2019 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 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 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; however, most are stable or increasing with a fairly equal proportion currently increasing, decreasing, and stable.
Table 1. Range-wide estimation of population size, harvest, and hunter numbers of mule deer provided by member agencies of WAFWA.

<table>
<thead>
<tr>
<th></th>
<th>Estimated Population</th>
<th>Total Harvest</th>
<th>% males in Harvest</th>
<th>Hunter Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>150,532</td>
<td>14,523</td>
<td>48%</td>
<td>41,293</td>
</tr>
<tr>
<td>Arizona</td>
<td>85,000 - 100,000</td>
<td>10,964</td>
<td>96%</td>
<td>38,611</td>
</tr>
<tr>
<td>British Columbia 2</td>
<td>100,000 - 170,000</td>
<td>10,742</td>
<td>86%</td>
<td>56,144</td>
</tr>
<tr>
<td>California 3</td>
<td>459,450</td>
<td>28,682</td>
<td>98%</td>
<td>173,389</td>
</tr>
<tr>
<td>Colorado 4</td>
<td>433,000</td>
<td>38,303</td>
<td>79%</td>
<td>88,185</td>
</tr>
<tr>
<td>Idaho</td>
<td>267,039</td>
<td>26,977</td>
<td>80%</td>
<td>84,285</td>
</tr>
<tr>
<td>Kansas</td>
<td>53,600</td>
<td>1,811</td>
<td>90%</td>
<td>17,029</td>
</tr>
<tr>
<td>Montana 5</td>
<td>334,965</td>
<td>52,242</td>
<td>75%</td>
<td>153,284</td>
</tr>
<tr>
<td>Nebraska 6</td>
<td>120,000 – 150,000</td>
<td>11,779</td>
<td>79%</td>
<td>93,523</td>
</tr>
<tr>
<td>Nevada</td>
<td>93,000</td>
<td>8,018</td>
<td>85%</td>
<td>17,500</td>
</tr>
<tr>
<td>New Mexico 4</td>
<td>80,000 - 100,000</td>
<td>10,701</td>
<td>99%</td>
<td>32,109</td>
</tr>
<tr>
<td>North Dakota 6</td>
<td>20,000 (Badlands)</td>
<td>5,863</td>
<td>62%</td>
<td>8,327</td>
</tr>
<tr>
<td>Oklahoma 7</td>
<td>1,750 - 2,250</td>
<td>222</td>
<td>99%</td>
<td>No Estimate</td>
</tr>
<tr>
<td>Oregon</td>
<td>180,000 - 220,000</td>
<td>15,920</td>
<td>91%</td>
<td>58,631</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>50,000-75,000</td>
<td>8,536</td>
<td>54%</td>
<td>11,704</td>
</tr>
<tr>
<td>South Dakota 5,8</td>
<td>69,400</td>
<td>7,460</td>
<td>80%</td>
<td>69,255</td>
</tr>
<tr>
<td>Texas</td>
<td>177,576</td>
<td>12,939</td>
<td>86%</td>
<td>34,623</td>
</tr>
<tr>
<td>Utah</td>
<td>372,500</td>
<td>36,060</td>
<td>89%</td>
<td>86,788</td>
</tr>
<tr>
<td>Washington 9</td>
<td>90,000 - 110,000</td>
<td>7,148</td>
<td>91%</td>
<td>103,448</td>
</tr>
<tr>
<td>Wyoming</td>
<td>357,600</td>
<td>27,134</td>
<td>85%</td>
<td>50,264</td>
</tr>
<tr>
<td>Yukon</td>
<td>1,000</td>
<td>9</td>
<td>100%</td>
<td>12</td>
</tr>
</tbody>
</table>

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 All data presented are from the most recent year available.
3 Black-tailed and mule deer numbers combined. “Hunter Numbers” is “number of tags issued” so the actual number of hunters will be less.
4 Estimated population, harvest, and hunters include mule deer and white-tailed deer. These estimates cannot be easily removed 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).
5 Total deer hunters, includes both mule deer and white-tailed deer hunters.
6 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.
7 Numbers are difficult to estimate as many permits allow the take of mule deer or whitetail deer.
8 Estimates are preliminary 2019 pre-season.
9 Estimates of Total Harvest and % males reflect 2018 general season harvest only. Estimate of Hunter Numbers reflects all deer hunters for the general season; WA does not estimate hunters by subspecies.
Table 2. Range-wide estimation of population size, harvest and hunter numbers of black-tailed deer provided by WAFWA member agencies.

