Collecting Data to Manage White-Tailed Deer

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Many hunters and hunt clubs practice quality deer management (QDM) on their properties; however, the level of involvement in QDM varies, and the level of QDM and techniques used varies by property based on the hunter, landowner, or hunting club's goals. Some clubs impose antler restrictions of various kinds, while others focus on doe harvest, food plots, camera surveys, habitat management, or a combination of these. All of these activities are an important part of taking an active role in managing and potentially improving local deer populations. But how do you know if it's working?

Surprisingly, many hunters and hunt clubs do *not* know whether their QDM program is working. While some hunters may think or feel that their deer herd is doing better, wouldn't it be worthwhile to know if the investment in habitat improvement and harvest management is paying off? Many hunters and landowners invest thousands of dollars and a great deal of time each year managing deer but forget the most essential part of any QDM program, which is collecting data from harvested deer. This data helps deer managers make decisions about how to better manage their deer populations.

There are a number of techniques for gathering information about local deer herds, including trail cameras, spotlight surveys, hunter observations, drive counts, pellet counts, browse surveys, and harvest data. Information from any of these sources can be helpful in understanding the health of local deer herds; however, harvest data should be a mandatory part of any QDM plan. For example, density is difficult to measure accurately and changes constantly throughout the year and from year to year, and density is not always a good indicator of herd condition. Many other factors, such as soils and habitat quality, play an important role in determining deer health at any given density. Data must be collected directly from animals to best assess herd condition, and collecting and analyzing harvest data is the most simple and convenient way to accomplish this. Success in deer management partly depends on the data collected and the use of that data to make adjustments to your QDM program.

Figure 1. Data collection is required to make sound management decisions.

Collecting and Using Data

Collecting data from harvested deer is easy and takes little time to accomplish. The goal is to document several characteristics of the deer herd as a whole; therefore, it is important to collect data from every deer that is harvested, including bucks, does, and fawns, and to collect data each and every year. There is considerable variability in deer weights from year to year, and several years of continuous data are required to determine trends in deer herd condition.

In figure 3 of 1.5-year-old-doe weights, for any given 2- to 3-year period, a different story could be told regarding the condition of does on the property (increasing or decreasing). However, over the course of the 10 years, it is clear that the trend in doe weights is steadily increasing.

Figure 2. Is your deer management program working? You won't know unless you collect data from the deer you harvest.

Several uncontrollable factors may be responsible for short-term highs and lows in a data set. For example, mast production (such as acorns, persimmons, muscadines) may have been above average, resulting in heavier deer in 2001. Conversely, a severe drought in 2002 may have stunted natural browse, causing a decline in deer weights from 2001 to 2003. These are just some of the environmental factors, other than a QDM program, that may influence year-to-year deer weights. As a result, it will take several years of data collection to uncover underlying trends in deer condition.

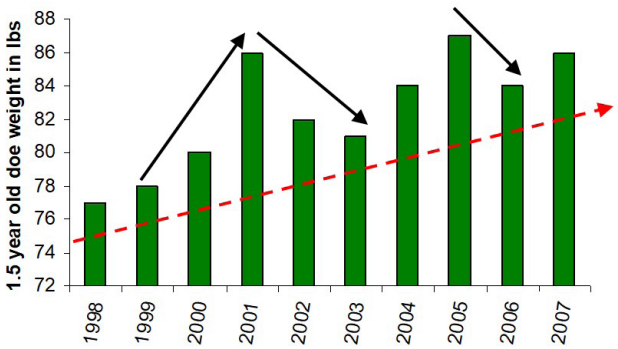

Figure 3. Several years of data are necessary to determine changes in the deer herd.

What to Collect

There is much data to collect, so use a data sheet such as the one provided at the end of this publication to document the data collected. Doing so helps ensure that all necessary information is collected from each deer in a consistent manner. Equipment needed for data collection are a hanging scale, a jawbone extractor, loppers or pruning shears, deer data tags, and wire. The data to collect includes the date of harvest, the harvest location, the hunter's name, the deer identification number, the deer gender, age, and weight, the lactation status of does, and the antler size of bucks.

The **date of harvest** must be recorded in order to effectively analyze data and detect potential trends. Body weights often fluctuate throughout the hunting season, and bucks can lose up to 20 percent of their body weight during the breeding season. Data analyses that do not account for date of harvest can, therefore, generate misleading information. Knowing the date of harvest is also necessary when examining reproductive data, such as lactation, from does.

