$169. Fees for guided hunters ranged from $132 to $3,000 with a mean of $1,106. By 2009, I estimated that these fees would have at least doubled from those cited in the mid 1980s. Private hunting fees for CWMUs are several times higher.

For most private landowners, fee hunting provides three positive incentives: supplemented income to the ranching operation, control of trespass, and compensation for any damages caused by hunters. Many private landowners involved with fee hunting simply lease their properties to hunting clubs and avoid the problems of liability, hunter management, and insurance costs. My estimated minimum acreage needed to provide fee hunting for big game species, dependent upon the quality of the habitat, is 600 to 2,000 acres or about one to three square miles of contiguous rangeland. It is often more economical for ranches of this size to combine their lands and manage as a CWMU.

Cooperative Wildlife Management Units (CWMUs) were originally known as Posted Hunted Units; the name was changed in 1998, and in 1996 they were added to the list of alternatives for wildlife management for some landowners. However, minimum acreage to be eligible was set at 5,000 acres for deer and pronghorn, and 10,000 acres for elk and moose. Although many restrictions as well as incentives apply, the CWMU program gave landowners, or in some cases landowners with adjacent properties, the opportunity for improved control of the hunting resource, decreased hunter trespass, and greatly increased economic gain. Hunter density is much lower but success rates and hunter satisfaction are much higher on CWMUs. In most cases the landowner receives 90 percent of the buck or bull tags, and public hunters receive 10 percent of the buck or bull tags and all of the antlerless permits. Normally the landowner sells the buck or bull tags to private hunters at market value. Both public and private hunters are required to purchase licenses from the state. The number of Utah's CWMUs has gradually increased to about 80.

**Protection of Riparian Zones**

Riparian habitats along streams, ponds, springs, and marshlands are the most vegetatively productive of wildlife habitats. They potentially always provide high quality and quantity of forage and cover. Unfortunately riparian areas are often heavily used by livestock, decreased in size by agricultural cultivation, and channeled for agricultural and other
purposes. Water is often diverted from riparian corridors, thereby further reducing environmental values. Consequently, potential values to wildlife are often curtailed in riparian zones.

Riparian habitats become critically important during mid-to-late summer under drought conditions. When most other forage sources become dry and decrease in nutritional value and palatability, deer gradually increase use of riparian habitats. Often in late summer, especially during dry years, high numbers of deer can be observed in the evening along water courses throughout the state. Although deer utilize the stream water as needed, the main attraction is the succulent vegetation.

Grazing use of riparian habitats by livestock and big game must be carefully monitored. Riparian habitats must not be degraded or over-utilized. Abused areas must be allowed to recover. Riparian zones also serve as valuable forage reserves for deer during winter and should receive the highest habitat management priority. Fencing of riparian zones has been found to be an effective management tool to maintain balance between productivity and utilization.

The DWR has been purchasing riparian habitat conservation easements from private landowners since the early 1990s. These easements limit the use of livestock, usually provide sportsman access, provide income to the landowner, protect stream banks, decrease erosion, and ensure perpetual wildlife habitat.

**Factors Affecting Changes in Deer Populations**

Numerous factors have short and long-term effects on deer populations. Unfortunately many of these factors are negative and have long-term effects. State game agencies must deal with both the positive and problematic factors. Although most of these factors are discussed elsewhere in the manual, and many are subjective, they are presented below in summary form as having positive, neutral or negative influences on deer populations. Even though these factors are prioritized within categories from more to less significant, the order could radically be altered over time or between areas. Additionally, and as applied to specific deer herds, some of these listed factors would be eliminated and others added. Although most of these factors have been present for decades, I consider this listing as applicable to Utah’s mule deer populations beginning about 1993 and continuing well into the twenty-first century.
Management Challenges

Negative External Factors List 1

These factors are not influenced by the Division of Wildlife Resources or by hunter organizations:

- Increases in transportation methods, number of people, and number of vehicles.
- Urbanization of deer winter ranges, increased housing density, fewer or smaller corridors.
- Climatic or weather changes.
- Increase in bald and golden eagle populations.