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<tr>
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<th>Total Harvest</th>
<th>% males in Harvest</th>
<th>Hunter Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaska</td>
<td>333,000-346,000</td>
<td>14,926</td>
<td>82%</td>
<td>14,282</td>
</tr>
<tr>
<td>British Columbia</td>
<td>98,000 - 155,000</td>
<td>5,342</td>
<td>85%</td>
<td>14,101</td>
</tr>
<tr>
<td>Hawaii</td>
<td>950-1,050</td>
<td>55</td>
<td>56%</td>
<td>No Estimate</td>
</tr>
<tr>
<td>Oregon</td>
<td>No Estimate</td>
<td>16,671</td>
<td>91%</td>
<td>86,716</td>
</tr>
<tr>
<td>Washington</td>
<td>90,000 - 110,000</td>
<td>9,744</td>
<td>89%</td>
<td>103,448</td>
</tr>
</tbody>
</table>

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 Alaska population size is provided from our population objectives, rounded up to the closest thousand. These objectives were derived based on a combination of habitat capability modeling and expert opinion panels. This gross estimate is not re-calculated from year to year, but is rather a general ball-park figure. Harvest data is for the 2017 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 Estimates of Total Harvest and % males reflect 2018 general season harvest only. Estimate of Hunter Numbers reflects all deer hunters for the general season, 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 South Central Alaska, including Prince William Sound and on Kodiak and Afognak islands. 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 game management unit (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 ranges 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. The deer harvest season in Alaska is very long, with federally qualified subsistence hunters receiving additional benefits in some areas such as longer seasons or higher bag limits. The deer hunting season varies in length from one GMU to another, but the earliest open date is July 24th, and the latest closing is January 31st.

In Alaska, populations fluctuate with winter severity - increasing during a series of mild winters and sometimes declining dramatically after one or more severe winters. 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 also slow recovery of deer after these events. Harvest by deer hunters is believed to be compensatory in Alaska as a whole, due to the remoteness of most areas and lack of extensive road networks. However, where logging roads exist adjacent to communities, a lack of substantial snowfall may allow hunters continued access to deer range, and can lead to site-specific higher hunter harvest. In contrast, heavy snowfall can concentrate deer at low elevations or on beaches, and 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 of “any deer” hunts to “buck only” hunts.

In Southeast Alaska, SBT deer are fairly ubiquitous, and the most frequently pursued big game species. Southeast Alaska experienced 2 severe and 1 above average winter between 2006 and 2009, which led to substantial declines in the deer population and management actions such as doe harvest closures were taken in parts of the region. Subsequent to the high harvest in 2006-2007, pellet-group counts went down, and much lower harvest levels were experienced. 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. From 2010-2019 we experienced average to below average winter severity across most of the region, with the winter 2015-2016 being one of the mildest on record. Overall hunter harvest and effort trends appear to be rebounding from previously mentioned lows. Similarly, pellet group counts and populations estimates (in the limited areas where they have been conducted) indicate an increasing or stable trend in most areas. Deer densities in GMUs 1A and 3Z have been a concern due to a perceived reduced number of deer in these GMUs and a failure to meet harvest objectives, which resulted in the implementation of intensive management plans in 2013. Deer pellet densities conducted since the early 1980’s indicate deer tend to occur at a lower abundance in this area than other areas of the Region, likely due to differences in habitat quality, but were much reduced from average counts and not rebounding quickly after the hard winters previously mentioned. A comparison of deer abundance in a few key indicator watersheds indicate that deer abundance increased from 2014 to 2016, and recent deer pellet counts in both GMUs indicate counts are relatively high for these areas. Harvest trends over the last few years also indicate deer in these GMUs are rebounding. Efforts to evaluate changes in habitat utilization as well as habitat quality continue, and the investigation of using alpine surveys to index deer abundance has also been implemented. A new DNA mark-recapture effort combined with the use of trail camera data is underway in GMU 3Z to evaluate current deer abundance on Mitkof island. Deer appear to also be doing well in most other areas of Region 1, and no regulatory actions are expected.
In South Central Alaska (Region II), Sitka black-tailed deer are at the northern extent of their range. While still a maritime environment, the weather patterns can differ substantially from that in Southeast Alaska. Deer populations occur at lower densities in Region II, likely due to colder temperatures and less optimal winter range. Deer are not native to Region II, but are the result of translocations in the early 1900s. Between 1916 and 1923, at least 24 deer were moved from Sitka in Southeast Alaska to Hawkins and Hinchinbrook islands in Prince William Sound (GMU 6). This was the first big game translocation in Alaska, and one of the most successful. Deer were later translocated to the Kodiak Archipelago in GMU 8. In 1924, 14 deer were translocated from Sitka to Long Island. In 1930, another 2 deer were translocated from Prince of Wales Island to Long Island. In 1934, 9 deer were translocated from Petersburg Alaska to Kodiak Island. Legal hunting of deer in Region II began in GMU 6 in 1935 and in GMU 8 in 1953.

Since their introduction in GMU 6, deer have thrived and spread to inhabit most islands and the adjacent mainland area as well. Like Southeast Alaska, winter severity is the primary factor that regulates populations, and high winter mortality events have occurred periodically over the years in Region II, about once every decade. During the winter of 2011-2012, the effects of winter severity in GMU 6 was the worst in 30 years, with over 27 feet of snowfall recorded in Cordova. Winter mortality was estimated at >50% overall, and was likely as high as 70% in areas of western Prince William Sound. Deer congregating on beaches due to early and heavy snowfall increased hunter success in winter 2011-2012 to a record high, but subsequent effects of this harvest combined with high winter mortality caused a decrease in harvest numbers of approximately 80% during the 2012-2013 regulatory year. The hunting season was modified in regulatory years 2012 and 2013 to reduce harvest while the population was recovering. Deer numbers have likely rebounded after several milder winters in a row. Improvements have been noted in winter survival and body condition, and deer pellet counts in Unit 6 in spring 2017 were the highest observed since 1998. GMU 6 researchers plan to implement DNA mark-recapture to obtain density estimates in some areas. No regulatory action is anticipated for GMU 6 at this time.