Knowing the **harvest location** of each deer is helpful for looking at differences across large properties and may also indicate where the hot spots are on a property, or at least where hunting has been concentrated. Whether you name landmarks or divide the property into sections, it is important to record the harvest location for each deer harvested on large tracts.

The **hunter's name** is important to record in case any questions arise, such as discrepancies in the data that is recorded. If guests frequently hunt the property, it may be worthwhile to also include their phone number or email address.

Assign an **identification number** to each deer harvested. Number the deer consecutively to simplify recordkeeping. Keep in mind that you will be collecting harvest data for several years, so you need to create a numbering system that will allow you to uniquely identify harvested deer from many seasons. An example of a numbering system is to use the year the season begins followed by a number that shows the order in which the deer were harvested. The number 901 would be the first deer harvested in the hunting season that began in the fall of 2009, for example. If you harvest more than 100 deer, you may want to number the deer as 2009-001, 2009-002, and so on. Another numbering system similar to the one above also uses a unique identification number but ends in a B for buck and D for doe. The first doe harvested would be 2009-001D, and the first buck harvested would be 2009-001B. Record this identification number on the data sheet and on a deer data tag, and attach the tag to the extracted jawbone immediately after extraction.

The deer's **gender** must be known so that the weight data can provide meaningful information. Weight data should be examined separately for bucks and does because bucks typically weigh more than does do. Knowing the gender of the deer harvested will allow you

to track and review your data and assess the trends of antlerless harvest efforts and the ratio of bucks to does in the harvest.

Knowing a deer's **age** is necessary in analyzing data such as weight and antler characteristics. Because antler size and body weight typically increase with age, it is common for deer managers to examine trends in body characteristics for particular age classes of deer. The age of a deer is determined by extracting the jawbone and examining the teeth, the process of which is covered later in this publication. The number and type of teeth are used to determine the age of younger deer, and tooth wear is used to age older deer. One side of the jawbone is usually sufficient for aging, but both can be collected if there is concern that injury or uneven wear patterns will affect the accuracy of aging.

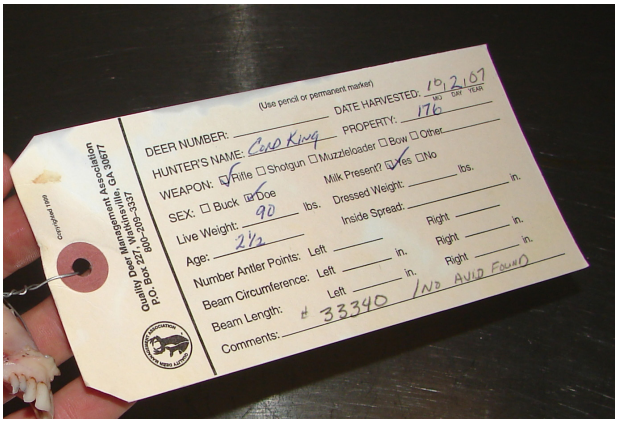

Figure 4. Tags are used to link entries on the data sheet to jawbones that have been collected.

Figure 5. Remove the jawbone, and tag it immediately after removal.

One of the most important measures used to assess a herd's condition is body weight, which must be recorded by age class for every deer harvested. Use hanging scales, as shown in figure 6, to weigh all harvested deer. It is best to weigh each deer before field dressing; however, if deer are weighed after field dressing, their approximate weight can be estimated using the chart in figure 7. Regardless of whether deer weight is measured dressed or predressed, note the weighing method and be as consistent as possible, as inconsistencies will impair your ability to draw logical conclusions about the condition of your herd.

Figure 6. Use a hanging scale to weigh all harvested deer.

