UTAH MULE DEER
STATEWIDE MANAGEMENT PLAN

UTAH DIVISION OF WILDLIFE RESOURCES

DEPARTMENT OF NATURAL RESOURCES

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STATEWIDE MANAGEMENT PLAN FOR MULE DEER

I. PURPOSE OF THE PLAN

A. General

This document provides overall guidance and direction for managing Utah's mule deer populations. This plan briefly describes general information on mule deer natural history, management, population status, habitat, and issues concerning mule deer management in Utah. This plan also outlines the goals, objectives, and strategies for managing mule deer populations and their habitats. The plan will be used to help set priorities for statewide mule deer management programs and provide guidance for individual unit management plans.

B. Dates Covered

The mule deer management plan was approved by the Wildlfe Board on December will be in effect for five years upon approval of the Wildlife Board. (Expected dates covered December 1, 2014 – December 1, 2019).

II. SPECIES ASSESSMENT

A. Natural History

Mule deer (*Odocoileus hemionus*) are part of the deer or cervid family along with moose (*Alces alces*), elk (*Cervus elaphus*) and caribou (*Rangifer tarandus*). A unique feature of the cervid family is that males of the species grow boney antlers that are shed each year. The name "mule deer" comes from their large ears, which resemble those of mules. The specific epithet *hemionus* means half mule. Mule deer occur throughout the western U.S. with as many as 11 subspecies described (deVos, 2003).

Mule deer males, females, and young are known as bucks, does, and fawns respectively. Fawns are born as singles or more commonly as twins after a gestation period of approximately 7 months. Fawns are normally born in June with the mean fawning date in Utah ranging from June 13–20 (Robinette et. al. 1977, Freeman et. al. 2014). Fawns born too early have a higher likelihood of encountering late winter storms, which may decrease survival. Conversely, fawns born too late may not have time to grow large enough and build up sufficient fat reserves to withstand Utah's long, cold winters. Pregnancy rates for mule deer are high and typically exceed 95% (Freeman et. al. 2014).

The antlers of bucks begin to grow as soon as the old antlers are shed in late winter. Bucks will generally live apart from the does and fawns through the summer antler growing period (Geist 1998). The velvet which covers and provides nourishment to the growing antlers begins to shed in early September. In Utah, the rut or breeding period for mule deer peaks in mid-November. During the rut, bucks seek out and "tend" several does, waiting for them to come into estrus. During the peak of estrus, does are receptive for less than a day and sometimes for only a few

hours. If females are not bred during the first estrous cycle, they will enter another estrous cycle about 4 weeks later (Wallmo 1978).

After the rut, bucks become reclusive again until they shed their antlers in late winter and join herds of does and fawns, blending in with the rest of the antlerless population. In late spring, the does seek solitude for fawning. At this time, yearlings from the previous year are aggressively driven away by the does. Once new fawns are several months old, adult females form family groups for the remainder of the summer that often include yearlings born the previous year.

B. Management

1. UDWR Regulatory Authority

The Utah Division of Wildlife Resources operates under the authority granted by the Utah Legislature in Title 23 of the Utah Code. The Division was created and established as the wildlife authority for the state under section 23-14-1 of the Code. This Code also vests the Division with necessary functions, powers, duties, rights, and responsibilities associated with wildlife management within the state. Division duties are to protect, propagate, manage, conserve, and distribute protected wildlife throughout the state.

2. Past and Current Management

History of Mule Deer Management

Mule deer were common in Utah at the time of settlement, although not as abundant as today (Rawley, 1985). Mule deer harvest was unrestricted until after the turn of the twentieth century. In 1908 the hunting season on deer was closed to help protect Utah's dwindling deer herd (Rawley 1980). In 1913 deer hunting resumed when the legislature enacted a buck only law which remained in effect until 1950. However, as the deer herd increased game managers realized the need for antlerless harvest in order to keep the deer herds in balance with their habitat. The first limited harvest of does began in 1934 on 4 separate herd units and multiple permits, multiple seasons, and extra permits for antlerless deer were common in the 1950s and early 1960s. Deer harvest peaked in Utah in 1961 when over 132,000 deer were harvested (Figure 1). As the number of hunters and permits increased, deer populations were gradually reduced and brought more in balance with available forage and habitat. Extra permits and antlerless harvest were gradually reduced through the mid 1960s and early 1970s.

By the mid 1970s it was apparent that the deer herds were in decline and, in many areas, below the carrying capacity of the habitat. In 1975, the state again adopted a statewide buck only hunting strategy and a symposium was held in 1976 to discuss the decline of mule deer in the west (Workman and Low 1976). Under buck only hunting the deer herd went through a series of boom and bust cycles depending on annual production. The peak harvest of buck deer in the state occurred in 1983 when 82,552 bucks were harvested during the general season. Buck hunter numbers also peaked in 1983 with 228,907 hunters participating in the general season deer hunt, whereas the total number of hunters peaked in 1988 with nearly 250,000 total hunters afield (Figure 1).

Mule Deer Management Plans

Management plans provide guidance and direction for deer populations in Utah. These plans are taken through a public process to gather input from interested constituents and then presented to the Wildlife Board for approval. The first statewide deer management plan was approved in 1995 and called for managing public land general season units to a minimum regional average of 15 bucks per 100 does. Individual management plans were then developed for 53 deer management units and approved by the Wildlife Board in 1996. Unit management plans were revised in 1998 following a reduction in the number of deer units from 53 to 30 and revised again in 2001 to incorporate new objectives and habitat information. The 1995 statewide management plan remained in effect until 2003 when it was updated and approved by the Wildlife Board. In 2008, the statewide plan was again revised and approved by the Wildlife Board. In 2011, the statewide plan was amended with the general season buck to doe objectives being raised from 15–25 to 18–25 bucks per 100 does across the 5 regions.

Due to concerns over chronically low buck to doe ratios on specific units within the regional hunt boundaries, the Wildlife Board amended the plan again in 2012 and approved a general season unit by unit hunt structure. Under this management system, the state was divided into 30 hunting units with 14 units managed at 15–17 bucks per 100 does and 16 units managed for 18–20 bucks per 100 does. The lower buck to doe ratio objective was designed to provide for increased hunting opportunity whereas the higher objective was intended to provide opportunity for hunters to harvest older and larger bucks.

All unit plans were revised in 2006 and again in 2012. Unit plans are currently revised on a staggered schedule with each unit plan being revised the year following range trend data collection. By doing so, the latest and most accurate habitat data is being incorporated into each unit plan. On some units, local working groups have been used to help with the development and implementation of mule deer unit plans. Those groups have been instrumental in garnering local support for mule deer management and providing local knowledge on factors limiting population growth and locations where habitat projects may be beneficial. Local working groups will continue to be used on an as needed basis to assist in achieving the population and habitat management goals and objectives.

Recent Mule Deer Harvest Management

Following several years of drought and an unusually hard winter in 1992–1993, it was evident that Utah's deer herd could no longer sustain unlimited hunting opportunity, and in 1994, buck deer permits were capped for the first time. In 1994, 97,000 general season buck permits were issued among 5 hunting regions. The 97,000 permit cap remained in place through 2005, but due to difficulties in monitoring over-the-counter permit sales, buck hunter numbers exceeded 97,000 permits in some years. Permit sales were closer to the 97,000 cap after implementation of a drawing in 2000. Because of severe drought during the early 2000s, the permit cap was temporarily reduced to 95,000 in 2005 with 1,000 permits removed from both the Central and Northeastern regions. Due to continued drought concerns and, in some areas, severe winter weather, permits continued to be held below the 97,000 through 2012 when unit by unit hunting

was implemented. Unit by unit hunting removed the statewide permit cap, and, instead established permits to reach the buck to doe objective on each individual unit. The total number of general season deer permits available in 2013 was 84,600.

Prior to 1994, data on buck to doe ratios were collected by wildlife biologists but not used to determine harvest. The 1995 statewide mule deer management plan changed this management practice and set postseason buck to doe objectives for general season units at 15 bucks per 100 does for the 5 regions. The regions, and later individual units, have been managed for a set range of bucks per 100 does since that time. In 2013, 24 general season units either met or exceeded their buck to doe ratio objective, whereas only 6 units were below objective (Table 1).
Over the past 20 years, an average of 27,331 bucks per year has been harvested in Utah each year. The harvest level has remained relatively constant over this time period with a low of 21,292 in 2011 and a high of 33,031 in 2000. During the same time period, buck to doe ratios have shown an increasing trend in Utah with ratios rising from 8 bucks per 100 does in 1993 to 19 bucks per 100 does in 2013 (Figure 2). With fewer hunters and higher buck to doe ratios, hunter success has increased on general season units. Statewide average hunter success during the general season any-weapon hunt in 2013 was 37.4% compared to 18.4% during the 1993 any-weapon hunt.

In addition to general season hunting opportunities, Utah also manages for premium limited-entry and limited-entry hunts which provide a high-quality hunting experience, high hunter success, and few permits. There are 2 premium limited entry hunting units in Utah: the Henry Mountains and the Paunsaugunt. From 2008 to 2014, these units were being managed for 40–50 bucks per 100 does and 40–55% of the harvest 5 years old or greater. In 2008, management buck hunting (3 points or less on 1 antler) was added to these units to help reduce the buck to doe ratio and provide additional hunting opportunity while not reducing the top-end quality. In 2013, 205 premium limited-entry permits were issued, harvesting 172 bucks with 71% of the bucks 5 years old or older. Additionally, 53 management buck permits were issued harvesting 48 bucks. These 2 units met or exceeded both of their management objectives in 2013 (Table 2).

There are 7 limited-entry units in the state which are managed for a postseason buck to doe ratio between 25 and 35 bucks per 100 does. In 2013, 921 limited entry permits were issued and 747 bucks were harvested. In 2013, 3 of the 7 units met or exceeded the management objective (Table 3). Of the 4 units that were below objective, the Crawford Mountain and Dolores Triangle units involve migratory herds from other states, the Oak Creek Unit experiences both limited entry and general season harvest, and the Vernon has experienced drought issues for many years.

In addition to hunting bucks, doe harvest has been used to address habitat concerns on rangelands and alleviate depredation on private lands. In 1995, the Utah legislature passed a law that required the establishment of herd size objectives on each unit. In some instances, doe hunts have been used to meet population objectives; although, the current approach is to evaluate range trends, annual winter browse utilization, and deer densities to determine if population objectives need to be adjusted before recommending doe permits.

C. Population Status

The 2013 post-season population estimate for mule deer in Utah was 332,900 deer; 79% of the long term management objective of 425,400 deer. Since the large decline during winter 1992–1993, the deer herd has shown an increasing trend (Figure 3). The population had good growth during the mid-late 1990s, but then declined during the severe drought years from 2000 to 2003 when fawn production was reduced (Figure 4). The harsh winters in northern Utah in 2007-2008 and in southern Utah in 2009-2010 lowered adult and fawn survival and also caused population declines. Despite of those weather events, the deer population in Utah has grown at an average rate of 1.6%, over the past 20 years and is now at a level not seen since 1992.

