

## **EFFECTS OF HABITAT CONSERVATION EFFORTS ON NORTHERN BOBWHITE BROOD ECOLOGY**

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### **Introduction**

Northern Bobwhite (*Colinus virginianus*) (commonly called bobwhite) populations have declined across much of the southeastern United States. Figure 1 shows bobwhite population trend data extracted from the national Breeding Bird Survey. The bobwhite was once a common sight in agricultural landscapes of the southeastern United States. Now, it can be difficult to find a covey of quail. There are several reasons for this decline. A reduction in the amount of habitat for raising young (called ‘broods’) is one factor. Poor quality of brood habitat is another major factor adding to the decline. Converting farmland to other land uses is partly to blame. The intense management of the remaining farmland has also added to the loss of habitat. Dense stands of pine plantations add to the loss of habitat as well.

In 1999, the Georgia Department of Natural Resources initiated the Bobwhite Quail Initiative (BQI). This program pays a cash incentive to landowners who provide nesting and brood-rearing habitat in agricultural areas across parts of Georgia. This habitat is mainly provided in two forms. The first habitat type is fallow field borders (30-60 feet wide) along the edge of crop fields. The second habitat type is fallow strips (called weed rows) that pass through the interior of crop fields. Figure 2 shows how these habitat areas could be arranged. In 2002, we began a two-year study to determine the impact of the BQI habitat program.

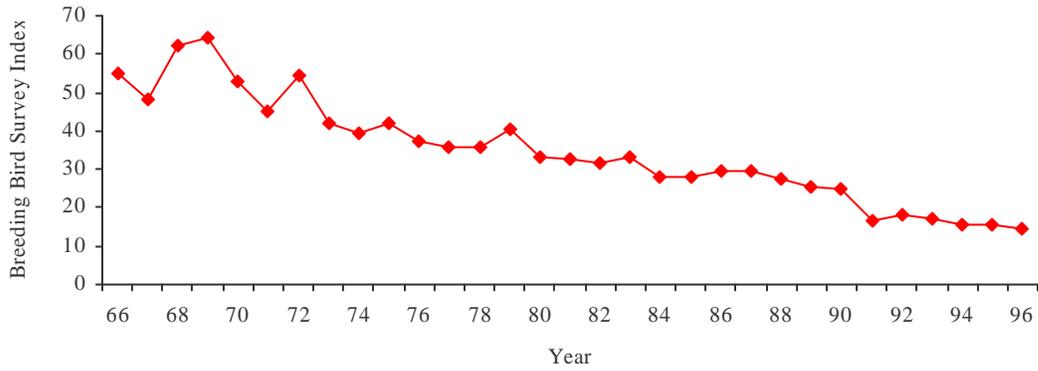
### **Methods**

We captured bobwhites during the winters of 2002 and 2003. We attached radio-transmitters to each bird. The quail were monitored throughout the breeding season to determine if and when they had a brood. Broods were located 2-4 times a day for the first 14 days after hatching. We estimated the home range of each hen and her brood. We also measured the distance between nest and center of activity for each brood. Broods with BQI habitats within their home range were considered to be BQI broods and all others to be non-BQI broods. Figures 3 and 4 illustrate the maps we drew from our radio-telemetry data.