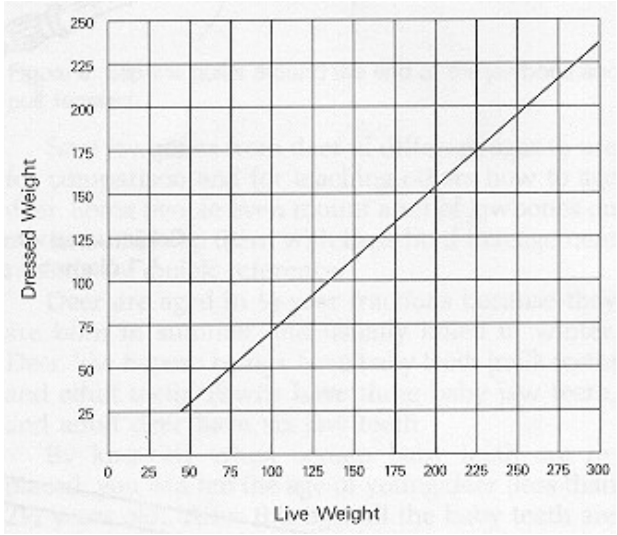

Figure 7. Estimating live weights of dressed deer.

Lactation status, or whether the deer was lactating when harvested, can be an indicator of the nutritional condition and productivity of the herd. Does harvested early in the season are more likely to have fawns young enough to still be nursing, so squeezing a teat may discharge milk. However, later in the season and when does are drying up, it becomes necessary to cut into the udder to determine whether the doe had been lactating. The presence of yellowish to brownish liquid indicates that the doe was lactating that year. It is good practice to cut into the udder of every doe to confirm lactation status and thereby minimize the likelihood of incorrectly assigning lactation status.

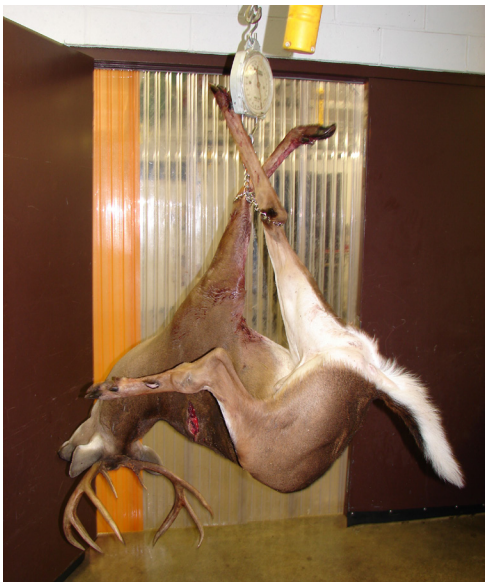

Figure 8. Chaining a front leg to the opposite rear leg before hoisting the scale aids in reading the weight.

Figure 9. Lactation is easily determined by squeezing a teat in the early hunting season but often requires that the udder be cut into as the hunting season wears on.

Antler measurements must include the number of points on each antler as well as the basal circumferences of both main beams, the lengths of both main beams, and the inside spread of the antlers. Additional measurements, such as the lengths of individual tines, the circumferences of the tines, and the overall Boone & Crockett (B&C) score, can be recorded. Measure antlers using a flexible measuring tape to the nearest 1/8 inch (a simple ½-inch-wide flexible sewing tape works well). On properties where yearling bucks are harvested, it is important to record the diameter of yearling antlers measured 1 inch above the burr. The diameter of the antler can be calculated from the circumference measurement by dividing the circumference by 3.14.

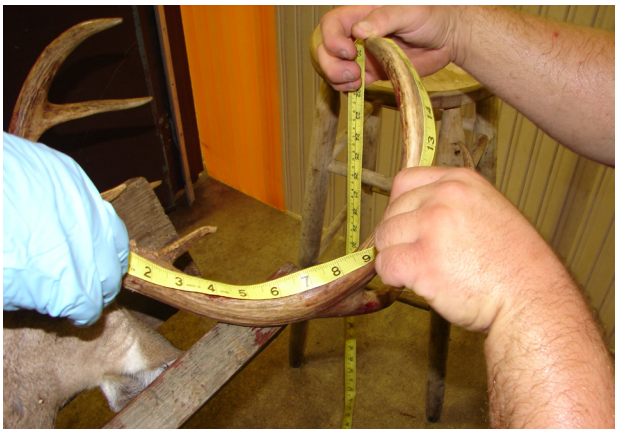

Figure 10. Use a tape to take antler measurements to the closest 1/8 inch.

Record any other pertinent data that is not included in any of the other categories on the data sheet, for instance, poor body condition, injuries, or signs of parasites and disease, in the comments section of the sheet.

