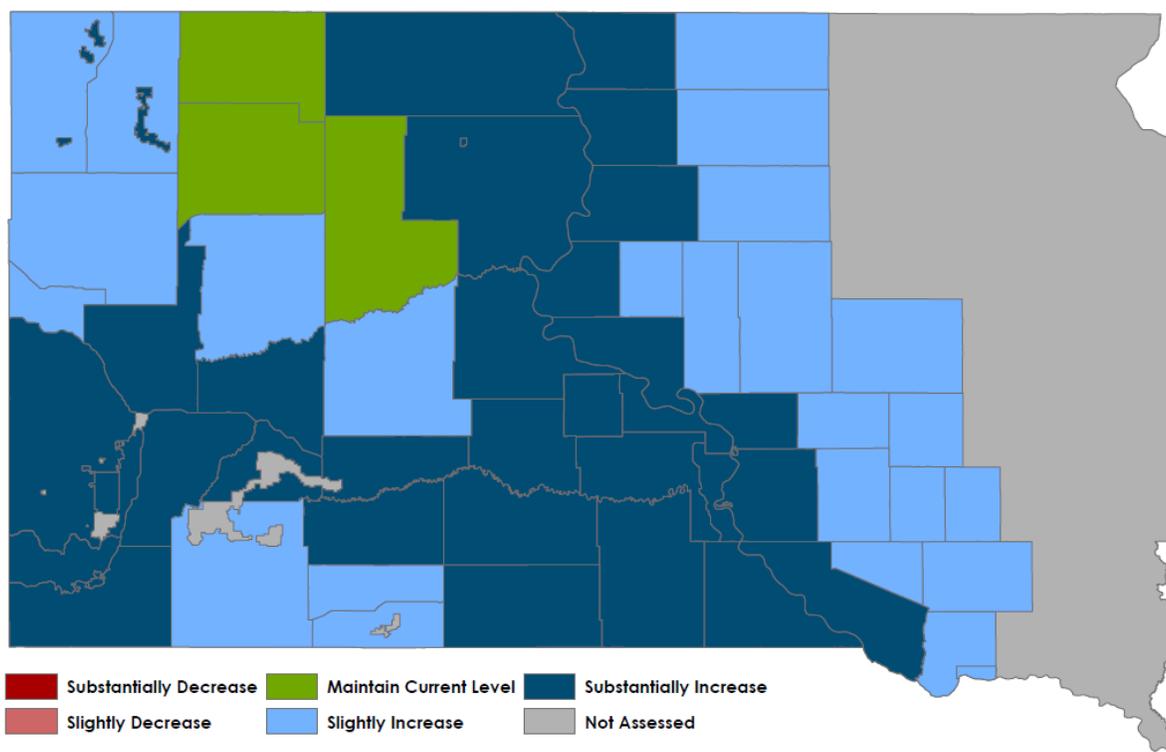


Figure 1. Mule deer population objectives for South Dakota hunting units, 2021-22.

