Planning and Prioritization of Northern Bobwhite Habitat Restoration in Mississippi

a collaborative effort

Forest and Wildlife Research Center, Mississippi State University

Mississippi Department of Wildlife, Fisheries and Parks

Northern bobwhite populations have declined throughout their range at nearly 3 percent per year since 1966. Although these declines have been attributed to a variety of factors, the most likely cause has been large-scale deterioration of quail habitat quality associated with advanced natural succession, intensive monoculture farming, and intensive timber management. In the Southeast, Midwest and Central regions of the United States, northern bobwhites are linked to early successional plant communities maintained by disturbance (e.g. fire). Early successional plants are the grasses and annual weeds that occur within the first one to three years following disturbance. Stemming the population decline and restoring bobwhite populations to former densities will require creation and maintenance of essential habitat on a massive scale. In the past, bobwhite were an accidental by-product of broadly applied land management practices. In modern landscapes, comparable densities will only exist as a result of premeditated, intentional creation and maintenance of early successional plant communities.

Distribution of Conservation Efforts

The Northern Bobwhite Conservation Initiative defines explicit, state-level habitat enhancement or creation objectives for each land-use category within each Bird Conservation Region. However, the recommendations are not spatially explicit in the sense that no recommendations are made as to how habitat management practices should be distributed within the Bird Conservation Region or among patches of a specific land-use category across the region.

A fundamental question of concern for all large-scale conservation initiatives is: "How do we distribute technical expertise, cost-shared practices, and other resources in a manner that optimizes conservation benefit per investment ratios?" Conservation investments should be placed within the landscape in regions that have potential for greatest population response and highest probability of eliciting a sustained response. Such regions might be characterized as already sustaining bird populations, yet having extensive quantities of potentially usable habitat available for enhancement. Tracts large in size and in close proximity to existing suitable habitat should receive priority status. Previous state-level bobwhite initiatives have selectively allocated resources using a variety of subjective and objective criteria to maximize return on investment. In this project, a state-level habitat modeling approach was used to classify suitable habitat for the purpose of identifying focal areas and guiding habitat enhancement efforts and conservation investments in Mississippi.

Bobwhite Habitat Model

Bobwhite habitat suitability was modeled as a function of landscape structure and composition in a logistic regression context. Bobwhite counts from 24 segmented Breeding Bird Survey routes were used as a measure of bobwhite abundance and were linked to landscape structure and composition estimated from the Mississippi GAP Analysis Land Cover Map.

A model selection process was used to identify the best approximating model from a set of competing candidate models that predicted probability of occupancy as a function of landscape structure and composition. The "best" model included the landscape structure and composition measures: 1) crop edge density; 2) grassland edge density; 3) percentage of landscape in hardwood; and 4) percentage of landscape with a hardwood core area. Edge density measures habitat patch edge length per hectare (2.5 acres). Percentage of landscape measures the proportional abundance of habitat patches in the landscape. Percentage of landscape with core area measures proportional abundance of habitat patches minus 100 meters of edge around habitat patches. The model was used to estimate bobwhite habitat suitability on a scale of 0-1 relative to landscapes in which populations exhibited greater abundance. To evaluate habitat suitability, the model was applied to the entire state to generate a surface of habitat suitability with a 2,500-meter grid cell size. Habitat suitability was projected at six levels: 1) 0.00-0.49; 2) 0.50-0.74; 3) 0.75-0.84; 4) 0.85-0.89; 5) 0.90-0.94; and 6) 0.95-1.00.