In fall 2009, UDWR began monitoring mule deer survival on 8 representative units across the state to improve annual population estimates. This study uses VHF radio collars on a sample of adult does and female fawns to obtain estimates of overwinter and annual survival. Adult female survival has been shown to have the most influence on population growth (White and Bartmann 1998), whereas fawn survival, although less influential, shows considerable temporal variation. Because population growth rate is primarily driven by the female segment of the population, monitoring natural mortality of bucks (i.e., mortality not caused by hunting) is unnecessary and can be assumed to be similar to adult doe survival.

Results from this study show that statewide adult survival has been relatively constant with estimates ranging from 84% to 86% (Table 4). Adult survival on individual units has ranged from 76% to 100%. In contrast, fawn survival has varied considerably by year and by unit with estimates ranging from a low of 7% on the Cache Unit in 2010–2011 to a high of 93% on the Oquirrh-Stansbury and Wasatch-Manti units in 2011–2012 and 2012–2013, respectively. In addition to estimates of survival, these collar data have provided information on the timing and causes of deer mortality including potential disease events and areas of high highway mortality.

D. Habitat

Mule deer are adaptable to a wide variety of habitats throughout their range (Wallmo 1981). In North America, they live from the northern boreal forests to the hot deserts of the southwest and from the coastal rain forests to the Great Plains. In Utah, mule deer are found across the state, although they are less abundant in the desert areas (Figure 5). Currently, 54% of the state is considered mule deer habitat. Total mule deer habitat in Utah is estimated at 29,370,577 acres with 10,189,038 acres of summer habitat, 13,787,762 acres of winter habitat, and 5,393,777 acres of transitional or year-long habitat.

Although mule deer occur in a wide variety of habitat types, there are many similarities in diet and habitat composition. Deer eat a wide variety of plants including browse, forbs and grasses. Deer are especially reliant on shrubs for forage during critical winter months. Similarly, fawn production is closely tied to the abundance of succulent, green forage during the spring and summer months. Even though vegetative communities vary throughout the range of mule deer, habitat is nearly always characterized by areas of thick brush or trees interspersed with small openings. The thick brush and trees are used for escape cover, whereas the small openings provide forage and feeding areas.

Mule deer do best in habitats that are in the early stages of plant succession. The relationship is described in the Western Association of Fish and Wildlife Agencies (WAFWA, 2003) publication on mule deer which states: "Mule deer thrive in early successional habitats, where forbs, grassy plants and shrubs dominate. These environments are not as stable as forest habitats, and they rely on fire or some other type of disturbance to return them to an early successional stage. If they are not disturbed, they become more stable plant communities dominated by large trees and large shrubs. Tree-dominated habitats offer mule deer a place to retreat from severe weather, but these areas offer little in the way of food. That is why it is important to provide a mosaic or pattern of habitats that can provide food, cover and water."

One of the major problems facing mule deer populations in Utah is many of the crucial deer ranges are in late successional plant community stages dominated by mature stands of pinion-juniper or other conifer trees and old even-aged stands of shrubs such as sagebrush. Many crucial deer winter ranges are covered with older shrubs with little or no recruitment of young plants, or are being replaced by annual grasses like cheatgrass (*Bromus tectorum*). Additionally, many forest aspen habitats are being replaced by conifers that provide little forage for mule deer. In order for mule deer herds to thrive in Utah, it is essential that extensive habitat treatments be completed to revert crucial sagebrush habitats back to young, vigorous, shrub-dominated communities, and restore aspen communities to early seral stages. Habitat treatments vary by site but generally include chaining, bullhog, and pinyon-juniper lop and scatter on winter range and prescribed fire and logging on summer range. Figure 6 shows the habitat restoration priority areas for mule deer in Utah.

III. ISSUES AND CONCERNS

A. Habitat

Deer habitats are classified into three main categories based on season of use: winter, summer and transitional. Deer use high quality forage during the spring and early summer to aid in fat and protein deposition (Cook et. al. 2013). The higher the quality of spring and summer forage, the better the antler growth in bucks, the better does are prepared for lactation and estrus, and the more fat reserves deer can build up for use during winter. High quality forage on winter range helps slow the rate of decline of the accumulated fat reserves, and helps deer survive harsh winters. The size and condition of mule deer populations are primarily determined by the quantity and quality of these habitats as they provide the necessary nutrition to sustain deer throughout the year. Lack of quality habitat has been associated with decreased survival and recruitment of fawns, increased age at first reproduction, decreased reproductive output, and decreased survival by adults (Monteith et. al. 2014).

Loss and degradation of habitat are thought to be the main reasons for mule deer population declines in western North America over the last few decades (Workman and Low 1976, WAFWA 2003). Crucial mule deer habitat is continuously being lost in many parts of Utah and severely fragmented in others due to human population expansion, development, and natural events. For purposes of this plan, crucial mule deer habitat is defined as habitat essential to the life history requirements of mule deer. Continued degradation and loss of crucial habitat will lead to significant declines in carrying capacity and/or numbers of mule deer. Urbanization, road

construction, off-highway vehicle (OHV) use, energy development, drought, catastrophic wildfire, and expansion of invasive plant species have all resulted in loss or degradation of mule deer habitat.

The quality and quantity of forage available on important mule deer ranges can be limited by a variety of factors. The encroachment of pinyon and juniper threatens to choke out understory forbs and shrubs and increase catastrophic wildfire. Annual weeds such as cheatgrass alter natural fire cycles by increasing fire frequencies, often resulting in shrublands being converted to annual grasslands. Aspen habitat is declining in part due to conifer encroachment resulting from the suppression of naturally occurring fires. The seeding of aggressive introduced perennial grasses that outcompete native shrubs and forbs can reduce the ability of rangelands to meet the dietary requirements of mule deer. The DWR Range Trend Project has documented many of these threats and how mule deer habitat in Utah has changed over the last 30 years (UDWR 2009–2013). During the 1940s and 1950s, deer herds erupted in response to abundant shrub growth on mule deer ranges throughout the state, as a result of heavy grazing on most rangelands (deVos et al. 2003). Since that time, many shrub-dominated rangelands have gradually converted to juniper-dominated communities due to lack of fire or other disturbances. The conversion of shrublands to annual grasslands has also been accelerated in recent decades due to an increase in invasive weed species, drought, and large wildfires.

To address the decline in mule deer habitat throughout Utah, restoration projects are being implemented to target habitat improvement on crucial mule deer ranges that have shifted in dominance to less desirable types or have degraded and provide little productivity. In Colorado, Bergman et. al. (2014) found higher deer fawn survival in pinyon-juniper areas that had been treated as compared to those with no treatment. Habitat restoration projects are designed to move communities to earlier successional states, while restoring community functionality by providing a diversity of grasses, forbs, and shrubs that are available during critical seasons throughout the year. Ideally restoration projects that benefit mule deer should be large in scale, include mosaic patterns to increase patchiness and edge effects, and be conducted in areas with high potential for success. Although fire can be beneficial for mule deer habitat, in some instances large wildfires can be extremely destructive, especially on winter range. Projects in heavily burned areas are designed to restore lost food and shelter and protect water and soil resources. Restoration of shrubs in these communities can be a slow process, but the long-term goal is to increase and improve mule deer habitat throughout Utah, which in turn, will provide the necessary habitat requirements to meet statewide and unit population objectives.

B. Water Distribution

Water is also a fundamental need for mule deer. When browse, forbs, and grasses consumed by mule deer have high water content, mule deer likely don't need to drink as they can obtain adequate amounts of water from their food. However, when forage contains only limited amounts of water, access to water sources becomes important. The spatial distribution of mule deer populations is often positively associated with availability of water in arid regions of western North America (Hervert and Krausman 1986, Boroski and Mossman 1996). Consequently, recent work by state wildlife agencies depicts large expanses of the Intermountain West ecoregion as water limiting to mule deer (Wasley et al. 2008). Wildlife water

developments (i.e., guzzlers) can help provide water to mule deer in arid areas, but need to be designed and placed in areas conducive to use by mule deer. To maximize benefits to mule deer, guzzlers should be built in areas used by females with young, spaced less than 5 km from other water sources, and fencing needs to be constructed of sufficient size to allow access (Krausman et al. 2006, Larsen et al. 2011, Shields et al. 2012).

C. Energy Development

A boom in energy development has claimed and fragmented thousands of acres of mule deer habitat in portions of Utah. Energy is a 4.7 billion dollar industry in Utah, and in 2012, Utah ranked 10th in natural gas production and 11th in crude oil production among US states (Utah Office of Energy Development 2014). Mule deer, particularly in eastern Utah, are facing the challenges associated with increased, large-scale energy development. The impacts of energy development on mule deer are not fully known but generally include direct and indirect loss of habitat, added physiological stress, disturbance and displacement, habitat fragmentation and isolation, and other secondary effects (e.g., oil/chemical spills and contamination, increased noxious weeds, etc.; Sawyer et al. 2002, Lutz et. al. 2011). Small, isolated disturbances within non-limiting habitats are of minor consequence within most ecosystems. However, larger-scale developments within limited habitat types are a major concern to managers because such impacts cannot be relieved or absorbed by surrounding, unaltered habitats (Watkins et al. 2007). For mule deer populations to thrive in areas of extensive energy development, it is essential to work closely with energy companies to minimize and mitigate for potential impacts.

D. Population Objectives

The current statewide population objective for mule deer in Utah is 425,400 and is based on the sum of the population objectives from individual unit plans. Deer unit plans are approved through a public process, and population objectives are set based on what the habitat can biologically support, while considering possible detrimental impacts to surrounding land uses. When deer unit plans are revised, it is essential that the best possible population and range data be used to assess the current unit conditions. In some instances, these data may indicate the population objective is too low and should be raised to allow for more deer. In other situations, the data may show that the objective is too high and cannot be attained under current habitat and climatic conditions. In these cases, population objectives should be lowered to reflect a realistic view of what can be obtained in the foreseeable future. Population objectives can be revisited as needed to address improving conditions for mule deer.

E. Predator Management

Predators are often identified as one of the main causes for mule deer herd declines in Utah. However, predator-prey relationships are complex and not always easily understood. There are often many factors which can negatively affect mule deer populations including predation. The complex relationship between predators and habitat is described by Geist (1999). "Inevitably predators are blamed for declining mule deer populations, in particular when the survival of fawns is low. There is no doubt that today's predators are effective in killing deer. However, predation is not independent of poor habitat quality. Such translates itself less as a reduced birth

rate, but as fawns born too small, too poorly developed and too weak to be viable. Here predators take fawns that have a low chance of survival anyway. Improved habitat quality, which leads to better growth and larger body size in deer, is also expected to lead to large, vigorous fawns that are more difficult for predators to catch."

