Mule Deer

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Hunter Density

Hunter density or hunter crowding is a very important factor to almost all hunters in determining hunt quality. Hunter densities are simply calculated by dividing the rangeland acreage by the number of hunters afield. Hunter densities ranged from near zero to over eight hunters per square mile. Eight hunters per mile roughly translates to one hunter per 80 acres or about eight square city blocks.

Units with large acreage associated with desert winter ranges, such as the Southwest Desert, generally have low hunter densities. In the western half of Utah low hunter densities over the entire units are common. However, because hunters concentrate on the limited summer ranges contained on these units, actual hunter densities may equal or exceed densities on units having extensive summer range. Lowest hunter densities on extensive summer ranges occur on the North and South Slopes of the Uinta Mountains. Generally, the further away from the Wasatch Front a deer unit is located, the lower will be the hunter density.

Buck Harvest Density

The number of bucks harvested per square mile of combined winter and summer range can provide an excellent comparison between units of overall habitat quality. However, the comparisons become less reliable due to differences in hunting regulations between units and may also be skewed by the influence of variability in management effectiveness. Nonetheless, the buck harvest per square mile provides a useful index to year-round buck density as well as habitat effectiveness for maintaining mule deer.

Many units with limited winter range, such as South Slope or Plateau, show reduced productivity, whereas units associated with vast acreage of desert, such as Box Elder and San Juan, are low in productivity because of the lack of summer range. Some units, such as the Book Cliffs and Paunsaugunt, are low in productivity due to severe limitations of hunters.

In my opinion generally buck harvest density exceeding 1 buck per square mile should be considered excellent, between 0.99 and 0.50 as good, between 0.49 and 0.25 as fair, and less than 0.24 as poor. Units having high density indexes maintain a good balance between available summer and winter range, and demonstrate effective management
decisions. Thus, the combined northern region adjacent units of East Canyon, Chalk Creek, and Kamas probably provide the best combination of productive summer and winter range in Utah. The Central and Wasatch Mountains including Monroe and Panguitch Lake comprise the second most-productive combined units. The adjacent Cache, Ogden, and Morgan-Rich units comprise the third most-productive combined areas. Sustaining productive buck harvest on these three large areas must remain a high priority for deer management in Utah.

*Note:* The Fillmore unit, located in central Utah and close to the center of the range of mule deer in North America, represents the average of Utah’s deer units. Buck and antlerless harvest, hunters afield, hunter success, size of unit, hunter density, and buck harvest density are all very near the state average. In terms of buck harvest and hunters afield, the Central Mountains, followed by the Wasatch Mountains, South Slope, and Cache, are the most important units in the state.

**Buck Harvest and Hunter Success by Unit, 2006–2008**

Probably the most engaging data that the hunter, landowner, or wildlife manager examines all year is the buck harvest data for the area or unit of interest. Each year the data indicate the conclusion of the story of events effecting the deer population that occurred over the past year or years. An observant hunter, landowner or biologist can usually fit the puzzle pieces of weather, natality, mortality and hunting factors together in determining the positive or negative causes leading to the annual changes in the harvest data. Each unit has its own slightly different story, and the story for each unit usually changes from year to year. Generally, many factors are involved annually to define the changes.

Changes in harvest data by about five percent and sometimes up to ten percent may be attributed to sampling error of the harvest data, and generally should not be considered significant. In such cases populations and harvest may not be indicating trends or changes. Referring to the unit harvest data for 2006 to 2008 in Table 12-6, a few very simplified examples of the annual stories of harvest trends follows.
Table 12-6. Utah mule deer buck harvest and buck hunter percent success by unit, 2006–2008.

