Landscape-scale Geospatial Assessment of Open Pine and Natural Grassland Condition for Northern Bobwhite in the Gulf Coastal Plains and Ozarks

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Male bobwhite photographed by Ben Robinson

BACKGROUND

Species of Concern

Widely distributed across the eastern United States and parts of Mexico, **northern bobwhite (*Colinus virginanus*)** is one of North America's most economically important game birds. The ongoing and widespread decline of bobwhite populations has been a concern among wildlife scientists since the 1930s, with research on bobwhite conservation increasing dramatically during the past two decades. In the Southeastern U.S., bobwhites depend on a heterogeneous mix of open, early successional landscapes dominated by grasses and forbs and interspersed with woody cover for most of their habitat needs, and their decline is associated with the conversion of such habitat to large-scale monoculture agricultural and silvicultural practices over the past century.

The National Bobwhite Conservation Initiative

The National Bobwhite Conservation Initiative (NBCI) is a range-wide plan for recovering bobwhites and features a **Biologist Ranking Information (BRI),** a spatially and temporally explicit conservation planning tool designed to be pragmatic, flexible, and usable by multiple organizations (Figure 1). The BRI was developed through an expert solicitation process to characterize bobwhite habitat potential across 25 states using four tiers of habitat potential: **"High"** indicates land use compatible with bobwhites and other early succession species at the landscape scale. **"Medium"** indicates that conversion to suitable habitat is possible but more expensive and difficult. **"Low"** indicates land impossible to convert at the landscape scale although small isolated patches may exist. **"None"** represents urban and other land uses nearly impossible to convert.

The Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative (GCPO LCC)

The Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative (GCPO LCC) Conservation Blueprint 1.0 incorporates the efforts of at least a hundred people and from more than fifty organizations in an iterative **Landscape Conservation Design** process (Figure 2). The Blueprint integrates quantitative assessments of eight priority ecological systems into a suite of map layers developed to guide large landscape conservation for a 180-million-acre region of the Southeastern United States. The quantitative **Ecological Assessment** process takes a data-driven approach to generate ecosystem-specific **Condition Index** maps based on measurable landscape conditions (basal area, percent canopy cover, patch size, etc.) representing desired habitat conditions of species of greatest conservation need. Ecosystem-specific **Watershed Ranks** maps represent another iteration beyond the Condition Index, incorporating information about threats to habitat (urbanization and climate change), conservation partner actions, and species presence.

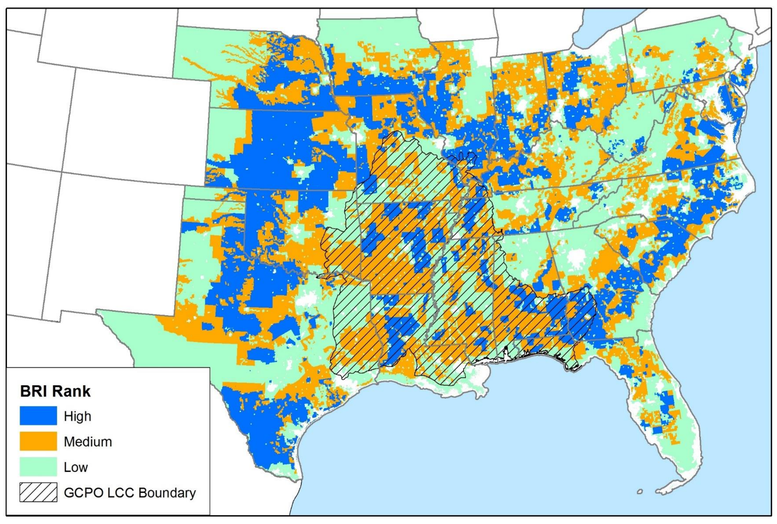

Figure 1: NBCI Biologist Ranking Information (BRI) indicating potential for conversion to suitable bobwhite habitat at the landscape scale