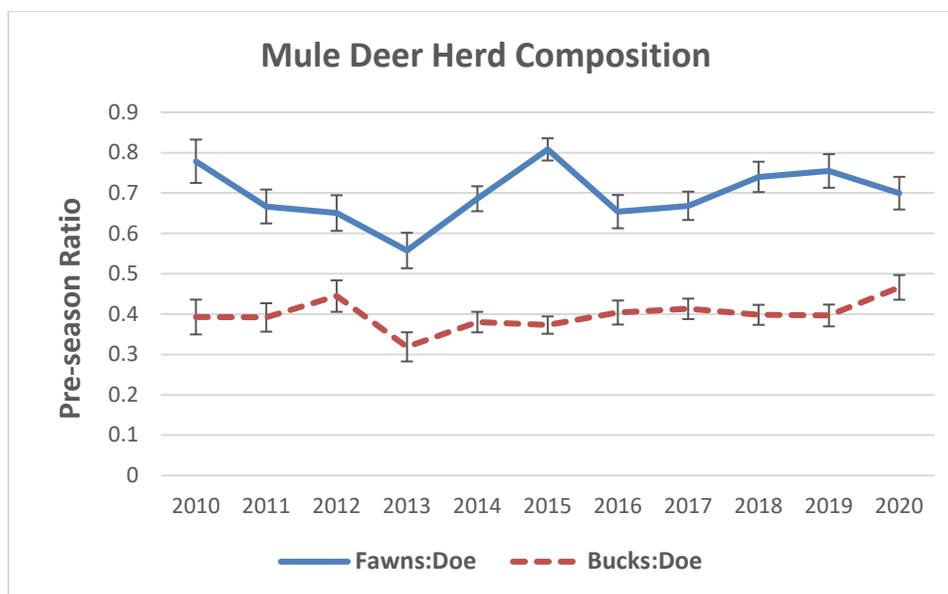


Figure 2. Statewide sex and age ratios from pre-season herd composition surveys in South Dakota, 2010-2020.

Currently all deer hunters are surveyed via email or electronic submission methods. Annual deer hunter surveys are conducted to estimate harvest at each management unit for each species and age/sex cohorts. Statewide mule deer harvest has slowly increased from a low of about 5,400 in 2014 to 7,400 in 2020, mostly due to increased buck harvest since doe harvest has been substantially restricted for the past 7 years (Figure 3). A consistently low mule deer doe harvest of approximately 1,500 has allowed some deer herds of the state to grow to more desirable levels although many areas are still substantially below objective (Figure 1 and Figure 3). The current harvest of antlerless mule deer occurs primarily from youth deer hunters or hunters with “any deer” licenses.

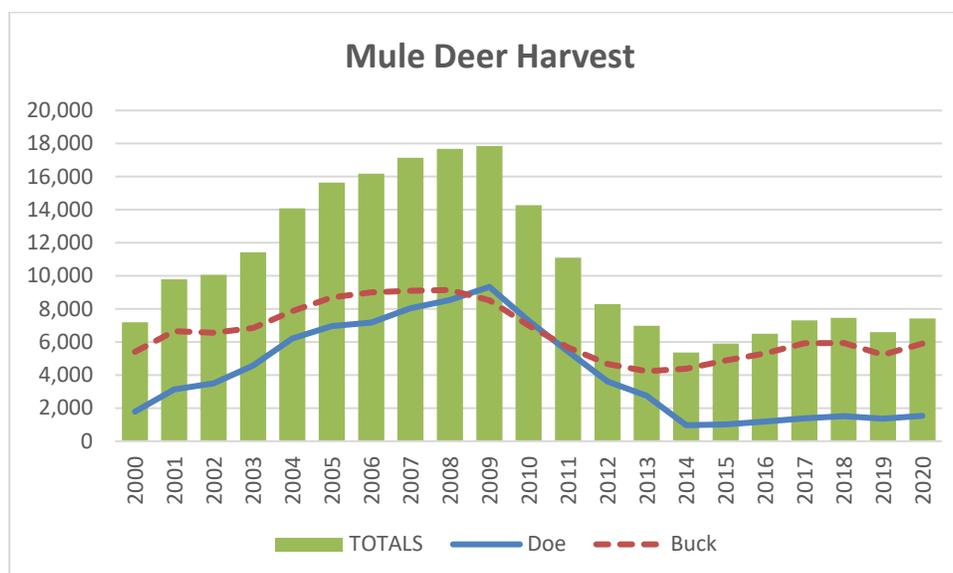


Figure 3. Mule deer harvest from all hunting seasons in South Dakota, 1990-2020.

Radio collaring and survival monitoring efforts continue in South Dakota with approximately 475 collared mule deer being monitored across 4 study areas in 2020. Survival rates for 2020 in the Black Hills were 76% for adult females (18+ months of age; 95% CI: 65-85). In the White River and Upper Missouri River study areas, adult females survival rates were 84% (76-90) and 80% (73-87), respectively. Mule deer were also captured and GPS radio collared in the Grand River study area for the third year of a larger research project investigating habitat use, movements, and influences on survival for both white-tailed deer and mule deer. Preliminary survival for adult females was 83% (76-90) for adult females in this study area last year. 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 is 80,600 mule deer in 2021.