<table>
<thead>
<tr>
<th>Unit</th>
<th>2006 Harvest</th>
<th>%</th>
<th>2007 Harvest</th>
<th>%</th>
<th>2008 Harvest</th>
<th>%</th>
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<tr>
<td>Box Elder</td>
<td>1,433</td>
<td>35.3</td>
<td>1,482</td>
<td>41.3</td>
<td>1,059</td>
<td>29.8</td>
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<td>Cache</td>
<td>1,410</td>
<td>19.9</td>
<td>1,607</td>
<td>26.0</td>
<td>1,196</td>
<td>19.5</td>
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<td>Ogden</td>
<td>624</td>
<td>25.3</td>
<td>603</td>
<td>28.4</td>
<td>463</td>
<td>21.9</td>
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<tr>
<td>Morgan-Rich</td>
<td>701</td>
<td>33.1</td>
<td>1,082</td>
<td>43.6</td>
<td>417</td>
<td>19.7</td>
</tr>
<tr>
<td>East Canyon</td>
<td>857</td>
<td>23.4</td>
<td>1,003</td>
<td>29.3</td>
<td>454</td>
<td>14.1</td>
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<tr>
<td>Chalk Creek</td>
<td>887</td>
<td>45.7</td>
<td>872</td>
<td>45.8</td>
<td>466</td>
<td>27.8</td>
</tr>
<tr>
<td>Kamas</td>
<td>584</td>
<td>18.7</td>
<td>524</td>
<td>17.1</td>
<td>319</td>
<td>10.9</td>
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<tr>
<td>North Slope</td>
<td>816</td>
<td>32.2</td>
<td>761</td>
<td>25.4</td>
<td>599</td>
<td>19.4</td>
</tr>
<tr>
<td>South Slope</td>
<td>2,306</td>
<td>38.4</td>
<td>2,493</td>
<td>37.3</td>
<td>1,809</td>
<td>29.0</td>
</tr>
<tr>
<td>Book Cliffs</td>
<td>463</td>
<td>90.0</td>
<td>469</td>
<td>91.4</td>
<td>467</td>
<td>86.5</td>
</tr>
<tr>
<td>Nine Mile</td>
<td>472</td>
<td>37.8</td>
<td>463</td>
<td>30.2</td>
<td>391</td>
<td>30.9</td>
</tr>
<tr>
<td>San Rafael</td>
<td>215</td>
<td>29.7</td>
<td>265</td>
<td>31.4</td>
<td>214</td>
<td>32.8</td>
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<tr>
<td>La Sal</td>
<td>808</td>
<td>47.6</td>
<td>429</td>
<td>35.1</td>
<td>497</td>
<td>30.9</td>
</tr>
<tr>
<td>San Juan</td>
<td>1,358</td>
<td>49.8</td>
<td>818</td>
<td>44.8</td>
<td>1,216</td>
<td>47.7</td>
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<tr>
<td>Henry Mountains</td>
<td>28</td>
<td>100</td>
<td>32</td>
<td>88.9</td>
<td>41</td>
<td>95.3</td>
</tr>
<tr>
<td>Central Mountains</td>
<td>4,443</td>
<td>27.2</td>
<td>3,885</td>
<td>25.1</td>
<td>2,599</td>
<td>17.7</td>
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<td>Wasatch Mountains</td>
<td>2,799</td>
<td>22.2</td>
<td>2,929</td>
<td>23.4</td>
<td>1,876</td>
<td>15.1</td>
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<td>Oquirrh-Stansbury</td>
<td>883</td>
<td>29.5</td>
<td>772</td>
<td>28.8</td>
<td>611</td>
<td>25.1</td>
</tr>
<tr>
<td>West Desert</td>
<td>549</td>
<td>28.2</td>
<td>548</td>
<td>30.1</td>
<td>560</td>
<td>27.2</td>
</tr>
<tr>
<td>Southwest Desert</td>
<td>169</td>
<td>27.8</td>
<td>114</td>
<td>18.9</td>
<td>131</td>
<td>17.8</td>
</tr>
<tr>
<td>Fillmore</td>
<td>713</td>
<td>27.9</td>
<td>1,211</td>
<td>30.8</td>
<td>841</td>
<td>21.0</td>
</tr>
<tr>
<td>Beaver</td>
<td>1,142</td>
<td>32.6</td>
<td>1,185</td>
<td>32.8</td>
<td>959</td>
<td>29.2</td>
</tr>
<tr>
<td>Monroe</td>
<td>798</td>
<td>31.4</td>
<td>813</td>
<td>35.1</td>
<td>679</td>
<td>30.5</td>
</tr>
<tr>
<td>Mt. Dutton</td>
<td>254</td>
<td>36.5</td>
<td>268</td>
<td>35.6</td>
<td>275</td>
<td>31.1</td>
</tr>
<tr>
<td>Plateau</td>
<td>1,655</td>
<td>37.0</td>
<td>1,580</td>
<td>32.1</td>
<td>1,394</td>
<td>30.1</td>
</tr>
<tr>
<td>Kaiparowitz</td>
<td>73</td>
<td>37.4</td>
<td>76</td>
<td>35.3</td>
<td>48</td>
<td>22.9</td>
</tr>
<tr>
<td>Paunsaugunt</td>
<td>160</td>
<td>78.8</td>
<td>157</td>
<td>78.9</td>
<td>172</td>
<td>84.3</td>
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<tr>
<td>Panguitch Lake</td>
<td>1,041</td>
<td>30.6</td>
<td>1,151</td>
<td>31.8</td>
<td>1,052</td>
<td>29.7</td>
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<tr>
<td>Zion</td>
<td>1,019</td>
<td>40.8</td>
<td>962</td>
<td>38.0</td>
<td>749</td>
<td>34.4</td>
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<tr>
<td>Pine Valley</td>
<td>1,575</td>
<td>36.0</td>
<td>1,290</td>
<td>29.0</td>
<td>1,120</td>
<td>28.1</td>
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<tr>
<td>Unidentified</td>
<td>313</td>
<td>27.2</td>
<td>367</td>
<td>30.1</td>
<td>184</td>
<td>21.6</td>
</tr>
<tr>
<td>Statewide Totals</td>
<td>30,548</td>
<td>30.5</td>
<td>30,211</td>
<td>30.4</td>
<td>22,857</td>
<td>25.6</td>
</tr>
</tbody>
</table>

