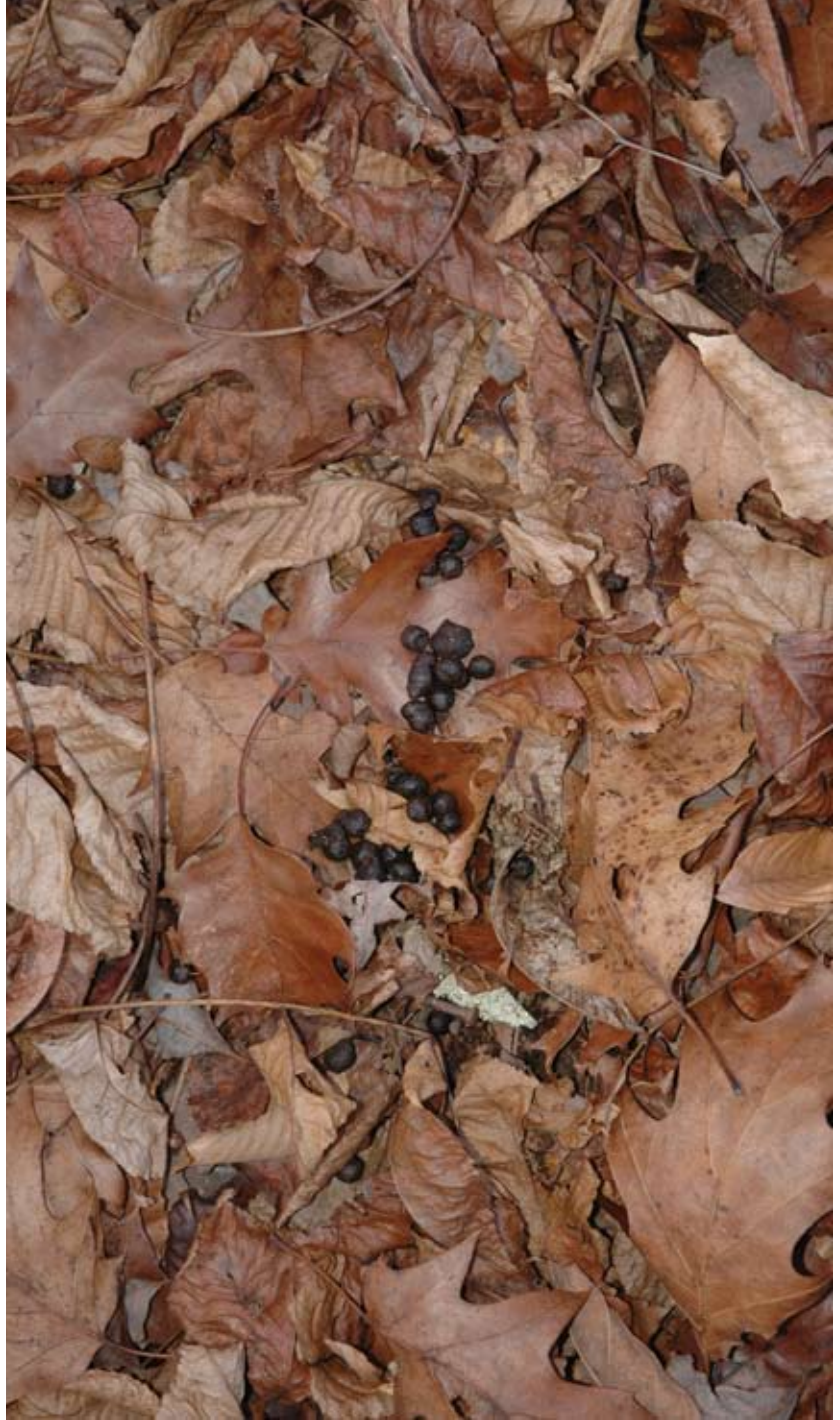


Happiness is a Large Pellet Pile

Are you looking to start a herd-monitoring program or add new dimensions to an existing one? Pellet-count surveys give hunters a window into deer densities and provide data critical to deer and land management.



By John Donoughe and Mike Wolf

The Brush Mountain Sportsmen's Association (BMSA) property spreads over 600-plus forested acres on the flank of a 2,500-foot Appalachian ridge. Located in Central Pennsylvania's Ridge and Valley system, the club was founded in 1945 by first-generation German immigrants looking to set aside land where they could hunt and manage game. Today close to 40 members enjoy deer hunting on the property. The club is steeped in hunting tradition and is slow to change.