In GMU 8, winter severity plays a similar role in moderating deer populations as it does elsewhere in the state. The deer population of the Kodiak archipelago declined due to the same severe weather winter of 2011-2012 that was experienced in GMU 6. For reasons similar to those stated for GMU 6, harvest for 2012-2013 regulatory year was down by over 40% from the previous year. Deer mortality was greatest on the northern portion of Kodiak and the western side of Afognak Island. Mild winters allowed deer populations to rebound. The winter of 2018-2019 was very mild with low snowfall, so deer should continue to rebound. Managers anticipate increased hunter success in all areas of GMU 8 during the upcoming 2019-2020 season. Hunters’ observations in regulatory year 2016 indicated deer were plentiful and in good condition.
Alberta

The 2018 pre-hunting season population estimate of mule deer in Alberta is 150,532. This represents a slight decrease from 2017. For 2019, the pre-hunting season population of mule deer increased to 164,326. The population goal in Alberta’s most recent management plan for this species (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 is much nearer to the current population estimate.

Interest in mule deer hunting continues to increase in Alberta. The number of antlered mule deer special license applicants has steadily increased in the past 4 years with 75,122 in 2015, 81,068 in 2016, a considerable increase to 101,980 in 2017, with a similar number of applicants in 2018 where 98,791 hunters applied for an antlered mule deer license. Antlerless mule deer special license applicants is also on the rise with 32,292 in 2015, 36,666 in 2016, 43,191 in 2017, and 43,112 in 2018. Based on voluntary hunter harvest surveys, during the 2018 hunting season 41,293 mule deer hunters in Alberta directed an estimated 218,145 days hunting for mule deer, producing an estimated harvest of 14,523 mule deer (~48% antlered deer).

The 2019 hunting season will support 12,337 antlered mule deer special licenses and ~17,640 antlerless mule deer special licenses in addition to certain Wildlife Management Units (WMUs) providing unlimited licenses to harvest mule deer. Allocations have increased in certain areas in an effort to control the prevalence and spread of Chronic Wasting Disease. Alberta also supports a healthy commercial hunting industry, with approximately 1,500 antlered mule deer licenses available for non-residents through outfitter-guide allocations. There is an unknown number of rights based hunters in Alberta that do not require a license to hunt for sustenance and thus information on effort and harvest by these groups are unknown.

-Karin McCoy, Alaska Department of Fish and Game
Alberta implements a big game population monitoring program that aims to survey ungulates on 5 year intervals at the WMU scale, although admittedly several WMUs undergo longer survey intervals. Additionally, there are no long term intensive monitoring programs for mule deer (i.e. collaring programs). As a result, Alberta is not in a position to confidently report on trends in buck to doe ratios, survival rates, or recruitment rates.

Alberta mule deer management objectives currently implement density goals at the WMU scale. These are used in combination with allocation percentages by cohort and estimated harvest rates from online voluntary hunter harvest surveys to determine special license numbers (i.e. draw quotas). In 2017, for those WMUs that reported on density goals and pre-season population estimates, 16.3% of 92 WMUs were within 10% of the goal, 33.7% were 10-20% deviation from goal, and 50% of WMUs were greater than 20% deviation from goal.

Chronic wasting disease (CWD) is present in Alberta, primarily in eastern Alberta along the Saskatchewan border. Prevalence in 2018/19 increased to 7.4% (n=7,866 deer heads tested), up from 5.2% in 2015/16 (n=6,340 deer heads tested). In 2018/19, CWD was detected in 3 additional WMUs where CWD was not known to occur. In Alberta CWD occurs primarily in mule deer and males. Local prevalence in mule deer bucks in several WMUs exceeds 20%, with some WMUs approaching 30%. More information on CWD in Alberta is found at http://alberta.ca/cwd

-Justin Gilligan, Alberta Environment and Parks

Arizona

Mule deer populations reached the most recent peak in the mid-1980s. Mule deer declined through 2000 and since then have increased gradually. Total mule deer harvest reached the most recent low in 2003 with a harvest of only 4,638 (all weapon types). In 2018, about 10,945 mule deer were harvested, representing over a 130% increase from the historic low point in 2003, but still only about 60% of the 1986 peak harvest of 17,413. Population parameters
indicate the statewide populations are stable and some slightly declining. Most deer populations within the state are now surveyed every other year using fixed-wing aircraft or helicopter with supplemental ground surveys used as well. Mule deer were surveyed during the breeding season to estimate buck:doe and fawn:doe ratios.  

