PREDICTING THE SEASON

Leonard Brennan, Ph.D.
C.C. Charlie Winn Endowed Chair for Quail Research

Anticipation is part and parcel of the beginning of any hunting season. Quail hunting season is no exception. It is a fundamental element of human nature to wonder about how the upcoming season will unfold, how many birds there will be, and if things will be better—or worse—than last year.

As a wildlife scientist, an important part of my job is to create models that make predictions. After all, one of the key tenets of science is to make predictions. As scientists, we strive to make predictions that are accurate, or at least as accurate as possible. Making accurate predictions about ecological systems is a challenge because so many different factors can vary simultaneously. Nevertheless, I take this challenge quite seriously, and consider it an important part of my job as a quail researcher.

Over time, quail hunters and quail researchers, have observed that there is a strong positive relationship between rainfall and quail numbers. The more it rains during a given year, the more likely it will be that quail populations will be abundant during fall and winter. However, from a scientific standpoint, the challenge lies in being able to understand the metrics— or numbers—in the relationship between the abundance of rainfall and the abundance of quail populations. This essay is about how we have unraveled the metrics between rainfall and quail production in South Texas over the past decade.

From 2001 through 2009 we accumulated many tens of thousands of quail wings from members of the Quail Associates Program. Each year, somewhere between 12 and 20 ranches contributed a wing from nearly every bobwhite bagged by quail hunters on that particular ranch. By looking at the feather patterns on each wing we are able to classify it as a juvenile (hatched that summer) or adult (hatched the summer before, or even earlier). The ratio of juvenile to adult bobwhites provides an excellent metric of productivity; the greater the ratio of juveniles to adults, the greater the annual productivity. Typically, during a “good” quail hunting season, the juvenile:adult ratios will be > 4:1. Thus, each year, ranches that contributed wings received a report on quail production on their ranch and how their ranch compared to other ranches in South Texas.

In addition to obtaining individual property assessments of annual quail productivity based on juvenile:adult ratios, we were also able to compile all of the data from across South Texas for each hunting season. This gave us, for the first time, a landscape-level assessment of quail productivity across most of the South Texas landscape. Note in Figure 1 how annual bobwhite production varies widely. During the past decade or so, the range of

juvenile:adult ratios has ranged from less than one (a disastrous quail-hunting season) to more than eight (a fabulous quail-hunting season). Note also in Figure 1 how the annual cumulative April to August rainfall (measured at the weather stations in Falfurrias and Hebbronville) closely tracks the annual variation in juvenile:adult ratios.

