A Proposal for Guiding Restoration of Northern Bobwhites in Midwestern Landscapes

A conservation effort led by Brent Manning and Dr. Zachary Lowe of the Max McGraw Wildlife Foundation's Center for Conservation Leadership. This proposal was written by an invited research team of scientists, including Drs. Adam Janke of Iowa State University and Andrew DeWoody of Purdue University.

For more about the Center for Conservation Leadership, see page 5 or visit ***mcgrawconservation.org.***

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Our Purpose: To outline the scientific architecture of an approach to better understand existing quail populations in the Northern range and determine the viability and utility of "trap and transfer" techniques as a method to reintroduce bobwhite into suitable habitats.

Background

The translocation of wildlife from their current habitat into unoccupied landscapes as a means of reestablishing populations is a well-established concept that continues to have social and biological appeal. In the case of bobwhite quail, whole coveys and/or breeding pairs from an established source population are trapped in the spring and immediately transferred to a release site. This trap and transfer technique for quail has produced both success and failure in establishing new populations. The importance of the quality of the release sites and its suitability to maintain quail through time is critically important and a topic in need of further research. It is also critically important to understand and define the environmental and biological condition of existing remnant quail populations in the Northern Range, or from any source population. The ecology, genetics, and landscape level requirements of northern quail are not well understood. These are critical components of determining how to improve the success of future reintroductions and have bearing on how we best increase the sustainability of habitats for existing relic populations.

In 2017, the McGraw Center for Conservation Leadership was asked to assemble a team of scientists, wildlife managers, and quail specialists to discuss how and if quail might be reintroduced into previously occupied and seemingly suitable quail habitat in Northern Illinois. These thoughts were expanded to include other landscapes in Indiana and Iowa, all of which are very similar regarding their land uses and quail populations.

Introduction to the Research Design

Northern bobwhites once thrived in Midwestern agricultural landscapes, attracting generations of sportsmen and serving as test subjects for pioneering research in game management and conservation. However, a century of land use change associated with urbanization, invasive species, and intensive agriculture production has left only relict populations in the Midwest. Bobwhite abundance in the Midwest is driven largely by the frequency and occurrence of severe winter storms, where research has shown that high-quality winter habitat can buffer populations from extirpation. However, many suitable habitat patches go unoccupied because of larger processes at play driving the distribution and resiliency of extant populations. Furthermore, many remaining occupied habitat patches support small populations which are subject to declining genetic diversity (GD) due to isolation and geographic separation of gene flow between remnant populations. A lack of gene flow can lead to declines in a population as the population may lose its inherent ability to overcome exposure to pathogens, parasites, environmental extremes. This proposal outlines an approach to address critical questions at the heart of reconnecting bobwhite populations with suitable habitat and sufficient genetic diversity to help restore this icon of rural Midwestern landscapes.

Major Objectives

This proposal has two major objectives, each of which addresses the intrinsic (e.g., genetic) and extrinsic (e.g., habitat) components that are critical to the restoration of any wildlife species.

1) HOW DO NORTHERN BOBWHITES CURRENTLY MOVE IN MODERN, FRAGMENTED AGRICULTURAL LANDSCAPES?

This question is fundamental to understanding the potential for unoccupied habitat to be effectively (i.e., sustainably) recolonized following extirpation or before an attempted reintroduction. Many landowners and managers in the Midwest lament the loss of bobwhite populations or the failure of populations to respond to management efforts including reintroductions. In most cases, broader landscape level constraints and declining GD are likely to blame. Previous research in the upper Midwest has rarely attempted to understand how bobwhites move through the landscape, or their GD, but rather focused on demographics of extant populations. This proposed work would use translocation as an innovative means to understand the movement and ecology of northern bobwhites during three key life-phases: spring dispersal, brood rearing, and fall dispersal. Spring dispersal has been documented to exceed 10 miles in some rare instances, and is a critical mechanism to maintaining GD—which, if lost, is a major contributor to the extinction of wildlife populations. The other two primary movement periods in bobwhites—summer brood rearing and late summer early fall shuffle—are important periods for ensuring fledging young recruit into coveys to survive the winter and ultimately maintain the GD of the population. This life stage is poorly understood in the north where coveying is highly adaptive. Published research from Ohio has suggested bobwhites move among coveys differently in northern populations than in southern, more homogenous landscapes. Understanding this different behavior is necessary to guide conservation actions, such as prioritizing large-scale landscape level restoration projects, identifying critical micro/niche habitat requirements at the landowner level, and managing genetic diversity.