For 2018, hunter harvest was estimated using a voluntary online questionnaire. The questionnaire was located on the back of the permit-tag, a change from mailing questionnaires to hunters. Response rates were dismal; the Department plans to mail out questionnaires once again and allow hunters to respond online or by return mail. Buck:doe ratios for mule deer were managed at 20–30:100 and currently the statewide average is 24. 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 approximate about 5% of the opportunity offered annually. The statewide number of fawns per 100 does is 37 which is within management guidelines (40-50).
British Columbia

There remain localized differences in mule deer abundance throughout the province which can be attributed to differences in habitat quality, predation, severe winter conditions, and varied historical and contemporary land-use/habitat modification. Extensive wildfires during the summers of 2017 and 2018 will increase forage availability, except where snow interception may have been lost on some winter ranges. Concerns exist that high road access in some burned areas could facilitate increased harvest in those areas. Following two years of higher than normal snowfall and prolonged snow cover, the winter of 2018/2019 was at or below long-term averages for snowfall throughout much of the province, which contributed to higher winter fawn survival. Data in some northern areas of the province suggest early fawn survival during 2018 was lower than previous years and low fawn ratios were observed in parts of the province prior to winter 2018/19. In addition, recent surveys have found buck:doe ratios generally close to or below the provincial objective of 20 bucks per 100 does post-hunt. Harvest of mule deer bucks is managed through general open seasons (GOS) using a combination of antler point restrictions (i.e., 4-point or greater) and any-buck seasons in most areas, while some areas have exclusive 4-point or greater seasons. There are some opportunities for antlerless harvest through limited entry hunts (LEH). Overall, managing mule deer to target buck:doe ratio objectives has become increasingly challenging with recent trends in road expansion and increasing hunter access, while changes to habitat quality and predator/prey dynamics may be affecting population growth in many areas.

A new 5-year research project was recently initiated in the south-central part of the province to examine mule deer population response to landscape changes. Four study areas were identified in 3 Regions (Thompson, Okanagan, and Kootenay regions) with relatively large populations of mule deer that exist under different ecological conditions. Of these study areas, mule deer survival over the past year was highest in the Thompson Region, which was burned by
recent wildfires; adult doe survival was >90%, and fawn survival to 7 months was approximately 75%.

The Boundary study area in the Okanagan has seen the least amount of wildfire and mule deer here exist alongside the greatest number and diversity of ungulates and predators (e.g. cougar, wolves, black bears, grizzly bears, coyotes). Survival rates in the Boundary study area of both adult does (i.e. ~65%) and ~7 month old fawns (~40%) are the worst of all study areas measured in the province in 2018/2019. 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 controlling mule deer populations in southern British Columbia.

Trends in provincial abundance of black-tailed deer were similar to mule deer; black-tailed deer numbers also appear to have stabilized from 2014 to 2017. Predation from wolves and cougars on black-tailed deer continues to be a concern in most areas as well as the need for effective measures to conserve high quality habitat. Black-tailed deer buck harvest has dropped by approximately half since the early 1990s. There is some opportunity for antlerless harvest which is mostly limited to agricultural areas. In general, black-tailed deer numbers are thought to be most impacted by increased predation and reduced habitat quality. Overall, in most areas of intensive forestry activity, increased road density is assumed to result in increased predation rates on deer. Maintaining or increasing hunter harvest will remain challenging given current predator densities and lack of measures available to mitigate disturbance and enhance critical seasonal ranges.

British Columbia uses a harvest questionnaire to determine hunters’ combined GOS and LEH harvest and effort for mule and black-tailed deer. Estimates of harvest and effort are generated for each wildlife management unit (WMU) and include combined LEH and GOS hunting (i.e. estimates of all hunting activities within each WMU for each species).

![Figure 1. Mule deer population trends in British Columbia](image-url)
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. Currently, the Department is reevaluating and updating deer survey methods and schedules to provide ongoing short- and long-term estimates of all deer populations within the state.

The modeled 2019 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 850,000 over the past 29 years (Figure 1). These estimates are only for the hunted portion of the total deer population, which excludes 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 agriculture, and are becoming quite dense. Depending on the results of local population estimates, updated Deer Conservation Unit plans will set forth specific actions to decrease, maintain, or increase deer numbers where needed.
For the past several decades, the California Department of Fish and Wildlife 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 current year demographic ratios (fawns per doe and bucks per doe) from fecal DNA mark-recapture, camera trapping, road surveys, and helicopter-based aerial surveys. Information from hunter harvest reporting, which was historically low (~51% average for twenty years) prior to mandatory reporting (~75% average for the previous two years), is supplemented with information on harvested deer from commercial game processing facilities.

To improve the accuracy of deer population estimates and monitoring, the Department is transitioning to integrated population modeling approaches that combine data from a variety of sources to generate population estimates. The Department is also currently developing 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.

In terms of estimating statewide trends in deer harvest, the Department uses harvest reports submitted by hunters, corrected with records collected from commercial game processing facilities. Prior to 2015, the Department required only successful hunters to submit the report card portion of their deer hunting 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 51 percent for the twenty years prior to 2016, to 75 percent on average for 2017 and 2018.

The estimated statewide deer harvest in California has ranged from 25,000-45,000 since 1996 (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), and the inherent variation in estimating populations.

Figure 2. Harvest estimates of California deer 1996 – 2018.

- Nathan Graveline, California Department of Fish and Wildlife

**Colorado**

The statewide post-hunt 2018 deer population estimate is 433,000, up from 419,000 (Figure 1). Population estimates are still far below the sum of statewide population objective ranges of 500,000-560,000 for all 54 deer herds combined. In 2018, 23 of 54 (43%) deer herds are below their population objective ranges. Population objectives that are appreciably higher than population estimates reflect Colorado Parks and Wildlife’s (CPW) desire to stabilize, sustain, and increase deer populations.