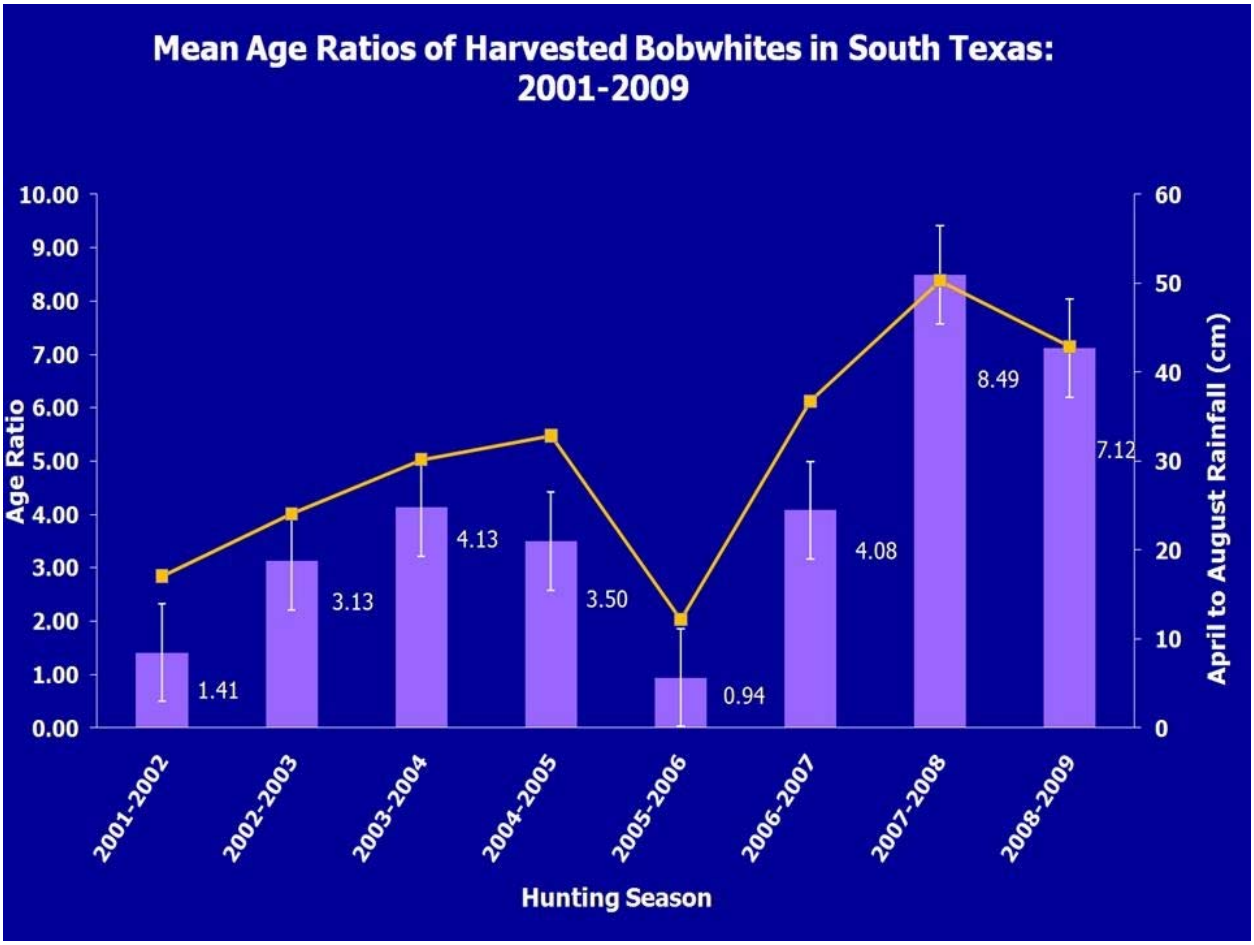

Figure 1. Variation in annual juvenile:adult, ratios (bars) and cumulative April through August rainfall (yellow line) for bobwhites across South Texas from 2001 to 2009.

Using a statistical analysis method known as regression, my graduate student Andy Tri tested the extent to which April to August rainfall was able to predict annual variation in juvenile:adult ratios, or actual quail productivity. We were astonished at the result. As it turned out, April to August rainfall was able to explain (predict) 92% of the annual variation in South Texas bobwhite production (see Figure 2). What this means is that we now have a very powerful mathematical model for "predicting the season."