Several units responded to the moderately harsh winter of 2007–2008. During that winter on many units fawn mortality losses were significant and adult losses were noticeable, especially on many of the northern
region units. Thus the Morgan-Rich and East Canyon units decreased by 61 and 55 percent, respectively, in buck harvest between 2007 and 2008. These units apparently received the heaviest impacts from the winter storms. Adjacent and nearby units showed smaller declines with the Chalk Creek population down by 47 percent, Kamas by 39 percent, Wasatch Mountains by 36 percent, Box Elder by 28 percent, Cache by 26 percent, and Ogden by 23 percent. However, the West Desert just to the south of Box Elder unit showed no decrease in harvest, meaning the effects of the winter were probably negligible, and the data suggest this unit is maintaining a stable population. Many other units showed smaller decreases, mostly resulting from the winter.

The Book Cliffs unit shows a remarkably consistent harvest over these three years as a result of limited entry hunting. The consistent and very high success rates indicate bucks were abundant and hunters were likely very selective in their harvest. Perhaps the few hunters who were unsuccessful simply could not find a buck meeting their expectations. The unit could support a higher buck harvest, but the quality of the harvested bucks and the quality of the hunter experience would decline. The Paunsaugunt and the isolated Henry Mountains have similar stories.

In many cases only the observers in the field may be able to determine the story explaining the changes. Thus, the abrupt decrease in harvest between 2006 and 2007 on the La Sal and adjacent San Juan units and the abrupt increase the following year on the San Juan unit may only be able to be explained by local observers. Conversely, the Fillmore unit followed the opposite pattern with an abrupt increase from 2006 to 2007 followed by a decline the following year. As expected when deer herds are managed on a geographic herd unit basis, populations and harvest may react independently with little influence from adjacent units.
A research deer is shown browsing an apple sapling tree. Apple tree buds and twigs are a favorite winter food of deer. Browsing can lead to significant crop losses.
Determining Management Decisions
Misshapen and broken antlers are usually the result of injuries. Occasionally a hunter may miss and shoot off antler tines.
Chapter 13

Management Challenges

Primary Wildlife Responsibilities

The three most important and recurring challenges of mule deer management are:

1. Maintaining habitat quantity and quality.
2. Collecting sufficient data.
3. Balancing deer populations with available habitat.