One thing that never goes out of season at the BMSA is busting chops. I was about to float the idea of conducting a deer pellet count, and I was prepared for the worst.

"Let me get this straight," said the grizzled deer hunter, fighting back tears. "You're going out into the woods to count deer sh—?"

"Sure," I said matter-of-factly. I hoped that my air of self-assurance would win over the crowd.

"And just why are you doing this?" he asked. The hunter scanned the smirking faces to be sure that everyone was ready for his punch line.

"To get a handle on the deer population density of our ground," I said.

"Don't you mean *poop*-ulation?"

I smiled right along. After all, I once shared his skepticism. As a college student in the 1980s, I was bent on a career in wildlife management. One of my professors described a method in which biologists counted deer droppings to estimate whitetail population densities. The researchers went into the woods 24 hours after a snowfall. They would travel a straight line and stop at regular intervals to count groups of deer droppings within a circle of a given radius. The claim was that by calculating the total area in their sample plots and dividing by the average number of pellet groups that a deer makes per day, biologists could arrive at an accurate estimate of deer density for that area. I found the idea intriguing, if not a bit fanciful. Later, as a high school science teacher, I often mentioned the method to snickering students. I viewed the technique as a novel approach to wildlife management. I was unaware that the once-obscure method was gradually gaining favor with deer and land managers.

Fast forward to 2003. I signed up for a deer and forest management seminar in which the focus was an updated version of the old idea. Mike Wolf, a Penn State Cooperative Extension Forester, introduced several biologists and foresters. Their mission was to instruct the assembled hunters and landowners in the finer points of estimating deer populations, assessing browse damage, and gauging the general health of forested deer habitat. At the core of their curriculum was the pellet count survey. Seven hours later I was sold. I took the proven technique back to my classroom and my hunting club.

Hunters and landowners who are serious about Quality Deer Management understand that herd monitoring is a cornerstone

of any QDM plan. Even before the science of deer management advanced to modern levels of sophistication, our grandfathers undoubtedly wondered how many deer roamed the woods. In those days the answers were simply barber shop and deer camp speculation. Today, reliable deer population estimates can be made by landowners, clubs and cooperatives. The more flashy techniques run the gamut from high-tech infrared-triggered trail cameras to the high-flying aerial infrared photography. We'd like to introduce you to the downright low-tech. Welcome to the decidedly low-budget, low-brow world of deer pellet group counting.

The pellet count method of estimating deer populations fills an important niche in herd data collection. Spotlight surveys may be equally dirt cheap, but like trail camera use, where bait piles need to be maintained and cameras checked on a regular basis, spotlight surveys are time-intensive. They require multiple runs to smooth out spikes and dips in data that result from any number of variables ranging from weather to lunar phases. Finding time can be challenging when managers and volunteers travel any distance to their hunting land.

Forward Looking Infrared (FLIR), or aerial infrared photography, is now in vogue with state wildlife and forest agencies and even some clubs and cooperatives with large cash reserves. Aerial infrared photography will very precisely reveal the number of deer on your property at any given instant, but every hunter knows that there could be a mess of deer in the back 40 on Tuesday and none by Friday afternoon. Because the results may or

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You want me to count WHAT?
Pellet-count surveys are based on the scientific survey technique known as point sampling, in which accurate conclusions are extrapolated from the values of samples. "Cruising" a forest to appraise timber value is a form of point sampling. In pellet-count surveys, deer density is estimated using the number of deer pellet groups in a given number of sample "plots."



may not represent the average number of deer on your property over time, aerial surveys are best applied to regional rather than localized deer population estimates.

What Can Pellet Count Surveys Accomplish?

Depending upon your property's location and the expertise of your volunteers, pellet count surveys can be used for any or all of the following:

1. An accurate estimate of the wintering deer population on your property. For reasons described below, these results are most valid for deer habitat in "snowbelt" states.
2. To track annual deer population trends.
3. To pinpoint locations of concentrated deer activity, especially on larger tracts of land.

Additionally, we and all the experts we interviewed incorporate a few extra steps into pellet count procedures which help gather information on:

4. The browsing impact of deer on forested habitat.
5. Any other habitat quality factor that you'd like to quantify.

This article will provide specific instructions on accomplishing step 1 through 3. Until you become familiar with the survey method, it's best to limit the number of things you are looking for along the way.