-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. The 2020-21 helicopter mule deer survey effort was postponed because of the tragic helicopter accident that occurred while conducting bighorn sheep surveys in August 2020. A thorough review of aerial survey protocols and safety procedures was recently finalized and approved. Therefore, helicopter mule deer surveys will resume in 2021-22. Because of the postponement of mule deer surveys during 2020-21, last year's data are included in this report.

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. In 2019, the Trans-Pecos mule deer population estimate was 135,655, over a 30% increase from 2018. Surveys were not conducted in 2007 and 2010. The estimated 2019 fawn crop of 34 fawns:100 does was higher than 2018 (23 fawns:100 does). The sex ratio for 2019 was 56 bucks:100 does, the highest bucks:100 does estimate since 2011.

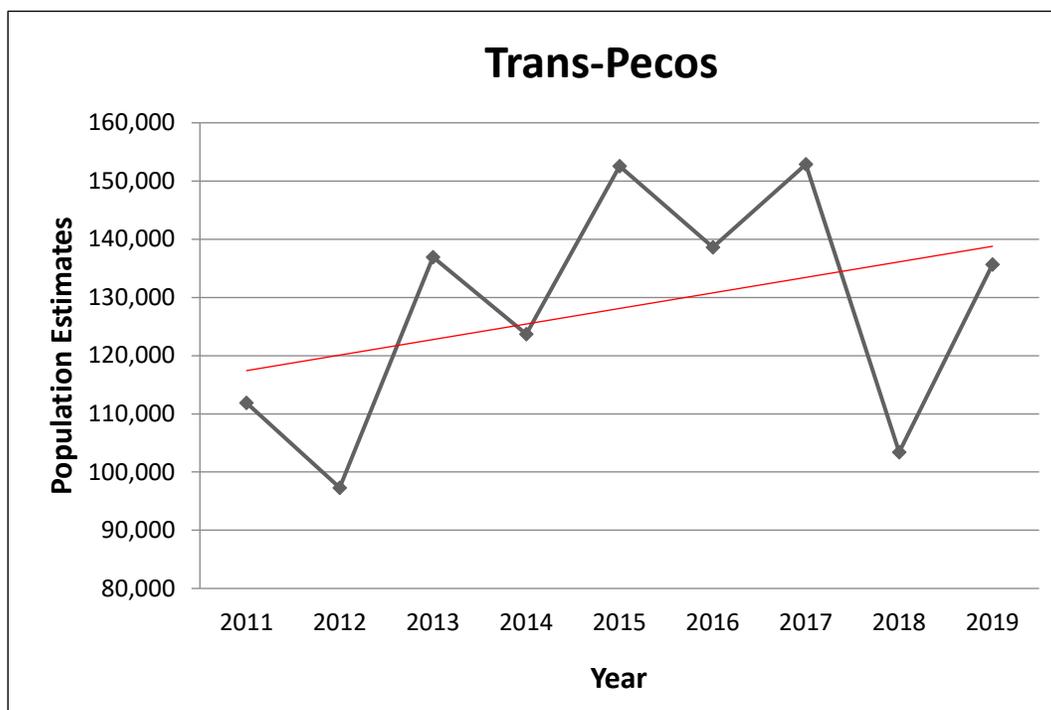


Figure 1. Trends in mule deer population estimates in Trans-Pecos, Texas, 2011-2019.

Panhandle

The Panhandle population trend has been increasing since 2011. Surveys were not conducted in 2015. The 2019 population estimate of 91,737 was slightly lower than the 2018 estimate of 96,713. Fawn production was 43 fawns:100 does in 2019, which was above the region average (37 fawns:100 does). The sex ratio for 2019 was 32 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 all years, but the post-season sex ratio has been above 21 bucks:100 does in 8 out of 9 survey years.

