

Evaluation of New Weed-Control Strategies on Northern Bobwhite Quail Habitat and Mortality

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New production practices must be evaluated not only for their effects on pest populations, but non-targeted species as well. Besides causing shifts in weed and foliar insect populations, new weed-control practices can affect insects living on the soil surface and, hence, the wildlife that feed upon them. Over the last several decades, bobwhite quail (*Colinus virginianus*) populations have declined in the Southeastern USA, at least partially due to the use of clean tillage practices by farmers. Since quail habitat includes agricultural fields, we conducted a two-year study to examine the affects of new weed-management systems (centering on conservation tillage) on bobwhite quail food availability and habitat quality.

An innovative weed-control system for use with conservation tillage was compared to a traditional production system on five split fields at the Pee Dee Research and Education Center in 2003 and 2004. Each field was divided into four sampling areas: conversation tillage system, traditional tillage system, transitional zone, and wooded habitat. Year one (Y1) split fields were all planted with doublecropped soybeans (*Glycine max* L. Merr) and year two (Y2) fields were planted half in doublecropped soybeans and half in corn (*Zea maize* L). Quail were monitored using flush counts in year 1 and radio telemetry in year 2 to understand the impacts of tillage treatment and crop selection on quail habitat use and mortality. Insects and vegetative samples were also randomly collected within these four areas to determine habitat attributes including crop canopy coverage for brood and escape cover, insect populations for food availability, and tree stand density for comparison among forested areas. All data such as field location, field characteristics, insect trap location, and forest and intermediate sampling were mapped using GPS and transferred into a GIS system for comparison and modeling.

The Pee Dee Research and Education Center has been managed in a manner similar to most modern farms in the region, using practices that are termed clean farming. Field edges and drainage ditches are mowed on a regular basis, the crop fields are planted close to the wooded areas resulting in little field border area, and the woods are not managed for wildlife habitat. These practices have no doubt contributed to a less than ideal bobwhite quail population, which would account for the low flush counts and trapping success we observed. Pen-raised quail were used in our study due to the insufficient number of wild birds captured. The higher-than-expected mortality rate for the pen-raised birds was also probably due to less than ideal habitat at the research Center. Habitat-use was significantly greater in conservation tillage (CT) fields than the traditional tillage (TT) fields, border area, and woods. The majority of quail that entered into the wooded areas died within 48 hr; probably due to the lack of ground story cover making them very susceptible to predators.

The greatest and fastest crop canopy structure development occurred with the CT treatment which should have provided greater cover from avian predators, which caused the second highest mortality rates in our study. Mammalian predators (fox, bobcat, raccoon, coyote, and possum) accounted for the majority of the quail killed, followed by avian or reptile predators. The number of birds that died after being observed in a given treatment was similar for the CT and TT treatments, indicating mortality rate was less with the CT treatment than the TT treatment.

Insect abundance was highly variable between years, probably due to the differences in the amount of rain received. Insects comprise the majority of food consumed by quail during the breeding season, mainly due to the high protein needed for reproduction. The Orders Hymenoptera and Coleoptera are the most frequently ingested insects by bobwhite quail, and were found to be greater in CT treatment than in TT, border, and woods treatments.

Pen-raised and native bobwhite quail should benefit from new weed-control systems centered on conservation tillage because of the greater crop cover, increased insect abundance, and more environmentally friendly herbicides that are applied with these systems. Past research has shown that native bobwhite quail will nest within soybean planted with conservation tillage; however we could not examine this observation in our studies due to the use of pen-raised quail. It is difficult to extrapolate our results to native quail due to the many differences that occur between pen-raised and native quail. However, if quail nesting and reproduction success can be increased through the use of these newer weed-control systems, it is safe to assume that the decline in native quail populations will be reduced, if not reversed. On the other hand, the impact these agronomic systems can have on quail numbers will also depend on improvements in wooded and border habitats.