How Pellet Count Surveys Work

Pellet count surveys are based upon the scientific sampling

technique known as "point sampling" or "point transect surveys." Point sampling is very similar to the way public opinion or election polls are conducted. Researchers randomly select say 1,000 people, have them answer questions, and then, with a manageable degree of statistical uncertainty, assume that the answers are representative of the larger population. In our pellet count, we randomly select "sample plots" across deer habitat. Within a sample plot we count groups of deer droppings. We assume that deer defecate in our sample plots at roughly the same rate that they defecate over the larger habitat.

In other words, if our sample plot is 1/1000 of a square mile, then we can take the number of pellet groups counted within the sample plot, multiply that number by 1,000, and arrive at a reasonable estimate of the total number of pellet groups in a square mile. All that remains is to factor in the number of pellet groups that the average deer produces per day and the number of days since the groups began to accumulate. The result will be a surprisingly close approximation of the number of deer per square mile. The actual calculations will be presented below.

How do we know how many times deer "drop" per day? Past research and observation of captive deer populations have led biologists to an accepted value of 25 pellet groups per day. This is known as the pellet deposit rate (PDR).

How do we know the number of days since the pellet groups began to accumulate? As mentioned in the introduction, pioneers in the field of pellet-based population estimates used a fresh snowfall to "set the clock." Since neither wildlife biologists nor your club's volunteers can stay on call for the next snowstorm, we now rely upon the date of autumn "leaf-off" as the starting date.

Leaf-off date is the date in the fall after which the bulk of the habitat's leaves have fallen. It is assumed that deer pellet groups deposited before this date that haven't yet decomposed will be covered by leaves and will be missed by your spring survey crew. Pellet groups deposited after this date will be visible to observers and will be counted. In central Pennsylvania, we use November 15. The leaf-off date for any location can easily be determined by keeping a watchful eye each fall and marking the date on a calendar.

Pellet count surveys are conducted after thaw but before green-up. By counting backwards from the day of the survey to the date of leaf-off, we find the total number of days that pellet groups have accumulated.

Keep in mind that what's true for election polls is also true for pellet counts – the larger the sample size, the more accurate the results. Obviously, most of your sample plots will contain no pellets, and a few will be Dung Central Station. When you do 200 plots as opposed to 20, the law of averages kicks in and accuracy goes way up.

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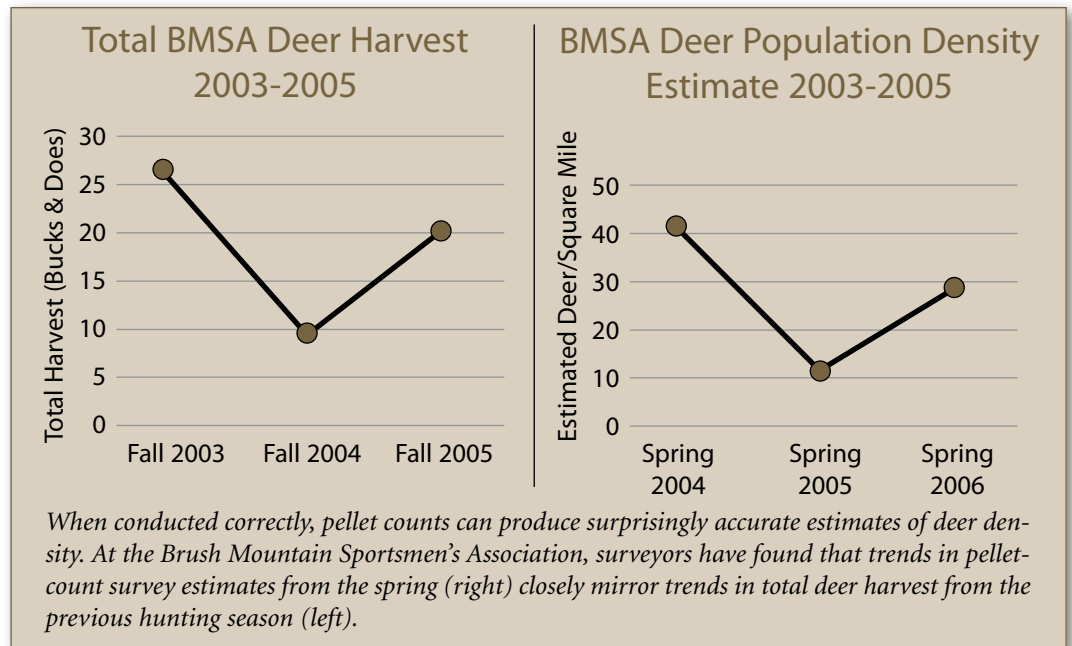
How Accurate are Pellet Counts?

