Solving The Riddle Of Deer Movement

PART 4

Everyone has a theory about how the moon affects deer activity, right? Well, we decided to toss aside the hype and get down to the truth — and in so doing, found there's more to this mystery than meets the eye.

by Dr. James C. Kroll & Ben Koerth

Does the moon control whitetail movement?

Scientists and laymen have been trying for years to answer that question, and it has not been a simple task. The problem is that isolating the effects of the moon from all other factors that affect the activity of deer and other animals is tricky. Some studies have shown no correlation between the moon and animal activity, while others have found definite positive connections to specific behaviors. To borrow a phrase used by Arnold Palmer in describing the game of golf, the effects of the moon are "deceptively simple, yet exceedingly difficult" to understand and interpret.

Let's be clear about what the moon can do. It cycles in a predictable pattern in its orbit around the earth, making it a reliable environmental cue. We also know that the moon is one of many factors that affect animal activity. But it is not necessarily the *major* factor in deer movement, nor can it override the effects of other factors, such as inclement weather, that depress activity. So, there is no conceivable way to accurately predict deer activity solely on the basis of moon phase or position. However, because of its predictable cycle, the moon can be a constant in the multi-factor equation that determines "what makes deer move."

In order to understand how the earth's only natural satellite impacts deer activity, we all must be "on the same page" regarding terminology and concepts. Here is a quick primer:

LUNAR LINGO

One of the moon's most important effects is its ability to cause tides. It does this by actually distorting the earth's surface with gravitational pull. The earth is actually quite "plastic," with its surface bulging in response to the moon's pull. The earth's shape is somewhat like that of an egg, with the ends of the "egg" being in line with the moon.

It has been calculated that the moon accounts for about 70 percent of the earth's total movement. Just as the moon affects the earth, so does the sun, which accounts for most of the other 30 percent. In a simplistic model, the greatest fluctuation occurs when the moon and sun are in direct alignment with the earth, during the full-moon and new-moon phases. In the first-quarter and last-quarter phases, the gravitational pull of the moon and the gravitational pull of the sun are at right angles to each other and somewhat cancel each other out.

Adding to the complexity of determining the moon's influences is the fact that its orbit is elliptical (oval-shaped), not circular. Because of this, there are times when the moon is closer to the earth than it is at other times. The closer the moon is to the earth's surface, the stronger the gravitational pull. About once a year, the new moon and full moon each will occur near their closest points to earth, and the resulting tides will be especially high.

A second major effect of the moon is that it provides light for nighttime activities, particularly during the full-moon phase. (Of course, we all know the moon does not emit light; the illumination we see is sunlight reflected from the moon's surface.) The *amount* of light we see is based on the position of the moon relative to the earth and the sun, with the full cycle being repeated each lunar month.

The *new* moon occurs when the moon is positioned between the earth and the sun, meaning that only the smallest sliver of reflective surface is in our view. During this phase, the moon rises shortly after sunrise, reaches meridian (directly overhead) near midday and sets shortly after sunset. For only a small part of the night between sunset and sunrise is the new moon above the horizon, so the earth gets only minimal illumination from the moon during this time.

With each successive day, however, the moon moves farther away from the sun, and a larger portion of the reflective surface becomes visible to us on earth. About seven days after the new moon, the visible portion has reached a crescent shape; half of the visible side of the moon is light, and half is dark. This is the *first quarter,* or half-moon, phase. Now the moon is directly overhead near sunset. The early part of the night has visible moonlight, but the latter part is dark.

Following the first quarter, the visible portion of the moon continues to grow. A *full* moon occurs roughly a week after the first-quarter phase. Now the moon is on the opposite side of the earth from the sun, so the complete reflective surface is visible. A full moon comes up near sunset, reaches zenith in the middle of the night and sets near sunrise. Under such conditions, virtually all of the time between sunset and sunrise has visible illumination from the moon.

One-half of a full lunar cycle has now been completed. Obviously, the second half of the moon cycle mirrors the first, but in reverse. After the full moon, the visible portion of the lunar surface starts to shrink.

Approximately seven days after the full moon, the *last quarter* is reached; once again, half of the moon is dark and half is light. Since the full moon, moonrise has been later and later each night. During the last quarter, the moon is directly overhead near sunrise. The first part of the night is dark, the latter part light.

