

COVER PREFERENCE AFTER FLUSHING BY
PEN-REARED NORTHERN BOBWHITES, *Colinus virginianus*,
ON A HUNTING PRESERVE IN CENTRAL TEXAS

THESIS

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By

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ACKNOWLEDGMENTS

Completing a master's thesis takes more than data collection and writing skills. It takes personal drive and confidence in one's abilities. Confidence is instilled by the support and guidance given from those who are closest to you. Without the guidance and support of my family and friends, completing this thesis would have been impossible.

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TABLE OF CONTENTS

	Page
LIST OF TABLES	vi
LIST OF FIGURES.....	vii
ABSTRACT.....	viii
INTRODUCTION.....	1
METHODS and MATERIALS.....	4
RESULTS	7
DISCUSSION.....	13
MANAGEMENT IMPLICATIONS.....	16
LITERATURE CITED.....	17

LIST OF TABLES

	Page
Table 1. Variation in the mean densities of the vertical profile of vegetation in three cover types (Brush, Grass, Open) at four different heights at the Double D Ranch Hunting Preserve in Bastrop County, Texas, 2001-2002.	12

LIST OF FIGURES

	Page
Figure 1. Aerial photograph of the bird hunting preserve at the Double D Ranch, Bastrop County, Texas, 2001-2002. The darker shaded areas represent brush, gray represents grass, and white represents open areas.	5
Figure 2. Number of northern bobwhites flushing to brush, grass, and open cover types from all cover types on the Double D Ranch hunting preserve in Bastrop County, Texas, 2001-2002	8
Figure 3. Number of northern bobwhites flushing from brush to brush, grass, and open cover types on the Double D Ranch hunting preserve in Bastrop County, Texas, 2001-2002	9
Figure 4. Number of northern bobwhites flushing from grass to brush, grass, and open cover types on the Double D Ranch hunting preserve in Bastrop County, Texas, 2001-2002	10
Figure 5. Number of northern bobwhites flushing from the open to brush, grass, and open cover types on the Double D Ranch hunting preserve in Bastrop County, Texas, 2001-2002	11

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ABSTRACT

Northern bobwhites (*Colinus virginianus*) are the most abundant and widely distributed species of quail in North America. From 1980 to 1999, the autumn population of bobwhite decreased by 65.8%. To fill the void left by the decline of wild quail, an increasing number of quail hunters, landowners, and hunt outfitters have resorted to releasing pen-reared birds for hunting. The northern bobwhite inhabits an environment with a combination of bare ground, grass cover, and brush. The challenge for wildlife biologists using pen-reared quail as a substitute for wild quail in hunting centers on finding pen-reared quail that exhibit covey and flushing behaviors of wild quail. Identifying and describing effective landscape design for landowners to establish hunting preserves with escape cover is beneficial in many ways. These preserves can be aesthetically pleasing, ecologically beneficial to multiple wildlife species, and provide maximum enjoyment for hunters and observers. Eighteen hunts were conducted between November 2001 and March 2002. Birds were hunted using guides, pointing dogs, flushing dogs, and shotguns. At the landscape level, I identified three cover types: brush,

grass, and open. I observed the flushing flight of 398 birds and recorded the specific cover type to which each bird flushed (brush, grass, open) to determine whether retreat was random or associated with a specific cover type. I used a vegetation profile board to determine cover density for brush, grass and open cover types. A goodness of fit test (Chi-square) was used to determine preference by quail for escape cover. Of 578 birds released, 360 (62.3%) were harvested and 398 flushing events were observed. There was a significant difference in flushing cover preference to brush when flushing quail from brush ($\chi^2 = 381$, 2 df, $P < 0.001$), grass ($\chi^2 = 145$, 2 df, $P < 0.001$), and open ($\chi^2 = 88.67$, 2 df, $P < 0.001$) cover types. The proper design of hunting preserves can result in better habitat for wildlife species as well as hunting pen-raised birds. Through the use of bird preserves hunting pressure on wild populations can be reduced, resulting in higher survival and more nesting females. By improving habitat for hunting pen-reared birds, we can assist in restoring native populations of northern bobwhites.