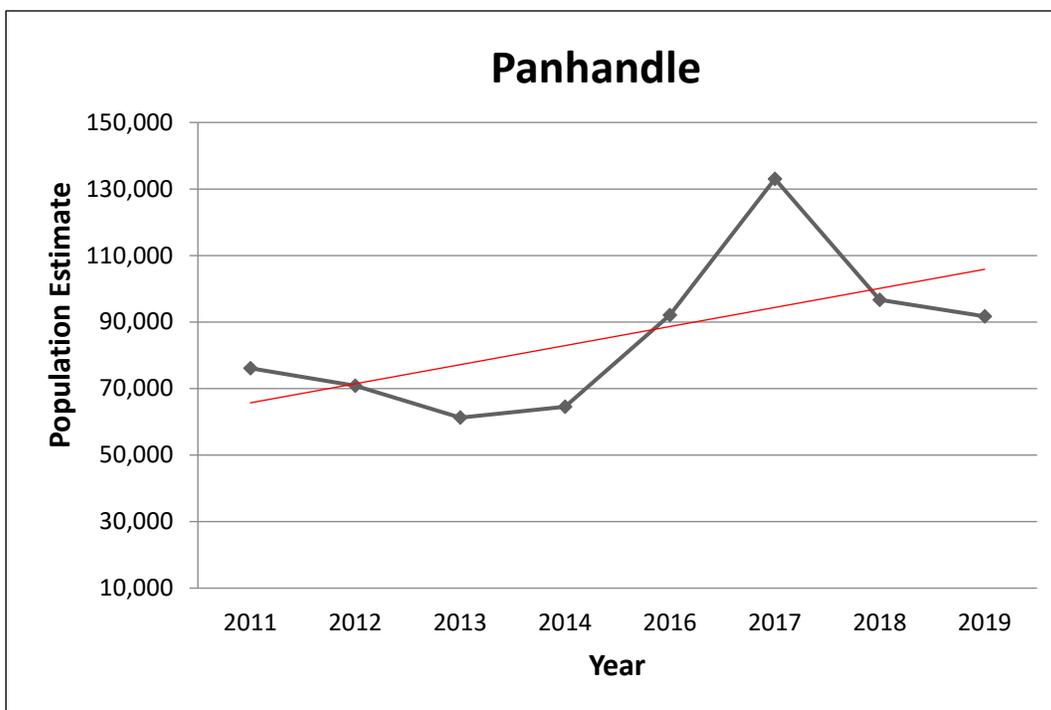


Figure 2. Trends in mule deer population estimates in the Texas Panhandle, 2011-2019.