For the entire year, the mean difference between moonrise times on successive nights is roughly 50 1/2 minutes. However, this time varies throughout the year, depending upon the angle of the moon's path in relation to the angle of the earth on its axis. The difference in moonrise times varies from as little as nine or 10 minutes in the fall to more than 90 minutes in spring.

The full moon falling near the autumnal equinox (first day of fall) in September is known as the *harvest moon.* At this time, the moon rises at nearly the same time near sunset for several successive nights. The next full moon, in October, has long been known as the *hunter's moon.* During this period, moonrise times are similar to those during the harvest moon.

It is widely understood that the time it takes for the moon to completely orbit the earth is about one month. However, a complete orbit does not exactly match our calendar month. If we measure the amount of time it takes the moon to return to a fixed point in orbit about the earth in relation to the stars, it would be sufficiently accurate to say it takes 27 1/3 days. However, for



A full moon over the shoulder of a mature buck standing in broad daylight is a lovely sight — but statistically, it's also relatively uncommon, the authors' research shows. Unbiased sampling of whitetails in a number of study areas has led the authors to the conclusion that, as many hunters suspect, daytime activity is usually suppressed somewhat during the full-moon phase. Photo by John R. Ford.

the moon to reach the exact same phase, say new moon to new moon, takes 29 1/2 days, because the earth is moving in its orbit about the sun. This period is approximately the same as our calendar month.

Believe it or not, the above is a "simple" explanation of moon movements and terms. However, it is sufficient background to let us discuss how lunar variables might influence whitetail activity.

DEER & THE MOON

Do gravitational pull, surface deformation and/or tidal flow affect deer movement? We might never develop technology sophisticated enough to answer that question, but we do know that many migratory birds depend on magnetic fields and gravitational attraction to guide them over literally thousands of miles of unknown territory to familiar breeding and wintering grounds. As science advances, perhaps we will learn whether or not the moon affects deer in a similar way.

For now, one lunar variable does stand out as being both measurable and relevant: the amount of moonlight available at various times of the month. It is true that deer can see quite well with only a fraction of the light necessary for human vision, but they cannot see in the absence of light. While even moonless nights are not completely dark, moonlight certainly changes the characteristics of the nighttime environment.

It stands to reason that the amount and timing of nocturnal deer activity are affected somewhat by the moon. And because the amount of nocturnal activity affects daytime activity, the moon clearly has some influence on how many deer we can expect to see moving naturally during legal hunting hours.

But how much of an effect is there, and is it predictable? These are questions we have been working on for many years at the Institute for White-tailed Deer Management and Research, and now we have enough data to yield some answers.

TESTING THE MODELS

Recently, certain authors have espoused the idea that moon position affects the feeding activity and other movements of whitetails. Of course, for years a number of magazines have published monthly tables and "moon charts" purporting to reveal the best times for hunting and fishing. The basic idea behind these is the location of the moon relative to the horizon. So, our first order of business is to investigate whether or not moon position is the answer.

If this is the case, we should be able to demonstrate a relationship between the location of the moon in the sky and the corresponding degree of deer activity. Because there is a definable cyclic nature to whitetail movement, based on the fact that deer need to feed every four to six hours, we have a basis for testing the idea that moon position affects this pattern.

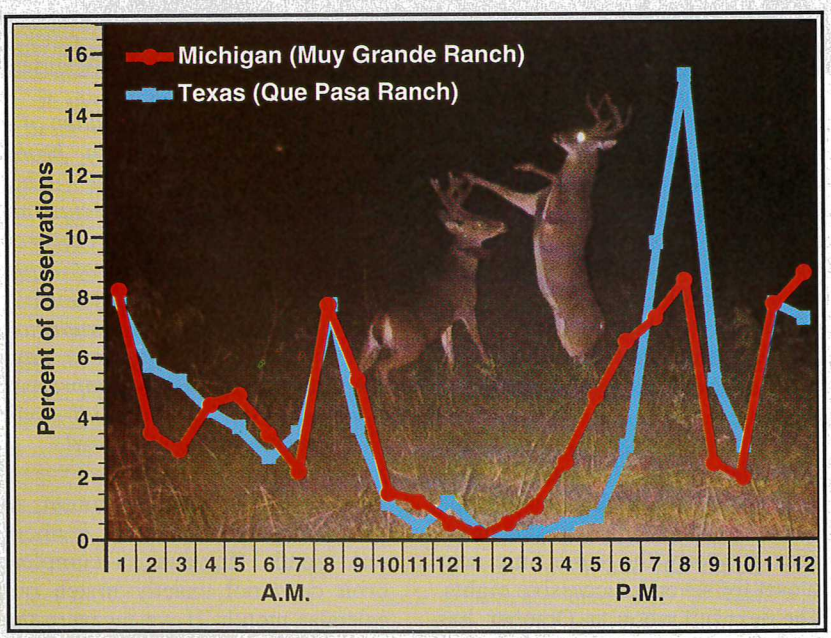
The accompanying graph of feeding activity shows the general pattern for both Northern and Southern deer. This information was acquired using infrared-triggered cameras at Muy Grande Ranch in Michigan and Que Pasa Ranch in Texas. These two whitetail herds are roughly 1,000 miles apart on a north-south line, so they should tell us a great deal about the effects of latitude on the timing of movement.