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.

Diverse habitat types and environmental conditions around the state create considerable geographic variability in population performance. Many deer herds are performing well, and population sizes and license numbers are increasing. Despite these increases, there’s still reason for concern because of declines in many of the large westernmost herds in Colorado.
CPW intensively monitors annual adult doe survival and winter fawn survival in five mule deer herds. We also monitor buck survival in two of these herds. These herds were selected to ecologically and geographically represent mule deer west of 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 81%. Survival rates for this past winter of 2018-2019 vary by herd with one being well above average, one somewhat below average, and the other three monitoring areas, including the Gunnison Basin, are tracking around the long-term average for late-April 2019.

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 30 bucks/100 does. During the post-hunt herd inventories in 2018, CPW staff classified 71,000 deer and observed an average sex ratio of 35 bucks/100 does, which is up from 34 bucks/100 does in 2017 (Figure 2). Reproduction and fawn survival to December was up this year compared with the previous year, as the statewide average observed age ratio from helicopter inventory was 59 fawns/100 does compared with 57 fawns/100 does in 2017. Figure 3 shows 5-year average fawns/100 doe ratios by herd.
Figure 2. Colorado statewide average of observed post-hunt bucks/100 does for 2005-2018 weighted by herd population size.

Figure 3. Colorado 5-year average fawns/100 does by herd.
Since 1999, all mule deer hunting in Colorado is by limited license. In 2018, the estimated harvest from 88,185 deer hunters was 38,303 (Figure 4). Based on high observed post-hunt sex ratios and a high average hunter success rate of 48% for all rifle seasons in 2018, 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 2017 on Kauai public hunting areas.

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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**

After four years (2013-2016) of population increases, the winter of 2016-2017 saw statewide winter fawn survival at 30%. Reductions in antlerless hunting opportunity for the fall of 2017 and 2018 were made across several regions in southern Idaho. During the winter of 2017-2018 fawn survival was back to the long term average of 58%. Fawn survival for this past winter (2018-2019) will be below the long term average.

The state continues the process of converting population monitoring techniques to allow total population estimates through a combination of sightability, survival estimates, composition surveys and modeling. Although not all areas have yet been assessed, recent winter population levels have likely decreased slightly to 267,000 mule deer. Short- and long-term objectives are to increase mule deer numbers. Post-season buck ratios exceed the statewide minimum objective of 15:100 does. Over the last several years December fawn:doe ratios have generally shown increases over the typical (mid-50s to mid-60s), and winter fawn survival has fluctuated with winter weather conditions.

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 years’ license and tag sales data indicate an
increase in nonresident hunters in Idaho. Percent bucks with 4-point or better antlers harvested in the rifle controlled hunts have remained at or above 40% since 2010.

A statewide mule deer hunter attitude and opinion survey was completed in 2017. Results were similar to the 2007 survey. Idaho is in the process of rewriting the statewide mule deer management plan for 2020 to 2025.

Mule deer population estimate from the Salmon River drainage south. Estimates are midpoint of Confidence Limits based on Integrated Population Model, from January 1, 2019.

-Daryl Meints, 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 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 2018 was estimated to be 2.1 mule deer/mile$^2$ (95% CI: 1.3 – 3.3) while the density in the eastern zone was estimated to be only 0.06/mile$^2$ (95% CI: 0.01 – 0.24) resulting in a pre-firearm season total population estimate of 53,600 mule deer. In the west zone, the mule deer buck:doe ratio was 40.5B: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 9 mule deer were observed over 316.7 miles of private land spotlight transects in 2018. Fawn:doe ratio in the west zone was 20.8F: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 regards 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 15.9% of the either sex deer permits issued in Kansas last year. Landowners received 44.7% 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 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. Hunters have taken an average of 2,465 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 2018, for the third consecutive year, no antlerless permits allowing the take of mule deer were issued. In 2018, Kansas had the lowest estimated total harvest (1,811) of mule deer since 1984 (1,789).

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 interspecies interactions of mule deer and white-tailed deer in western Kansas. During February 15-18, 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. 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 45 fawns, 23 mule deer and 22 white-tailed deer, were marked with expanding VHF collars during the spring of 2018. In February of 2019, an additional 13 white-tailed deer males and 12 mule deer males were captured to replace marked individuals that were legally harvested or removed from the study sample due to other natural, anthropogenic or undetermined mortality sources. A total of 74 white-tailed and mule deer does were captured to replace the 60 does marked in 2018 which dropped their collars for retrieval to acquire stored data. 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.

Public interest and concern about chronic wasting disease (CWD) has been renewed recently. CWD currently is found only in the western portion of the Kansas where mule deer are endemic. A human dimensions survey effort regarding public knowledge, concerns, and support for various management activities has been initiated. The afore mentioned study will also provide important information about deer movement within areas with differing levels of CWD prevalence. 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.

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

**Montana**

Montana Fish, Wildlife & Parks (FWP) annually estimates the statewide mule deer population because of a statutory requirement that the agency provides one. However, that estimate is based on a crude model that biologists have low confidence in and is not used for making management recommendations. For management purposes, FWP relies on harvest and population survey data. 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 spring aerial surveys of 102 trend survey areas across the state that represent publicly accessible deer across a diversity of habitat types.