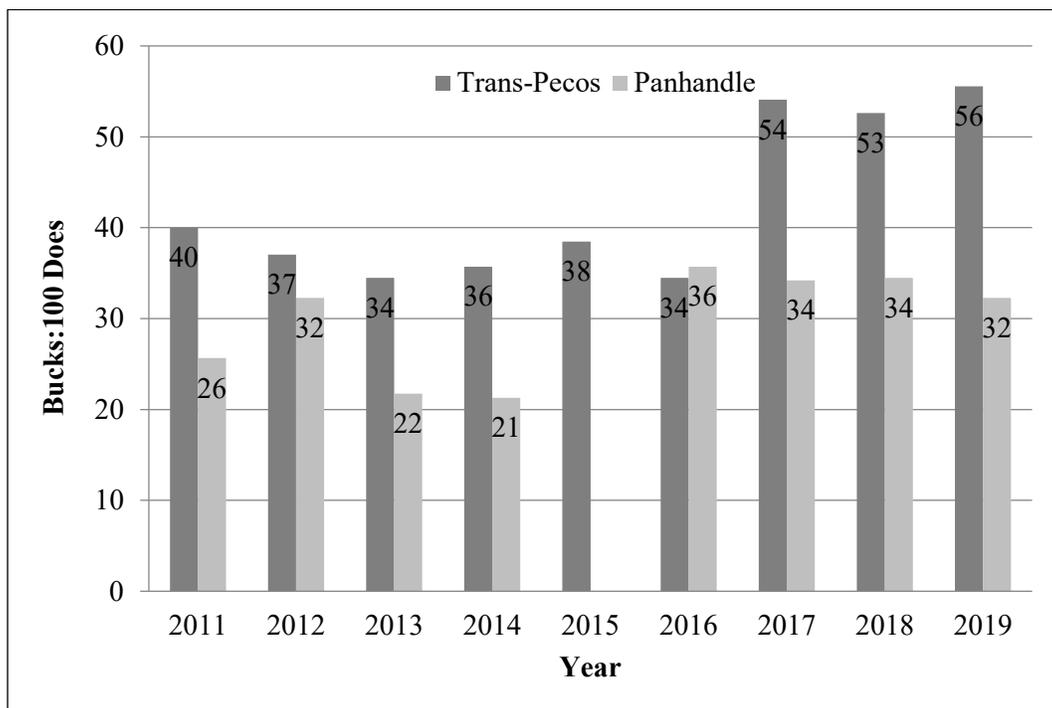


Figure 3. Trends in the number of mule deer bucks per 100 does in the Texas Panhandle and Trans-Pecos areas, 2011-2019.

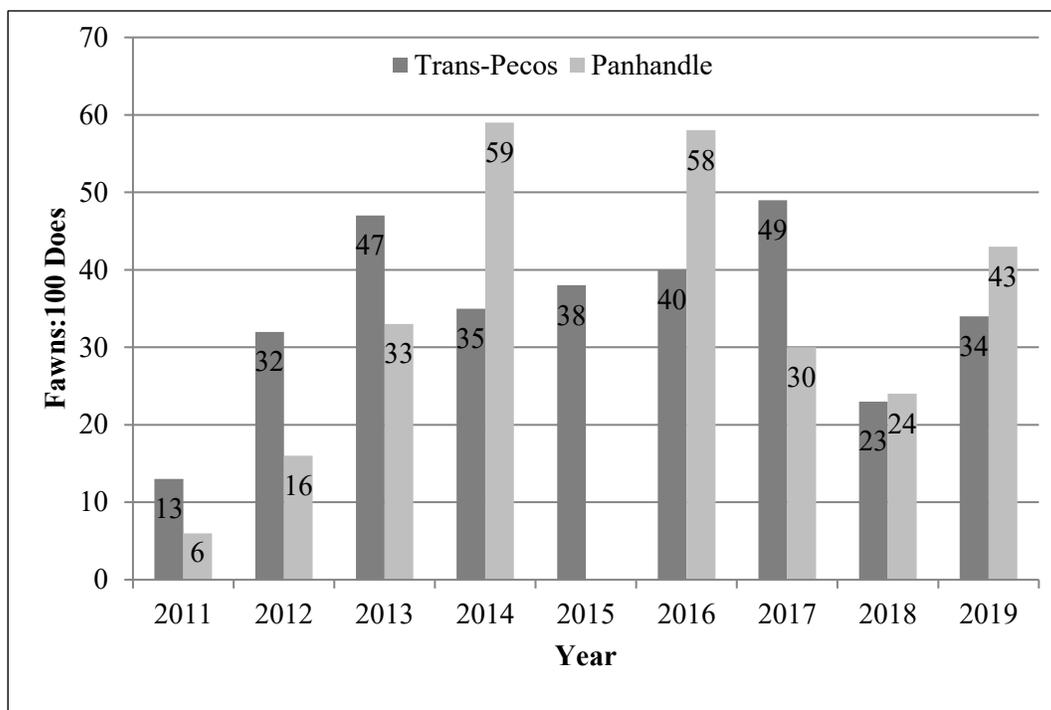


Figure 4. Trends in the number of mule deer fawns per 100 does in the Texas Panhandle and Trans-Pecos areas, 2011-2019.