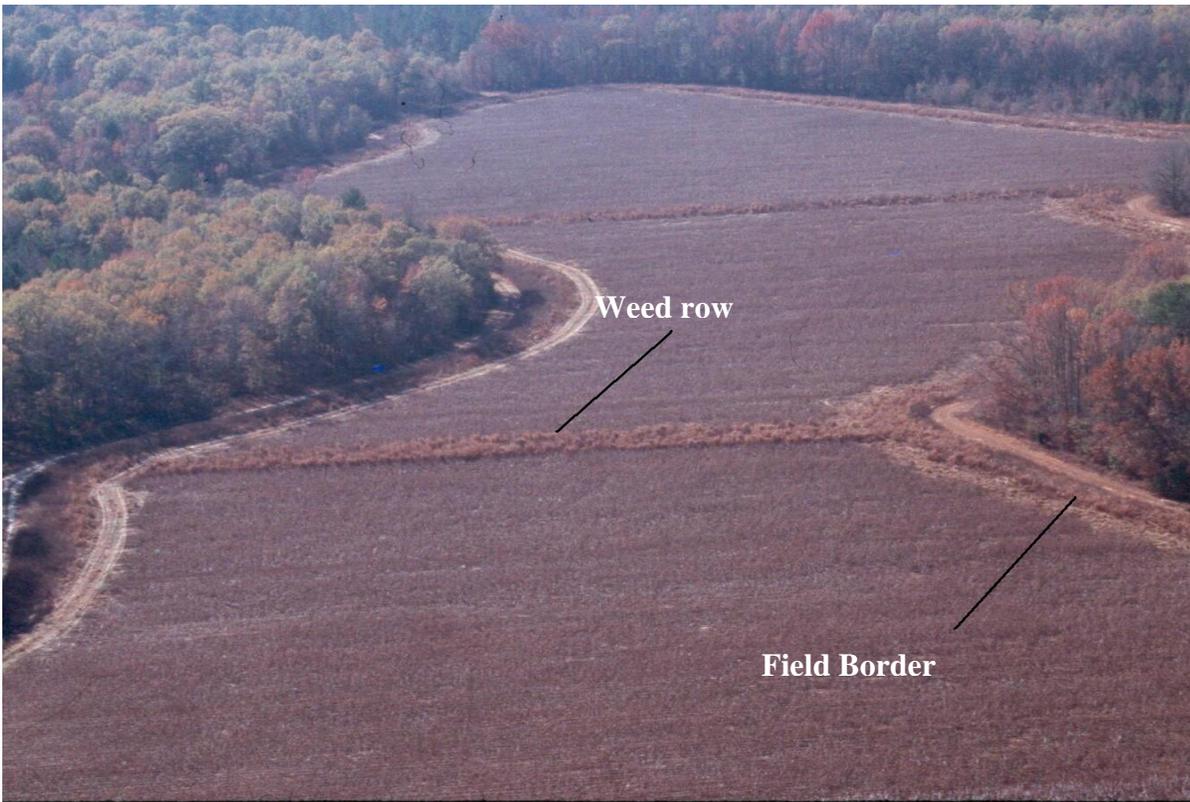
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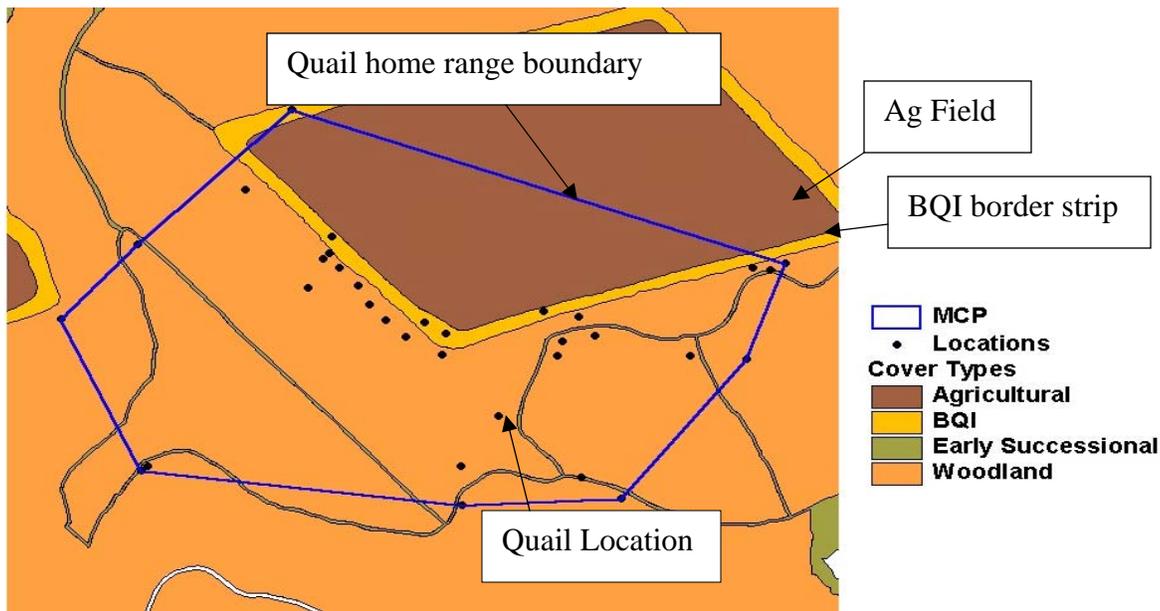
**Figure 1. Data from the annual breeding bird survey indicating decline of the bobwhite quail throughout the southeastern United States.**



**Figure 2. Aerial photo of crop field being managed for bobwhite with the major BQI habitats: field borders and weed rows.**

At approximately 8 days of age, we attempted to capture each brood by locating them on the roost. If we were successful in locating the roost, we built a fence around the roost area and then removed all vegetation within the fence. The fence and roost area with vegetation removed is shown in Figure 5.

