SPATIO-TEMPORAL DYNAMICS OF NORTHERN BOBWHITE (*COLINUS VIRGINIANUS*) IN ILLINOIS

by

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Northern Bobwhite (*Colinus virginianus*) are declining in abundance throughout their distribution. This decline is traditionally tied to degradation and loss of habitat. In Illinois, the bobwhite population has been rather stationary after a severe decline in the 1970s despite continued loss of habitat important to this species. Thus, objectives of my dissertation were to 1) estimate historical temporal and spatial patterns in bobwhite population dynamics and determine their contribution to current dynamics; 2) estimate bobwhite population distribution and abundance; 3) determine the spatial structure of current populations; and, 4) determine environmental and historical factors at multiple spatial scales contributing to the distribution, abundance, and persistence of bobwhite. I used multiple logistic and spatial linear regression to relate climatological and landscape variables to bobwhite presence and abundance in Illinois, respectively. The models were parameterized with counts from the North American Breeding Bird Survey and validated with data from annual Christmas Bird Counts and Illinois Department of Natural Resources surveys of bobwhite. The spatial linear model accounted for small scale

spatial autocorrelation between nearby survey sites. I found that residual effects of historical winter weather influenced extant bobwhite distribution, resulting in a fairly contiguous distribution of suitable landscape-level habitat throughout the western and south-central portion of Illinois. Landscape variables positively associated with the likelihood of bobwhite presence included amount of small grain agriculture and forested land within a 5,000 ha landscape; Shannon's Evenness Index and the mean number of days in winter with >2.5 cm of snow were negatively associated with presence. At a habitat suitability index value of 0.5, the mean model predicted 71,294 km^2 (48.9% of the state) of potentially suitable habitat for bobwhite. Within these suitable landscapes, shape of small grain agriculture fields, proportion of the landscape in sedimentary soils, variation in row crop field size, and various aspects of wood patches influenced bobwhite abundance. Variables most important to bobwhite occurred at the 5,000 ha scale. Other major findings included identification of a strong association between bobwhite and the El Niño Southern, Arctic, and Pacific Decadal Oscillations (R^2's $\geq$ 0.73), the importance of gross habitat area over number of suitable neighbors in determining metapopulation persistence, and 175 landscape patches deemed depauperate and suitable for translocation of birds from occupied habitat. Also, human habitation was found to be directly related to increased probability of population extirpation, and that increasing urbanization in Illinois will continue to degrade and remove suitable habitat. My results suggest if a focus in wildlife management in Illinois is directed at bobwhite, then there will need to be, in addition to appropriate field- or site-level features, a focus on surrounding landscapes.

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PROLOGUE

Environment is the theater, as G. Evelyn Hutchison once remarked, and evolution is the play. My intent in the following thesis is to review the performance of one of Illinois' native actors, the Northern Bobwhite. In doing so, I hope to learn more about *actors* in general, in effect, what their cues and motivations are? I also hope I may learn something about the way the theater is constructed and how, when the sets are changed for each new play, the actor responds to these changes. I ask, why, for instance, does our actor occur in some scenes and not in others? We know the director plays no favorites, and thus leaves our actor out of scenes which beg for her performance. Why? In the end though, I am especially interested in how the theater caretakers, playwrights, and stage hands may provide future scenes for our favorite actor.

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