

IRRATIONAL NUMBERS

By Dr. James C. Kroll

It seems like a century ago I was sitting in Dr. Jack Inglis' ecology class at Texas A&M. Jack was one of the most promising ecological minds of his time, but on that day he was not impressing me a bit. Seems Jack loved to challenge students with scenarios that, on the surface, seemed to have nothing to do with wildlife management.

As an idealistic, young biologist, I was in no mood for philosophizing. "Consider this," he said with that wry old smile. "I'm a Bulgarian radio operator, sitting in a small hut in the middle of nowhere. My job is to receive messages, then retransmit them to another station. I do this day in and day out. I am alone. Now, convince me the world is really out there."

I had hoped for a deep discussion on population ecology, but instead got a silly mind game. That was the final straw. I stood up in the class and said, "Dr. Inglis, you are full of @#%&!" It was a dumb thing to do, but hey, I was young and idealistic. To the shock of my fellow students, I stormed out of class.

Arriving back at the Department of Wildlife and Fisheries Sciences, I poured myself a cup of coffee and sat down in the break room to cool off. My major professor came into the room to get himself a refill and did a double-take. "What are you doing here? Why aren't you in Inglis' class?" he queried. I told him what I had done, and that I now was considering new career options. He agreed.

About 15 minutes after the end of class, I heard Jack coming down the hallway. A very big, booming-voiced man, he was easy to recognize. I sat frozen as he poured a cup. Several other faculty and graduate students also entered the break room since it was customary for all of us to have coffee at that time of day.

Jack spied me sitting at the table, eyes fixed on the surface tension of my coffee. He broke into a big laugh, "Boy, I really got under old Kroll's skin today!" And then, he laughed again. That day I learned Jack was a better man than me; I would have kicked myself out of class. Instead, I got the only A in the class. I guess he saw something worthwhile in me after all.

For many years thereafter, Jack and I had fun talking about wildlife management and more and more about philosophy. I regret never telling him how much he really taught me. He died a few years back in an ultra-light plane accident. (It was just like the old codger!)

It wasn't about Bulgarians in radio shacks. It was about gaining correct information from the natural world, particularly wildlife. His point was: this guy was gathering information faithfully, then very faithfully passing it on to someone else, who in turn passed it on, and on and on.

Yet, how did the guy know the information was real? He didn't care! He had concrete information in hand, and it made him comfortable to have it. Without even knowing its validity, the presence of information alone made him satisfied with life.

Unfortunately, most wildlife biologists never had the pleasure of knowing Jack Inglis or his little scenario. If they had, we might be doing things differently in wildlife management.



DR. JAMES C. KROLL PHOTO

Managing wildlife is one of the hardest things to do in the world. We must make decisions and take actions based on less than reliable data. It is art more than science. And, the most unreliable data of all come from census.

Each year, biologists faithfully go out and conduct surveys on our deer herds, often knowing full well they have little reality. Then, they pass these IRRATIONAL NUMBERS on to higher-ups. It makes them feel good to have something on which to base decisions, even though they seldom do.

The term "irrational numbers" comes from mathematics, meaning "...numbers that can be expressed as an infinite decimal with no set of consecutive digits repeating itself indefinitely and that cannot be expressed as the quotient of two integers." In a nutshell, they are useless! Unless you are a mathematician, they are very difficult to deal with, hence the word "irrational."

Each year, thousands, if not millions, of dollars are spent censusing wildlife. From these estimates, significant decisions arise affecting the future of the species and availability of game for harvest.

Over the years, Texas biologists have used an array of techniques to estimate deer numbers. Among these are the Hahn cruise line, spotlight counts, track counts and aerial surveys. Yet, every study on the validity of any of these surveys produces error rates bordering on guessing.

Wildlife biologists Milo Shult and Bill Armstrong noted, "Wildlife biologists have done a good job if their estimate is within plus or minus 10 percent of the actual population." I think they were optimistic, at best.

Research by scientists such as Dr. Charles DeYoung and others found error estimates for aerial surveys as high as 60 percent. Spotlight counts are not even that good. Putting these error figures into perspective, a 60 percent error rate means if you estimate there are 100 deer on the property, there may be as few as 40 and as many as 160!

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Such results brought biologists at the Noble Foundation in Oklahoma to the conclusion: "Currently, there are no true deer census techniques because it is not possible to obtain an exact count of a wild deer population." So, why do we continue to use them?

Every wildlife student is taught how to conduct various census techniques. In 1933, the father of wildlife management, Aldo Leopold, wrote the first wildlife management book in the U.S., "Game Management."