Extracting A Jawbone

As mentioned, the age of a deer is determined by extracting the jawbone and examining the teeth. One side of the jawbone is usually sufficient for aging, but both can be collected if there is concern that injury or uneven wear patterns will affect the accuracy of aging. A lower jaw can be extracted using a knife and saw, but it is much quicker and easier to use a jawbone extractor and set of long-handled loppers or pruning shears. Jawbone extractors can be purchased for about $20 from a forestry supply company, or you can have a welder make a jawbone extractor using the dimensions shown in figure 11.

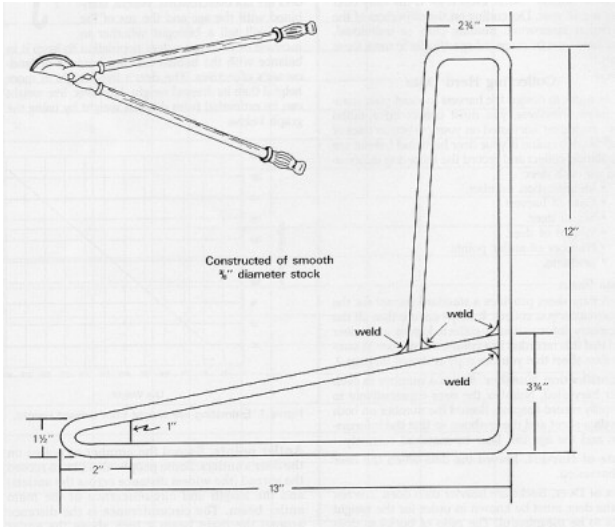

Figure 11. A jawbone extractor can be purchased or can be fabricated using smooth 3/8-inch-diameter rod stock.

Removing one of the jawbones is a fairly simple process, as shown in figures 12 through 17, and will not destroy the head, even if you plan to have it mounted because taxidermists do not use it in mounting. The first steps involve using the loppers to cut the back of the jawbone. Use the extractor to separate the skin from the jawbone up to the diastema (the section of the jaw with no teeth between the molars and incisors), and then use the loppers to cut the jawbone at that point. This ensures that you do not accidentally tear the lip by extracting the full jawbone.

Figure 12. Pry open the mouth if necessary.

Figure 13. Insert and twist the jawbone puller to loosen the muscles and membrane between the teeth and cheek.

Figure 14. If you are unfamiliar with the location of the jawbone and teeth, it may be necessary to use a knife to cut the cheek skin to fully expose the jawbone. However, if the deer is to be mounted, do not make this cut.

Figure 15. Use the loppers to cut through the back of the jawbone, but be careful not to break the tops of the back teeth as those are necessary for aging the deer.

Figure 16. After cutting the jawbone, insert the smaller, rounded end of the extractor through the cut. Using your fingers, push the back point of the lower jaw through the small end of the extractor. Loop the small end of the extractor around the lower jawbone where it was cut with the loppers.

Figure 17. Place your foot across the deer's throat to anchor the deer's head, and pull quickly on the extractor. The extractor will slide along the bottom edge of the jawbone, breaking the connective tissue. Separate the two jawbones in the front where they meet. Give the extractor a quick, vigorous tug to remove the jawbone.

Using a knife, scrape away all muscle and tissue from the extracted jawbone, and then dry it using a cloth. Use a permanent marker to write the deer's identification number on the jawbone and/or attach a deer data tag. (Make deer data tags out of durable cardstock paper or purchase them at a forestry supply outlet to ensure they hold up.) Store the jawbone in a dry, open place away from rain and where no animals can get it. A bag or basket suspended from a rope in a shed is a good place.

Figure 18. Clean the muscle and connective tissue from the jawbone, and then mark the identification number and/or attach a deer data tag.

Examining Teeth to Determine Age

Deer lose and replace baby, or milk, teeth and molars with permanent adult teeth in a very predictable manner during the first 2 years of life, making it easy to determine the age of young deer by examining their teeth. Fawns have four or five molars; adult deer have six.

Deer are aged in 1/2-year increments because they are born in summer and usually killed in winter. After the age of 2.5, all the baby teeth are gone, and tooth wear is examined to determine age.

Fawns are born with four teeth on each side of their jaw: three premolars, or milk teeth, and one molar. The first two milk teeth are bicuspid (have two points); the third is tricuspid. At about 12 months of age, a permanent molar erupts at the back of each side of the lower jaw. A deer that has fewer than 5 teeth per side and a tricuspid third premolar is, therefore, a fawn.