INTRODUCTION

Northern bobwhites (*Colinus virginianus*) are the most abundant and widely distributed species of quail in North America. From 1980 to 1999, the autumn population of bobwhite decreased by 65.8% (Dimmick et al. 2002). With the decrease in natural populations, some states in the northern distribution of the species no longer have huntable populations. To fill the void left by the decline of wild quail, an increasing number of quail hunters, landowners, and hunt outfitters have resorted to releasing pen-reared birds for hunting (Hurst et al. 1993). The risk of released pen-reared northern bobwhites interacting with wild quail has caused concern. Mortality factors, such as disease transmission, increased mortality of wild birds, and genetic pollution, have not been examined but remain a concern (Brennan 1991, Landers et al. 1991, Hurst et al. 1993, Mueller et al. 1993). In addition, offspring from breeding pen-reared birds with wild birds may be biologically inferior (Devos and Speake 1995). Lack of development of a social hierarchy, decreased flight speed, and poor use of escape cover may contribute to low survival of pen-reared birds (Perez et al. 2002). Because of low survivability, interactions between pen-reared and wild quail are usually brief.

Kozicky (1993) predicted that decreasing populations of northern bobwhites would increase demand for populations to hunt, thus making quail hunting more expensive and requiring intensive management. One solution to the lack of native quail for hunting involves the use of pen-raised quail as a substitute for native quail. By using pen-raised quail, opportunities for hunting can remain relatively inexpensive, while providing an authentic hunting experience. However, the hunting experience with pen-

reared quail must simulate the features of hunting wild quail. Hunter satisfaction and success are determined by the set up and execution of the hunt.

The northern bobwhite inhabits an environment with a combination of bare ground, grass cover, and brush. Leopold (1933) classified northern bobwhites as farm game because of the low successional stage of the plant community it inhabits and low mobility of the species. According to the law of interspersions (Leopold 1933), the configuration and interspersions of habitat types occupied by quail must give birds access to two or more habitat types within a space of a hectare. This interspersions of habitat types provides the best environment for eliciting normal behavior by quail. When constructing a shooting preserve for pen-reared quail, the placement of habitat types determines hunter success and enjoyment of the hunt because birds use habitat types over a broad area. However, many shooting preserves lack a vegetational configuration that simulates suitable habitat for quail. Studies of landscape cover patterns and release techniques for pen-reared northern bobwhites are needed to provide hunting opportunities with a suitable level of hunter satisfaction (Hurst et al. 1993).

In a hunt with pen-reared quail, birds are placed in a landscape setting different from that in which they have been raised. These birds lack the advantage of learning habitat characteristics from their parents. These birds also may lack the bird-habitat recognition of wild birds (Partridge 1978, Cody 1985, Weins 1994). Individuals of a species possess an internal image or template (genetically determined and/or learned) of what constitutes suitable habitat (Weins 1994). Habitats that fit the template provide various components of habitat structure, floristics, edge area, interspersions and juxtaposition of habitat types, microclimate, and other species that cause a bird to display

behaviors typical of the species (Svårdson 1949, Hildén 1965, Slagsvold 1980, Weins 1969, 1985, Helle and Helle 1982, Ambuel and Temple 1983).

The challenge for wildlife biologists using pen-reared quail as a substitute for wild quail in hunting preserves is finding pen-reared quail that exhibit covey and flushing behaviors of wild quail. Hunter satisfaction depends on how birds fly. The exhibition of flushing behavior by pen-reared quail may or may not be associated with the configuration of the landscape onto which they are released. Even though raised in captivity, these birds may have a hereditary propensity for habitat that provides escape cover after flushing. Therefore, in pen-raised northern bobwhites, heredity could affect cover selection. Some studies suggest captive-reared animals retain a selection for habitat components used by their wild counterparts. Wecker (1963) concluded that habitat preference of laboratory-raised deer mice (*Peromyscus maniculatus*) was predetermined by heredity even after 20 generations. Chipping sparrows (*Spizella passerina*) raised in captivity preferred pine branches, just as wild chipping sparrows (Klopfer 1963).

Identifying and describing effective landscape design for landowners to establish hunting preserves with escape cover is beneficial in many ways. These preserves can be aesthetically pleasing, ecologically beneficial to multiple wildlife species, and provide maximum enjoyment for hunters and observers.