Negative External Factors List 2

These external factors are somewhat influenced by DWR and various hunter organizations:

- Increase in highway speeds, ineffective highway fences, increase in vehicular mortality.
- Reduced livestock grazing of winter ranges during spring on public lands.
- Decline in productivity of winter ranges on public lands.
- Increased fire frequency on winter ranges on public lands.
- Increase in range problems associated with introduced weeds.
- Increases in recreational harassment.
- Reduced control of coyotes.
- Decrease in the number of effective predator trappers and hunters.
- Changes in depredation legislation.
- Increase in fire frequency of winter ranges on private lands.
- Livestock grazing during fall and winter on private and public winter ranges.
- Effects of chronic wasting disease and other deer-related diseases.
- Increase in populations of red fox.
- Decrease in productivity of winter ranges on private lands.
- Overgrazing by livestock on some winter range riparian areas.
- Overgrazing by livestock on some ranges during summer.
- Since the winter of 1992–1993, overutilization of some winter ranges by big game.
Positive Internal Factors

These internal factors are often controlled by DWR:

- Implementation of livestock grazing plans on DWR winter ranges.
- Revegetation of winter ranges on DWR wildlife management areas.
- Revegetation of winter ranges on private and public lands.
- Closure of DWR winter ranges from all public uses from Jan 1 through April 31.
- Cooperation, contribution, and encouragement for conservation easements of private lands.
- Additional acquisitions of critical winter ranges.
- Law enforcement efforts.
- Increasing effectiveness of range management on DWR lands.
- Effects of winter deer feeding during some years and at some locations.

Neutral Internal Factors

These internal factors are also controlled by DWR:

- Data collection, including fall and spring classification, check station, harvest, and other data.
- Number of management units reduced from 56 to 30.
- Ratio of bucks to does for breeding (DWR minimum goal of 15 bucks per 100 does), increase in trophy bucks.
- Implementation of the Cooperative Wildlife Management Unit program.
- Implementation of the Dedicated Hunter program.
- Requirement of hunters to select region.
- Limitation of deer hunters from 97,000 to 95,000.
- Complicating of the deer hunting rules and regulations.
- Changes in administrative personnel.

Negative Internal Factors

These negative internal factors are often slightly influenced by DWR:

- Increase in disease problems in mule deer.
- Depredation problems, changes in landowner tolerance on farms, ranches, and backyards.
Management Challenges

- Decrease in total numbers and in revenues from deer hunters.
- Decrease in applied research.
- Shifts in resources’ allocation away from mule deer management to people-related problems and other wildlife species.
- Increase in competition with elk for browse on winter ranges.
- Decrease in annual range assessments, e.g. range rides, browse production and utilization surveys, and pellet group surveys.
- Increase in number and adaptability of cougars and coyotes on some units.
- Increased effects of predation by bobcat, red fox, and other predators on some units.
- Increase in number of dogs harassing deer in winter.
- Continued poaching, illegal kill, and unrecovered carcasses.
- Increase in competition with white-tailed deer.
- Increase in hunter harassment into the breeding period on some units.
- Increased, sometimes negative, influence of public opinion on wildlife management decisions.
Chapter 14

Lessons From the East Canyon and Oak Creek Management Units

East Canyon

Population versus Range Carrying Capacity

Between 1951 and 1968, under either-sex hunting, buck harvest on the East Canyon Unit was relatively consistent, and the total population was considered to be maintained within winter range carrying capacity. Increased population and buck harvest began about 1969, and by 1975 the population was clearly exceeding the carrying capacity as evidenced by very heavy use on shrubs on most of the scattered winter ranges within the unit. However, the winter ranges remained healthy, most shrubs recovered during the summer, winters were moderate, hunters were happy, and deer populations remained high. Winter range conditions were probably gradually deteriorating, but the decline was not visually evident until about 1980.