The Utah Division of Wildlife Resources has expended a significant part of its time and monetary resources available to accomplish these three major goals. Since the 1940s, DWR has acquired more than 450,000 acres of wildlife habitat within the state of Utah for the purpose of wildlife management. Most of these purchases were acquired for winter range to maintain healthy and viable numbers of big game. However, these lands are also important for many other game animals as well as non-game species of wildlife. These wildlife habitats are managed primarily for wildlife survival and harvest, and only secondarily for other uses such as non-consumptive recreation, watershed protection, or livestock production.

Collecting the data necessary to determine population indices as well as the assessment of forages available within the various habitats is a major part of the yearly activity budget of time and money. This challenge and high-priority item is to collect at least minimum information on each deer unit every year. However, sometimes one or more data collections are deleted from work schedules due to heavy workloads in the wide variety of wildlife tasks delegated to too few biologists.

Using data analysis and field observation evaluations, the balancing of deer populations with available habitat remains both a science and an art. Data is essential in understanding population dynamics and range
conditions, but management requires subjective judgment with regards to antlerless harvest needed, weather, competition for resources, natality or birth rate, depredation, predation and other mortality losses, public perceptions, missing or incomplete data, political formats and necessary legislation, budget priorities, manpower priorities, and so on.

Besides these three major areas of concern—maintaining habitat, data collection, and balancing populations—many additional problems must be addressed by the wildlife agency. Indeed, most biologists would be overjoyed if their entire job consisted of data collection and habitat and population management. The importance of the various problems that DWR must face changes over time; however, the line-up of conflicts reaching center stage and the biologists’ desktop is continuous. This chapter addresses a few of the major concerns and problems.

**Hunter Management Strategies**

Because resources and deer numbers are limited by habitat, a perfect solution to hunter management, where all hunters are satisfied, simply does not exist. Between the extremes of no hunting and no hunting restrictions, which are both potentially disastrous to deer populations, countless generally workable and biologically acceptable strategies exist. Consequently wildlife managers in Utah favor alternatives which are believed to best serve Utah hunters as a group. The management challenge is to balance hunting opportunity with quality of the experience and still maintain necessary managerial income. Following are listed 11 of the more commonly perceived options available for hunter management along with the probable effects on harvest.

**Limit the Total Number of Licenses Sold**

Limiting license sales is the most obvious means of improving quality of the hunt, since fewer hunters afield means more bucks available, especially mature bucks, and more deer sighted in general. However, a large majority of hunters oppose the license fee increases that are necessary to offset decreased sales. By restricting license sales wildlife revenue is also restricted, which means fewer dollars for management programs and research. Restricting license sales results in a decrease in hunter harvest, but the decrease in harvest is highly variable and dependent upon many other factors that affect population dynamics. However, a limit on
sales establishes a long-term standard for minimum buck hunter success and for hunt quality, places a cap on statewide hunter density, and probably increases the demand for the license. As adopted, the overall effect creates an umbrella for a minimum quality hunting experience under which additional management options are available to further improve quality. Despite the pros and cons of the option, the 11 western states have been forced to take this approach due to declining deer numbers in recent years.

In the late 1980s most hunters believed the total number of hunters in Utah should be restricted by limited license sales at various identified levels (Austin et al. 1992). Almost two-thirds of hunters supported limiting hunter numbers by setting the upper limit at 200,000 total Utah deer hunter license sales. At that time, the current level of license sales was over 200,000 hunters, and the recommendation would have slightly decreased the number of hunters. Almost the same two-thirds majority supported placing limits at 150,000 buck licenses if antlerless licenses were available to hunters not able to obtain buck tags. In response, the Utah Wildlife Board set deer hunter number objectives beginning in fall of 1993 at 40,000 archers, 16,000 muzzleloaders, and 110,000 rifle hunters. Most hunters agreed with those objectives and preferred license sales limitations for each of the hunts. However, subsequently in 1994 the Wildlife Board established a hunter cap of 97,000 for general season deer hunters. That cap remained through 2004 and was changed to 95,000 in 2005.