Antlered mule deer hunting regulations have remained unlimited allowing one deer per resident hunter and approximately 25,000 non-resident opportunities valid across much of the state for many years. 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. Since 2016, the statewide mule deer buck harvest estimate declined to 39,302—compared to the 1960-2017 average of 45,322. 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. However, survey and harvest data suggest a decline in mule deer since 2016. Severe winter conditions across the state during 2018-19 likely precipitated this decline.

Within the state, long-term mule deer populations have varied. Those across the western 1/3 of the state, 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, the prairie breaks environment, have generally remained stable or increased.

The statewide estimate for deer (mule and white-tailed) hunters was 152,284 in 2018, compared to 152,213 in 2017 and a 1986-2017 average of 164,136. The number of deer hunters in Montana peaked at 201,576 in 1994, annually decreased to 148,736 in 1998, and has remained relatively stable since that time. Following the 2017 hunting season, the statewide average buck:doe and fawn:doe ratios were 32:100 and 64:100, compared to 29:100 and 65:100, respectively, following the 2016 hunting season.

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 population survey, recruitment, and hunter harvest data for five population management units based on ecotype. Working within these guidelines, biologists have reduced antlerless harvest opportunity as modern populations have trended down (Figure 2). Beginning with the 2016 hunting season, biologists in a portion of southwest Montana recommended a liberal antlerless harvest season outside of AHM plan guidelines, working with the hypothesis that declining populations are being influenced more by habitat limitations than hunter harvest. This effort is currently being implemented and monitored with an experimental approach that may or may not inform future AHM guidelines for southwest Montana.

![Figure 1. Montana statewide mule deer population estimate, 2006-2018.](image-url)
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 collect age data on more than 4,500 mule deer annually. Population trends are based on total adult buck harvest at DMU level. Barring significant change in buck permit allocations these indices provide consistent indicators of annual population and age structure change at DMU level.

Harvest of mule deer bucks was 9,250 in 2018, a slight decline from 2017 and accounted for 79% of total mule deer harvest. Total deer harvest in 2018 was 58,348 in Nebraska, of which 20% were mule deer. 52% of harvested mule deer bucks were aged 3 or older at check stations in 2018 (see graph). Mule deer harvest is great than white-tailed deer harvest in 5 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.

Chronic Wasting Disease was first discovered in a mule deer in Nebraska in 2000. Since then, CWD has been found in 42 of 93 counties in mule deer, whitetail deer and elk. Since 1997, NGPC has tested more than 53,000 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.

In February 2018, the University of Nebraska and NGPC collared 60 mule deer does and 93 fawns to study mule deer doe and fawn survival rates, mortality factors and habitat use in southwest Nebraska. In 2019, the project was expanded, and 60 does were collared in the Pine Ridge and an additional 60 does were collared in the southwest as the second year of the southwest project. Researchers will catch fawns in both study locations during the summer of 2019. Preliminary results have shown poorer than expected doe and fawn survival in the southwest.
Nevada

The Nevada Board of Wildlife Commission approved a statewide quota of 17,367 mule deer tags for the 2018-2019 season. Of those, 730 tags were returned that could not be re-issued resulting in 16,637 deer hunters with valid tags when the season began. Total deer harvest for 2018 was 8,018 including bucks and does. Of the 7,113 bucks harvested, about 41% were 4-point or greater. Success rate for all deer hunters continues to increase at the statewide level. Of those who reported they hunted, success rate was about 54% statewide for all mule deer hunts.

In 2018, Nevada Department of Wildlife game biologists classified about 17,700 mule deer during the fall survey. Statewide fawn production was slightly higher during 2018 with 49
fawns:100 does counted during post-season surveys, compared to 45 fawns:100 does during the fall of 2017. The observed post-season buck ratio was 33 bucks:100 does for 2018.

Unfortunately, over-winter fawn survival was significantly lower for the 2018-19 winter, with an observed ratio of 26 fawns:100 adults during the spring survey. This represents the lowest observed spring fawn ratio since 2008. The low fawn recruitment is likely due to dry summer conditions followed by above average snow depths and cold temperatures for much of northern and eastern Nevada.

Trends in statewide mule deer harvest and observed post-hunt buck ratio for Nevada, 2009 to 2019. Observed fawn ratios are obtained by directed search helicopter surveys. Harvest data are from mandatory return questionnaires.

-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, the deer population can grow; during periods of drought, or if the summer monsoonal rains are too late in the summer, fawn survival may be low leading to declining populations. For example, moisture levels and timing in 2016 and 2017 were appropriate, and fawn recruitment was adequate for slow population growth. In 2018, however, New Mexico experienced a severe drought during much of the growing and fawning season. When the monsoons arrived, they were late in the summer and fawn recruitment for the year was lower than average as a result of the poor timing. Despite the poor recruitment year in 2018, the state’s mule deer population remains stable to slightly increasing.

Precipitation for the 2018-2019 winter and early spring was excellent throughout New Mexico. If precipitation patterns hold until the summer monsoon season, 2019 fawn recruitment should be higher than average, and the mule deer populations should continue to rebound across 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 signs of continued and rapid growth.