-Shawn Gray, Texas Parks and Wildlife Department

Utah

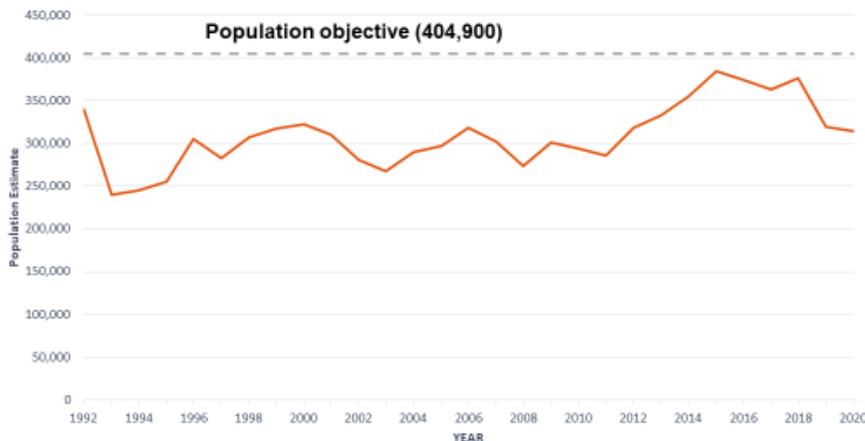
Utah's current statewide population estimate is 314,850 with a total population objective of 404,900 (Figure 1). This is a decrease of 4,300 deer from previous years, largely due to severe drought. Fawn:doe ratios in 2018 and 2019 were low at 53 fawns per 100 does, in 2020 they increase slightly to 56. Adult and fawn survival is estimated annually by radio-collaring around 500 deer on 7 representative units throughout the state. Annual doe survival averages 0.82 (0.75-0.86) and fawn survival has averaged 0.58 (0.30-0.82). In 2020, severe drought and led to reduced adult and fawn survival (0.79 adult, 0.61 fawn) resulting in population reductions across much of the state.

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.

Over the past 25 years, buck to doe ratios have increased as a result of growing populations and decreased buck permits (Figure 2). In 1994, roughly 97,000 public draw permits were issued for general season units, and the post season buck to doe ratio was 8 bucks per 100 does. Last year 79,675 public draw permits were issued, and the post season buck to doe ratio exceeded 17 bucks per 100 does. For the 2020 hunting season, Utah is recommending a decrease in general season deer permits (74,025) in order to manage to the buck:doe ratios in our

management plan.

STATEWIDE DEER POPULATION TRENDS



BUCK-TO-DOE RATIO TRENDS (1994-2020)

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

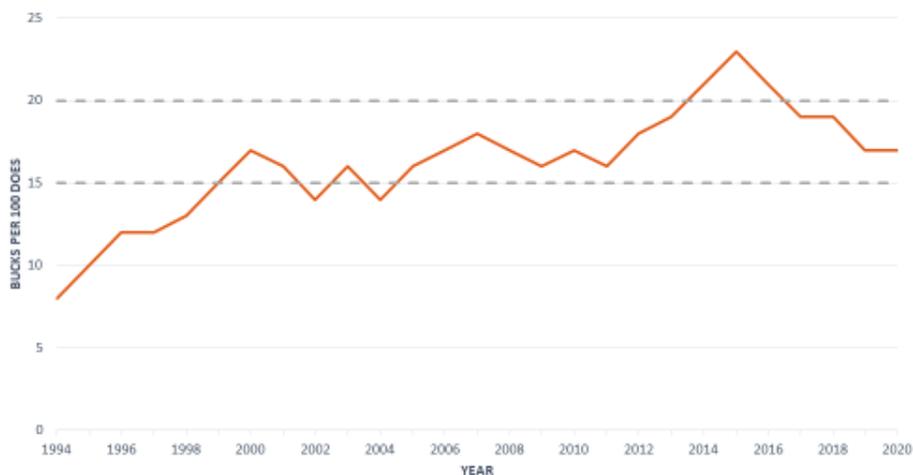


Figure 1. Mule deer population estimates from 1992-2019.
 Figure 2. General season buck to doe ratios from 1993-2019.