**Number and Types of Hunts**

Total harvest as well as hunter pressure is increased with each added hunt. Potentially deer can be hunted from mid-August through December during six consecutive hunts: early depredation, archery, rifle, muzzleloader, post-season and late depredation hunts. DWR has responded to several reasonable hunter requests and gradually added hunting opportunities. Although the effects of hunter harassment on the vitality and health of deer has not been clearly defined, unpublished information from a Utah State University graduate study suggests potentially negative effects on deer physiology.

For example, in Utah I found that buck deer of the same age classes lost two to three percent of body weight between the opening and second weekend of the rifle hunt. In Colorado, hunting pressure resulted in deer moving into denser cover compared to deer in areas where hunting
was prohibited (Kufeld et al. 1988). Mule deer harassed by ATVs in fall suffered significant disruptions in their biology. Compared with deer not harassed, deer harassed by ATVs in the fall shifted feeding bouts into the dark hours of the night, more often used dense cover, departed from home ranges more frequently, increased flight distances from approaching vehicles, and showed significantly reduced reproductive success (Yarmoloy 1988). In my opinion, hunting, a necessary component of management, has some potential negative effects on deer physiology. These effects would likely become more stressful and exacerbated later in the fall during the November and December periods because of the decline in forage quality, cold temperatures, and snow cover.

**Season Length**

Extending the hunting period to longer seasons would have similar negative effects on deer physiology as adding increased numbers and types of hunts. However, extending seasons into the rutting period, beginning in early November, could lead to increased harvest because buck deer are often more interested in the does and less cautious toward hunters during the breeding season. Shortening the hunting periods would tend to have the opposite effect, but depending on hunter intensity may show no change in hunter effort. This was the result when the rifle season was shortened from 11 to 9 days. Hunters generally plan to hunt a certain number of days during the season; shortening the season, in most cases, simply forces hunters into a shorter time period to put in their desired number of hunting days.

**Limit Hunters to One Hunt**

This option, first adopted in 1993, initially reduced hunter pressure on bucks and resulted in a slightly lower harvest during at least the first two or three years of the program. A small but positive increase in the mean size and age of harvested bucks occurred. This option reduced hunter opportunity. However, since the number of bucks harvested is more dependent upon the number of bucks available and less dependent upon the number of hunters, the effects were not very observable.

**Limit Hunters to Harvest One Deer per Year**

Also adopted first in 1993, but rejected in 1994, this regulation reduced hunter pressure on bucks. A strong positive point is that hunters choosing
to harvest an antlerless deer would have an excellent opportunity to be successful. This option clearly limits hunting opportunity.

**Change to a Mid-Week Opening Day**

This would probably reduce opening day hunter crowding a little, but more likely, only lead to a five-day opening weekend, Wednesday through Sunday. Little change in harvest would be expected.

**Weapon Restrictions**

Restricting equipment, such as requiring the use of only sightless recurve bows, round balls and true muzzleloaders, rifles without scopes, or even limiting rifles to the traditional western lever-action 30-30 caliber, would make hunters less effective and would at least somewhat reduce buck harvest. In an unpublished hunter opinion poll, about 55 percent of hunters favored some units with weapon restrictions, thereby increasing the degree of challenge and difficulty in harvesting a deer. Weapon restriction hunts have not been attempted in Utah.

**Increase Fees**

Increasing license fees would reduce hunter numbers and have some effect on reducing total harvest. To maintain funding levels for wildlife management, license fees periodically need to be adjusted to maintain pace with the consumer price index.

**Access Management**

Restricted use of vehicles on public lands to main access roads would provide more areas of escape cover and refuge for deer. The likely result would be a reduced buck harvest on areas with vehicle restrictions. For example, experience with access restrictions at Hardware Ranch has been met with mixed hunter opinions. Many hunters complained initially of the road closures during the rifle deer hunt, but complaints essentially ended after only a few years, and support for the closures has gradually increased. The effects on buck harvest, however, have only been very minor.