Note that there is actually little difference between the two herds' feeding activity patterns. The only major difference is in late afternoon and early evening, with the Michigan deer appearing to move earlier than the Texas deer do. (This will be explained later in the series.)

These data represent deer activity over a lengthy period of time, so no accommodation for moon phase or position is discernible. But in a similar study at Georgia's Fort Perry Plantation, we plotted deer movement against the four moon phases — and still we saw the same basic pattern. The feeding periods every four to six hours are indeed present, but they are heavy at some times and reduced at others. Robert Skinner's work with radio-collared wild deer in Louisiana showed similar results.

Many writers have claimed that moon position affects deer activity patterns, so we decided to test that idea, using data from various herds. The moon positions most often said to coincide with high deer activity are: (1) when the moon is directly overhead and (2) when it is directly underfoot. Moon-overhead, moonrise and moonset activity could be related to light availability, depending on the time of day or night at which the moon is in those positions. But the moon-underfoot position clearly could not affect light, so if it is correlated to activity, other forces must be at work.

If whitetails key simply on moon position, their feeding times should have to change over the course of a full lunar month. However, this is inconsistent with our observations, which are based on *nearly 3,000 unbiased infrared-triggered photos of undisturbed mature bucks from seven study areas in four states over*



This graph shows that for two properties roughly 1,000 miles apart on a north-south line, there is little overall difference between when deer become active and when they "shut down." (The background shot is of two mature bucks on one of the study areas and shows the type of unbiased photos used by the researchers in developing these activity graphs.)

a span of four years, as well as 24-hour computerized monitoring of wild deer in one study area.

For this analysis, we calculated what the expected number of buck sightings would be if the animals moved at random times. Then, we looked to see if that was the case. As you would expect, the bucks did *not* move at random times. There was instead a rhythmic cycle of activity periods, followed by other periods of little or no activity. *While there was some feeding during the day, movement during bright daylight hours was minimal, regardless of moon phase or position, and deer movement during these hours could not be predicted with any degree of accuracy. However, under low-light conditions, deer were quick to capitalize on certain moon positions if they occurred at times that were conducive to activity.*

Rather than overwhelm you with charts and graphs to make this point, let's instead simply hit the highlights of our findings:

Many writers have claimed that moon position affects deer activity patterns, so we decided to test that idea. . . .

- The moon-overhead position was associated strongly only with nighttime feeding activity around the time of the full moon (in the middle of the night).
- Early-morning and late-afternoon feeding activity when the moon was overhead (during the last and first quarters) was erratic at best.
- Feeding activity seemed to increase during the latter part of the first-quarter phase, when the moon was overhead well after sunset, providing some additional light during non-hunting hours.
- High late-afternoon feeding activity occurred during the last-quarter phase, as did late-night activity during the new-moon phase (generally times of high activity regardless of moon position).
- There was little early-morning or midday feeding during the first-quarter phase, when the moon was directly underfoot.
- Little midday feeding activity occurred during the full-moon phase, with the moon directly underfoot.

The bottom line is simply this: *Moon position does not appear to have consistent effects on whitetail activity.* While moon position can be correlated in some ways to activity, it is unlikely to be the *cause* in any case.

When the moon is in position to provide conditions conducive to deer feeding (i.e., adequate moonlight) during non-hunting hours, the animals will take advantage of the situation. But as a sole predictive force, moon position just does not measure up.

No matter where the data are collected, the primary difference among the four moon phases is in the amount of daytime activity. The least daytime activity occurs during the full-moon phase, while the new moon sees the greatest amount. But across the board, our estimates show that between 70 percent and 90 percent of all whitetail foraging activity occurs during non-hunting hours (from 30 minutes after sunset to 30 minutes before sunrise).