The short answer: Surprisingly accurate – when used within their limits.

At the BMSA, we've found that our pellet count results closely mirror harvest results for the preceding hunting season (see charts at right). This suggests that, at least on our ground, both figures provide a reliable index of deer densities. Experts agree.

Dave deCalesta has helped to bring pellet count surveys to the forefront of whitetail management. He's a retired U.S. Forest Service wildlife biologist from the Northeast Forest Experiment Station. He has worked extensively with the Kinzua Quality Deer Cooperative, a 74,000-acre public hunting area in Northwest Pennsylvania. The KQDC has used pellet counts for the past six years to help determine annual deer harvest goals. Dave cites several reasons for his high confidence in pellet-count results.

"We conduct roadside counts of the KQDC area every fall," Dave said. "Deer counted per mile of roads driven is very highly



and positively correlated with pellet group density estimates in the spring." His confidence is based on more scientific studies as well. The Pennsylvania Bureau of Forestry conducted FLIR counts on two areas last spring where the KQDC conducted pellet group counts. The results were very close.

Dave conducted another scientific cross-check, this time in a two-square mile section of forest that has been fenced for decades. Both a pellet count survey and a deer drive were conducted. According to Dave, "The pellet count produced a slightly higher estimate until I recalculated to subtract off deer that deposited pellets before they were harvested in the fall." After the correction, the results were nearly identical. The bottom line: the pellet count gave an excellent ballpark estimate at a fraction of the cost of an aerial infrared survey.

Conducting the Survey

Step One: Develop a Plan

Deer managers in the snowbelt will conduct their pellet counts in early spring to allow for calculating the number of days pellets have been accumulating. This is based on the assumption that cold weather since the leaf-off date has prevented pellets from decaying. In setting a date, try to find the weather window after snow melts but before average temperatures are warm enough to hasten pellet decay. In Pennsylvania, we generally work in late March or the first week of April.

South of the snowbelt, pellet counters cannot rely on cold weather to prevent pellet decay between the time of leaf-off and the time the survey is conducted. More on how this affects results later. For now, it means that southern deer managers can conduct a pellet survey almost any time of the year that is practical.

First, decide how many sample plots your crew can reasonably handle. The annual BMSA pellet count is conducted by a handful of members and a few junior hunters. We break into two teams. Each team is assigned 30 sample plots spaced along an approximately 4,500-foot transect. We spend two or three minutes collecting data at each plot. The whole operation takes no more than about three hours. The amount of time that you

spend will depend upon terrain, habitat, skill of the participants, and how much data you collect. If you are sticking strictly to deer population estimation, counting pellet groups may go fairly quickly. The density of vegetation will be a major factor. The lack of forest regeneration at the BMSA may be bad news for forest health but makes for quick work on pellet-count day.

The next step will be to locate the transects on a topographic map, aerial photo, or detailed sketch of the area to be surveyed. A transect is simply a line that crosses your land. Your sample plots will be spaced at regular intervals on that line. Your lines may run east-west, north-south, or anywhere in between. Every year, we begin along a fencerow and follow a compass bearing of 120 degrees as we cross our property. On your map, delineate different types of habitat such as dry ridges, stream bottoms, regenerating clearcuts, and mature timber. Draw straight lines through the area to cross these different habitats. The number of transect lines you need to thoroughly sample all of these habitats will depend on the dimensions of the tract and distribution of habitat types. Do your best to include all wooded habitat types in the approximate proportions that they are found on your property. For instance, if roughly 10 percent of your property is regenerating clearcuts and

40 percent is mature hardwoods, then 10 percent of your sample plots should fall within the clearcuts and 40 percent should be located in the timber.

Note: For snowbelt surveyors, the presence of leaf litter is critical to the final deer density calculations. For this reason, sample plots should not be located in food plots or dense conifer stands. Also, if your property is small, try to involve neighboring properties and landowners in your survey.