Once we captured the brood, we weighed each chick (Figure 6). We calculated the daily chick growth for each brood by subtracting the current weight from the previous day's weight. We also determined how many chicks had survived from hatching to the date of capture. Lastly, we calculated the daily chick survival for each brood based on the number of chicks hatched, their age at capture, and the number alive at capture.



**Figure 3. Radio locations of a quail brood with BQI habitats within its home range. The dots are the radio locations, the straight lines are the estimated edges of the quail home range.**

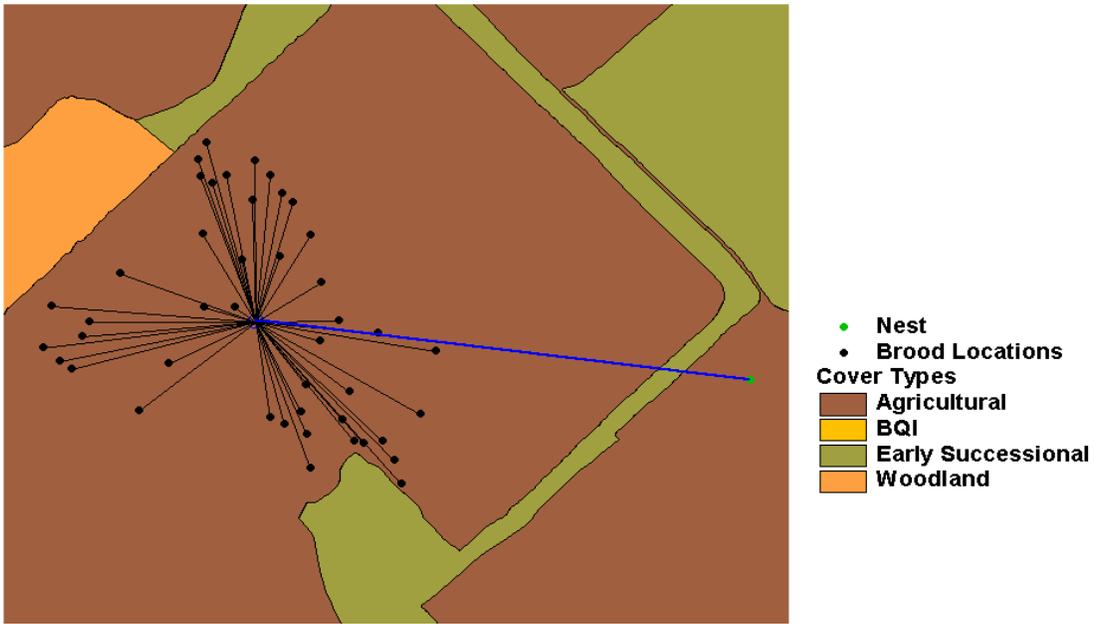


Figure 4. The distance from a quail nest to the center of brood activity.