Ballard et al. (2001) reviewed 40 published papers on the response of deer to predator control and found removing predators is most effective when 1) the deer population is below carrying capacity, 2) predation is identified as a limiting factor, 3) control efforts reduce predator populations enough to yield results, 4) removal of predators occurred just prior to the reproductive periods of predators or deer, and 5) control efforts occurred at a focused scale. Mountain lions, coyotes, and in some areas black bears are the primary predators of mule deer in Utah (Smith 1983). In 2012, we initiated a study on Monroe Mountain to better understand the causes of neonatal mortality and the impacts of coyote removal on deer survival. This study is ongoing and is expected to be completed in 2016.

Predator management in Utah is guided by a predator management policy (UDWR 2011*a*). This policy specifies that predator management can occur on units well below population objectives providing a predator management plan is written and approved. Triggers have also been identified and adopted by the Wildlife Board as to when an evaluation will be conducted to determine if a predator management plan should be written. Intensive predator management is costly, and therefore is probably not warranted on units that are near objective or where habitat is limiting population growth. Mountain lion populations should be managed at levels that allow mule deer population objectives to be met. On some units, this may require additional reduction of mountain lion populations which are negatively impacting mule deer populations. In regards to coyotes, the Utah Legislature passed the Mule Deer Protection Act in 2012 which allocates additional funds for coyote control efforts in Utah. These funds allow for a statewide bounty and targeted removal of coyotes by Wildlife Services and private contractors.

F. Disease

Identifying, understanding, and monitoring disease is important for mule deer management. Chronic Wasting Disease (CWD) is a contagious, slow-acting, degenerative disease that affects members of the cervid family including mule deer, white-tailed deer (*O. virginianus*), elk, and moose. CWD has the greatest affect on the central nervous system of an infected animal which results in weight loss, deterioration of body condition, and eventually death. At present, there is no known vaccine, treatment, or way to eradicate the disease.

CWD is currently found in 18 states and was first detected in Utah in 2003. Since then, nearly 21,000 samples have been collected and tested throughout the state, and the disease has been found in 3 distinct geographical areas in northeastern, southeastern, and central Utah (Figure 7). To date 58 samples collected from mule deer have tested positive for CWD. Thirty-nine of the 58 positive samples come from the LaSal Mountains, 6 from the Vernal area, and 13 from the Manti Unit near Fountain Green. Prevalence rates on the La Sals are near 2%, whereas the Vernal and Manti areas remain below 1%.

Previous efforts have identified the distribution and prevalence rates of CWD and future efforts should focus on containing the disease to its current distribution and minimizing prevalence. To accomplish this, DWR should not feed in CWD positive areas as this tends to congregate deer and increases the risk of disease transmission. Transplanting deer from CWD positive areas should also be prohibited as it may introduce the disease to new locations. DWR should also manage for lower age class bucks in CWD positive areas as studies have shown prevalence rates to be 2–4 times higher in older age class bucks compared to females and younger bucks (Miller and Conner 2005, Grear et. al. 2006). Additionally, in these infected herds the overall life expectancy of mule deer males is decreased by 2 years.

Bluetongue and Epizootic Hemorrhagic Disease (EHD) are other common diseases that may affect mule deer in Utah. Both diseases are caused by viruses with cattle thought to be the primary reservoir. Epizootic outbreaks of bluetongue and EHD generally occur during late summer and early autumn and all age and sex classes may be affected. The most important vectors for bluetongue and EHD are gnats of the genus *Culicoides*, and die-offs can be expected to terminate shortly after temperatures drop below freezing. EHD outbreaks have been documented in several areas throughout Utah, and although losses to these diseases can be substantial, they are most often isolated events and populations generally recover quickly.

G. Access Management

The use of OHVs in Utah has dramatically increased in recent years. OHV registrations increased more than 3-fold from 1998 to 2006 (from 51,686 to 172,231) and that trend continues to increase (Smith 2008). Uncontrolled use of motorized vehicles and OHVs can cause damage to mule deer habitat and disturbance to mule deer during critical phases of their life cycle. Shed antler gathering and the associated human disturbance on crucial winter ranges, especially with the use of vehicles, can cause undue stress on mule deer during a time when they must conserve energy. State and federal land management agencies are currently struggling with issues involving the use of OHVs on public land. Those agencies acknowledge OHVs as a legitimate use of public land, but also recognize the potential problems associated with uncontrolled activity. As such, these agencies have developed or are currently working on travel management plans on federal lands.

There is also a demand for walk-in and horseback only access areas in Utah. Many hunters want the opportunity to hunt in a remote area that has lower hunter densities, where they don't have to compete with vehicle traffic. Biologically, limiting areas to foot and horse travel can limit hunter pressure, reduce harvest, and increase buck to doe ratios.

H. Depredation

Depredation of private croplands is an ongoing challenge and, in some areas, can be a significant problem for deer to reach their management objectives. DWR has committed substantial resources to address depredation concerns, and there are numerous programs designed to assist landowners with depredation situations. Depredation problems need to be addressed within the sideboards of state code, rule, and policy, and in a timely and efficient manner so that landowners will better tolerate migratory mule deer populations on their lands.

I. Private Land / Cooperative Wildlife Management Unit Issues

The value of private lands to the overall deer population in Utah cannot be overstated. Many crucial mule deer habitats throughout the state are on privately owned lands. Unfortunately, some of those private rangelands have been converted from mule deer habitat to housing developments, recreational properties, or other uses. As such, programs that provide incentives to private landowners to manage their properties for mule deer and other wildlife are critical to the success of the state's deer management program. Programs like the Cooperative Wildlife Management Units, Landowner Associations, General Season Landowner Permits, and Walk-In Access currently provide incentives for landowners to manage for healthy habitat and deer population on their properties. Additionally, the Utah Watershed Restoration Initiative has worked with numerous cooperating landowners to provide funding and other resources to accomplish vegetation treatments on private and public lands to benefit mule deer and other wildlife, as well as livestock.

J. Winter Feeding

Supplemental feeding is often viewed by the public as a solution to a lack of forage on crucial deer winter ranges, especially during severe winters. However, there is evidence that the potential harm created by feeding mule deer may outweigh the limited benefits (WAFWA 2003). Winter feeding programs are generally costly and can potentially cause problems for mule deer including behavioral changes, range destruction, and increased disease transmission. Additionally, feeding deer in winter may have limited value because of the complex and highly specialized digestive system of mule deer (WAFWA 2013). If deer do not adapt quickly enough to dietary changes, deer may die of starvation despite having a full stomach. Moreover, adult deer will likely outcompete fawns for available feed, causing increases in fawn mortality at feeding sites.

In some situations, it may be necessary to feed deer to sustain a base population (WAFWA 2003). If necessary, winter feeding of mule deer in Utah will be guided by the winter feeding policy (UDWR 2011*b*). The Division will not participate in any emergency big game feeding program that occurs within the known range or use area of any big game population where CWD, brucellosis, or tuberculosis has been detected as feeding concentrates animals and can increase disease transmission and prevalence.

K. Competition

Competition occurs when two species use the same limited resource, and one of the two suffers in some way because of that use (WAFWA 2003). When resources are limited, competition may potentially occur between deer and other ungulates such as horses, livestock or elk. This competition could be direct for specific resources such as food or water, or a more general displacement of a species from preferred habitats due to behavioral characteristics.

From a direct resource competition standpoint, it is often assumed that deer and elk do not compete for forage since elk diets consist primarily of graminoids (grasses) and mule deer largely consume woody vegetation or browse. Although this may be true much of the time, there

are circumstances when diet overlap can become a concern. For example, during a hard winter when forage is limited, elk can successfully shift to a diet largely comprised of browse causing a high degree of diet overlap with mule deer (Frisina et al. 2008). This overlap can create direct competition for forage between elk and mule deer when mule deer are most vulnerable.

Mule deer can also experience behavioral and spatial competition with elk. Behavioral competition is most likely to occur on summer ranges during drought years or on generally arid units. Elk return to higher elevations and calve sooner than deer have fawns, which allows them to select preferred habitats for raising young. The mere presence of elk may displace mule deer into lower quality habitats. GPS collar data has shown that mule deer avoid elk when selecting habitat, but elk habitat selection is independent of mule deer distribution (Stewart et al. 2002).

Horse populations in Utah continue to grow. Horses are less efficient at extracting nutrients from forage than ruminants like mule deer and elk. As such, horses must consume larger quantities of forage to survive. In arid environments, horses may also defend water sources from other species. In some instances the feed and water consumed by horses may have direct and indirect effects on mule deer. It is crucial that the Division work closely with federal land management agencies to actively manage horses on federal lands to minimize negative impacts to wildlife habitat.

Crucial ranges where elk, livestock, and/or horses coexist with mule deer should be closely monitored to prevent over use and competition. Although competition may exist in some areas where resources are limited, the Division continues to work closely with our partners to restore and improve habitats to benefit both wildlife and livestock.

L. Deer-Vehicle Collisions

Of all the causes of mule deer mortality, vehicle collisions may be the most apparent because carcasses are highly visible on roads, and the public are directly affected. As such, it is often perceived that vehicle collisions are having the most significant impact on mule deer populations in Utah. Assessing direct impacts from vehicle collisions to deer populations, however, is complex and difficult to quantify.

Deer-vehicle collisions occur most often during spring migrations from winter to summer ranges and during winter. Bissonnette and Olson (2013) found more deer were hit by vehicles during winters with higher amounts of snowfall compared to light winters. They also reported that vehicle collisions had a limited impact on the deer population in Utah at a statewide level (2-5% of deer population killed by vehicles annually); however, local populations (migration areas or specific winter ranges) may be substantially impacted by vehicle collisions. Additionally, of the estimated 10,500 deer killed annually on roadways, 65% were female which may limit population growth depending on where the population is relative to its carrying capacity. Vehicle collisions may be viewed as adding another predator to the landscape because of their similarities in percentage of deer killed annually and impacts on population demographics (Bissonnette and Olson 2013).

To address deer/vehicle collisions, DWR and our partners have worked to identify deer migration routes and locations where deer are commonly hit on roadways. This information has allowed us to know where to place underpasses and fences to increase deer survival. These studies have also provided data on the types of underpass structures these animals will use (Cramer 2014). Although costly, these efforts are helping to prevent future collisions, increase public safety, and minimize deer mortalities.

M. Translocations

One of the more recent areas of debate with respect to mule deer management in Utah is the potential merits of translocating mule deer. Translocation projects are an increasingly common strategy for managing wildlife populations on modified landscapes (e.g., bighorn sheep (*Ovis canadensis*), pronghorn (*Antilocapra americana*), and mountain goats (*Oreamnos americanus*)), but only limited information is available on the translocation of mule deer. Several previous attempts have produced equivocal results (McCulloch 1968, Wakeling 2003, Martinez-Garcia 2009). Preliminary information from a large study in Utah suggests approximately 50% survival of adults during the first year, high site fidelity (most surviving deer return to winter range where they were released during the second year), and reproduction similar to that of resident deer. This same study found no difference in survival for deer captured and released in early (January) compared to late (March) winter suggesting that translocation could occur throughout the winter. Survival of deer in their second year following translocation is much higher and appears similar to that of resident deer.