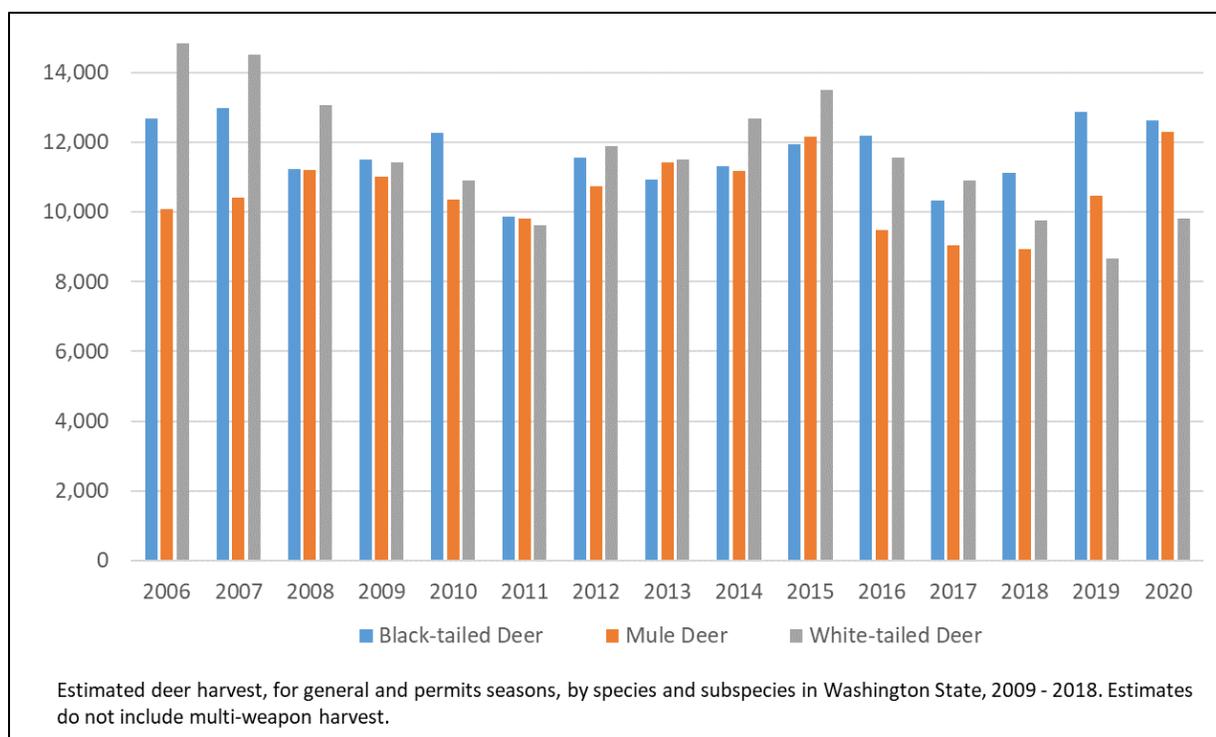
-Covy Jones, Utah Division of Wildlife Resources

Washington

Populations within most of Washington’s 7 mule deer management zones are stable but status varies by region. Populations within the 5 black-tailed deer management zones are stable to increasing. The statewide deer harvest estimate (all species, general and permit seasons combined)

Range-wide Status of Black-tailed Deer and Mule Deer ~ 2021

for 2020 was 29,435 deer and increased by ~8% compared to 2019 (27,187 deer). Trends in harvest estimates indicate mule deer and black-tailed deer populations have returned to historical levels after experiencing declines 2015-2017. Harvest estimates and composition ratios from annual monitoring efforts for mule deer indicate populations along the northern Cascade Mountains, are likely stable to increasing. However, southern herds remain stable to decreasing. Similar to last year, antlerless permits for mule deer will be limited in most management zones. Habitat management activities for mule deer are on the rise due to restoration projects begun 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. Regional harvest trends indicate black-tailed deer in western Washington are increasing. Some localized population segments in each zone fluctuate due to forest production rotations, but potential remains to increase abundance if public forests were managed for greater early successional habitat. Loss of black-tailed deer habitat due to encroaching human development continues to be a concern.