**Hunter Training**

Beyond the required Hunter Safety courses, education of hunters about the management of deer and the ethics of hunting will have mainly
positive effects, especially if made mandatory. Among those probable positive effects would be a reduced illegal kill and wounding loss, higher hunter selectivity of harvested animals, and increased appreciation for care, cooking, and consumption of the harvested deer.

Restrict Individual Hunters to Units or Regions

Restricting hunters to certain geographical boundaries provides the best control of hunter density. However, since most hunters tend to hunt in many areas of Utah during the season, this restriction has had negative impacts, especially on families that live in different locations but that prefer to spend the hunting season together. This scheme, by itself, has had little effect on harvest. However, combined with limited license sales, it provides the greatest control for limiting buck harvest and for increasing the quality of the hunter experience and harvest totals.

Every deer manager knows that regulations do not exist that will make all hunters happy, nor do regulations exist that can be totally equitable to all hunters. The deer manager faces the daunting challenge of defining regulations which find a level of acceptable hunter satisfaction and somewhat equal opportunity for all hunters.

Depredation

Depredation occurs when big game animals begin feeding on commercial agricultural products. Damage from depredation happens only when crop production is decreased as a result of the depredation. Crop utilization usually results in costs and crop losses to the landowner, but not always.

Depredation by big game of alfalfa growing in fields during the summer was recognized as a problem before 1930 when deer numbers began to increase rapidly and the use of alfalfa fields, especially in southern Utah, became apparent. Use of winter haystacks in northern and central Utah was similarly first recorded about 1930, as was the use of orchards and other crops during the mid-to-late 1930s. To ameliorate at least part of the problem, the Utah Division of Wildlife Resources, formerly the Utah Department of Fish and Game, began building fences around highly impacted winter haystacks and providing some landowners with the materials to do so themselves.
Politics of Depredation

As big game populations continued to increase, so did the farmer complaints about the depredation problem. In 1947 the legislature passed Utah’s first wildlife damage law. This legislation was designed to reduce the economic losses incurred to farmers and permitted DWR to pay for big game depredation crop losses up to a maximum payment of $100 per year per landowner. More importantly, however, the law clearly indicated that the state of Utah, through DWR, accepted at least part of the responsibility for commercial crop utilization by big game. The maximum payment was increased to $200 in 1953, and abruptly raised to $2,000 in 1977. The maximum payment amount was later eliminated, making DWR responsible for all crop damage which was properly claimed by landowners.

Agency Costs of Depredation

The budget for depredation is significant and rising. Prior to 1977, monetary expenditures and the number of claims from private landowners were small, with the number of claims per year generally less than 15 and total program costs per year less than $30,000. However, since 1977, the costs of maintaining the required depredation program increased over 10 times and annual costs exceeded $600,000 per year.
These costs are about equally divided between direct payments to landowners, fencing purchases, and personnel costs to address the problems and work with landowners.

Commercial agricultural products which are considered for crop loss payments include alfalfa hay, grass hay that is mechanically harvested, cereal grains, stored crops, orchards, vineyards, tree plantations, row crops, and commercial nurseries. The three major areas of big game agricultural depredation conflicts are field-growing alfalfa hay in spring through fall, green leafy cereal grain grass in early spring and often again in fall, and orchards, especially apple trees, in winter. Almost all depredation activity occurs at night.

**Common Depredation Solutions**

There are six solutions to the problem of depredation that are commonly used in Utah.

(1) In some cases, the best solution is simply to harvest the animals doing the damage. The preferred option is to issue depredation permits to hunters. A second option is to assign DWR personnel the task of removing the deer. This is usually accomplished most efficiently by wildlife officers using spotlights at night. Landowners dissatisfied with the DWR response may file the required paperwork and kill big game doing damage to their crops. The landowner is required to notify DWR of the harvest, and DWR is responsible for the removal of the carcasses. Although this option often leads to increased conflicts between the state and the landowner, sometimes it becomes the only workable option available to the landowner. In one infamous case in northern Utah, a single landowner killed at least 168 deer in alfalfa and wheat fields over the course of one winter. However, when under a revised DWR depredation program the same landowner began working with the new local biologist and allowed hunters, friends, and family to harvest the deer, the number of offending deer killed by the landowner was reduced to zero within two years.