Deer translocation can be an expensive and time-intensive management activity. Costs can range from roughly $100 to $1,000 per animal based on the number of animals involved, capture method used, and duration of the project. Additional costs can include purchasing radio-collars, disease testing, and monitoring of translocated animals. Partnering with local governments, conservation groups, and other interested parties can help defray some of the costs associated with mule deer translocations.

Choosing an appropriate release site is important and should afford the greatest potential for success. The best areas generally contain winter ranges that are below carrying capacity, historically held more deer, and have adequate forage, water, and cover (Figure 7, Table 5). Additionally, releases may be more successful in areas with low predator abundance and should exclude areas that will create future depredation problems in agricultural areas. The impacts deer may have on other species such as bighorn sheep and elk should also be considered when selecting release sites. Deer that reside in CWD positive areas should not be considered for translocation, and special consideration should be taken when transplanting deer into CWD positive areas due to increased risks of large-scale deer movements and disease transmission. Translocated deer should be moved a minimum of 50 km to limit the return of translocated animals (Eberhardt and Pickens 1979). Finally, efforts should be made to reduce handling time and stress on animals during capture and translocation.

N. Poaching

The effect of poaching on wildlife populations can be difficult to assess. Poachers are sometimes considered the great unknown predator, and poacher's motivation can be caused by a variety of things, including a desire to get a jump on hunting season, annoyance with state game laws, a desire to shoot and kill something, or the money and prestige associated with trophy heads.

During winter 2009–2010, Utah experienced an increased number of illegally taken deer on winter ranges, likely due to the increased snow in southern Utah. In response, conservation officers conducted winter range patrols in an effort to protect vulnerable wintering deer herds. A concerted outreach effort was implemented to solicit assistance from conservation groups and the public to recognize and report suspicious activities while in the field. Law enforcement will continue to make mule deer protection a high priority by concentrating efforts on prioritized winter ranges. Success will only be achieved when poaching is no longer socially acceptable and only with assistance from our conservation partners and the general public.

IV. USE AND DEMAND

Mule deer are the most important game animal in Utah. Hunter demand and interest has always been high and the family tradition of mule deer hunting is strongly rooted in Utah (Figure 1). From 1960 to 1993, no fewer than 150,000 hunters participated in the annual mule deer hunt. Over 200,000 hunters participated in the deer hunt each year from 1977 to 1992, except in 1984. In 1994, general season hunter numbers were capped at 97,000 due to concerns over declining deer numbers. The number of general season permits has continued to be reduced with a total of 84,600 permits issued in 2013. The reduction in permits has provided for increased numbers of bucks on the landscape and increased hunter success, but has also helped to make permits more difficult to obtain.

In addition to the number of permits being reduced, the number of applicants for permits has increased causing the demand for both limited entry and general season permits to rise (Table 6). In 2013, the overall odds of drawing a limited entry buck tag were 1 in 32.5, compared to 1 in 8.3 in 1998. The odds of drawing a general season permit also increased from 1 in 1.1 in 2000 to 1 in 1.6 for 2013. Although limited entry permits are popular, it is clear that many Utah hunters are also interested in being able to hunt every year. As demand for both permit types continues to increase faster than supply, many hunters are giving up on the sport. The North American model of wildlife management is based on the premise that hunters are largely responsible for funding the management of game animals. If we continue to lose hunters and fail to recruit youth hunters, the current system under which we manage wildlife may be in jeopardy. Thus, it is critical to the future of hunting and wildlife management in Utah to provide people with both the opportunity to hunt and a high-quality hunting experience.

Mule deer are also a high interest watchable wildlife species since nearly everyone enjoys seeing deer in the wild. Many thousands of hours and considerable dollars are expended each year in deer watching activities. Units that produce large bucks are especially attractive not only to hunters but wildlife watchers and photographers as well.

V. CONCLUSION

Mule deer are the most abundant big game animal in Utah and are of high interest to sportsmen and non-consumptive users. The mule deer population in Utah is less than what it was in the 1960s and 1980s, but it has been relatively stable to slightly increasing over the past 2 decades with minor population spikes and declines during that time. Mule deer face a myriad of factors that can have a cumulative impact on their ability to flourish. The loss and degradation of habitat, combined with unfavorable weather conditions, have likely had the most significant impact on mule deer numbers. Other factors such as predation and disease are intensified when habitat quality is reduced. If deer herds are to reach their population objectives in Utah, extensive habitat work will need to be done to rehabilitate crucial mule deer ranges and compensate for a climatic trend toward hotter and drier conditions. It is vital that the DWR, state agencies, Native American tribes, federal agencies, conservation organizations, private landowners, and others work together to protect and improve mule deer habitat if we hope to maintain and expand mule deer populations to meet management goals.

VI. STATEWIDE MANAGEMENT GOALS AND OBJECTIVES

Population Management Goal: Expand and improve mule deer populations throughout the state within the carrying capacity of available habitats and in consideration of other land uses.

Population Objective: By 2019, increase mule deer populations within the state as conditions allow and bring all populations to their unit objective (currently (2014) 425,400).

Implications: This objective can be accomplished if favorable environmental conditions exist and through the implementation of the strategies in this plan.

Strategies:

a. Review individual herd unit management plans and revise where necessary to provide consistency with this plan.
b. Conduct annual browse assessments to ensure habitat can support current populations.
c. Support all habitat objectives and strategies in this plan to protect and improve mule deer habitat, including energy development mitigation in crucial mule deer habitat.
d. Manage predators on all units according to their species management plans.
e. On units chronically below objective, where habitat is not limiting, manage predators according to the current predator management policy.
f. Investigate and manage diseases that threaten mule deer populations and continue monitoring for chronic wasting disease (CWD).
g. Work with federal and state land management agencies to adopt seasonal closures or travel restrictions to minimize human disturbance of mule deer during critical phases of their life cycle.
h. Use antlerless harvest as the primary tool to manage deer populations in specific areas where habitat concerns or depredation problems exist.
i. Continue to explore using translocation as a management strategy.
j. Continue to monitor all mule deer populations annually to evaluate fawn production, herd composition, and habitat use.
k. Continue to collect annual adult doe and fawn mortality estimates on representative units statewide.
l. Use the most reliable population models to evaluate herd size and population trends over time.
m. Work with UDOT, universities, local conservation groups, and landowners to minimize highway mortality by identifying locations of high deer-vehicle collisions and constructing sufficient wildlife crossing structures and employing other mitigation options in those locations.
n. Evaluate the effectiveness of the crossing structures and other mitigation options over time and implement new technologies to minimize highway mortality.
o. Implement research to identify and protect migratory corridors.
p. Continue to implement research studies on specific herd units that are chronically below population objective to identify problems and recommend solutions.

q. Support incentive programs for landowners that will increase tolerance and promote deer populations on private lands such as the CWMU, landowner permit, and the Walk-In Access programs.
r. Educate the public on the value of private landowner incentive programs.
s. Address all depredation problems in a timely and efficient manner to increase landowner tolerance of deer populations.
t. Work with municipalities to promote zoning that benefits mule deer on crucial mule deer habitats that have the potential to be developed.
u. Continue to support law enforcement efforts to educate the public concerning poaching and reduce illegal take of deer.
v. Implement emergency feeding when needed in accordance with the DWR feeding policy.

Habitat Goal: Conserve, improve, and restore mule deer habitat throughout the state with emphasis on crucial ranges.

Habitat Objective 1: Maintain mule deer habitat throughout the state by protecting and enhancing existing crucial habitats and mitigating for losses due to natural and human impacts.

Implications: Loss of crucial mule deer habitat will need to be minimized to achieve population objectives. Mitigation is essential for loss or degradation of all crucial habitats due to natural and human impacts.

Strategies:
a. Continue to identify, map, and characterize crucial mule deer habitats including migration routes throughout the state.
b. Identify and rank threats and limiting factors within each unit.
c. Work with local, state and federal land management agencies via land management plans and with private landowners to identify and properly manage crucial mule deer habitats, especially fawning, wintering and migration areas.
d. Minimize impacts and recommend mitigation for losses of crucial habitat due to human impacts.
e. Use established energy guidelines (e.g., WAFWA Energy Development Guidelines for Mule Deer) to minimize and mitigate impacts to mule deer from energy development and other habitat disturbances.
f. Acquire thru fee title and conservation easements additional crucial mule deer habitats to offset loss of habitat due to human encroachment.
g. Work with municipalities to promote zoning that benefits mule deer on crucial mule deer habitats that have the potential to be developed.
h. Support incentive programs for landowners that will increase tolerance and promote deer populations on private lands such as the CWMU, landowner permit, and the Walk-In Access programs.
i. Explore additional opportunities to provide incentives to landowners that provide habitat for mule deer.

j. Support the establishment of multi-agency OHV travel plans developed on a county or federal land management plan level and ongoing efforts to reduce illegal OHV use to prevent resource damage and protect crucial mule deer habitat.
k. Where appropriate, work with county, federal and state land management agencies to adopt seasonal motorized route closures to minimize human disturbance in existing crucial mule deer habitats.
l. Work with county, state, and federal agencies to limit the negative effects of roads by reclaiming unused roads, properly planning new roads, and installing fencing and highway passage structures where roads disrupt normal mule deer migration patterns.

Habitat Objective 2: Improve the quality and quantity of vegetation for mule deer on a minimum of 500,000 acres of crucial range by 2019.

Implications: Habitat will need to be improved on at least 500,000 acres of crucial mule deer range to meet the population objectives in this plan. If habitat improvement projects cannot be completed because of inadequate funding, environmental restrictions, or unfavorable climatic conditions, population objectives may not be achieved. Additionally, because habitat treatments often require a number of years before they provide optimal benefits to mule deer, and if large catastrophic wildfires and energy developments continue to negatively impact crucial mule deer ranges, the population and habitat goals of this plan may not be achieved within the 5-year life of this plan.