The Department conducts annual post-hunt aerial surveys in December to obtain composition ratios for select Game Management Units (GMU). During the winter 2018 post-hunt survey, the statewide buck to doe ratio was 37 bucks:100 does (Figure 1); this is consistent with the long-term average. The 2018 fawn to doe ratio was down (29 fawns:100 does) compared to 2017; however, the long-term trend is stable across the state. The Department is refining aerial survey methods to also estimate deer densities in the surveyed GMUs while continuing to obtain composition ratios.
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 a few youth antlerless hunts and an antlerless archery hunt to help keep the localized deer population in check.

Harvest reporting has been mandatory since 2006. During the 2018-2019 hunting season an estimated 32,109 hunters harvested 10,568 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 33% during the 2018-2019 hunting season for all weapon types combined. This is higher than the long-term average success rate for deer hunters in New Mexico (29%; 1953-2018).
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 2011-2015 and the mule deer population has increased since 2013. The 2019 spring index was 20% lower than the 2018 index, but still 14% 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 analyzed survival for 203 mule deer using radio-tracking data. 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

Oklahoma

With Oklahoma being the eastern edge for what is considered mule deer habitat, we estimate between 1,750 and 2,250 animals pre-hunting season in our panhandle, NW and far SW portions of the state. 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 2018-2019 season (222) compared to the 2017-2018 hunting season (196) mule deer.

After a mild wet spring and summer, habitats are beginning to rebound. This is aiding a slight increase in populations, with folks beginning to see Mule Deer in areas that haven’t held populations in quite some time.
-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 hover around 180,000–220,000. 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 methods has moved to include two wildlife management units in southwest Oregon. This effort is in slightly different habitats and management strategies will prove to be very insightful.

During winters of 2015–2018, over 1,200 GPS radio-collars have been deployed on mule deer across their eastern Oregon distribution to refine herd range boundaries for data collection and monitoring. Analyses from three years of Blue Mountains deer data and analysis of the south-central mule deer data have identified ten mule deer populations in the core of Oregon’s mule deer distribution in eastern Oregon. Additional work is continuing to delineate populations around the periphery of the core distribution. Survival continues to vary considerably across the landscape but has improved over the very low levels observed during winter 2016–2017.

-Don Whittaker, Oregon Department of Fish and Wildlife

**Saskatchewan**

In Saskatchewan, mule deer populations are monitored through annual spotlight surveys and intermittent aerial surveys. As winter severity is the main driver of mule deer population fluctuations in Saskatchewan, recent mild winters have allowed the population to increase over the past ~5 years (Figure 1). Available licenses have increased to reflect the detected change in the population (Figure 1). Aerial surveys were conducted in the winter of 2018-19, encompassing 15,517 km$^2$ over four wildlife management zones (WMZ). Mule deer density estimates ranged from 1.05 deer/km$^2$ to 2.48 deer/km$^2$ depending on zone and available habitat. Aerial survey estimates indicated strong population numbers, when compared to historical aerial survey estimates, and corroborated by increases in trend data from annual spotlight surveys.
Hunters holding either-sex draw licenses harvested 4,442 mule deer, with a success rate of 77%. Although harvest nearly doubled from 2017 to 2018, success rates did not vary significantly (Figure 2). Hunters holding over-the-counter (OTC) archery mule deer licenses harvested 613 mule deer, with a success rate of 21%. Similar to either-sex data, OTC success rates remained constant at approximately 20%, despite a 20% increase in harvest over the past four hunting seasons. Antlerless license opportunities were not included in this analysis, due to varying bag limits by WMZ and differing harvest success rates.

Currently, Saskatchewan’s mule deer management program is under review as part of development of an updated provincial mule deer management plan. Management and harvest strategies are being examined to better utilize the resource, while incorporating strategies to manage for chronic wasting disease.

Figure 1. Total mule deer licenses sold in Saskatchewan and Provincial population trend data (deer/km\(^2\)) obtained through annual spotlight surveys.
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 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 showed increases in recruitment in almost every Data Analysis Unit (DAU) in 2018, and overall recruitment has increased the last two years to 75 fawns:100 does in 2018. The statewide pre-season sex ratio in 2018 was 39 bucks:100 does (Figure 2).
Figure 1. Mule deer population objectives for South Dakota hunting units, 2019.

Figure 2. Statewide sex and age ratios from pre-season herd composition surveys in South Dakota, 2010-2018.

Hunter survey cards are mailed to selected license holders in order to estimate hunter success, deer harvest, and related information for each season. Hunters may also report harvest
information through an internet response. Approximately 7,460 mule deer were harvested in 2018 (5,950 bucks, 1,510 does; Figure 3). Substantial hunting season changes occurred in recent years to address low deer densities, including the elimination of “any antlerless” firearm, archery, and muzzleloader deer hunting licenses in most units. 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, 1990-2018.](image)

Radio collaring and survival monitoring efforts have increased substantially in South Dakota, with approximately 800 collared mule deer being monitored across 4 study areas. Survival rates for 2018 in the Black Hills were 44% for juveniles (5-17 months of age; 31-57), and 83% for adult females (18+ months of age; 71-90). In the White River study area, survival rates in 2018 were 56% for juveniles (47-65), and 84% for adult females (74-93). And in the Upper Missouri River study area, survival rates were 85% for juveniles (77-91), and 84% for adult females (73-92). Mule deer (105 adult females) were also captured and GPS radio collared in the Grand River study area in the winter of 2019 as part of a larger research project investigating habitat use, movements, and influences to survival for both white-tailed deer and mule deer. These vital rates, in conjunction with other survey data, are used in an Integrated Population Model to estimate abundance and trends at the DAU level. Preliminary pre-season estimates for 2019 are 3,200 mule deer in the Black Hills and 66,200 mule deer on the prairie. Current growth rates in 2019 across DAUs vary from a low 0.98 to a high of 1.17.