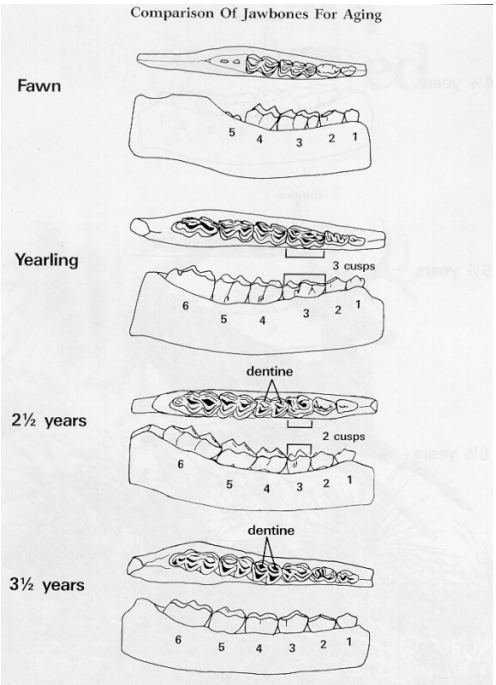

Figure 19. Teeth can be used to reliably age deer to 2.5 years of age.

Yearlings have five to six teeth and still have the tricuspid third milk tooth. During the second year of life, the milk teeth fall out and are replaced by permanent adult premolars, all of which are bicuspid; therefore, deer having six teeth and a bicuspid third premolar are 2 years old or older.

There is debate among biologists as to whether tooth wear can be used to accurately age deer older than 2.5 years of age; however, wear patterns can be analyzed to obtain an estimate within a year or two of the correct age.

Deer teeth are made of enamel, the light-colored substance covering the outside of the tooth, and dentine, the dark-colored substance inside the enamel layers. Since the dentine is wider at the base of the tooth than at the top, more and more dentine is exposed as a

deer's tooth wears. A comparison of the width of the dentine with the width of the enamel indicates the deer's age as shown in figure 20.

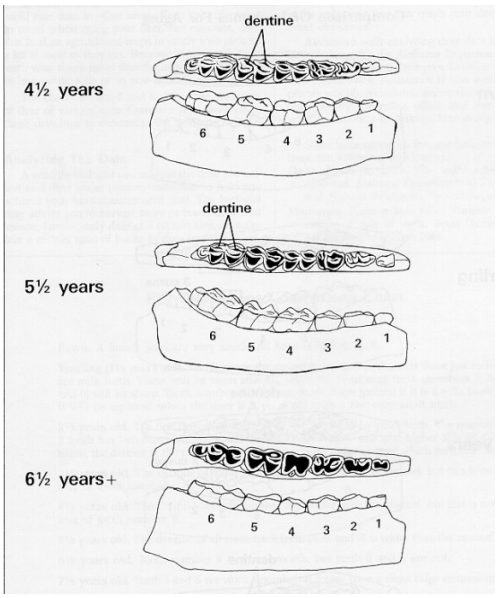

Figure 20. The relative amounts of dentine and enamel can be used to estimate the age of deer 2.5 years and older, but accuracy is usually only within 1 to 2 years, even when analysis is by professional biologists.

An important fact to keep in mind is that in some areas, tooth wear occurs more rapidly than in other areas. Deer that pick up sand or soil as they feed have greater wear than those that feed in less sandy soils or in nonagricultural areas.

Once a jawbone has been used to determine age, it is good practice to save it for comparison with those of other-aged deer and for teaching others how to age deer. One idea is to mount a set of jawbones on a board and keep it with other herd management records for quick reference.

Interpreting Harvest Data

For those who have just begun collecting data, seeking the assistance of an experienced wildlife or deer biologist is recommended. Ideally, select a biologist who knows about the deer in your area, the habitat conditions on your property, and the previous deer harvest on the property and those that surround it. The biologist can help you better interpret the data you collect and then make recommendations to help you achieve your herd-management goal. These recommendations may be to harvest more or fewer deer next season, harvest only deer of a certain size, or maintain a certain ratio of bucks to does in the harvest, depending on your management objectives. Your data may also lead to habitat improvement recommendations or goals to better sustain a healthy herd. As you become comfortable with interpreting data, you will be able to make sound management decisions on your own.