Strategies:

a. Continue to support the interagency Big Game Range Trend Studies crew in monitoring the long-term trends of crucial mule deer ranges throughout the state.
b. Work with land management agencies, conservation organizations, private landowners, and local leaders through the regional Watershed Restoration Initiative working groups to identify and prioritize mule deer habitats that are in need of enhancement or restoration (Figure 6).
c. Work with university extension to increase landowner participation in the Watershed Restoration Initiative program.
d. Initiate broad scale vegetative treatment projects to improve mule deer habitat with emphasis on drought or fire damaged sagebrush winter ranges, ranges that have been taken over by invasive annual grass species, and ranges being diminished by encroachment of conifers into sagebrush or aspen habitats, ensuring that seed mixes contain sufficient forbs and browse species.
e. Continue to support and provide leadership for the Utah Watershed Restoration Initiative, which emphasizes improving sagebrush-steppe, aspen, and riparian habitats throughout Utah.
f. Seek opportunities through the Watershed Restoration Initiative to improve aspen communities that provide crucial summer habitat for mule deer.
g. Encourage land managers to manage portions of pinion-juniper woodlands and aspen/conifer forests in early successional stages using various methods including timber harvest and managed fire.
h. Conduct any mule deer feeding in accordance to UDWR policy to limit habitat damage.

i. Properly manage elk populations to minimize competition with mule deer on crucial ranges.
j. Work with local, state and federal land management agencies to properly manage livestock to enhance crucial mule deer ranges.
k. Encourage and support federal land management agency efforts to minimize competition with wildlife from horses and burros and to manage these animals at appropriate numbers.
l. Continue to support the conservation permit and habitat enhancement programs which provide critical funding for habitat improvement efforts.
m. Educate the public on the value of the general license, conservation, and convention permits for mule deer habitat improvement projects.
n. Promote and enhance programs that encourage volunteer participation in habitat restoration projects that benefit mule deer.

Recreation Goal: Provide a diversity of high-quality hunting and viewing opportunities for mule deer throughout the state.

Recreation Objective 1: Maintain a hunting program for mule deer that encourages a variety of quality hunting opportunities while maintaining population objectives.

Implications: Current hunting programs can be maintained if population objectives are met.

Strategies:

a. Continue to provide three hunt unit categories (general season, limited entry and premium limited entry) in approximately the current distribution to provide a variety of hunting opportunities.
    1. Manage general season units for a 3-year average of 15–17 or 18–20 bucks/100 does. See Table 1 for units and objectives.
        i. Continue to evaluate general season hunt boundaries to manage hunting pressure on a unit/subunit scale. Unit hunt boundaries should encompass the majority of the movements of specific deer herds, while maintaining easily identifiable boundaries and taking private land issues into consideration.
        ii. If the 3-year average bucks/100 does on a unit/subunit falls below the lower end of the set objective, permits on this unit/subunit will be reduced accordingly to achieve objective. If the 3-year average bucks/100 does on a unit/subunit exceeds the upper end of the objective, permits will be increased accordingly to achieve objective. Buck to doe ratio trends will also be considered when determining if permits should be increased or decreased.
    2. Manage limited entry units for a 3-year average of 25–35 bucks/100 does. See Table 3 for units and objectives.
        i. If the 3 year average buck to doe ratio exceeds 35 bucks/100 does, limited entry permits will be increased to bring the population to objective within 3 years. If the 3-year average buck to doe ratio falls below 25 bucks/100 does, limited entry permits will be reduced to bring the population to objective within 3 years. Buck to doe ratio trends will also be considered when determining if permits should be increased or decreased.

3. Manage premium limited entry units for a 3-year average of 40–55 bucks/100 does with >40% of harvested deer 5 years of age or older. See Table 2 for units and objectives.
   i. Continue to provide management buck hunts on these units to provide additional hunting opportunity with a minimum of 10 permits on each unit.
   ii. If the 3-year average buck to doe ratio exceeds 55/100, management buck permits will be increased to bring the population towards objective. Buck to doe ratio trends will also be considered when determining if permits should be increased or decreased.
   iii. Baseline premium limited entry permits for the public draw will be recommended at current levels (2014) on the Henry Mountains and the Paunsaugunt. If <40% of the harvested bucks (3-year average) are 5 years of age or older, premium limited entry permits will be recommended to be reduced as needed to achieve objective. If >40% of harvested bucks (3-year average) are 5 years of age or older, premium limited entry permits will be recommended at the baseline number.

b. Recommend permits for the 3 weapon types based on the following percentages: 20% archery, 20% muzzleloader, and 60% any weapon. On some units, these percentages may be altered to help achieve minimum buck to doe ratio objectives.
c. On appropriate limited entry and premium limited entry units, provide a multi-season hunting opportunity that will allow 3% of the hunters to hunt all seasons for an increased fee. The permits this hunt will be removed from the any weapon quota.
d. Establish season lengths that provide adequate hunting opportunity as follows: 28-day archery season, 9-day muzzleloader season, and 9-day any weapon season. Season lengths for some hunts may be altered to allow for high country buck hunts (deer and elk seasons overlap), hunting of migratory deer leaving or coming into Utah, extended archery areas, or to administer management buck hunts.
e. On appropriate units, provide overlapping deer and elk hunting opportunities during the general season any weapon elk hunt.
f. Explore hunting bucks in late-October or early-November on general season units to provide additional limited entry hunting opportunity. If warranted, hunting would only occur when general season units managed for 18–20 bucks/100 does exceed their objective. Permits would be very limited in number and would be part of the bonus point draw system.
g. Evaluate allowing hunters to harvest a cougar with their buck deer permit on units that qualify for predator management and where the harvest objective quota has not been met. Hunters will not be allowed to use hounds during this hunt.
h. Investigate the issues associated with consolidating the mule deer preference and bonus points into a single draw system.
i. Explore additional opportunities to provide incentives to landowners that provide habitat for mule deer.
j. Support the responsible use of off-highway vehicles and other access restrictions in specified areas during hunting seasons.
k. Provide hunting opportunities that will encourage youth participation and maintain family hunting traditions. Explore increasing the maximum group application size from 4 to 6.

l. Investigate issuing a preference point to future first-time hunter education graduates.

Recreation Objective 2. Increase opportunities for viewing mule deer while educating the public concerning the needs of deer and the importance of habitat and other limiting factors.

Implications: Increased viewing opportunities for mule deer should be accompanied by efforts to educate the public on mule deer, mule deer habitat, and other limiting factors. Education should be a component of all viewing opportunities.

Strategies:

a. Work with partners (conservation organizations, state and federal agencies, etc.) to increase outreach efforts to promote mule deer conservation.
b. Encourage the installation of interpretive signs in mule deer viewing and habitat restoration project areas. Signage should emphasize the importance of habitat and minimizing disturbance to mule deer.
c. Produce written guides and brochures to educate the public on how and where to view mule deer, the importance of crucial habitats, highway fencing and underpass/overpass guidelines, and the importance of minimizing disturbance to mule deer.
d. Educate the public on limiting factors affecting mule deer (e.g. highway mortality, predator-prey relationships, habitat degradation, etc).
e. Work with the media to promote interest and educate the public concerning mule deer and their habitat needs.

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Figure 1. Statewide trends in deer hunters afield and harvest, Utah 1925–2013.

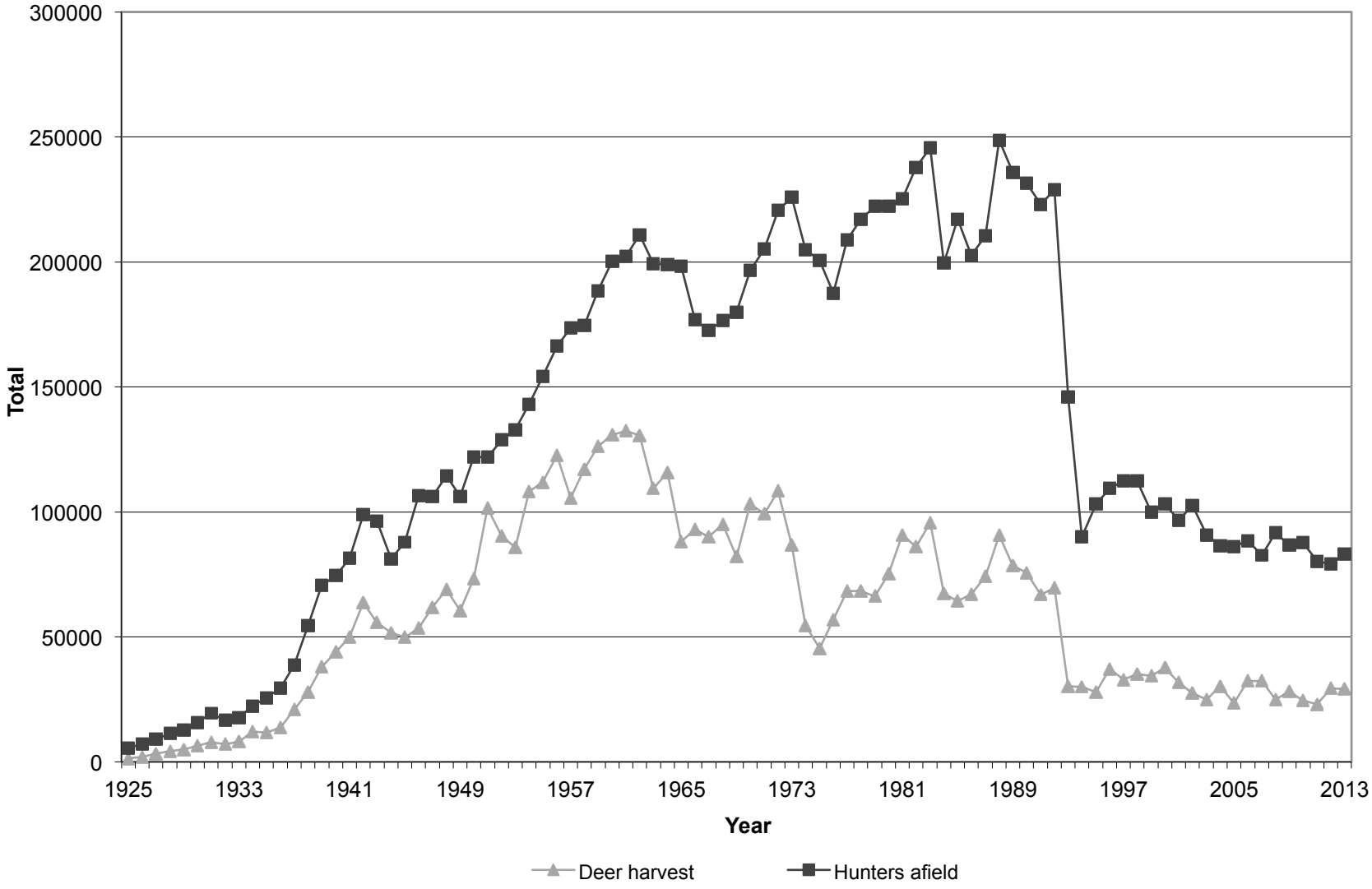

Figure 2. Statewide post-season buck to doe ratio estimates, Utah 1993–2013.