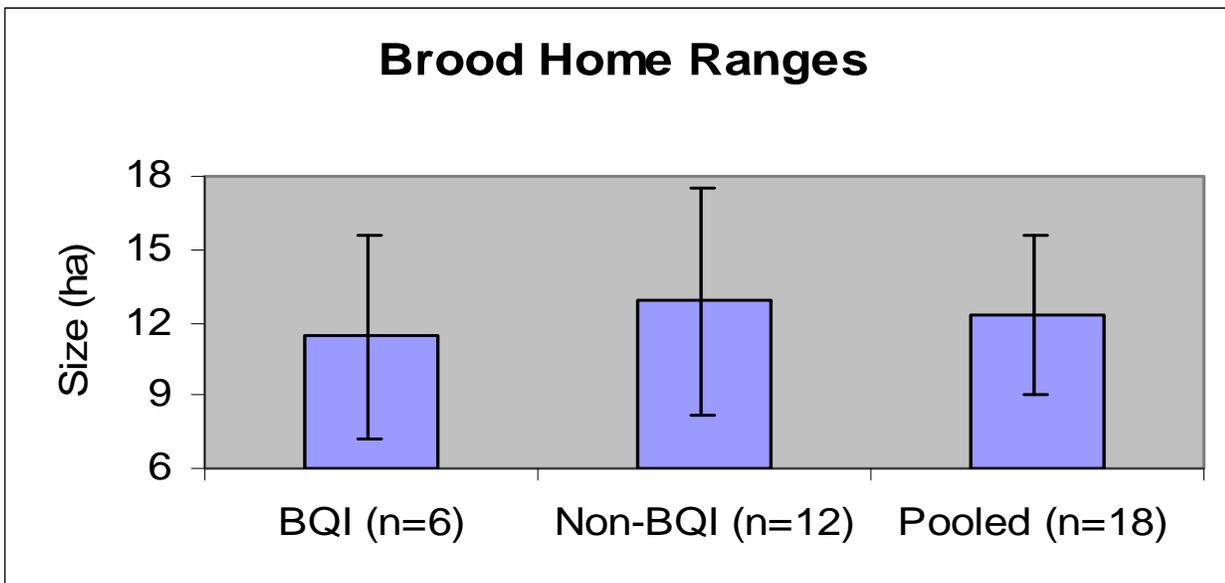
Figure 5. Brood capture site after all vegetation has been removed from within the fence.



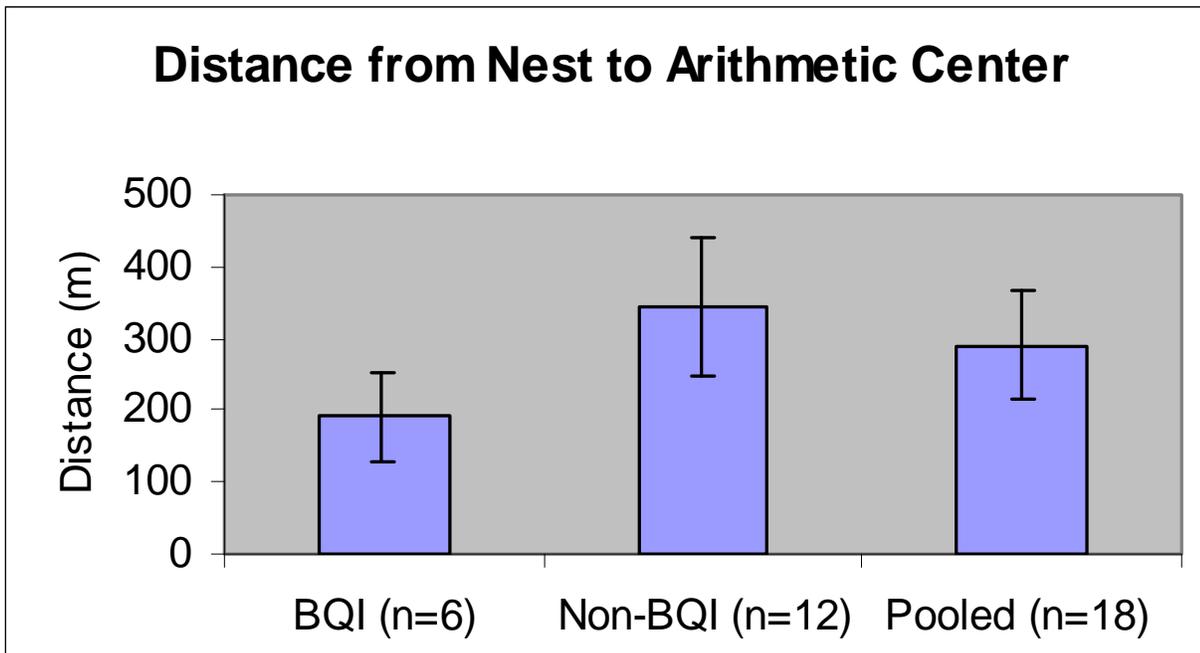
**Figure 6. Captured bobwhite chick being weighed.**

## Results

We obtained estimates of home range size for broods based on movements of the adults that were fitted with radio-transmitters. We had six broods in BQI habitat. That is, fields with fallow border strips and weed rows. Those broods had an average home range size of 11 hectares, or about 27 acres. We had 12 broods in non-BQI habitat. That is, fields without the fallow border strips and no weed rows. Those broods had a slightly larger average home range size of 13 hectares or about 32 acres. The differences were not statistically significant (Figure 7).



