

## APPENDIX I

### Deer Survey Techniques in the Trans-Pecos Region

#### Why count deer?

There are a number of reasons why a landowner might want to conduct a deer survey. The type of information needed regarding a given deer herd will be dictated by the management objectives on the ranch. Survey results can be used to determine an appropriate harvest intensity, which is essential in preventing the overharvest of a deer herd. In areas where white-tailed deer numbers are relatively high, survey results may be used to determine the appropriate doe harvest intensity to maintain deer numbers at or below carrying capacity. Some managers who operate hunting leases may be interested in evaluating the age and/or quality of bucks on the ranch prior to marketing their hunts (to determine number of hunters or lease price).

#### Survey Techniques

There are three deer survey methods with broad applicability in the Trans-Pecos Region. These survey techniques include: 1) fixed-wing aircraft, 2) helicopter, and 3) the mobile spotlight survey. Using a small, fixed-wing plane allows the observers to cover a lot of country in a relatively short period of time, and the method is less expensive than using a helicopter. However, fixed-wing aircraft are used infrequently relative to the other two methods because a large proportion of the deer are missed by the observers because of the speed and altitude necessary to safely conduct a survey. The problem of overlooking deer is magnified with increasing brush canopy and ruggedness of the terrain. As a result, deer surveys using fixed-wing aircraft generally result in lower deer density estimates than either of the two other survey techniques. Fixed-wing planes have their greatest applicability in relatively open and flat to rolling terrain.

The mountainous terrain of the Trans-Pecos Region, coupled with a semi-desert climate (frequent drought), present some survey challenges that do not exist in most other areas of Texas. For example, mountains can be problematic for mobile spotlight surveys in preventing vehicle access. In addition, deer concentrations that frequently exist in mountainous areas can cause sampling problems (deer distribution is influenced by environmental factors such as predators, woody cover, and changing forage conditions that are associated with elevational differences). Under drought conditions, deer herds will concentrate near watering sites, resulting in temporary shifts in deer distribution. Localized thunderstorms can produce isolated areas of forage green-up, which often results in deer concentrations and major shifts in distribution. When any of these unique challenges exist, special care must be taken to avoid biased or erroneous survey results. In certain situations, a given survey method may not be appropriate or produce reliable information. Factors to consider when determining the most appropriate survey method for your ranch include: 1) type of information needed, 2)

brush density, 3) terrain, 4) the road system on the ranch, 5) effects on deer distribution (crops, water, feeders, etc.) and 6) finances.

The two most common deer survey techniques in the Trans-Pecos and western Edwards Plateau are the spotlight survey and the helicopter survey.

## **SPOTLIGHT SURVEY**

### **Methodology**

The spotlight survey technique involves sampling a portion of a property to produce an estimate of the deer density on the entire ranch. More specifically, the method involves counting deer from the bed of a pickup (or elevated seat), using two spotlights (200,000 to 500,000 candlepower is adequate). Two observers shine the lights from either side of the truck while the driver maintains a speed of 8-10 mph (rough terrain will require slower speeds). Surveys should be initiated about 45 minutes after sunset and should be limited to less than 3 hours. Long routes that require more than 3 hours to complete can be conducted in sections on successive nights. Visibility estimates (distance that deer can be seen) on the right and left of the truck are taken every one-tenth of a mile for use in calculating the observed acreage. A maximum distance of 250 to 300 yards should be used, depending on light intensity and quality of optics (deer must not be confused with pronghorns, livestock, or exotics). Visibilities may be taken at night when conducting the initial count or during the day prior to the survey. If visibilities are taken during daylight hours, a laser rangefinder can help improve observer accuracy at the longer distances. Total numbers of observed deer are recorded while binoculars are used to identify bucks, does, and fawns within about 150 yards of the truck. Attempting to identify sex and age of deer beyond that distance will result in errors or biased data (spike bucks recorded as does, or fawns confused with does). The average width of the route is multiplied by the length of the route to produce the observed acreage<sup>1</sup>. The observed acreage divided by the total number of deer observed provides an estimate of the deer density (acres/deer). Deer identified as bucks, does, and fawns are used to calculate the buck:doe ratio and fawn survival. Daytime observations of deer can help to increase the sample size and improve accuracy of the fawn crop and sex ratio estimates. These should be conducted whenever possible during late summer and early fall.