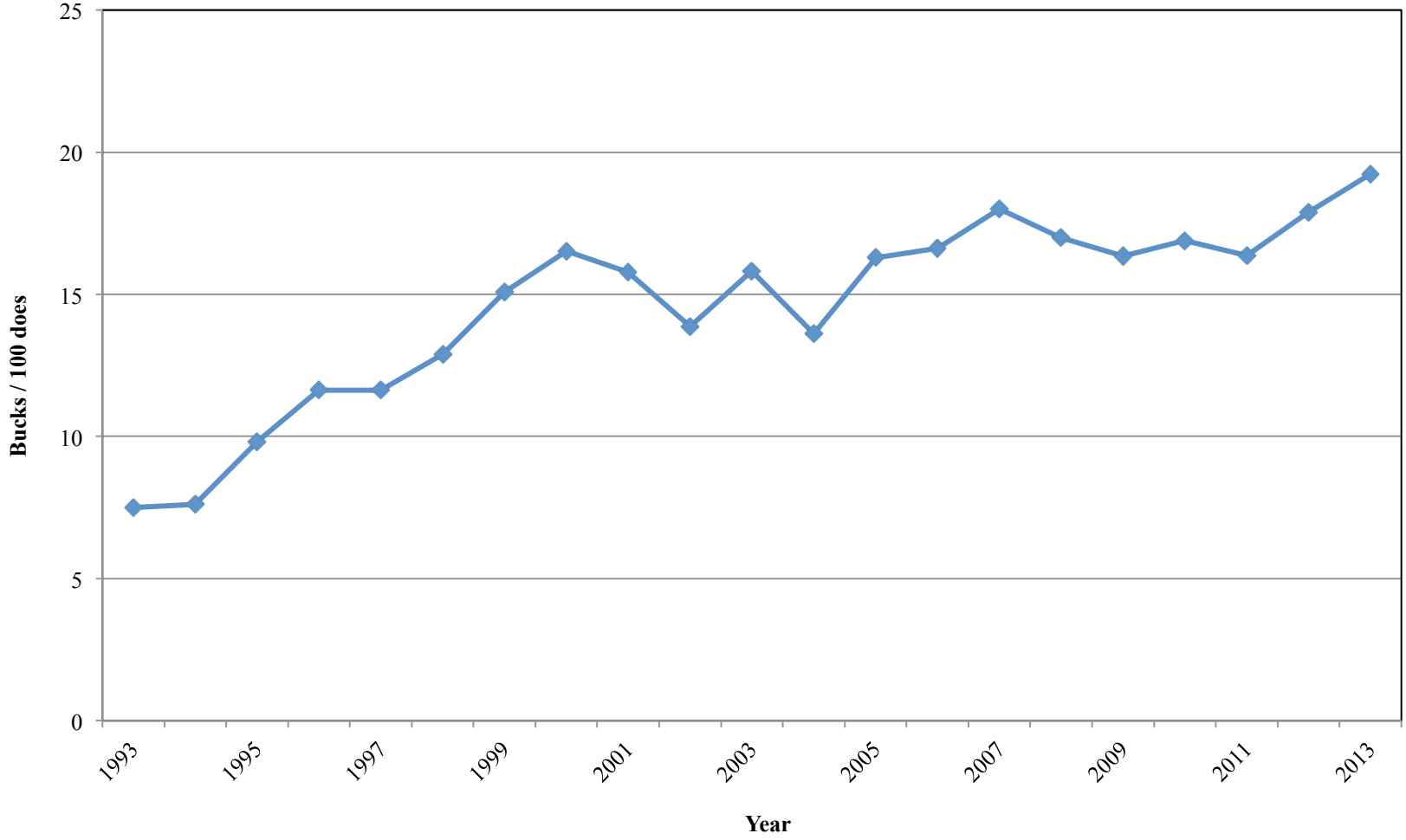

Figure 3. Statewide post-season deer population estimates, Utah 1992–2013.

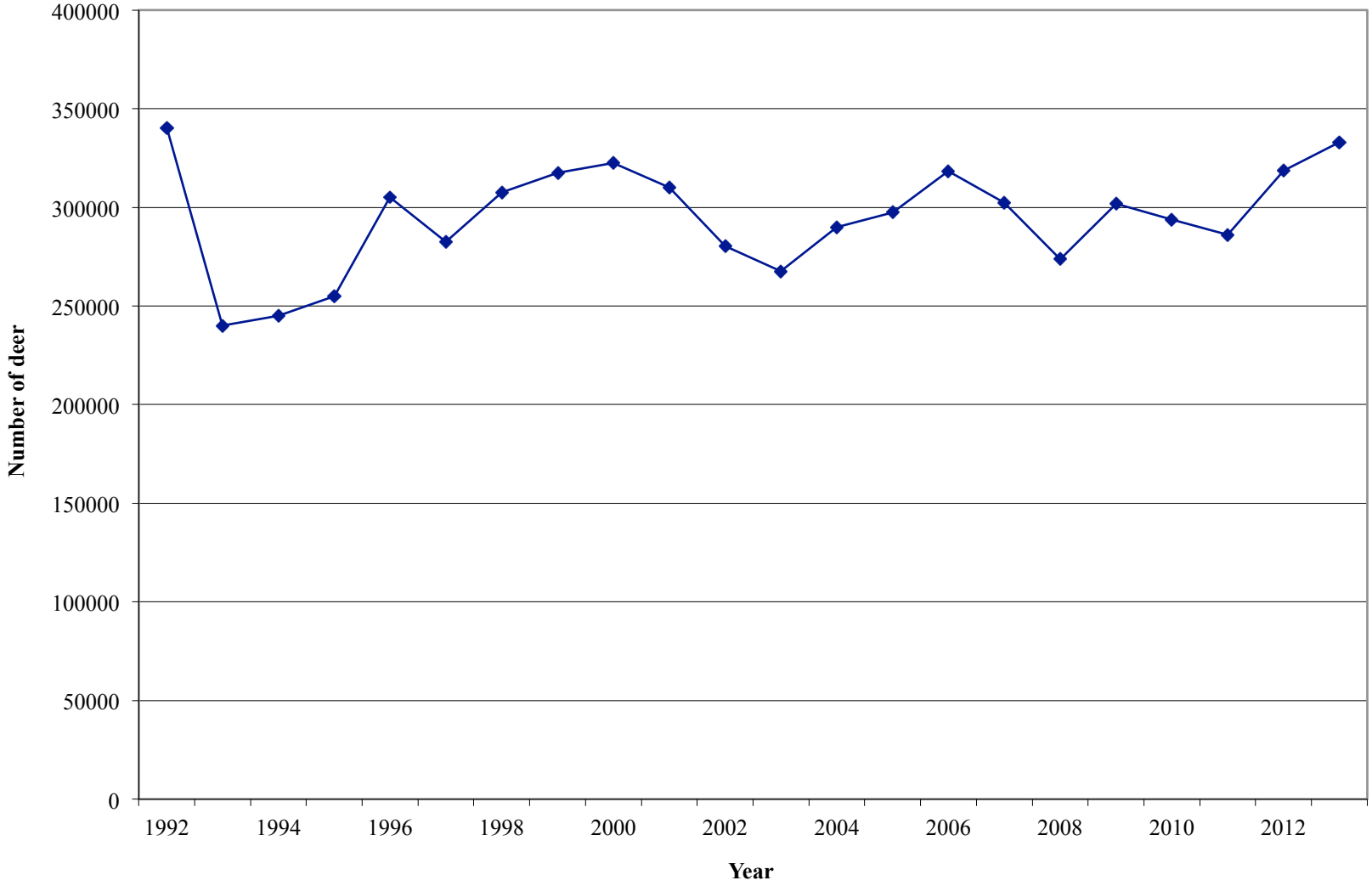

Figure 4. Statewide post-season fawn to doe ratio estimates, Utah 1993–2013.

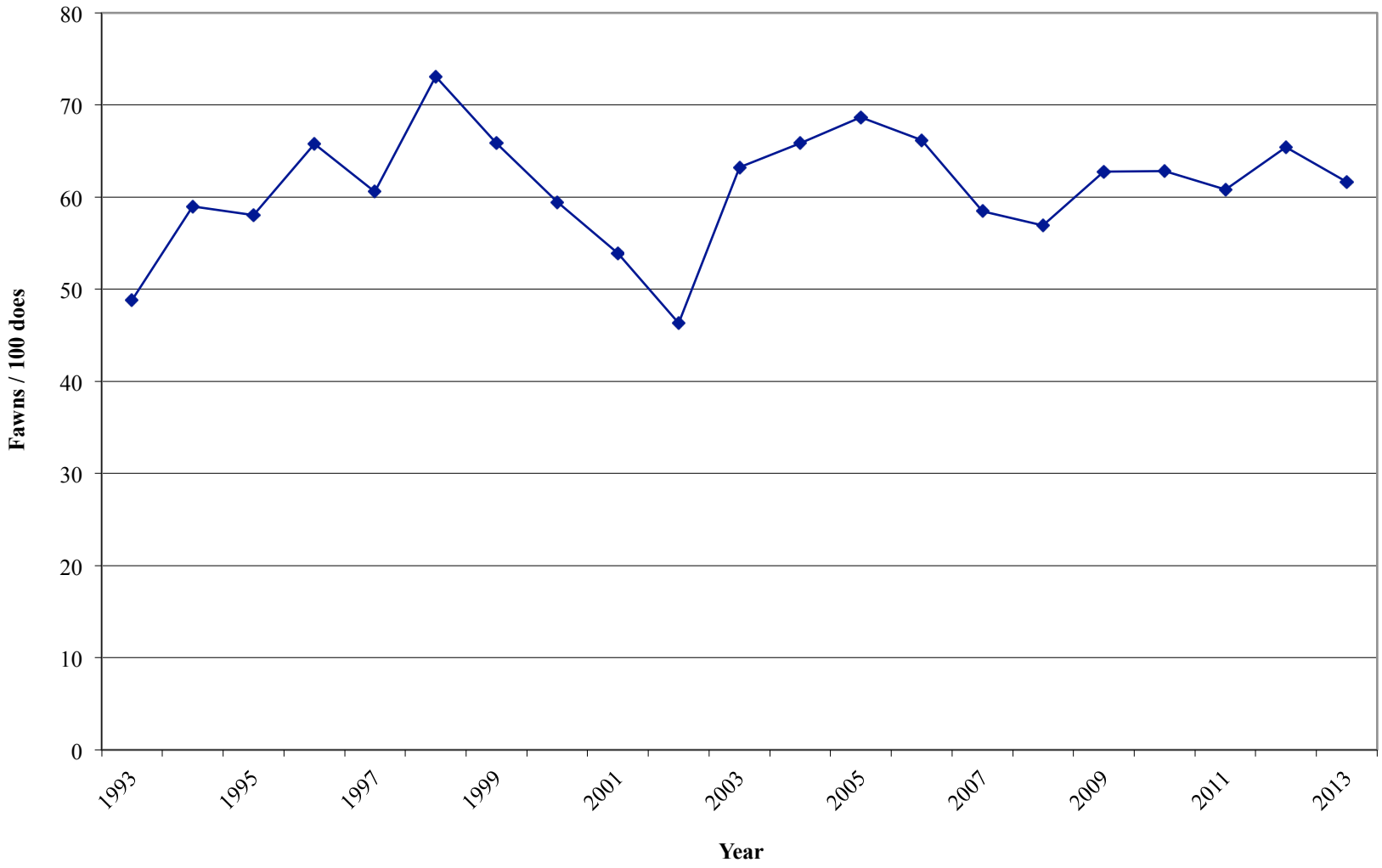

Figure 5. Mule deer habitat, Utah 2014.