Step Two: Assigning Teams

It is possible for one person to conduct a pellet count survey without help, but we have found that having two or more members per survey team speeds the process and makes it more fun. Each of our teams is appointed a team leader who has been well-coached on data collection. We've found that it also helps to have teams in radio contact with each other and the survey coordinator so that inevitable questions can be answered. Each team is equipped with a compass or GPS which will be used to maintain a straight transect, a pencil, and stick or string cut or marked to match the radius of the sample plot. Each team should also have

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Point sampling can be conducted by a lone person who sights the transect over their compass, selects a landmark along the transect, and paces the chosen distance to the next plot. However, it can help to have a two-person team. The “pointer” (right) sights the transect and guides the “pacer” (above) left or right until they are on the transect. The pacer then marks the plot center. Obviously, this becomes more of a challenge in a dense understory.

a data tally sheet that has all pertinent information available at a glance. A copy of the BMSA's data sheet is included (see page 28).

Step Three: Collecting Data

Start your survey at one end of a transect. Randomly choose a starting point. Sight over your compass to pick a distant landmark that is in line with your chosen compass bearing. Pace the distance between sample plots and mark the center of the first plot. In our survey plots are separated by 150 feet – or about 50 paces – but the actual distance between plots is not important as long as it is consistent. Once you pace the established distance along the transect, mark the center of your sample plot by staking a walking stick in the ground or scuffing the ground with a bootheel. The plot center can be the exact point of your 50th footstep, or you can close your eyes and toss a rock or other object into the air. Where it lands is the plot center.

However you do it, it's critical to ensure that the center of each plot is randomly selected. We've found that young hunters get very enthusiastic about pellet counts. They want "good" results, so they tend to cheat a bit by scanning the ground and placing plots where scat has been seen. Obviously, this will skew results toward an overestimate of deer densities. Likewise, older, wiser hunters may tend to steer the transect away from a nasty tangle of greenbrier.

From the center of your sample plot, count all pellet groups within the 4-foot radius. Pellet groups must contain at least 10 pellets to qualify for counting, and at least half the group must be located within the radius. This is where a pre-measured 4-foot cord or stick comes in handy. We've found that we work more efficiently and overlook fewer groups when we divide the circle into quadrants. We start with the 12 o'clock to 3 o'clock quadrant. We systematically scan the zone before moving on to the 3 to 6

Calculating Deer Density Using Pellet-Count Results

$$\text{Deer Density} = \frac{\text{Total Number of Pellet Groups}}{\text{PDR} \times \text{T} \times \text{SA}}$$

In this formula:

PDR = Pellet Deposit Rate in pellet groups/deer/day.
(Use the accepted value of 25)

T = Time in days since leaf-off.
(count back from survey day to leaf-off)

SA = Total sample area in square miles. This is calculated by taking the number of sample plots and multiplying it by the total area of each (A 4-foot sample plot is 50.24 ft²). Next, divide the result by 27,878,400 (the number of square feet in a square mile). For example, if you used 60 sample plots with a 4-foot radius, the total area of your sample plots will be .0001081 square miles.

Example: In the BMSA 2006 pellet count, 60 plots were sampled, and we found 11 pellet groups. The survey was conducted 139 days after leaf-off. The equation looks like this:

$$\text{Deer Density} = \frac{11}{25 \times 139 \times .0001081}$$

Deer Density = 29 deer per square mile



Young hunters become very enthusiastic about helping out with pellet counts, and it can be a great way to get kids outdoors and involved in deer management – even before they are old enough to hunt. However, kids are often very eager to score more “points” and may want to locate plots where they have already spotted deer droppings. To ensure accurate results, make sure plot centers are selected randomly and never relocated to improve the “score.”

o'clock quadrant. Pellet groups can be surprisingly easy to miss where leaf litter is disturbed or vegetative ground cover is heavy. You and your partners will quickly develop a trained eye. Record your findings on the tally sheet. Repeat the procedure at the next sample plot.

Step Four: Crunching the Numbers

The math is very basic. Use the formula listed in the sidebar on the facing page to arrive at the whitetail population density in units of deer per square mile.

Customizing Your Survey

The Point Sampling method is a time-honored research technique used by resource managers for everything from censusing endangered species to estimating numbers of diseased or insect-infested trees on the landscape. If your time, manpower and expertise permit, consider collecting other data which may be important to your deer and land management objectives. For instance, at the Brush Mountain Sportsmen's Association, we've also used our pellet count to tally winter deer mortality, dominant tree species in the overstory, extent of deer damage to seedlings, and the number and species of seedlings on the forest floor. In the future, we will consider using the method in the fall to determine acorn production in any given year.

The old advice to keep it simple applies. Don't overwhelm

volunteers or bite off more than you can chew the first time out. Get your crew comfortable with the basics and hooked on the fun. As we mentioned, a future article will take you to the next step – using a pellet count survey to also measure deer browsing impact and evaluate habitat quality.