**Figure 7. Estimates of brood home range size for BQI and non-BQI broods and all broods combined. The lines represent the 95% statistical confidence interval for the estimates.**



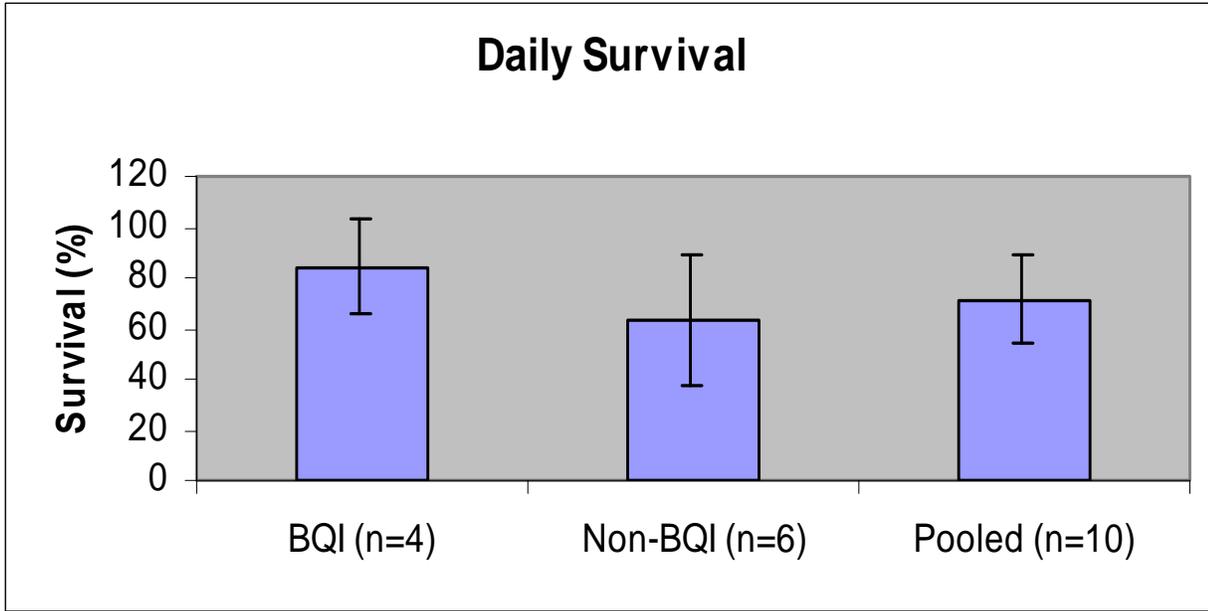
**Figure 8. Estimates of distance from nest to center of brood activity for BQI and non-BQI quail broods. The lines represent the 95% confidence interval estimates.**

The distance from the nest to the center of activity was 200 meters or about 218 yards for BQI broods and 350 m (381 yards) for non-BQI broods (Figure 8). We successfully captured and obtained estimates of daily chick growth (Figure 9) and survival (Figure 10) for 10 broods. There were no statistical differences in these estimates between BQI and non-BQI broods. However, average BQI brood survival was about 80% while average non-BQI brood survival was only about 60%.