The other "moon model" put forth recently is based on the idea that a number of variations in the moon's orbit (invisible to the eye, but

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calculable by scientists) affect deer activity patterns. By applying mathematics, it is contended, a person can devise a numerical index to accurately rate any future day's level of daytime deer activity.

Again utilizing our nearly 3,000 photos, all taken without the bias of human presence, we tested this model. While the cameras operate 24 hours per day, we checked the ratings against only those photos snapped during legal hunting hours.

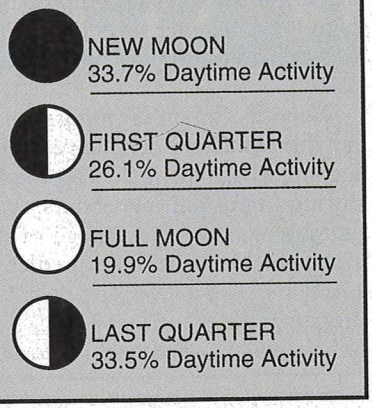
Theoretically, if this rating system was accurate, there would be a successive change in deer activity as the ratings ranged from low to high. Low activity (a poor rating) would mean fewer deer visiting feeding stations to be photographed by the cameras; high activity (a good rating) would mean more deer being photographed. Is that what we saw?

No. *We found a very poor correlation between this model's activity ratings and the number of deer photographed per day in any month, as well as with all months combined. The activity index ratings simply were not good predictors of actual deer activity.*

On the basis of these studies, we must concur with those researchers who, over the years, have failed to find a clear positive correlation between the moon and daytime deer activity patterns. After reviewing literally thousands of records on deer movement, we also have concluded that the whitetail is basically nocturnal, even when not heavily hunted. This animal is not physically comfortable in bright light.

This discussion probably has you thinking that the moon is hardly even worth considering as you plan your next hunt, but that is far from true. While we cannot say that the moon actually *controls* deer activity, our research has shown us that the right lunar conditions, in conjunction with certain other variables, can promote buck movement during legal shooting hours. As this series continues, we will show you how to recognize and interpret these variables and use them to your advantage as a hunter.

FIGURING OUT MOON PHASES

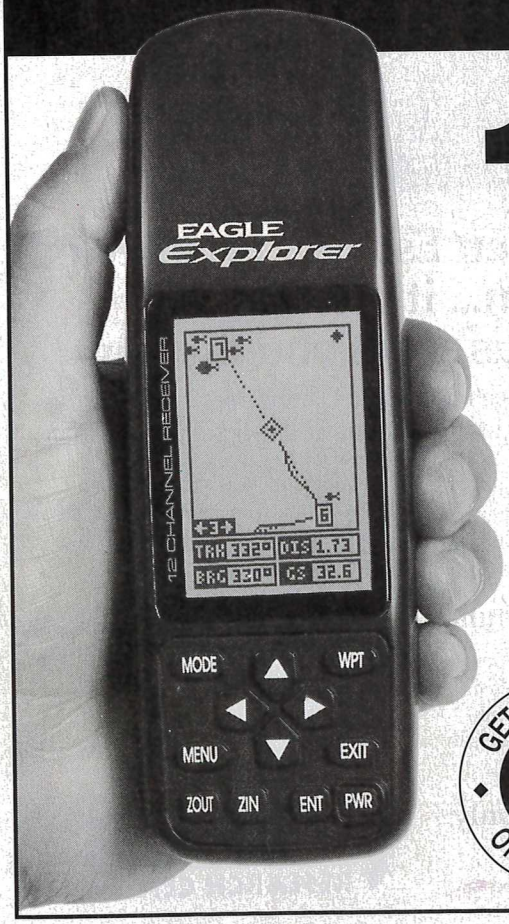


The authors' research, based on huge amounts of unbiased data, show that the full-moon and first-quarter phases have the least daytime activity.

FOR YOUR INFORMATION

The authors, who are on the staff of the Institute for White-tailed Deer Management and Research, are working with ***WHITETAIL*** to produce an in-depth book on deer movement. To learn more about the Institute's work, contact: Institute for White-tailed Deer Management and Research, Box 6109, SFA Station, Dept. WT, Nacogdoches, TX 7596l; (409) 468-2004.

GPS UPDATE



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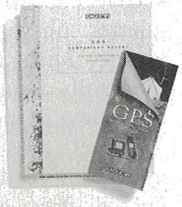
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