Between 1980 and 1983 hunting pressure was high on the East Canyon Unit, but deer populations were very high and greatly exceeded the carrying capacity of the winter range. The average number of bucks harvested during these four years was just under 3,000, and over 1,000 antlerless deer were annually harvested, as shown in Table 14-1. In 1982, the area conservation officer and I estimated that over 2,000 antlerless deer would need to be harvested just to maintain the population at the current level with a normal winter, and a harvest of 3,000 antlerless deer was recommended to reduce the herd to be closer to carrying capacity.

Herd reductions were not made and the extremely severe winter of 1983–1984 killed almost all the fawns and a high proportion of the adults, reducing the total herd by an estimated 70 percent. The number
of bucks harvested between 1983 and 1984 dropped from 2,810 to 960, a one-year 66 percent reduction in harvest.

However, the most significant result of the overpopulation of deer during the late 1970s and early 1980s was that the winter range was extremely over-utilized, resulting in high mortality and reduced vigor of shrubs, and importantly, a massive reduction of the future deer carrying capacity of the winter ranges.

Nonetheless, the next several years recorded high reproduction and recruitment rates and the herd rapidly recovered to a population again exceeding carrying capacity. The moderately severe winter of 1988–1989 killed most of the fawns, but the adult population was not significantly reduced. The result was a single-year decline in hunter harvest, mostly due to the lack of available yearling bucks, killed as fawns during the previous winter. Buck harvest declined from 1,706 to 800, a one-year 53 percent reduction in harvest.

The herd continued to show high, non-stop population growth following the winter of 1989, and by 1992 was again clearly and greatly exceeding the carrying capacity of the winter range. The severe winter of 1992–1993 killed an estimated 70 percent of the population, and the buck harvest plummeted from 2,916 to 362 bucks, a one-year 86 percent reduction in harvest.

The herd recovered during the next several years, but less rapidly, probably again to the point of exceeding winter range carrying capacity. Another moderately severe winter, 1997–1998, reduced the herd, and the buck harvest dropped from 1,331 to 746, a one-year 43 percent reduction in harvest.

The herd slowly recovered to about carrying capacity or slightly above, until the two mildly severe back-to-back winters between late 2000 and early 2002 reduced the herd through overwinter losses. Buck harvest declined from 1,177 to 912 to 568, during 2000, 2001, and 2002, respectively. This represents a 52 percent reduction in harvest over two years.

Between 2003 and 2007, herd numbers as well as the number of hunters remained rather constant, and within carrying capacity of the winter range. Herd growth had been controlled by antlerless harvest, moderate winters, vehicle mortality, and predators. However, the winter of 2007–2008 was moderately harsh and overwinter losses, especially of fawns, were significant. The 55 percent decrease in buck harvest between 2007 and 2008 reflected that winter mortality.
The main lesson from the East Canyon Management Unit joins that of the infamous North Kaibab and many others that have fallen to the same fate (Mitchell and Freeman 1993). Simply, overpopulation of deer on winter ranges leads to overutilization of shrubs, followed by massive die-offs during severe winters, and results in reduced future carrying capacity of winter ranges.

**Balancing Deer Populations with Winter Range**

The Utah Division of Wildlife Resources has estimated the deer range for the East Canyon Unit at about 230,000 acres, with about 194,000 acres of summer range and 36,000 acres of winter range. Clearly, winter range is the limiting resource on this unit and comprises less than 16 percent of the total deer range.

The state’s goals for the East Canyon Unit are to maintain a winter population of 8,500 deer and a minimum post-season buck-to-doe ratio of 15 to 100. Using these goals, about 1,000 bucks would be expected to be annually harvested on the unit. The five years, 2003 to 2007, of harvests were roughly between 800 and 1,000 bucks, with the mean equaling 879. The antlerless deer harvest averaged almost 300, with the mean equaling 267, and comprised almost one-fourth of the total harvest. These figures suggest a good balance between total population and range carrying capacity, indicate a well-balanced harvest between buck and antlerless deer, and reflect conscientious game management decisions.