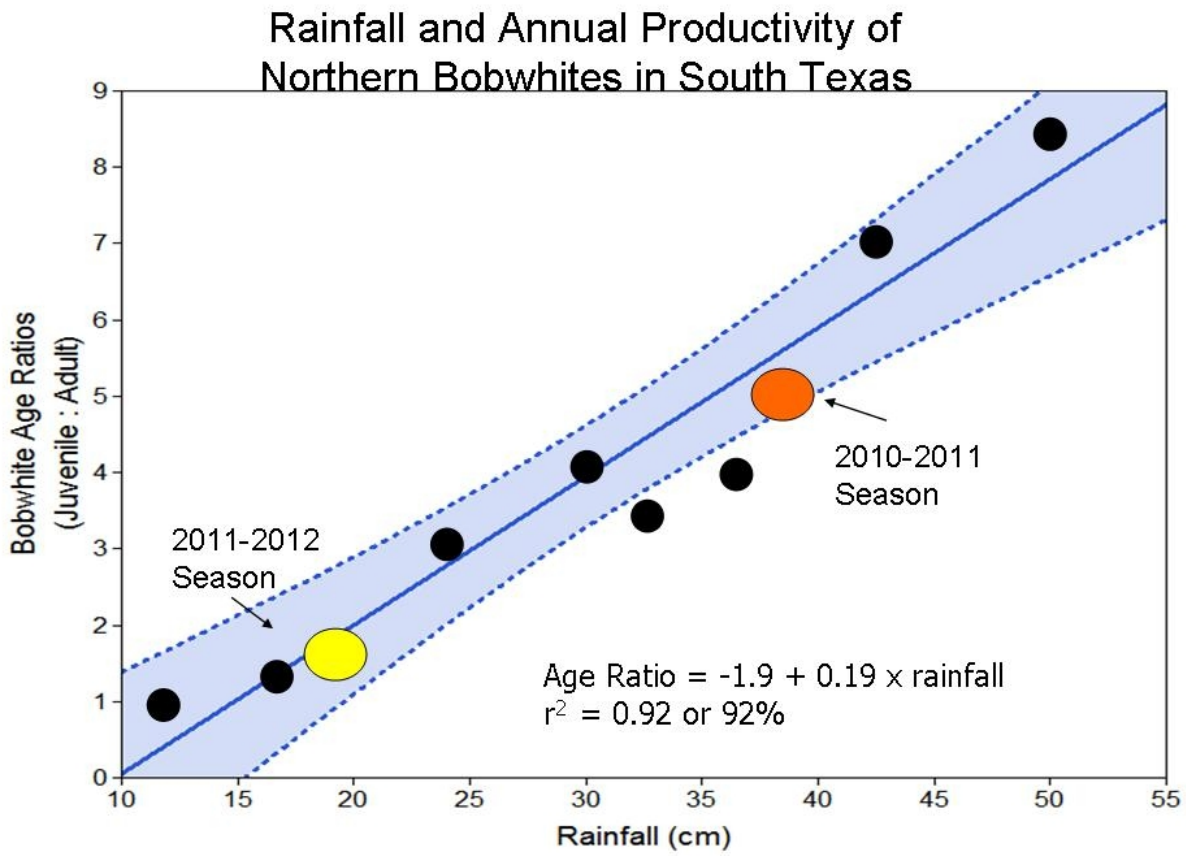

Figure 2. Predictive model showing the relationship between rainfall (horizontal axis) and annual productivity (vertical axis) for bobwhites in South Texas. The shaded blue region represents the margin of error of the model. To convert from centimeters to inches, multiply centimeters by 0.39. To convert from inches to centimeters, multiply inches by 2.54.

Here is how it works. By tracking the April to August rainfall (the horizontal line on the graph in Figure 2) all you have to do it find the point on the axis that corresponds to how much rainfall there was from April to August during a given year. Then, draw a line strait up to the point where it crosses the diagonal blue line, and then draw another line left to the vertical axis of the graph, represented by juvenile:adult age ratios. Last year, we did this for the 2010-2011 hunting season (see the large orange dot in Figure 2); the predicted juvenile:adult ratio was almost 5:1, and it was a very good hunting season. This year, the prediction (see the yellow dot in Figure 2) is not nearly as encouraging. However, recall that rainfall this past spring and summer was sketchy at best. There were rain events only in May and July, and these were minimal (about 4–6 inches total). However, even a little rain is better than none, and we did have at least some minimal bobwhite production this year. The September rainfall that we received, although not considered in our predictive model, should be considered a positive factor that will help keep the habitat in shape as we move into the fall.

There are also some lessons for management here:

Lesson one: Just because April to August rainfall explains 92% of the variation in quail

production, this does not mean that other factors, such as habitat, are not important. The data collected that we used to develop our predictive model were taken from ranches that all had good-to-excellent quality quail habitat. Thus, habitat remains a key factor. In this case, however, habitat is lurking in the background of the statistical model, rather than being at the forefront of it.

Lesson two: The ability of bobwhite populations to recover their productivity (and hence abundance) after a terrible year (or more) of below-average rainfall is directly related to the presence of good habitat. The presence of abundant bunchgrasses for nesting, optimal woody cover, and insect-producing forbs are directly related to management decisions that have kept these habitat components in place through periods of drought so that the quail can capitalize on them immediately when it finally does rain, instead of losing out on most of a nesting season while they wait for the habitat to grow back. When the birds have to do this, a nesting season with good rainfall will not be nearly as productive because nesting cover is limited, nest losses will be greater, and production will be lower.

Lesson three: Being able to “predict the season” allows quail hunters to manage their expectations. During any given decade, it is safe to say that, at least in South Texas, there will be a couple of boom years, several bust years and several average years of quail hunting. Consider Figure 2 one more time. If you visually split the field of the graph in “vertical thirds” you will get my point. The dots on the right third of the graph represent the boom years, the dots on the middle third represent the average years, and the dots on the left third represent the bust years. And no two quail seasons are ever the same, at least during the past decade in South Texas.