The most valuable method for interpreting and communicating harvest data is to display the data in graph form. Data are typically separated by gender and into the age classes of 0.5, 1.5, 2.5, and 2.5+. Also record the number of deer used to estimate each statistic. Be sure to have these graphs when meeting with a wildlife biologist.

For females, have a graph showing the average weight by age class and one showing the percentage of lactating females by age class. For males, have a graph showing the average weight by age class, the average main beam length by age class, the average inside spread by age class, and the average main beam circumference by age class.

Discrete numbers, such as the average body weight of 2.5-year-old bucks for a single year, have little or no meaning without the context of the same measurement from other years, which is why it is best to analyze the data as trends over time. In general, it takes at least 2 to 3 years after implementing a new management strategy for changes in the data to become evident, making consistent data collection important so that data can be compared throughout the years.

Keep in mind there is going to be natural variability from year to year in your data set. Don't worry if body weights go down during the second year of data collection. It may just be environmental factors at play, such as a year of drought or a mast failure, that is causing body weights to be lower. It may also be that last year was a bumper mast crop, causing body weights to be greater than normal. In most cases, biologists recommend at least 5 years of data to confidently document a trend, but you may be able to get an idea of progress with less data if that is all that is available. After all, abnormally low deer weights and nonlactating does are not a part of a normal trend and may indicate and lead to immediate herd and habitat management needs.

What Your Data May Be Telling You

Below are a few examples of what your data may be telling you about the deer herd on your property. Remember that no single measurement

can tell the complete story. Wildlife biologists make recommendations based on multiple sources of information including harvest data, habitat conditions, observed browsing pressure, and other factors.

Though there are countless ways to arrange and analyze harvest data, there are several graphs that are particularly useful, including doe harvest by percentage in age class, doe body weight, lactation rates by age class, and antler characteristics and size.

Doe Harvest by Percentage in Age Class

Doe harvest analyzed by percentage in each age class (0.5, 1.5, 2.5, and 3.5+ years) plotted over multiple years is a useful graph for predicting fawn survival and recruitment. If, for example, yearling doe harvest is unusually low one year, it could signal low fawn survival for that year. In addition, the percentage of does harvested at 4.5 years and older can be examined to determine the age structure and removal rates for does. About 25 to 30 percent of the doe harvest being does 4.5+ is generally regarded as normal; lower than that could indicate a young age structure and high removal rate. A doe harvest rate greater than that could indicate an older age structure, reduced removal rate, or possibly poor fawn survival.

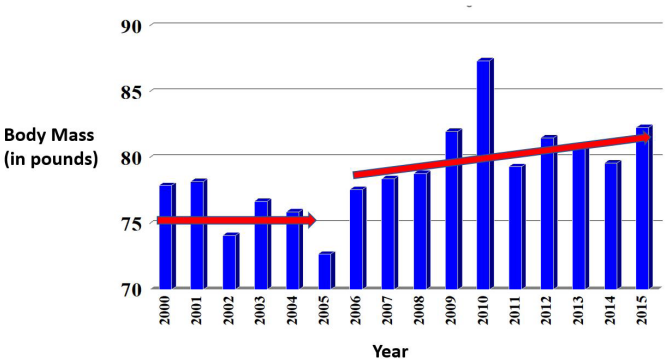

Figure 21. Example graph of yearling body weight over time. Note some slight year-to-year variability that is common. However, an increasing trend in body weights begins in 2006, coinciding with changes in harvest and habitat management.

Doe Body Weight

To determine whether available nutrition is adequate, look at the relative changes in weight over several years, because a normal weight for does is specific to that location and difficult to determine. Instead, see if weight remains constant at a level that is appropriate for your area or management objectives. If you are unsure of what an average weight for does in your area should be, consult a local or regional wildlife biologist. Decreasing weight could indicate that there is not enough high-quality forage available (or that deer density is too high), whereas an increase in weight may indicate that your strategy and efforts toward harvest or habitat management are working!