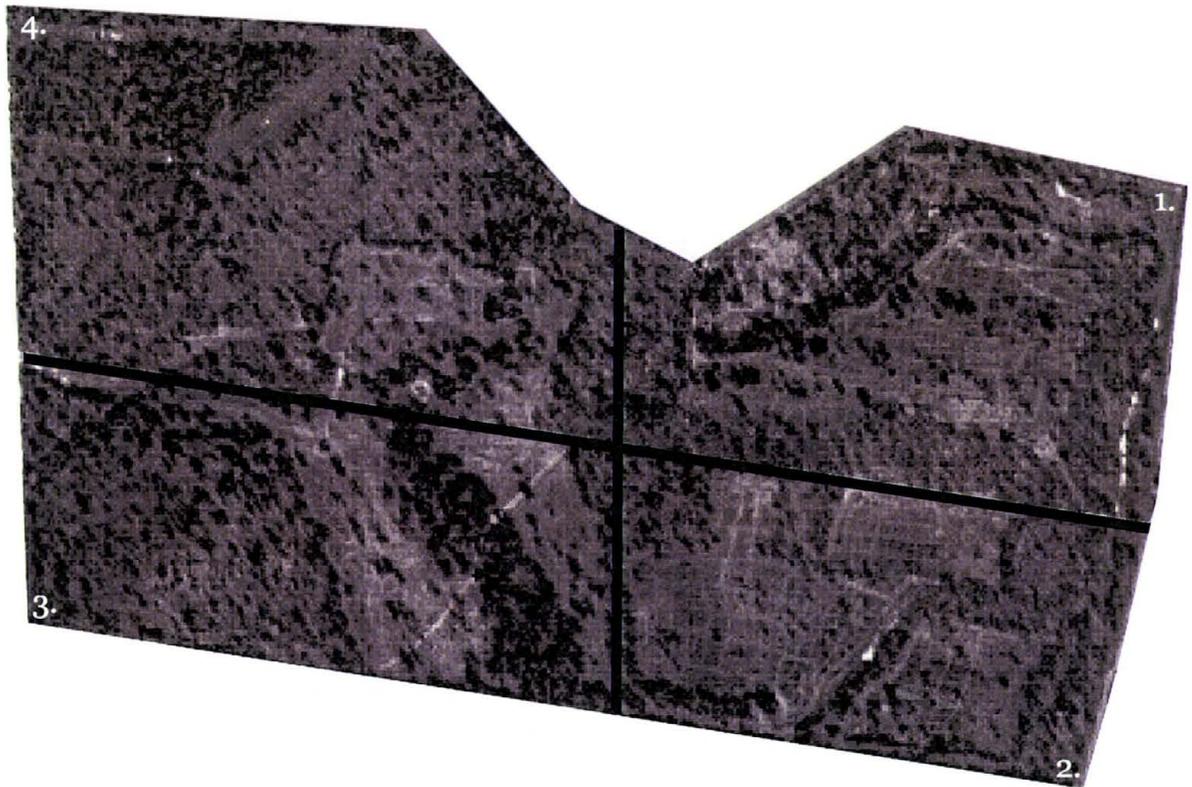
METHODS AND MATERIALS

The study was conducted on a 48.6-ha pasture (Fig. 1) at the Double D Ranch, Bastrop County, Texas. Topography of the area consists of gently rolling hills bisected by intermittent creeks. The dominant woody vegetation consists of live oak (*Quercus virginianus*), eastern red cedar (*Juniperus virginiana*), and yaupon (*Ilex vomitoria*). The area is divided into four sections for bird hunting, each consisting of approximately 12.1 ha. The vegetation in the pasture is manipulated and sculpted by mowing with a tractor for ease of movement by both hunters and hunting dogs. The pasture also is used for cattle grazing.

Quail were purchased from a local hatchery. Birds were hatched in incubators, raised in dirt floor pens for two weeks, and moved to flight pens until sale. Purchased birds were delivered approximately 3 days before hunts. Following delivery, birds were held in pens and loaded into release boxes the morning or afternoon of the hunt.