In it, he outlined the steps to managing game species. These are: 1) census; 2) measure of productivity; 3) diagnosis; and 4) control. He spent a great deal of time discussing methodologies related to census, but cautioned, "The composition and condition of the stock is often quite as important as it numbers..."

Over the years, census has become one of the things you must do in order to manage a particular species. Yet, very few biologists who actually manage game animals such as deer pay much attention to census. In spite of this, they still conduct an annual census. It is irrational.

I have had the opportunity on three occasions to conduct a total kill-out of deer from large properties and each time we ultimately removed up to twice the deer predicted by census.

On one such property in Georgia, the DNR (Department of Natural Resources) worked for years on the assumption the sandy, longleaf pine habitat in that area would "hold" a deer to 20 acres. We fenced two 500-acre parcels and then killed all the deer within them. The first had 37 deer, the second 43. The fellow who had owned the second tract told us he never hunted there since there were no deer!

Almost half the deer we killed were bucks, one scoring about 160 inches! These were adult deer, so the respective deer densities were 13.5 acres and 11.5 acres per deer, well above a deer to 20 acres. That's a variation from expected of 148 percent and 172 percent, respectively.

On another property in Michigan, we estimated there were about 450 deer on 1,500 acres. The kill-out showed over 700 deer! The take-home message is: You can't accurately count deer using traditional techniques.

What about infrared-triggered cameras? Dr. Harry Jacobson, Ben Koerth, Randy Browning and I developed a census technique using these devices that would give you a 95 percent accurate estimate of the deer on your property. That's good news, but you have to use a camera for every 160 acres to do so, and run them for 10-14 days. So, this technique is best for small properties or those who can afford the equipment.

What do you do then? The truth is, we do not need to know how many deer we have in order to manage them. At this point, some of you probably are lying on the floor out cold or tearing this magazine to shreds! Yet, this statement is entirely

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defensible. I prefer to let the deer tell me what is going on, and not to worry about how many are there. If you are doing a good job of measuring the following characteristics, you can do a great job of managing your herd without ever spending a dime on census.

First, the best indicators of how your deer are doing involve reproduction, more specifically recruitment. If they are at least 2-1/2 years of age, most does have twin fawns, even under less than optimum nutrition. On the other hand, in many of our ranges a large percentage of fawns are dead within two weeks of birth.

In order to determine the actual number of fawns being born is out of reach for most landowners. For years, we have conducted what we refer to as "health checks." Under permit, a biologist will collect a sample of does during late winter or early spring. Removing, counting and measuring the crown to rump length of the fetuses allows you to determine accurately when the fawns were conceived.

Since many Texas landowners now have MLDP (Managed Lands Deer Permit) Level III permits, providing seasons from October to February, properties with deer breeding in November can produce does with measurable fetuses. By counting the number of fetuses in each doe, and averaging the count, you can get a pretty good idea of the reproductive potential for your herd.

Leopold pointed out the need for standards for comparing measures of productivity. A well-managed herd should have adult doe fetal counts averaging from 1.8-2.1 fetuses. Conception dates of most of these should be rather tight, spanning only a week or 10 days. (Forestry Suppliers, Inc. in Jackson, Mississippi, sells an inexpensive fetal scale for this purpose.)

That's how many fawns could be born on your property, but what about the number surviving to fall? Unfortunately, since spotlight counts are conducted in August for much of the state, you cannot get a reliable estimate of fawns since they

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just cannot be seen in high vegetation.

Incidental sightings (recording all deer you see) are an excellent tool for this. By adding up all the does, bucks and fawns you see on your property from late August through the opening of the deer season, you can get a reliable estimate of the "fawn crop"—the number of fawns still alive per 100 does.

This number, then, is expressed as a percentage figure. In other words, a 70 percent fawn crop means there are 70 fawns alive per 100 does in the early fall. A good check on this estimate is the percentage of does "in milk," or lactating at time of harvest. We conservatively assign one fawn to every doe lactating at harvest and then calculate percentage lactation. This is a reasonable check against incidental sightings. Now, we are building confidence in our information.

Although certainly useful, fawn crop does not mean as much as recruitment—the number of new deer added to the population at 1 year of age. Some biologists think fawn crop and recruitment are the same thing, but this is totally false.

A great deal happens to fawns from fall to the following summer. Generally, there are three significant mortality periods. First, there is the high mortality during the two or three weeks after birth. There is the loss of young deer after weaning. And finally, the fawns lost during winter.

Subtracting all this mortality from the potential number of fawns conceived gives you true recruitment. THAT is the number that means the most in deer management since about half of these will become antlered bucks. It is Leopold's measure of productivity.