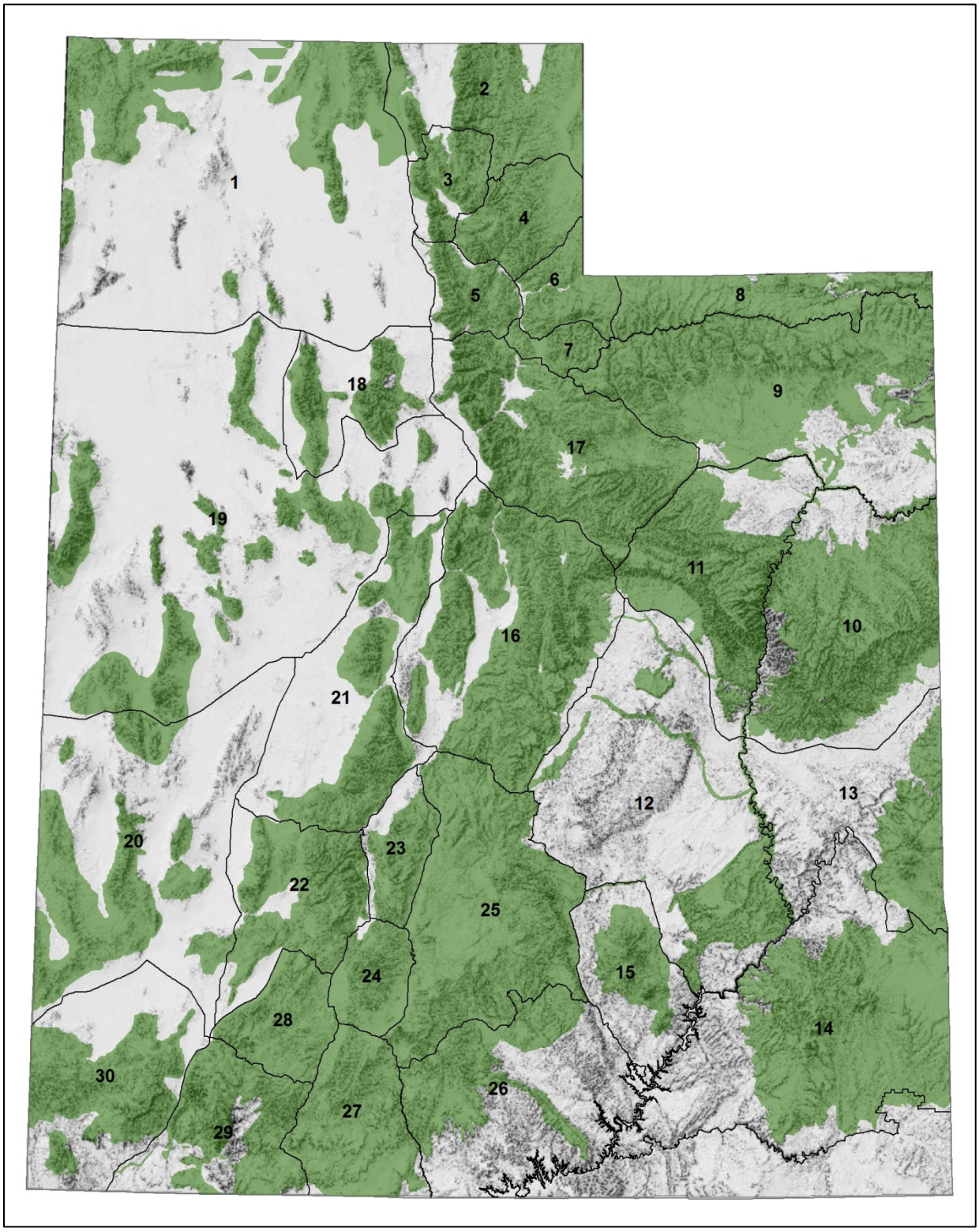

Figure 6. Crucial mule deer habitat restoration priority areas, Utah 2014.

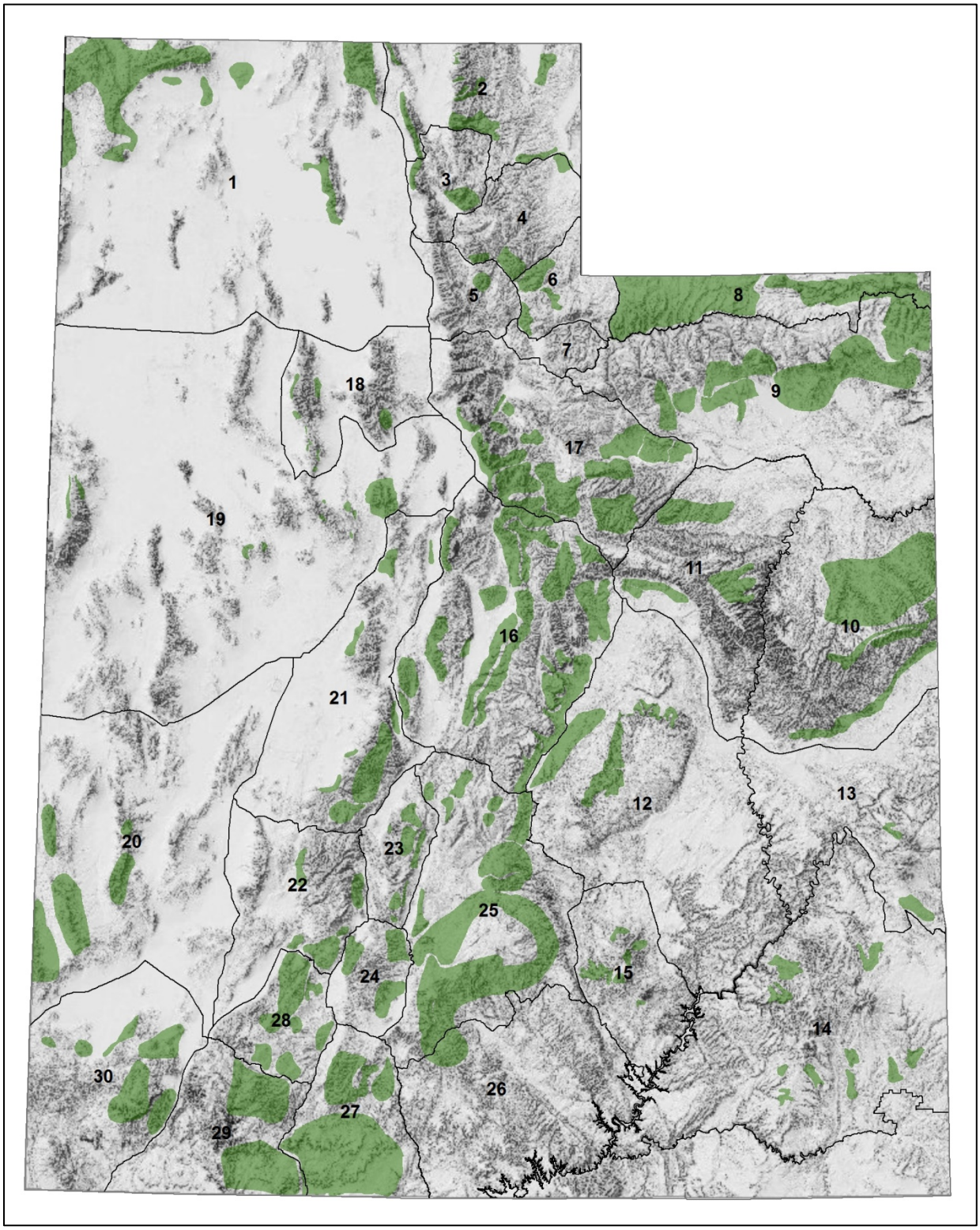

Figure 7. Chronic-wasting disease (CWD) positive locations (2003–2013) and potential translocation release sites, Utah 2015.

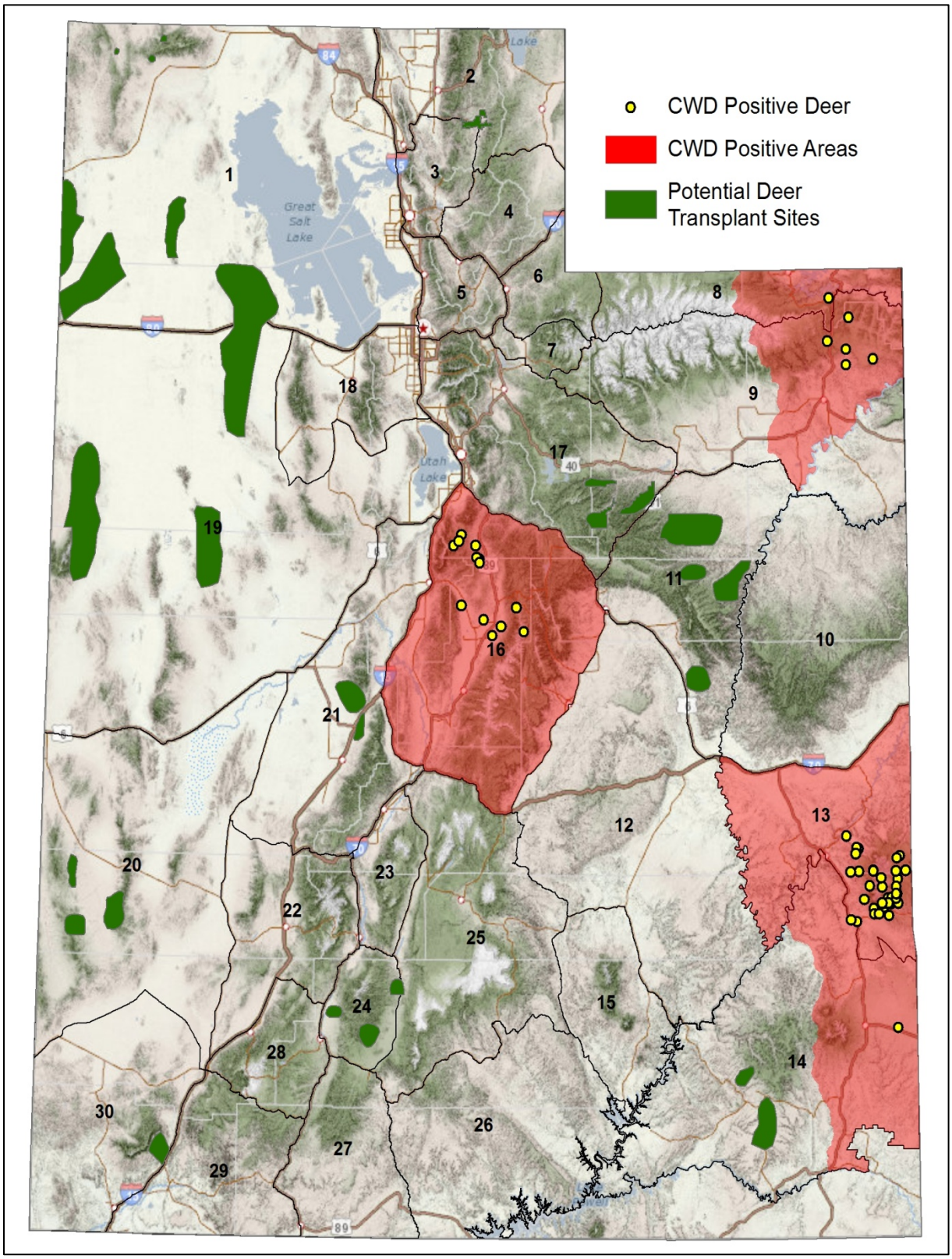

Table 1. General season unit bucks per 100 does and objectives, Utah 2011–2013.