Deer management plans are flexible and can be adjusted to increase or decrease deer numbers as additional information becomes available. For example, the estimated balance between winter range carrying capacity and the 8,500 deer is a reasonable approximation. However, based on available winter range and past history, a winter population of 7,000 deer is possibly a better estimate of carrying capacity and greatly reduces the risks of overutilization of the winter range. According to my rule of thumb, with one wintering deer per five acres of average condition and productive winter range, the carrying capacity of the winter range is roughly estimated at 7,200 deer (36,000 acres divided by five acres per deer). Using my rule of thumb for practical and potential harvest percentages, at 7,200 deer, annual buck harvest would be estimated at about 850 (approximately 12 percent of population), and a maximum antlerless harvest of about 425 (approximately six percent of population), but more realistically due to other mortality factors, about 300.
Table 14-1. Number of hunters and deer harvest on the East Canyon Unit 1980-2008.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Hunters</th>
<th>Harvest</th>
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<td></td>
<td>Bucks</td>
<td>Antlerless</td>
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Mule Deer

Oak Creek

Located in rural central Utah and near the center of the mule deer range in Western North America, the Oak Creek Management Unit was strategically positioned for intensive studies of mule deer (Robinette et al. 1977). The relatively small size of the study area within the Oak Creek unit, about 53 square miles, along with drainage and topography typical for the Great Basin also made it ideal for studying mule deer, which it was, intensively, from 1946 to 1960. The study area was mostly within the Fishlake National Forest but also contained about four square miles of private lands and one square mile of Bureau of Land Management lands.

The Oak Creek Management Unit was comprised of about 200 square miles. Essentially all deer on the unit were contained year-round on the summer and winter ranges within the study area. Pinyon-juniper, big sagebrush and Gambel oak comprised the major vegetative types.

Harvest Decline

Between 1947 and 1960 the herd size was estimated to be between about 2,200 and 2,400 deer, using the three then available methods of pellet group counts, classification indices, and Lincoln-marked individual ratios. As a research note, winter population counts by horseback, foot, or airplanes were determined to be ineffective and inaccurate in determining total herd population. During the same period slightly over 200 bucks were annually observed at checking stations and a total kill of about 240 bucks per year or about 10 percent of the herd was harvested.

Note: A hunter harvest of bucks amounting to 10 percent of the total herd is a good estimate of maximum sustained potential buck harvest. About 200 does and fawns were also harvested each year from this unit, or about 18 to 20 percent of the herd was harvested per year. A hunter harvest of 20 percent of the total herd is approaching the limit for the herd to be able to sustain constant mule deer populations.

Due to several fires on subunit winter ranges soon after 1960, the population and harvest greatly declined. The same quality and quantity of summer range remained intact. The population was estimated at less than
1,000 deer in the early 1990s and has remained at about that level or below. Because of limited-entry hunting regulations beginning in 1990, changes in unit boundaries, and a greatly reduced number of hunters afield from usually between 1,000 and 2,000 before 1990 to considerably less than 500 after 1990, direct comparisons of harvest are not possible. However, the buck harvest since 1993 has remained at less than half of that observed in the 1950s, and the antlerless harvest has remained near zero.

The main lesson from Oak Creek is that wildfire destroyed a considerable portion of the winter range, the winter range has not recovered even after 20 or more years, and the herd size remains considerably below the population observed in the 1950s.

Note: Both the East Canyon and Oak Creek units suffered significant losses in winter range productivity. Once that productivity in winter forage quality and quantity is lost, the deer herd will be perpetually reduced until the range productivity is recovered. Depending upon climate, and a number of environmental variables, the recovery period for the winter range may vary from one or two decades to never.