To obtain a reliable count using the spotlight technique, it is extremely important to establish the route through each habitat type on the property. Because it is a sampling technique, it is necessary to establish the route through various habitats or vegetation types in approximately the same proportion that they are present on the ranch. Conducting the survey through areas where most of the deer are normally seen can result in a biased (too high) population estimate. A soils map and a topographic map can be valuable tools when evaluating an appropriate location for the survey route.

---

<sup>1</sup> [Length of route (miles) x 1,760 yards/mile] x [Avg. visibility right (yards) + Avg. visibility left (yards)] divided by 4,840 square yards/acre = Acres Observed

Because of variability in deer movements from night to night, spotlight surveys should be conducted on 3 separate nights. One of the optimum times to conduct spotlight surveys is during late August, September and October, when bucks have hardened antlers and fawns are old enough to be following does. Important post-season information can be obtained on spotlight surveys in January. Visibilities are generally greater in winter (after leaf-drop) than in late summer; therefore, winter surveys have the advantage of increased acreage observation. However, it is generally necessary to conduct separate visibilities for late summer vs. winter surveys.

### **Strengths and Weaknesses**

One of the greatest strengths of the spotlight survey method is its ability to provide fairly accurate estimates of deer numbers when the technique is conducted within the intended assumptions. At night, when deer are up and feeding, it is very easy to observe deer because of the reflective nature of their eyes. However, spotlight surveys tend to be less accurate in their estimates of sex ratios and fawn survival. There are several reasons for this, one of which is the generally low sample size associated with many deer counts in West Texas. Daytime observations conducted by the ranch manager can increase the sample size and help to improve the reliability of sex ratios and fawn crops. Another problem with night time observations, especially with inexperienced observers, is the tendency to “miss” small antlers such as “spikes” and classify these deer as does and to confuse fawns and does. It is critical to have good lights and to use quality optics when attempting to classify deer as to sex or age. First-time observers are encouraged to “look for spikes on every deer”. In most deer herds, there are more yearlings (1.5 years) than any other age class of bucks. And in West Texas, there is normally a relatively high proportion of “spikes” in the yearling age class. If at least a few spikes are not observed during the survey, it is likely that some young bucks are being classified as does. A general rule that will help to minimize classifying errors is to only classify deer within a certain distance of the vehicle (150-175 yards). Deer beyond that distance should be recorded as “unidentified”, because classifying deer beyond this distance will invariably result in errors. It may be fairly easy to identify a 10-point as a buck at 200 yards, but the survey will be biased if all large bucks are identified, and all other deer are recorded as “unidentified”.

One of the basic requirements of an accurate spotlight survey is a good road system on the ranch. The survey route should traverse most pastures and sample representative portions of each habitat type. When selecting an appropriate route, a general “rule of thumb” to remember is that at least 10% of the ranch should be observed during the survey. Another basic assumption is that deer are randomly distributed within a particular habitat type. Naturally, deer will be attracted to certain habitat types more than others, and this fact is unimportant because each habitat type is proportionately sampled. The point of caution concerns deer concentrations. For example, reliable spotlight counts are generally not possible when deer are concentrating on crop fields such as wheat, oats, alfalfa, etc. The best and perhaps only way to obtain a good count is to conduct the survey prior to crop emergence (not possible with perennial crops such as alfalfa). During drought, deer will tend to concentrate in the general vicinity of

watering sites. The survey will tend to overestimate deer numbers if the route is established near many of the watering sites. If the water locations are completely avoided, deer numbers will tend to be underestimated. Although the deer herd will immediately redistribute following precipitation and the emergence of annual forbs and grasses, waiting for rain in the Trans-Pecos is seldom fruitful. The next best option is to establish the route near a few water locations (proportional to the ranch acreage observed) while avoiding most, recognizing that the results may be unreliable. The location of the survey route relative to watering sites is generally irrelevant under favorable forage conditions (deer will be widely distributed).

Costs associated with spotlight surveys include 2 spotlights (\$20-30 each), binoculars, truck operating expenses, and labor (~3 hours x 3 people x 3 nights).

## **HELICOPTER SURVEY**

### **Methodology**

The helicopter survey technique may involve surveying the entire ranch or sampling only a portion of the property (eg., 50% or 33%). The figures from a partial count can be extrapolated to the entire ranch. The most commonly used helicopters for game surveys in the Trans-Pecos are the Robinson R22, Schweizer 300, and Enstrom F28. These relatively small helicopters have excellent visibility and maneuverability, with a survey crew consisting of the pilot and the passenger. Larger jet helicopters may be used, which have the advantage of carrying additional observers, but they are much more expensive to operate and visibility is often limited.