General Season Unit	Unit #	Objective	2011	2012	2013	3 Year Average
Beaver	22	18–20	16.1	16.4	17.8	16.7
Box Elder	1	15–17	20.2	15.1	11.6	15.6
Cache	2	15–17	12.3	15.8	13.2	13.8
Central Mountains, Manti/San Rafael	16B/12	15–17	14.0	15.6	18.7	16.1
Central Mountains, Nebo	16A	15–17	10.3	13.7	21.4	15.1
Chalk Creek/East Canyon/Morgan-South Rich	4/5/6	18–20	33.9	33.5	27.3	31.6
Fillmore, Oak Creek	21A	18–20	21.3	21.3	22.2	21.6
Fillmore, Pahvant	21B	18–20	17.0	16.4	23.9	19.1
Kamas	7	18–20	19.2	27.9	22.9	23.3
La Sal, La Sal Mountains	13A	15–17	23.1	11.0	17.4	17.2
Monroe	23	15–17	14.5	18.3	23.3	18.7
Mt Dutton	24	18–20	18.2	13.7	22.2	18.0
Nine Mile	11	18–20	23.5	24.6	22.5	23.5
North Slope	8	18–20	18.4	15.6	15.4	16.5
Ogden	3	18–20	19.8	20.2	19.4	19.8
Oquirrh-Stansbury	18	15–17	15.4	12.3	20.2	16.0
Panguitch Lake	28	15–17	18.3	18.7	19.8	18.9
Pine Valley	30	18–20	17.5	23.9	20.6	20.7
Plateau, Boulder/Kaiparowits	25C/26	15–17	15.6	24.7	16.4	18.9
Plateau, Fishlake	25A	18–20	19.3	13.7	19.3	17.4
Plateau, Thousand Lakes	25B	18–20	26.7	17.3	24.8	22.9
San Juan, Abajo	14A	15–17	18.8	14.2	17.5	16.8
South Slope, Vernal/Bonanza	9B/9D	15–17	10.7	9.8	12.8	11.1
South Slope, Yellowstone	9A	18–20	14.3	19.6	19.4	17.7
Southwest Desert	20	18–20	32.4	29.9	29.2	30.5
Wasatch Mountains, Currant Creek/Avintaquin	17B/17C	18–20	15.3	20.0	21.0	18.8
Wasatch Mountains, West	17A	15–17	19.1	16.2	18.3	17.9
West Desert, Tintic	19C	15–17	5.9	—	26.4	16.2
West Desert, West	19A	15–17	—	—	—	—
Zion	29	18–20	22.7	24.5	23.8	23.6

Table 2. Premium Limited Entry unit bucks per 100 does and objectives, Utah 2011–2013.

Premium Limited Entry Units		Objective	2011	2012	2013	3 Year Average
Henry Mountains	Buck:doe ratio	40–50	60.9	52.3	54.8	56.0
	% ≥ 5 years old	40–55	63%	64%	89%	72%
Paunsaugunt	Buck:doe ratio	40–50	47.0	44.4	42.1	44.5
	% ≥ 5 years old	40–55	68%	62%	63%	64%

Table 3. Limited Entry unit bucks per 100 does and objectives, Utah 2011–2013.

Limited Entry Units	Objective	2011	2012	2013	3 Year Average
Cache, Crawford Mountain	25–35	14.6	15.6	23.1	17.8
South Slope, Diamond Mountain	25–35	38.9	37.0	36.4	37.4
Book Cliffs	25–35	35.2	30.2	36.2	33.9
La Sal, Dolores Triangle	25–35	26.3	22.1	24.2	24.2
San Juan, Elk Ridge	25–35	42.4	23.8	23.6	29.9
West Desert, Vernon	25–35	19.4	19.9	21.1	20.1
Fillmore, Oak Creek	25–35	21.3	21.3	22.2	21.6

Table 4. Estimated survival of adult and fawn mule deer monitored via radio telemetry along with population growth rates (lambda; values above 1 indicate a growing population while values below 1 suggest an annual decline) by management unit, Utah 2009–2013.

Unit	Year	Adult Survival	Fawn Survival	Lambda
Book Cliffs	2009-2010	0.79	—	0.93
	2010-2011	0.81	—	0.90
	2011-2012	0.79	—	0.94
	2012-2013	0.89	—	1.05
Cache	2009-2010	0.89	0.61	1.13
	2010-2011	0.93	0.07	0.96
	2011-2012	0.90	0.79	1.19
	2012-2013	0.79	0.79	1.13
Monroe	2009-2010	0.86	0.28	0.92
	2010-2011	0.85	0.70	0.98
	2011-2012	0.87	0.83	1.14
	2012-2013	0.85	0.67	1.08
Oquirrh-Stansbury	2009-2010	0.90	0.62	1.10
	2010-2011	0.80	0.44	0.94
	2011-2012	0.95	0.93	1.23
	2012-2013	0.86	0.73	1.05
Pine Valley	2009-2010	0.76	0.57	0.91
	2010-2011	0.82	0.89	1.07
	2011-2012	0.88	0.90	1.18
	2012-2013	0.90	0.77	1.13
San Juan	2009-2010	1.00	0.50	1.13
	2010-2011	0.88	0.80	1.07
	2011-2012	0.76	0.83	0.97
	2012-2013	0.90	0.86	1.12
South Slope	2009-2010	0.80	0.60	1.02
	2010-2011	0.76	0.37	0.89
	2011-2012	0.84	0.60	1.01
	2012-2013	0.89	0.66	1.11
Wasatch-Manti	2009-2010	0.90	0.54	1.08
	2010-2011	0.87	0.39	1.02
	2011-2012	0.80	0.58	1.00
	2012-2013	0.77	0.93	1.07
Statewide	2009-2010	0.86	0.53	1.03
	2010-2011	0.84	0.52	1.00
	2011-2012	0.85	0.78	1.08
	2012-2013	0.85	0.77	1.11

Table 5. Statewide mule deer transplant list, Utah 2014.

Region	Unit		County	Area (s)
Northern	1	Box Elder	Box Elder	Newfoundland Mountains
				Pilot Mountains
				Raft River Mountains
	2	Cache	Cache	Hardware Ranch
	7	Kamas	Summit	Cedar Hallow
Northeastern	11A	Nine Mile, Anthro	Duchesne	Big Wash
				Nutters Ridge
				Sowers Canyon
	17C	Wasatch Mtns, Avintaquin	Duchesne	Strawberry River
				Horse Ridge
				Lake Canyon
Southeastern	11B	Nine Mile, Range Creek	Carbon and Emery	Southern end of Tavaputs Plateau
	14B	San Juan, Elk Ridge	San Juan	Cedar Mesa
				Deer Flat
				Lower Lost Park
	16B	Central Mtns, Manti	Emery, Sanpete, Sevier	Southeast Manti
Central	19A	West Desert	Tooele and Juab	Deep Creek Mountains (Tom's Creek and Granite Creek)
				Dutch Mountain
				Gold Hill
				Northern end of Cedar Mountain
Southern	20	Southwest Desert	Iron, Beaver, and Millard	Indian Peaks Range
				Needles
				Wah Wah Mountains
	21A	Fillmore, Oak Creek	Millard	Oak Creek Mountains
	21B	Fillmore, Pahvant	Millard	Pahvant Mountains (North of Holden to South of Fillmore)
	24	Mt Dutton	Garfield and Piute	Deer Creek to Pine Creek
				East and West Forks of Hunt Creek
				Sanford Bench
	30	Pine Valley	Washington	Browse Area

Table 6. Limited Entry and general season odds of obtaining a permit, Utah 1998–2013.

Permit type	Year	Resident odds	Nonresident odds	Overall Odds
Limited Entry	1998	1 in 7.5	1 in 19.7	1 in 8.3
	1999	1 in 7.9	1 in 16.3	1 in 8.5
	2000	1 in 8.9	1 in 14.4	1 in 9.3
	2001	1 in 9.9	1 in 18.1	1 in 10.6
	2002	1 in 12.8	1 in 24.8	1 in 13.8
	2003	1 in 15.2	1 in 34.0	1 in 16.7
	2004	1 in 17.2	1 in 40.4	1 in 19.1
	2005	1 in 19.5	1 in 48.3	1 in 21.7
	2006	1 in 19.9	1 in 49.7	1 in 22.1
	2007	1 in 21.0	1 in 62.2	1 in 23.7
	2008	1 in 20.6	1 in 48.2	1 in 22.5
	2009	1 in 19.8	1 in 74.1	1 in 23.8
	2010	1 in 20.3	1 in 72.1	1 in 24.3
	2011	1 in 21.3	1 in 76.5	1 in 25.5
	2012	1 in 23.5	1 in 79.0	1 in 27.9
	2013	1 in 27.1	1 in 98.4	1 in 32.5
General Season	2000	—	—	1 in 1.1
	2001	1 in 1.2	1 in 1.6	1 in 1.2
	2002	1 in 1.3	1 in 1.7	1 in 1.3
	2003	1 in 1.3	1 in 1.9	1 in 1.3
	2004	1 in 1.3	1 in 1.7	1 in 1.3
	2005	1 in 1.4	1 in 1.7	1 in 1.4
	2006	1 in 1.3	1 in 1.7	1 in 1.4
	2007	1 in 1.4	1 in 1.7	1 in 1.5
	2008	1 in 1.4	1 in 1.5	1 in 1.4
	2009	1 in 1.4	1 in 1.5	1 in 1.4
	2010	1 in 1.3	1 in 1.4	1 in 1.3
	2011	1 in 1.4	1 in 1.5	1 in 1.4
	2012	1 in 1.5	1 in 1.8	1 in 1.5
	2013	1 in 1.6	1 in 1.8	1 in 1.6