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# DIURNAL OCCURRENCE OF GREAT-HORNED OWLS ON NORTHERN BOBWHITE HUNTING PROPERTIES IN SOUTHWEST GEORGIA

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## ABSTRACT

Understanding interactions between prey species and their predators is essential to discerning the ecology and management fundamentals of a species. Great-horned owls (*Bubo virginianus*) have long been considered an opportunistic predator of northern bobwhite (*Colinus virginianus*; hereafter, bobwhite) and recent studies have demonstrated that bobwhite survival is reduced at higher great-horned owl densities (Rectenwald et al. 2021). Managers on quail properties often mechanically remove live oak (*Quercus virginiana*) hammocks as part of larger predation management plans to reduce the amount of suitable predator habitat. While scattered live oaks are typically left for aesthetic purposes, these serve as preferred day roosts and hunting perches for great-horned owls. To improve bobwhite survival and fitness, managers on quail properties broadcast supplemental grain along designated trails at a density of 2.4 km/40.5 ha of upland habitat. From the peak of bobwhite brooding season to the end of the breeding season (i.e., Jun–Sep), it is common for managers to switch from broadcasting grain from feed trails to broadcasting grain from mowed roads to reduce tractor activity in obscured cover where broods or nests may be run over and destroyed. Bobwhite are potentially at higher risk for predation where live oak hammocks are intersected by feed trails due to increased exposure time in areas with higher predator occurrence. Additionally, bobwhite may be at higher predation risk when feeding on mowed roads in the summer, particularly when in close proximity to live oaks, due to the lack of screening cover from opportunistic owls perched above.

We evaluated the probability of use for great-horned owls in relation to live oak hammocks, feed trails, and roads that are fed in the summer. We compared use versus availability for landscape features using a resource selection function in a Bayesian framework. As part of a larger study detecting all raptors that were threat-specific to bobwhite, driving surveys using line-transect distance sampling on a 32.2-km route were conducted twice per month from September 2014–December 2020 between 0800–1000 at a speed of 16 km/hr. The surveys encompassed a 5,400-ha privately owned property in Baker County, Georgia, USA. Surveys were conducted only on days with fair weather (i.e., no fog or rain). When great-horned owls were visually detected, their location was recorded on a Global Positioning System (GPS). Great-horned owl density on the property averaged approximately 0.86 owls/km<sup>2</sup> during the bobwhite breeding season and 0.58 owls/km<sup>2</sup> in the non-breeding season (Rectenwald et al. 2021). The site was 60% upland pine (*Pinus elliotii*, *P. palustris*, *P. taeda*), 20% fallow field, 10% pine for timber production, 5% live oak, and 5% wooded wetland. Habitat features were delineated using satellite imagery and GPS units. Random locations were generated to determine resource availability and we used observed locations in a logistic model using vague priors to estimate probability of use with increasing distance from landscape features.

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We detected 111 great-horned owls during 135 surveys. Our study indicated that great-horned owls were 9.1 times (odds ratio, 95% credible interval [CrI]: 6.0–16.6) more likely to use an area for every 48.3 m closer to live oak hammocks. Great-horned owls were also 1.8 times (95% CrI: 1.4–2.6) more likely to use an area for every 38.8 m closer to feed trails that were being fed. Our results suggest that great-horned owls were 1.9 times (95% CrI: 1.0–4.6) more likely to use an area for every 29.3 m closer to roads being fed in the summer compared to unfed roads other times of the year. Our study indicates that great-horned owls are more likely to select areas within close proximity to live oaks even though hammocks are found at a low density of 1 hammock/8 ha of upland habitat. While great-horned owls are likely utilizing residual live oak hammocks largely because they are suitable day roosts, they are even more likely to use these areas where prey bases are likely to be higher. Feeding roads in the summer may increase the likelihood of bobwhite predation because of the lack of cover and changes in predator behavior (i.e., hunting roads). While great-horned owls are not the most common bobwhite predator, they influence bobwhite survival and research has indicated that bobwhite survival decreases when great-horned owl density increases. To mitigate predation potential, we suggest that managers should either remove existing live oaks that are within 50 m of feed trails and roads or disengage the feed wagon when approaching live oak hammocks. Alternatively, new feed trails could be established so that they avoid being near live oak hammocks altogether. Considering that roads fed in the summer may attract higher predator levels, we also recommend blowing feed into the cover from the roadway to reduce exposure on mowed, open grass. Further studies should investigate how survival rates vary when road feeding occurs on mowed roads versus only on designated feed trails.

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**Key words:** *Bubo virginianus*, *Colinus virginianus*, great-horned owl, habitat use, live oak, northern bobwhite, predation, raptor, supplemental feed, survival

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Rectenwald, J. A., E. Bellier, D. C. Sisson, T. M. Terhune, and J. A. Martin. 2021. Top-down effects of raptor predation on northern bobwhite. *Oecologia* 197:143–155.