Aerial surveys should be conducted during early morning and late afternoon when temperatures are cooler and deer are most active. Most deer will be bedded from mid-morning through mid-afternoon, and surveying during this time will result in a relatively poor count. Cool weather can extend the survey flight time, as deer will remain active throughout much of the day. An altitude of 40-60 feet should be maintained. In relatively dense juniper or mesquite, the flight speed of the helicopter should be maintained at about 35 mph. In fairly open country that exists across much of the Trans-Pecos, the air speed can be increased to about 45 mph. A lot of deer will be missed if flight speeds exceed 50 mph.

Deer and other animals of interest (javelinas, feral hogs, turkeys, quail, predators, etc.) are counted within 100 yards of the flight path of the helicopter (a 200-yard observation strip). Ranches with extremely dense brush and trees will require a narrower observation strip (100-150 yards), while very open country may allow a wider observation strip (i.e., 300 yards). The use of a global positioning system (GPS) will improve the accuracy of transects and allow easier calculation of the observed acreage (72.7 acres/mile @ 200 yard strip-width). Deer are classified by species (whitetail vs. mule deer) and categorized as bucks, does, and fawns. Generally, bucks are further categorized into "age" or "quality" groups (i.e., spikes, small forked, medium forked, and mature).

Mountainous terrain can sometimes be surveyed more effectively along elevational transects rather than linear transects. A common practice is to survey the “bottoms” first and gradually work up the mountain because most deer will run down the mountain toward the brushy bottoms when flushed (deer may be counted twice if lower and upper elevations are surveyed in reverse).

### **Strengths and Weaknesses**

The helicopter survey technique is a very good indicator of the deer herd sex ratio and is generally a good estimator of fawn survival, especially if conducted several months after the peak of fawning (when virtually all fawns should be following does). Another advantage of helicopter surveys is that they allow an evaluation of buck age and/or quality because a relatively large proportion of deer are observed compared to other techniques. In addition, helicopter surveys can provide population trends of other wildlife species (eg., quail, predators, elk, aoudads, etc.), some of which are difficult to survey by any other means (eg., Rio Grande turkeys, javelinas, and feral hogs).

Helicopters surveys are considerably less effective in determining accurate wildlife numbers, including deer. Numerous studies have demonstrated that only a portion of the deer in the flight path are observed (40-85%), which is largely dependent on brush density and the canopy cover of trees and brush. Other factors that will affect deer movement and observability are temperature, wind, and altitude and speed of the helicopter. Ruggedness of the terrain is another important variable affecting deer observability.

Because deer numbers are usually (if not always) underestimated using the helicopter survey technique, harvest recommendations tend to be very conservative. This is generally not a problem in west Texas if land managers are simply interested in producing mature bucks and maintaining deer numbers. However, when land managers are attempting to improve their income through deer hunting, extremely conservative recommendations can translate to dollars lost. The opportunity to harvest mature bucks is foregone, and this opportunity is replaced by considerable natural mortality of adult deer. Another problem with underestimating deer numbers exists in the western Edwards Plateau and portions of the eastern Trans-Pecos, where white-tailed deer herds commonly exceed the carrying capacity of the land (low coyote numbers and high fawn survival). Conservative doe harvest recommendations will only result in the perpetuation of the problem.

Costs associated with helicopter surveys include flight time (\$300/hour for 2-person helicopter; \$550-600/hour for 4-person jet helicopter), trailering fee (\$1.50-2.00/mile one-way), and labor (1 person x flight hours @ 2,000-3,000 acres/hour).

### **Summary**

Spotlight surveys are relatively inexpensive to conduct and can provide good estimates

of deer numbers if conducted within the assumptions previously described. However, they require more time than a helicopter survey, and estimates of sex ratios and fawn survival tend to be unreliable. This is partially because of the relatively small number of deer observed along the route and because of differences in behavior and movement by bucks, does, and fawns. Helicopter surveys produce more reliable estimates of buck to doe ratios and fawn crops, allow population estimates of other wildlife species, and allow the land manager to evaluate the age and/or quality of his buck segment. However, annual helicopter surveys can be expensive, and they tend to underestimate the number of deer on the property by 15-60%. The survey technique that is most appropriate for a given ranch will depend directly on the type of information that is most critical to achieving the deer management objectives. Each survey technique has strengths and weaknesses in estimating certain herd parameters, but more importantly, either technique can be used to effectively manage a deer herd through annual monitoring of deer population trends.