Limitations of the Pellet Count Method

Unlike trail cameras and spotlight surveys, pellet counting does not allow for identification of individual deer, so sex ratio and age-structure data will need to be collected using alternate methods.

The pellet count method is designed for regions of deciduous forest with snow cover during at least some of the winter months, essentially the northeast and north central United States. When conducted elsewhere, use results as an index of deer density trends rather than an accurate estimate of density. For example, if five years of consistently-conducted

pellet count surveys yield steadily increasing numbers of pellet groups, you can be confident that your deer density is increasing.

Merlin Benner is a wildlife biologist with Pennsylvania's Bureau of Forestry. He's been conducting pellet counts since 1984. Like Dave deCalesta, Merlin uses his results to adjust the number of DMAP permits requested for his assigned area. Merlin suggests that pellet counts are useful in areas south of the Mason-Dixon

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“In addition to countless opportunities for off-color jokes and a guaranteed cure for cabin fever, your club will gain some very serious whitetail density data.”

Field Tally Sheet for Pellet Group Survey

Property/area _____ Date _____ Observers _____

Transect No. _____ Compass bearing _____ Distance between plots _____

Plot No.	No. Pellet Groups	Plot No.	No. Pellet Groups

- Transects should cross a variety of available wooded habitats.
- Randomly select your plot centers along each transect by following the bearing and pacing the designated distance. Don't "cheat" by placing sample plots where pellets have been sighted.
- To count a pellet group in a particular plot, there must be at least 10 pellets in the group and at least half of the pellets must be within the bounds of the circular plot.
- Only count pellet groups that are on top of the leaf litter.

Line where the technique can be used to find concentrations of deer on a large property. In fact, in the previously-mentioned KQDC, results of pellet count surveys are used to steer hunters to areas of highest deer densities. In this application, it would make sense to conduct several counts per year. Seasonal changes in deer concentrations could be tracked in this way, and preferred habitat at the beginning of hunting seasons could be pinpointed.

Obviously there are a ton of variables that will affect the precision of any one survey. Wind and animal disturbance of the

leaf litter, warm winters that hasten decomposition of droppings, density of vegetation on the forest floor, and skill of the observers are just a few of variables that will be in play.

We're not suggesting that pellet counts should supersede other herd data collection methods; rather pellet counts can become an integral part of your overall herd monitoring strategies and should be considered by clubs with limited budgets or whose members are strapped for time. Pellet count surveys are also an excellent first step that a club or landowner can take when beginning a herd-monitoring program. For clubs with established data collection programs, pellet count surveys provide the tremendous advantage of being easily adapted to collect habitat quality data in addition to deer population estimates.

Be prepared for some raised eyebrows when you suggest that the gang at your club or cooperative should join you in counting deer droppings. In addition to countless opportunities for off-color jokes and a guaranteed cure for cabin fever, your club will gain some very serious whitetail density data. Make no mistake about it, this is one of the best available tools for keeping tabs on deer densities and opening eyes to the principles of Quality Deer Management.



What else can you learn through point sampling?

Deer density estimates are only one of the things you can accomplish using the point-sampling method described in this article. For example, at the BMSA, surveyors collect additional information at each plot. By simply identifying the dominant tree above each sample point, surveyors learned that approximately 48 percent of the timber on the property is oak of mixed species. You can collect information about preferred plant species or habitat types, or even use this information to evaluate the impact of foraging deer on your habitat. You can also determine where your deer population is in relation to the habitat's carrying capacity.

This, in fact, is another article, and the authors will tell you how to do this in a future issue of **Quality Whitetails**. For now, keep it simple. Go out this spring and become familiar with the point-sampling method by simply counting pellet groups. In the future we will discuss additional evaluation techniques to add to your survey once you are an experienced point sampler.

About the Authors: John Donoughe is a high school Environmental Science teacher who designs and teaches units in wildlife management and forestry, among other topics. He is an occasional outdoor writer, a QDMA member, a Pennsylvania Hunter Trapper Education Coordinator, and a past president of the Brush Mountain Sportsmen's Association.

Mike Wolf is a Forestry Extension Educator with Penn State Cooperative Extension and a Society of American Foresters Certified Forester. He is creator and editor of the Southwest Forester, a quarterly newsletter for forest landowners. He is a founding member and vice-president of Pennsylvania's newest QDMA Branch, the Laurel Highlands Branch.