Eighteen hunts were conducted between November 2001 and March 2002. Birds were hunted using guides, pointing dogs, flushing dogs, and shotguns. Birds were released three h prior to the hunt into either brush or grass cover and allowed to settle.

At the landscape level, I identified three cover types: brush, grass, and open. Brush cover consisted of motts of woody vegetation with basal stems over 1.27 cms in diameter. Grass cover lacked woody vegetation and had a grass height of at least 8 cms. In open areas, the height of vegetation had been reduced by mowing or was bare ground. I observed the flushing flight of 398 birds and recorded the specific cover type to which each bird flushed (brush, grass, open) to determine whether retreat was random, or associated with a cover type.



1" = 200m
0  200M



Figure 1. Aerial photograph of the bird hunting preserve at the Double D Ranch, Bastrop County, Texas, 2001-2002. The darker shaded areas represent brush, gray shades represent grass, and white represents open areas.

I used a vegetation profile board (Nudds 1977) to determine cover density for brush, grass and open cover types. The board was 2.50 m high and is 30.5 cm wide. The board was marked in alternate colors of white and black, at 0.5 m intervals. The profile board was placed in a vegetation type (brush, grass, open) 13.7 m from the viewer. The percentage of visual obstruction at each interval was recorded with a value between 1 and 5 (1 = 0-20%, 2 = 21-40%, 3 = 41-60%, 4 = 61-80%, 5 = 81-100%).

A goodness of fit test (Chi-square) was used to determine preference by quail for a certain type of escape cover. This technique tested differences between the expected number of birds flushing to each cover type and the observed number actually flushing to each cover type (Siegel 1956).

RESULTS

During the 18 hunts, 578 northern bobwhite were released and 398 flushing events were observed and recorded. Multiple flushing events did occur per individual bird. Of 578 birds released, 360 (62.3%) were harvested. Hunting birds released in brush resulted in a harvest ratio of 1.65:1, while birds released in grass resulted in a harvest ratio of 1.57:1. Of 398 birds flushing, 351 flushed to brush, 37 flushed to grass, and 10 flushed to open areas (Fig. 2). There was a significant difference in flushing cover preference ($\chi^2 = 541$, 2 df, $P < 0.001$). Of 252 birds flushing from brushy cover, 230 birds flushed to brush, 15 birds flushed to grass, and 7 birds flushed to open areas (Fig. 3). There was a significant difference in flushing cover preference for birds flushing from brush ($\chi^2 = 381$, 2 df, $P < 0.001$). Of the 133 birds flushing from grass, 109 flushed to brush, 21 flushed to grass, and 3 birds flushed to open areas (Fig. 4). There was a significant difference in flushing cover preference for birds flushing from grass ($\chi^2 = 145$, 2 df, $P < 0.001$). Of the 13 birds flushing from open areas 12 flushed to brush, 1 flushed to grass, and no birds flushed back to the open (Fig. 5). There was a significant difference in flushing cover preference for birds flushing from open ($\chi^2 = 88.67$, 2 df, $P < 0.001$).

The mean density of vegetation layer by layer was greater in the brush cover type (Table 1). The vegetative density of the brush cover type was significantly different from the grass and open cover types. Below 1 m, the grass cover type had a greater density than the open cover type. However, above 1 m, the vegetative density for these two cover types was similar.