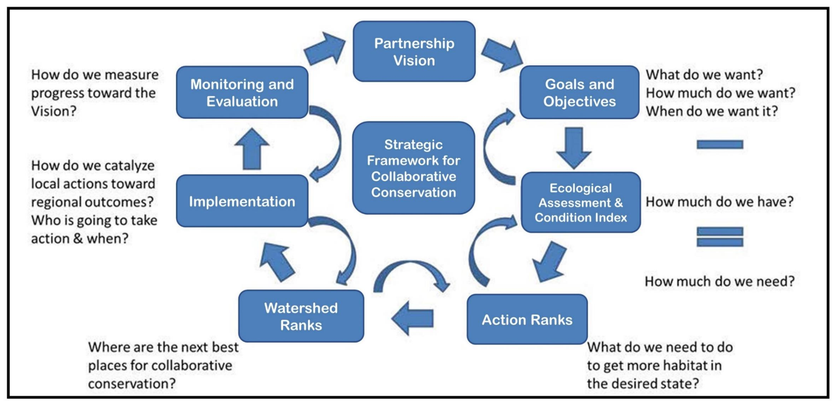

Figure 2: Conceptual model of Conservation Blueprint and associated decision support tools design process

For "Open Pine Woodland and Savanna" and "Grassland / Prairie / Savanna,". The GCPO LCC Draft Integrated Science Agenda identifies ten species as limited by conditions particular to Open Pine and seven species limited by grassland conditions, with northern bobwhite the only species common to both systems. The selected species and their hypothesized species-habitat relationships were derived from the relevant State Wildlife Action Plans and by expert opinion inputs by partners.

Desired Landscape Endpoints for Grasslands and Initial Assessment of Species Limited by Habitat Characteristics Reflective of These Endpoints, DRAFT - April 2013.

Desired Landscape Endpoints	Grasshopper Sparrow	Northern Bobwhite	Dickcissel	Henslow's Sparrow	Texas Horned Lizard	Eastern Meadowlark	Painted Bunting
Prairie patch size	x	x					
Vegetation Height			x				
Vegetation Density		x		x	x	x	
Bare Ground		x					
Shrub Cover		x					x
Tree Density	x		x				
Warm Season Grass Density		x					

Desired Landscape Endpoints for Open Pine Woodlands and Savannas and Initial Assessment of Species Limeted by Habitat Characteristics Reflective of These Endpoints, DRAFT - April 2013.

Desired Landscape Endpoints	Red-cockaded Woodpecker	Louisiana Pine Snake	Brown-headed Nuthatch	Bachman's Sparrow	Northern Bobwhite	Pine Warbler	Gopher Tortoise	Prairie Warbler	Eastern Diamondback Rattlesnake	Pocket Gopher
Forest patch size	X									
Connectivity	X	X	X	X						
Basal Area					X					
Average dbh	X		X			X				
Canopy Cover		X		X	X		X			
Midstory Shrub Density								X	x	
Midstory Hardwoods		X					X			
Herbaceous Understory		X		X			X		X	X
Early Successional				X	X			X		

METHOD

The BRI layer was clipped to the boundary of the HUC12 watersheds intersecting the GCPO LCC geography. To base the comparison on a common mapping unit, the four BRI classes (High, Medium, Low, None) were summarized by watershed by assigning to each watershed the class that occupied the majority of the coverage. Since the classes "None" and "Low" both indicate almost no possibility of conversion to quail habitat at the landscape scale, these classes were combined into a single class, "Low," not shown in the map displays.

GCPO LCC Watershed Ranks maps describe the best watersheds for conservation action (Restore, Enhance, Maintain) for each of the eight priority ecological systems in the region. The three-tiered approach to suitability characteristic of the BRI was imposed on the Grassland and Open Pine Watershed Ranks map layers by classifying the top 30% of watersheds as **"High,"** the 30% to 59% tier as **"Medium,"** and the remainder of the watersheds as **"Low."** The value of 59% is used as a data break in the watershed ranks map display in order to align with the proportions of Florida represented by the Florida Natural Areas Inventory (FNAI) Critical Lands and Waters Identification Project (CLIP). Once these maps were produced for Grassland and Open Pine, a Combined Watershed Ranks map was generated by assigning to each watershed the highest value from either system.

