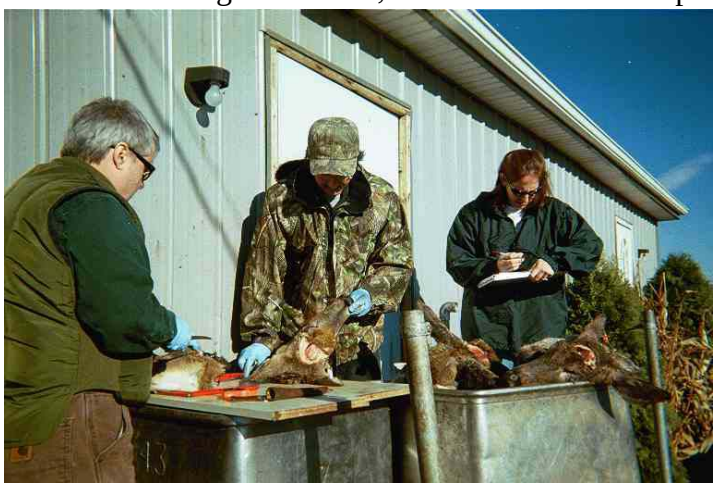
Seeing the Whole Picture

Estimating Deer Harvests

Counting the number of deer harvested each year is a basic part of deer management. In Pennsylvania, this task is enormous. The annual deer harvest involves hundreds of thousands of hunters, harvesting hundreds of thousands of deer over 4 months of deer hunting seasons across 45,000 square miles.

Each year more than 30 data collection teams examine deer across the state looking at 25,000 deer, on average. Data collected include age, sex, location of harvest (Wildlife Management Unit [WMU], county, and township), and hunting license number from ear tags. While teams are out collecting these data, successful hunters report their harvest through report cards, the internet or the telephone, which--like check stations--provides the Game Commission with a count of the number of deer those hunters report. However, when those 25,000 deer examined by teams are compared to reports submitted by hunters, a substantial number of those deer are missing from the reports. If the Game Commission considers only reported deer as those harvested, we are only seeing part of the picture. What about all those deer that were physically touched by a deer ager for which there is no report? Those deer are part of the harvest, too. With less than 40% of hunters reporting their harvest, should the Game Commission turn a blind eye to those deer harvested but not reported by a hunter?



The Game Commission doesn't ignore these unreported deer harvests. Using the information collected by those 30+ data collection teams, the Game Commission can calculate reporting rates, which, in fact, vary by year, antlered and antlerless deer, and WMU. These unique reporting rates allow the Game Commission to estimate the number of deer harvested but not reported by hunters. This is a science-based method used to estimate the total deer harvest.

To collect the needed information requires a substantial investment of personnel and resources. But the importance of precisely estimating the annual deer harvest is worth this effort. This data used for this procedure include:

1. The number of deer harvested AND reported by hunters on report cards
2. The number of deer examined by Game Commission deer aging teams
3. The number of deer examined by Game Commission deer aging teams AND reported by hunters.

With this known information, the deer harvest can be estimated by comparing what is known with what is not known as depicted by the equation below.

$$\frac{\textit{Number examined \& reported (\#3 above)}}{\textit{Number examined (\#2 above)}} = \frac{\textit{Number harvested \& reported (\#1 above)}}{\textit{Number harvested}}$$

Here is an example. If hunters reported 5 of the 10 deer examined by Game Commission deer aging teams, and hunters reported a total of 50 deer then,

$$\frac{5}{10} = \frac{50}{\textit{Number harvested}}$$

For this example, the *Number harvested* equals 100 deer. The equation used in this example is a basic mark-recapture procedure. When estimating deer harvests, the Game Commission uses a slightly different version of the mark-recapture equation that has been shown to be better statistically than the basic equation.

The Game Commission has and continues to monitor the performance of its deer harvest estimating procedures. For example, in 2003, the Game Commission completed an evaluation of its data collection and harvest estimating procedures. This evaluation was submitted to a scientific journal for an independent, scientific review by professional biologists and statisticians. Based on this review, the techniques used by the Game Commission were considered scientifically valid and published in the October 2004 issue of *The Journal of Wildlife Management*.

There is no practical method that can count every deer harvested in Pennsylvania without 100 percent cooperation from hunters. However, with the use of this mark-recapture procedure, we are able to see more than just a corner of the deer harvest picture.

For more information of harvest estimation and the deer management program, visit the Game Commission website and see the current deer management plan, *Management and Biology of White-tailed Deer in Pennsylvania 2009-2018.*