-Andy Lindbloom, South Dakota Department Game and Fish

**Texas**

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

**Trans-Pecos**

In general, the Trans-Pecos population has been on an increasing trend since 2012 because of good range conditions and fawn production and recruitment from 2013-2017. However, in 2018 the survey estimate (91,502) indicated a 40% decrease from 2017 (152,870). Surveys were not conducted in 2007 and 2010. The estimated 2018 fawn crop of 23 fawns:100 does was lowest since 2011. The sex ratio for 2018 was 53 bucks:100 does, the second highest bucks:100 does since 2005.

![Trans-Pecos Population Trends](image)

Figure 1. Trends in mule deer population estimates in Trans-Pecos, Texas, 2011-2018.

**Panhandle**

The Panhandle population trend has been stable to increasing since 2011. Surveys were not conducted in 2015. The 2018 population estimate of 86,074 was third highest among survey years. Fawn production was 24 fawns:100 does in 2018, which was below the region average (39 fawns:100 does). The sex ratio for 2018 was 34 bucks:100 does. Sex ratios have varied from 21 to 36 bucks:100 does since post-season surveys were initiated in 2005. Sex ratio data indicate a higher harvest rate on 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 11 out of 13 survey years.
Figure 2. Trends in mule deer population estimates in the Texas Panhandle, 2011-2018.

Figure 3. Trends in the number of mule deer bucks per 100 does in the Texas Panhandle and Trans-Pecos area, 2005-2018.
Figure 4. Trends in the number of mule deer fawns per 100 does in the Texas Panhandle and Trans-Pecos area, 2005-2018.

-Utah
Abundance of mule deer in Utah is estimated using models with inputs from age and sex classification (post hunt), harvest surveys, and survival rates of collared animals. These models suggest that abundance of mule deer has been stable to slightly increasing in 2018. The current statewide population estimate is 372,500, and the population objective is 453,100. Fawn:doe ratios have dropped to 53:100 but have been stable over the previous 8 years, and have ranged between 59 and 65 fawns per 100 does. Since 2010, we began radio-collaring several hundred does and fawns annually on 7 representative units throughout the state for monitoring purposes and to estimate survival rates. Annual doe survival has averaged 0.83 and ranged between 0.79 and 0.86. Fawn survival has averaged 0.61 and ranged between 0.30 and 0.82. From 2011-2015, mule deer populations in Utah grew by nearly 100,000 animals. In 2018, adult survival rates were low at 0.79 while fawn survival rates increased to 0.53 higher than the previous two years (Figure 1).

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 ≥ 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 90,650 public draw permits were issued, and the post season buck to doe ratio exceeded 19 bucks per 100 does. Additionally in the fall of 2018, hunters in Utah harvested just over 30,000 bucks on general season units, which is the second highest harvest observed since 1996. For the 2019 hunting season, Utah is recommending a slight decrease in general season deer permits because of the severe drought effects Utah experienced in portions of the state coupled with poor fawn production. This decrease is partially a result of a unit by unit hunting strategy which allows for more fine-scale management.

Figure 1. Mule deer population estimates from 1992-2018.
Washington

Populations within some of Washington’s 7 mule deer management zones are stable to decreasing, but remain within objective. 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) for 2018 (25,678 deer) decreased slightly compared with 2017 (26,529 deer), and was below the 10-yr mean (2009-2018) of 32,305. Harvest estimates and composition ratios from annual monitoring efforts for mule deer indicate populations along the Cascade Mountains, affected by recent severe weather conditions and large wildfires, are likely stable. However, late winter snowstorms across much of the state may have reduced fawn survival in the more southern herds. 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 have decreased but are now recovering. Some localized population segments in each zone fluctuate due to forest production rotations, but potential remains to increase abundance if private and 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.
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 18 times. Postseason buck:doe ratios have trended upward, ranging from 27 to 39 and averaging 32:100 since 2000. Throughout Wyoming, mule deer populations have declined by an estimated 187,000 (34%) mule deer since 2000. Harvest followed suit, declining 40%. After the 2018 hunting season, it was estimated there were 357,600 mule deer in the state. This is 25% below the statewide objective of 476,600 mule deer. Thirteen herds were at objective (35%), 21 herds were below objective (57%) and 3 herds were above objective (8%). Mule deer populations, while still below objective, trended upward from 2013 to 2016 but then decreased the last two 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.
Yukon

There has been no formal inventory work on mule deer in Yukon and there is no inventory work scheduled for the 2019-20 fiscal period. 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 2018 hunting season was 9 deer. Generally, the annual licensed harvest ranges between 4 and 9 deer.

-Sophie Czetwertynski, Yukon Department of Environment

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