The overall goal of this project was to compare methods and results of the species-focused BRI and the system-focused Open Pine and Grassland Watershed Ranks map layers in order to enhance the effort to identify potential bobwhite habitat across the NCBI and GCPO LCC partnership.

Black Prairie WMA, Lowndes County, Mississippi photographed by Toby Gray

RESULTS

Aside from a general tendency to exclude urban areas, wetlands, alluvial plains, and closed-canopy forests, the two approaches produce notably different images of the amount and configuration of potential conservation areas in the landscape (Figure 3).

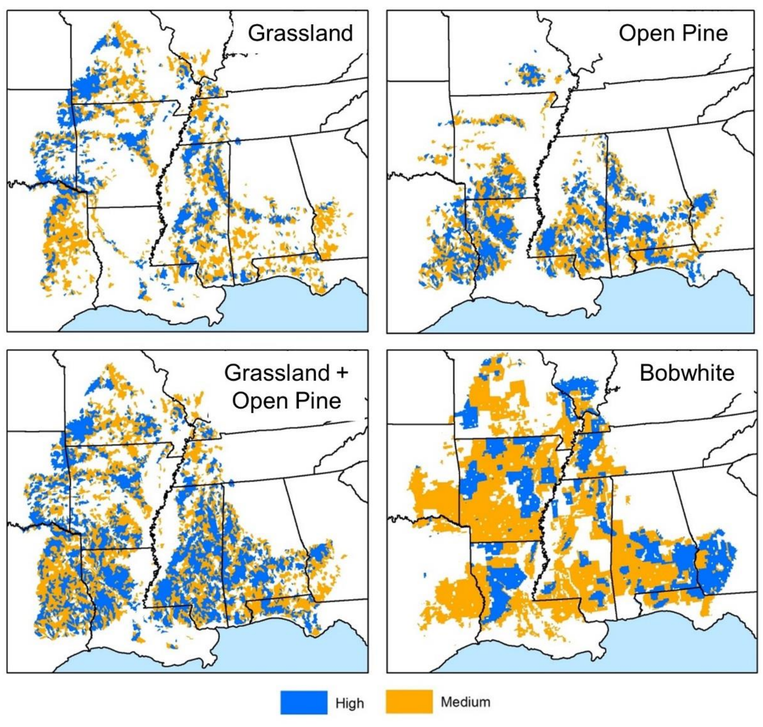

Figure 3: Maps of potential habitat described by the GCPO LCC (Grasslands, Open Pine, Combined Grassland + Open Pine) and by NBCI BRI (Bobwhite)

Similarities:
Both maps acknowledge that conversion to early successional or woodland-savanna-grassland conditions is possible (with varying degrees of difficulty) for large areas over most (LCC: 53%, BRI 63%) of the region. Both recognize the importance of large tracts of protected land in the East Gulf Coastal Plain. Both generally reject the floodplain of the Mississippi Alluvial Valley in Mississippi and Louisiana. Both recognize high conservation potential in the Grand Prairie region of Arkansas and in the pine forests of Central Louisiana.

Differences:
Only 39% of the watersheds receive the same rank in the LCC combined Grassland/Open Pine and the BRI maps, with only 7% agreement on the rank of "High". Some differences may be due to the fact that the LCC does not consider agricultural lands as having high potential for conservation. This is particularly noticeable in the Dougherty Plain of Southwestern Georgia and Southeastern Alabama and the alluvial plains of Northeastern Arkansas The LCC recognizes much greater potential in Coastal Mississippi, Alabama, and Florida, whereas the BRI describes high potential across a broad swath of Southern Illinois ignored by the LCC. In Eastern Texas and Oklahoma, the LCC describes hundreds of watersheds as having high potential whereas BRI acknowledges only a handful.