(2) Sturdy, permanent fences built to a height of eight feet are very effective in repelling deer. The DWR provides some fencing materials to growers who are very susceptible to deer
damage. Such materials become the property of the landowner, and it also becomes the responsibility of the landowner to construct and maintain the fence. Temporary, lightweight plastic fencing is also available from DWR to some growers. Plastic fence is usually used to protect haystacks during winter, and usually the material remains the property of DWR. Fencing is a viable solution for orchards vulnerable to depredation and other crops at some locations. Fencing provides workable compromise solutions between wildlife and agricultural interests.

(3) If depredation is expected to be very temporary, sometimes deer can be kept out of agricultural crops by repellents and scare devices. Repellents are commonly used in orchards and include several commercially available sprays, scents, and human hair. Human hair, usually available at no costs from barber shops and placed in nylon bags or stockings, has often been found to work as effectively as commercial repellents. Repellents usually work well when deer have alternative forage sites available. However, repellents have only minor effects when deer become hungry.

Scare devices include propane canons and firecrackers. They will often move deer to nearby, alternative locations if forage conditions are comparable. Scare devices are effective for only a few days, at best, and when deer are not limited in choice in feeding areas.

(4) Occasionally wildlife officers or biologists, working at night, herd deer away from crops. The use of horns, shotguns, and lights are effective in moving deer. However, deer usually return within a few hours after the horns, shotgun bangs, and lights have departed.

(5) Although deer can be trapped or tranquilized and moved to other locations, trapping is often unsuccessful because of difficulties in capturing a high percentage of the population, extremely high costs, and its general ineffectiveness as a long-term solution. For example, it has been estimated that only up to about 25 percent of any deer population can be live-trapped, primarily due to the behavior adaptability. Consequently, live trapping is only attempted under special circumstances.
When deer depredation cannot easily be controlled and crop loss has occurred, the grower can be compensated for the damage by DWR. Specific guidelines for evaluating crop damage, based upon current available research for each type of agricultural crop, are used by DWR for evaluation (Bartmann 1974; Katsma and Rusch 1980; Tebaldi and Anderson 1982; Austin and Urness 1987, 1989, 1992; Austin et al. 1998). Occasionally, the use of a third party to determine the losses is necessary when the landowner and the state cannot agree on a fair settlement. Although damage to landscaped yards, ornamental plants, and non-commercial orchards may be significant, DWR is not responsible for those losses (Austin and Hash 1988).

**Relationships with Private Landowners**

Wildlife advocates and private landowners share the common goal of appropriate management of rangelands in terms of proper forage utilization, watershed protection, water development, erosion control, animal production, weed control, and many others. Both parties rely on the resources of the land to produce many products. Private lands are important to Utah deer hunters as they provide some of the best hunting in the state. Furthermore, an estimated 15 percent of Utah resident hunters hunt deer on private lands (Austin et al. 1992). Many of Utah's landowners have recognized the economic values of big game on their lands and have been incorporating trespass fee hunting for many years, and sometimes for decades, to take economic advantage of the resource. Because private lands provide critical forage and habitat for wildlife, the DWR generally supports private land fee hunting. Fee hunting provides economic incentives for better wildlife management on private lands and usually results in livestock practices more favorable to wildlife. On private lands where fee hunting is not feasible because big game are not available on those lands during the hunting seasons, DWR and landowners must seek alternative cooperative avenues.

In 1986, landowners involved with fee hunting achieved net mean revenue of $6,649 (Jordan and Workman 1989). Although 18 percent of landowners experienced a net loss, three percent indicated that more than 50 percent of their gross income resulted from fee hunting. Fees for unguided deer hunting ranged from $5 to $2,000 with a mean of