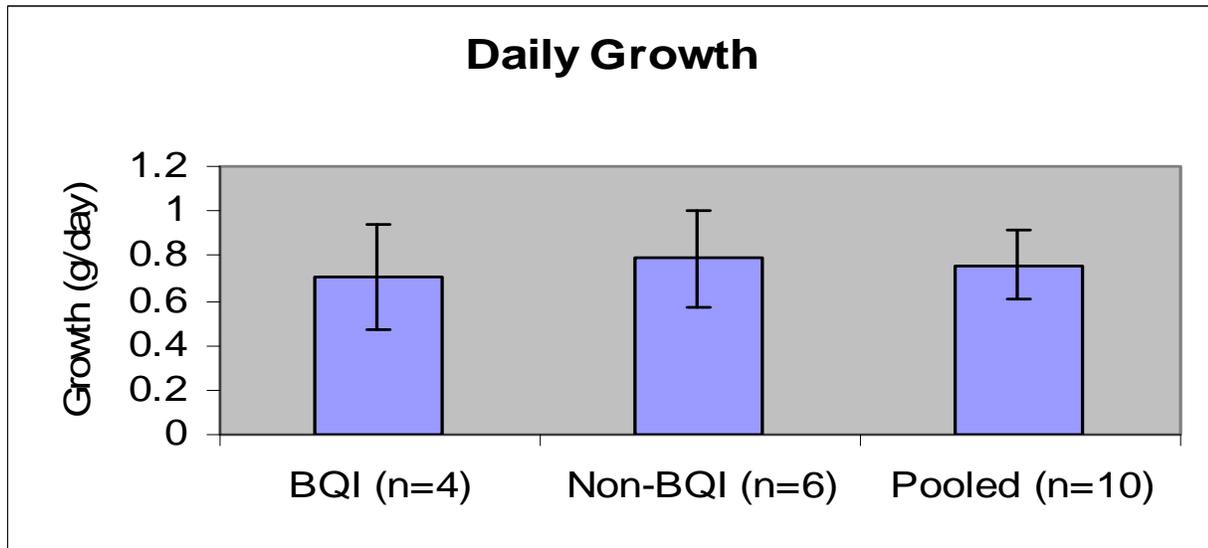
We also estimated the average daily weight gain for captured chicks. The BQI broods had average daily weight gains of about 0.75 grams per day while the non-BQI broods averaged about 0.80 grams per day. Again the differences were not statistically different.

## Discussion

In general, there is a relatively small amount of BQI habitat on this landscape. Thus it seems that adding field borders and weed rows has minimal impact brood ecology. However, there did seem to be a positive impact of BQI habitat on chick survival and distance from the nest to center of brood activity. BQI habitats extend over larger areas than patches of non-BQI habitat which may bring feeding areas closer to nesting habitat. This possibly allows broods to move shorter distances from nest to brood range and spend less time exposed to predation. We cannot recommend that the program be abandoned or continued based solely on these results. Our sample sizes were low and our system for classifying broods as BQI or non-BQI based only on the presence of BQI habitats within their home ranges may not be a completely fair comparison. Also, more information is needed on the effects of BQI habitats on mature birds.



**Figure 9.** Estimates of daily chick survival for BQI and non-BQI broods along with estimates of 95% confidence intervals.



**Figure 10.** Estimates of daily quail chick growth rate for four BQI quail broods and six non-BQI broods. The lines represent the 95% confidence interval.

However, our results do suggest that the management actions of the program may need to be re-examined. It may be that BQI habitats are not large enough. Also, the seed banks in these crop fields are unlikely to contain the seeds of beneficial plants. This could be due to their long history of intense

agricultural management. Eradicating undesirable vegetation (for example, Bermuda grass) and planting desirable plants (such as native legumes) may be required. Other forms of habitat improvement may be necessary such as strip-disking and burning the field borders and weed rows. Habitat management in this landscape is a complex process. The plant composition and amount of the landscapes surrounding the managed fields probably had a big impact on bobwhite ecology. Surrounding habitats need to be considered when determining which fields to enroll in the program.

Landowners are encouraged to work with DNR biologists or extension agents to develop quail habitat whenever possible. Even small increases in suitable acreage on a single farm can have a large impact across the bobwhite's entire range. Habitat management activities like strip disking, prescribed fire, leaving field borders fallow, and minimizing the use of pesticides will help increase quail survival. Predator control, while sometimes helpful, is expensive. The most cost-effective strategy is to manage food and cover resources to maximize quail productivity and minimize the effects of predation. Examples of managing habitat to offset predation are thinning out and prescribe burning woody fence rows or hedge rows to promote a grassy ground cover. Removing many of the trees will make the habitat less favorable for nest predators like raccoons and snakes. Prescribed burning will produce grassy ground cover and provide more favorable nesting, brood-rearing, and feeding cover. Contact the local office of the Wildlife Resources Department or the local county agent for more information on good quail management practices.

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