Cross tabulation of habitat potential descriptions by HUC12 watersheds

HUC12 watersheds n = 8367			
	BRI Low	BRI Medium	BRI High
LCC Low	1587	1453	687
LCC Medium	704	1137	484
LCC High	647	1093	575

Watersheds in agreement:	3299
% agreement	39
% agreement on "Low"	19
% agreement on "Medium"	14
% agreement on "High"	7
% with "Low" v. "High" discrepancy	16

Limitations
Assessment of particular site-scale features essential to bobwhite survival, such as bare ground and interspersion among bunch grasses, is impossible at the large landscape scale utilized by both products. Neither product can be expected to be predictive at the scale of land units smaller than HUC12 watersheds or the 64,000 acre grid cells used by the BRI.

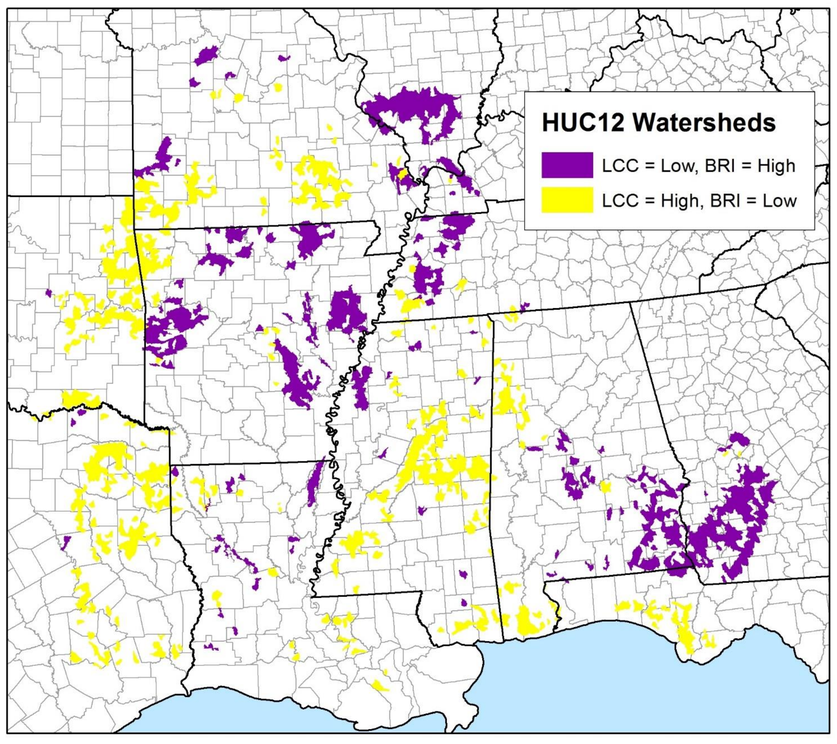

Figure 4: Watersheds ranked low by one process and high by the other

The pattern of divergent results is clustered and occurs over large areas (Figure 4), suggesting that large landscape features, such as physiographic characteristics or ecoregions, could be at play in addition to the neighborhood scale feature of agricultural land use.

FUTURE STEPS

This analysis provides both the GCPO LCC and the NCBI BRI the opportunity to examine the characteristic limitations of their respective approaches. Coming revisions of the LCC Conservation Blueprint and the NBCI BRI could include the following actions:

- GCPO LCC: Develop a method that incorporates information about grassland bird habitat conservation through voluntary USDA initiatives authorized under periodic Farm Bill legislation and similar programs for working lands. This is a challenge for large landscape comprehensive geospatial projects, since the information is more easily mapped by experts with local knowledge (within states) but difficult to apprehend at large landscape (across states) scales.
- GCPO LCC: Continue to explore ways of nesting local-scale conservation planning efforts into the larger scale Landscape Conservation Design Process
- NBCI: consider re-examining broad areas of Central Mississippi, East Texas, and East Oklahoma for possible "High" potential landscapes.