To address these questions, intensive investigation of bobwhite movement ecology and landscape genetics will be necessary. We propose a combination GPS-based telemetry and DNA sequencing technology to track and classify birds during these key life stages. Additionally, long-range dispersal can be simulated through translocation (trap and transfer of birds) between populations and habitats to evaluate how birds perceive and move through “new”, landscapes.

The resulting analyses would compare behavior between sites and scenarios (natural dispersal vs. translocated dispersal) to predict the ability of bobwhites to move through modern northern landscapes and help assess the likelihood of if a habitat can sustain a population after the release

of trapped birds. Furthermore, DNA-based approaches will evaluate gene flow (i.e., realized dispersal) and the maintenance of GD over the course of the study as this parameter is crucial to long-term population persistence. The predictions resulting from this study will be useful in guiding restoration and conservation goals in the landscape of regions with potentially suitable habitat and help identified barriers to quail dispersal.

2) WHAT FACTORS FACILITATE PERSISTENCE OF NORTHERN QUAIL POPULATIONS IN MODERN LANDSCAPES?

Despite a history of widespread population declines and range contraction throughout their northern range, some regions in northern Indiana, Illinois, and Iowa remain occupied by bobwhites. Understanding where these populations are, their relative year-to-year stability, and what factors facilitate occurrence and persistence (e.g., GD, habitat) is a necessary precursor to informing where conservation and restoration actions are merited or best allocated. Previous attempts at describing the distribution of bobwhite populations on large scales have based predictions on habitat suitability, a method poorly suited for dispersal-limited species like bobwhites that may be especially prone to inbreeding in the northern range. Similarly, typical density estimates (derived from spring male whistling surveys) ignore potential biases related to winter habitat quality and behavioral nuances of calling males during spring and summer. Finally, few studies have considered the importance of GD in the establishment of bobwhite populations, although work in other species (e.g., Florida panther) indicates GD is critical to the sustainability of isolated populations. Our proposed work will combine spring and fall surveys with auxiliary information about genetics, productivity, and population connectivity to paint a clearer picture of the distribution, stability, connectivity, and evolutionary potential of the current quail populations within the northern range.

We propose focusing landscape sampling efforts in northern Illinois, Indiana and Iowa where bobwhite populations still persist. We will use surveys to gauge spring and fall abundance in randomly selected focal areas throughout the study area. Genetic material and sex/age ratios would also be collected through targeted trapping in occupied sites. Genomic methods will be used to monitor quail GD over time and space. Collectively, these results will be used in concert with the dispersal studies proposed above to find priority restoration and conservation areas across the region to build connections between extant populations and potentially usable landscapes.

By using a genome sequencing approach we will quickly elevate our understanding of the genetic structure of the bobwhite quail and allow for a better understanding of what critical characteristics are maintained or lost among quail populations throughout the range. This genome sequencing will elevate wildlife science in general and ultimately serve as an example for many other species of conservation concern such as prairie chickens, whales, and bighorn sheep. These genome studies will also improve our understanding of species-specific factors that may drive bottleneck events (for example, avian influenza outbreaks among migratory waterfowl).

Expertise and Staffing

The McGraw Center for Conservation Leadership will support the research with staff expertise and take a primary role in program administration and communication products. The collaborative research effort is led by the invited expertise of two universities; Purdue and Iowa State, and includes Drs. Andrew DeWoody and Adam Janke, the principal investigators of the proposed research.

Conclusions and Deliverables

Upon completion of this research, scientists and conservationists will better be able to understand the capacity of quail populations in their northern range, promote critical habitat improvement practices at the landscape level and “single farm” scale, and define the genetic diversity critical to bobwhite quail productivity. This is needed and novel information that will quickly elevate the science of quail management and vastly improve our understanding of bobwhite quail in the northern range and much of North America.

About the McGraw Center for Conservation Leadership

The McGraw Center for Conservation Leadership is the nation's leading advocate for creative and entrepreneurial thought in conservation. Nonpartisan and not for profit, the Center's work enables informed strategic decisions rooted in economic efficiencies and science.

The Center was born from the realization that more than $20 billion in taxpayer and private sector dollars set aside for conservation each year can be expended more efficiently.

It is a natural outgrowth of the Max McGraw Wildlife Foundation, created more than 50 years ago by the visionary conservationist Max McGraw, founder of McGraw-Edison Co. The Foundation, headquartered on 1,250 acres in Dundee, Illinois, aims to secure the future of hunting, fishing and land management through science, demonstration, education and communication.

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