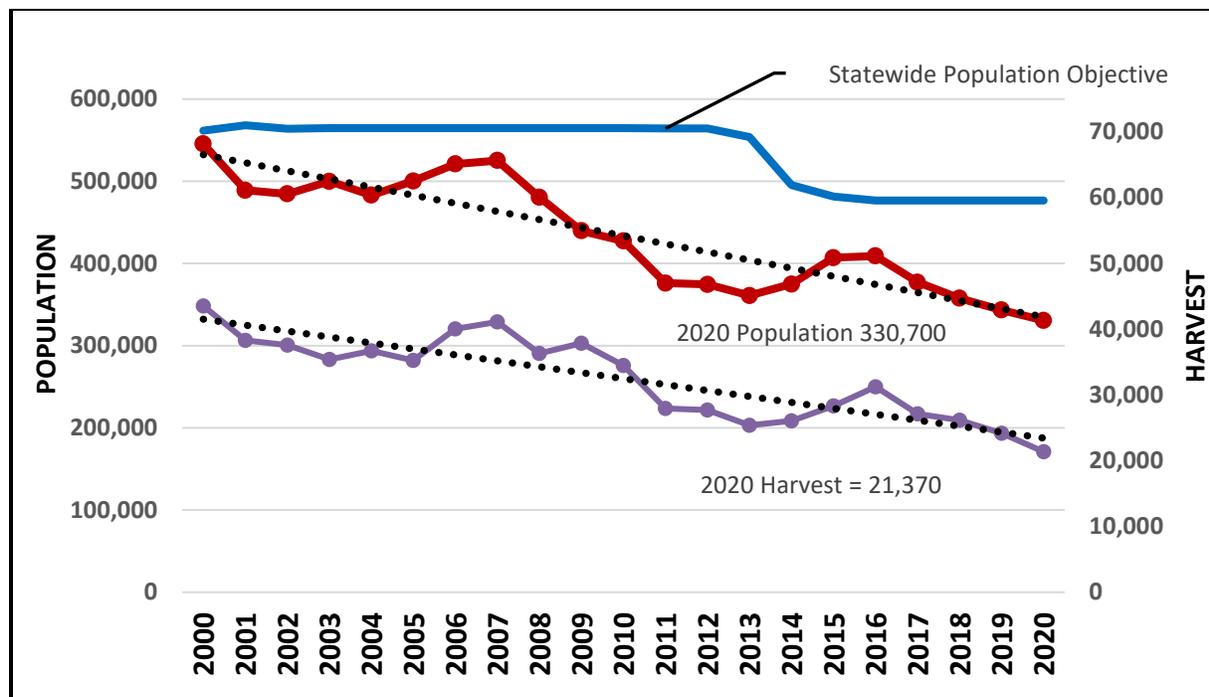


-Brock Hoenes, Washington Department of Fish and Wildlife

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 were responding in a density-dependent fashion to decreasing habitat availability and/or quality. Over the past 30 years, fawn productivity, on average, has decreased statewide by about 15% and has been below the objective of 66 fawns:100 does 20 times. Postseason buck:doe ratios have trended upward, ranging from 26 to 38 and averaging 32:100 since 2000. Throughout Wyoming, mule deer populations have declined by an estimated 237,000 (42%) mule deer since 2000.

Harvest followed suit, declining 44%. After the 2020 hunting season, it was estimated there were 330,700 mule deer in the state. This is 31% below the statewide objective of 476,600 mule deer. Eight herds were at objective (22%), 29 herds were below objective (78%) and no herds were above objective (0%). Mule deer populations, while still below objective, trended upward from 2013 to 2016 but then decreased the last four years. Population estimates are derived using post-season fawn and buck classifications in concert with measured harvest and 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, there are plans for the development of a deer program in 2021 and funding has been secured to initiate a pilot study in the Whitehorse area. 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 2020 hunting season

Range-wide Status of Black-tailed Deer and Mule Deer ~ 2021

was 7 deer and 41 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