Other information critical to deer management includes age-related antler measurements, dressed body weights and acres per buck and doe harvested. Together with recruitment, these data tell you more about your herd than any census. You do not manage a deer herd, you fine-tune it, meaning you make an adjustment and then monitor the response.

If the response is positive, you increase that activity until there is a negative response. Over time, you can fine-tune a herd into high productivity. By adjustments, I am referring to doe harvest, habitat management, supplemental feeding, etc.

So, where does census fit into all this? It really does not. You might use a census for trend data, but other than that, I see no real utility to census. Frankly, we are wasting a great deal of money and effort on census.

In some states, DNRs have cooperative management programs that require landowners submit data similar to those discussed before. It is from these data decisions arise, not census.

Each year, cooperators receive a booklet with comparisons of their results against those from their region. That way, they know how they compare to everyone else, again adhering to Leopold.

In Texas, we also have a management assistance program, the Managed Lands Deer Permit system. Required data include just about everything we need to assess the health and productivity of the state's deer by region and county. It is my opinion that data collected to receive the primary benefits of this program should be used to make management decisions. It would save money and improve the science behind deer management. Here's an example.

For some time, Ben Koerth and I have been working with Temple-Inland, Inc. here in eastern Texas. As part of their deer management program, we annually collect harvest data from cooperating clubs spread across the region's counties.

Combining incidental sightings, lactation data, and doe and buck harvest intensity, we have been able to show the clubs a positive response in reproduction by increasing doe harvest. This information provides the basis for harvest recommendations and generates support among the clubs for doe harvest.

Since they are the ones collecting the data, they have more faith in the results. Club members know quite well census is unreliable, so if we had tried to convince hunters to harvest more does based solely on census, we never would succeed.

But, why are we not using this information? It seems inherent to biologists that if they have not collected the data, they cannot possibly be accurate. Yet, many states have proven quality data can be collected by landowners and sportsmen, provided you teach them how to collect the data.

When it comes to deer, census is an antiquated wildlife management technique that should be used only when other data are not available. Of course, there are other species, such as prairie chickens, which require census. They are scarce, limited in distribution and more easily counted.

Placing more emphasis on hunter/landowner-collected harvest data and observations for deer management would do two things: save a great deal of money and increase buy-in from hunters and landowners.

But this is not my opinion alone. Recently, the Texas Parks and Wildlife Department (TPWD) commissioned the Wildlife Management Institute (WMI) to review its use of science in making wildlife management decisions. The WMI is a respected professional organization dedicated to addressing the various issues of wildlife management (see www.tpwd.state.tx.us/publications/agency_reports/pdf_docs/texas_wildlife_parks_science_review_final_report_jan25_04.pdf.). TPWD requested this review to improve the science behind decision-making and I applaud them for it.

In 2003, there were a reported 503 spotlight counts conducted by TPWD for white-tailed deer. Using a conservative four hours per count, and three individuals per night, this adds up to an estimated 6,036 man-hours of direct work! Of course, this does not include time for planning, travel and analysis.

After interviewing department personnel involved in these counts, the WMI reported employees seemed to have become blasé about them. They added, "Employees also indicated concerns about validity and value of the data, especially at the county level, and opinions of validity of the measures vary considerably from region to region."

WMI noted TPWD already is taking a second look at spotlight counts as a reliable source of information. WMI made the following recommendation: "We believe the spotlight count method applied on a sound sampling basis with strong written protocols could be an adequate estimator. Achieving this, however, would be difficult, if not impossible, due to availability of potential survey lines and available resources to conduct the surveys."

Moving to aerial (helicopter) surveys, Dr. DeYoung's research group found aerial counts often are not even as accurate as replicated spotlight surveys. My own experiences with this technique taught me deer quickly adapt to being observed, chased or captured from a helicopter; i.e., counts are not accurate. Their ability of deer to hide at the sound of a helicopter starting up is well known among deer managers, so this technique, no matter how exciting and glamorous, is also a waste of good money.

The bottom line is, Jack Inglis was right. We tend to cling tightly to any number that gives us a sense of confidence in our decisions, even if the numbers are irrational. It is my firm belief we need to spend more time and money working with landowners and sportsmen who are more than willing to help in gathering reliable data.

When coupled with habitat analysis, we then are able to let the deer "tell" us how they are doing. To do so will require a total change in attitude among biologists, state or private. This decision might hurt the pocketbooks of some consulting biologists, but then we could focus on the important measures of management progress. Believe it or not, laymen can collecting data just as good.

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