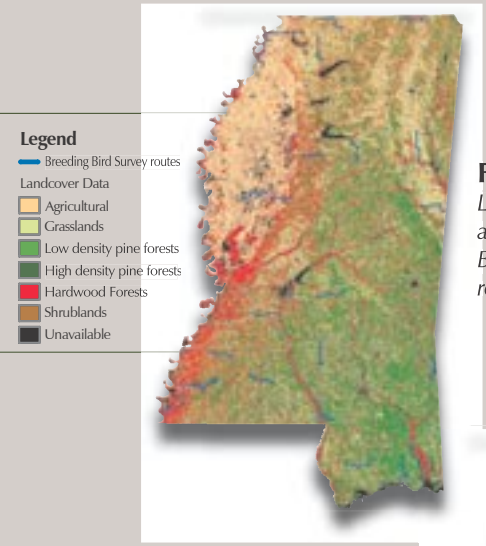

Figure 1
Land cover data and distribution of Breeding Bird Survey routes

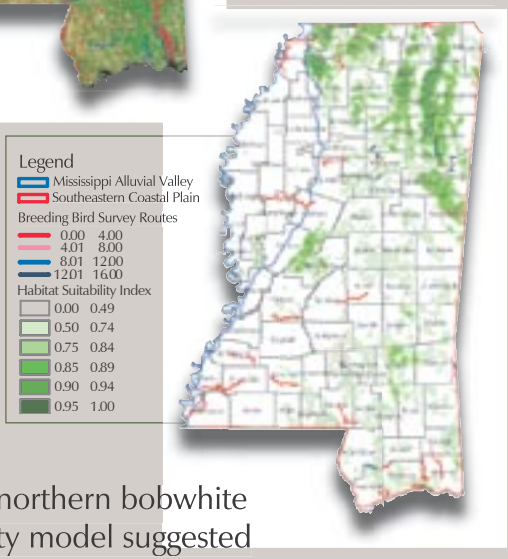

Figure 2
Breeding Bird Survey routes, scaled by bobwhite counts, in relation to predicted habitat suitability

The state-level northern bobwhite habitat suitability model suggested several areas within Mississippi as having a high probability of supporting moderate bobwhite populations. These areas would likely be most practical for application of habitat/population restoration efforts. There were about 16,389 square miles (34 percent of total state area) of habitat patches with suitability greater than or equal to 0.50; 6,412 square miles (13 percent of total state area) of habitat patches with suitability greater than or equal to 0.75; and 856 square miles (2 percent of total state area) of habitat patches with suitability greater than or equal to 0.95.

Model Utilization

The model was not sensitive to open-canopy pine forest-dominated landscapes because 1) there were not sufficient amounts of the land cover class to elicit an observed response or 2) there were not enough Breeding Bird Survey routes distributed among this land cover class to adequately measure its importance. Despite this shortcoming, the habitat suitability model does provide an objective, data-based approach for assigning management priority areas to agricultural and grassland landscapes within Mississippi. Habitat suitability is based on land-use characteristics that have the greatest probability of supporting moderate bobwhite populations. These areas likely represent the greatest opportunity for successful bobwhite population restoration in agricultural/grassland landscapes. Although pine dominated regions had relatively low predicted habitat suitability ratings, the state-level model did identify areas within pine dominated regions (e.g. South Mississippi) that had other landscape characteristics (e.g. grasslands) interspersed among pine forests. Existing bobwhite populations in these areas would likely respond favorably to proactive pine forest management (e.g. thinning and prescribed burning). The model also suggests that areas where bobwhite populations have experienced the most severe declines will need the most extensive management to restore and maintain sustainable populations.

Northern Bobwhite Conservation Initiative

In response to the decline in bobwhite quail, the Southeast Quail Study Group Technical Committee developed an ambitious, range-wide population and habitat restoration plan called the Northern Bobwhite Conservation Initiative. The goal for this initiative is to restore range-wide northern bobwhite populations to an average density equivalent to that which existed on improvable acres in the baseline year of 1980.

Bobwhite in Mississippi

Bobwhite populations declined at a rate of more than 5 percent per year from 1980 to 2003 in Mississippi. As of 2002, the Initiative estimated that 198,190 coveys would need to be added to the autumn population to restore bobwhite populations to 1980 levels. The Southeastern Coastal Plain and Mississippi Alluvial Valley are the primary Bird Conservation Regions in Mississippi. Important bobwhite habitat management practices include: 1) conversion of exotic cool season and warm season grasses or cropland to native warm season grasses and forbs; 2) longleaf pine restoration (where applicable); and 3) site preparation, burning, and thinning of pine forests to encourage favorable grasses and forbs.

For information contact:

Dave Godwin
662-325.5119
Mississippi Department of Wildlife,
Fisheries and Parks
dgodwin@cfr.msstate.edu

Wes Burger
662.325.8782
Forest and Wildlife Research Center
Mississippi State University
wburger@cfr.msstate.edu

Photos by Joe Mac Hudspeth Jr. and Marco Nicovich