Lactation Rates by Age Class

Lactation rates of does by age class over multiple years is a useful graph because it relates to herd health, as healthy deer produce more fawns. This measurement is most accurate if does are harvested earlier in the season when their fawns are still likely to be nursing. Typically, 3.5-year-old does are the most productive age class, and a 70 to 80 percent lactation rate is considered good for does 2.5 years and older. As with the average weight of does, examine lactation rates for trends. Be sure to separate yearling lactation rates over multiple years because it is an even stronger indicator of available nutrition. Does that are lactating as yearlings were bred as fawns, and doe fawns must be 70 to 80 pounds to reach sexual maturity. If the available nutrition is good, there will be more lactating yearlings. Habitat that provides good nutrition and good fawn survival can yield yearling lactation rates around 30 to 50 percent; however, fawn lactation rates lower than 5 percent do not necessarily indicate poor conditions.

Antler Characteristics and Size

Antler characteristics and measurements can be analyzed in many ways, but the value of yearling antler beam diameter tends to be overlooked. On properties where yearling bucks are harvested, graphing yearling antler beam diameter over multiple years will be a strong indicator of deer health and nutrition. Yearling antler beam diameter measures how much antler the yearlings can nutritionally afford to produce and is not likely to be strongly influenced by other factors such as poor body condition from the previous breeding season's efforts. Poor nutrition can lead to yearling antler beam diameters of 0.39 inches or less, while excellent nutrition can lead to yearling antler beam diameters near 0.80 inches.

For some, tracking changes in antler measurements may be the most exciting aspect of a QDM program. While antler data can definitely contribute as measures of herd health, they do have some limitations. As with other measures discussed in this publication, antler size and mass can vary from year to year. Moreover,

a large number of bucks will need to be harvested each year to develop average estimates for some of these antler-based measurements, something that may be counterproductive if trying to manage for older-age bucks. Therefore, it is important to keep in mind that other measures of herd health are still needed to assess progress of a QDM program. As deer age, more resources can be allocated each year to antler development, which peaks at full maturity around 4 to 5 years of age. Genetics also play an important role in determining antler size and conformation at maturity, so managers should set reasonable expectations based on historical data.

Summary

It should be clearly evident that if you aren't collecting data from harvested deer you are missing out on a lot of important information that you can use to manage the deer in your area. Without this information, deer management becomes a guessing game. Managing a deer herd is much more successful when you can accurately assess the health and condition of the deer and track harvest data changes over time. A small investment in equipment and time to collect and analyze the data can provide a wealth of information and lead to a healthier, more productive deer herd.

Revised by **Mark Smith**, Professor, Forestry, Wildlife and Environment, Auburn University. Originally written by **Stephanie K. Irvin**, former Graduate Research Assistant, **Stephen S. Ditchkoff**, Professor, and **Mark Smith,** Professor, all in Forestry, Wildlife, and Environment, Auburn University

For more information, contact your county Extension office. Visit www.aces.edu/directory.

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www.aces.edu

White-tailed Deer Data Collection Sheet

Property/Hunt Club Name:_____

						Weight [B]			Antler Measurements [C]				
Deer ID [A]	Date	Hunter Name	Harvest Location	Gender	Age	Live	Dressed	Lactating (yes or no)	Number of Points	Inside Spread	Left Main Beam Circum.	Right Main Beam Circum.	Comments

[A] Write this deer ID on the tag you attach to the jawbone.
[B] Measure weight in pounds.
[C] Measure to the nearest 1/8 inch.

Deer ID:_____ Hunter Name:_____ Club Name:_____

Date Killed:_____ Live WT:_____ Dressed WT:_____

Age:_____ Sex:_____ Number of Points: Left:_____ Right:_____

Beam Circumference: Left:_____ Right:_____

Inside Spread:_____ Beam Length: Left:_____ Right:_____

Comments:_____

_____

Deer ID:_____ Hunter Name:_____ Club Name:_____

Date Killed:_____ Live WT:_____ Dressed WT:_____

Age:_____ Sex:_____ Number of Points: Left:_____ Right:_____

Beam Circumference: Left:_____ Right:_____

Inside Spread:_____ Beam Length: Left:_____ Right:_____

Comments:_____

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Deer ID:_____ Hunter Name:_____ Club Name:_____

Date Killed:_____ Live WT:_____ Dressed WT:_____

Age:_____ Sex:_____ Number of Points: Left:_____ Right:_____

Beam Circumference: Left:_____ Right:_____

Inside Spread:_____ Beam Length: Left:_____ Right:_____

Comments:_____

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