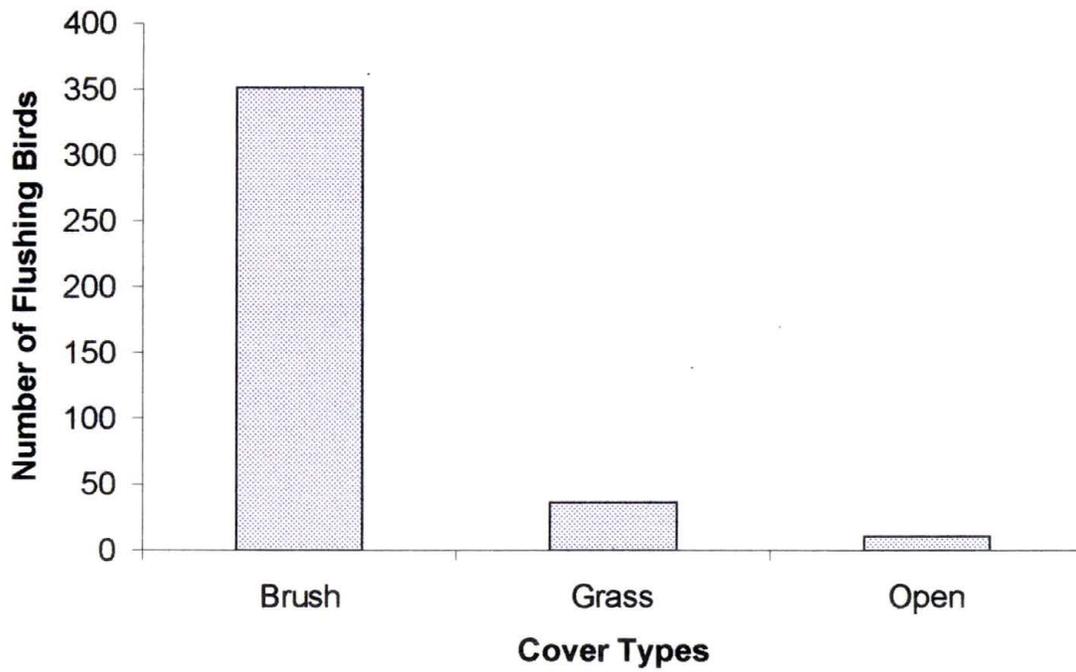


Figure 2. Number of northern bobwhites flushing to brush, grass, and open cover types from all cover types on the Double D Ranch hunting preserve in Bastrop County, Texas, 2001-2002.

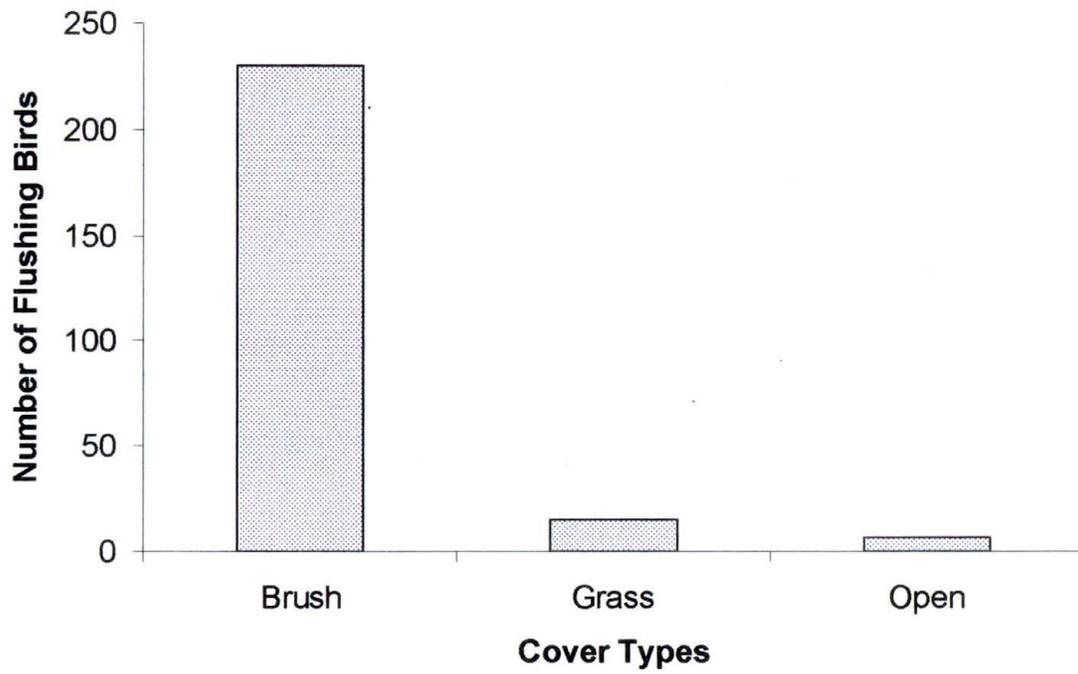


Figure 3. Number of northern bobwhites flushing from brush to brush, grass, and open cover types on the Double D Ranch hunting preserve in Bastrop County, Texas, 2001-2002.

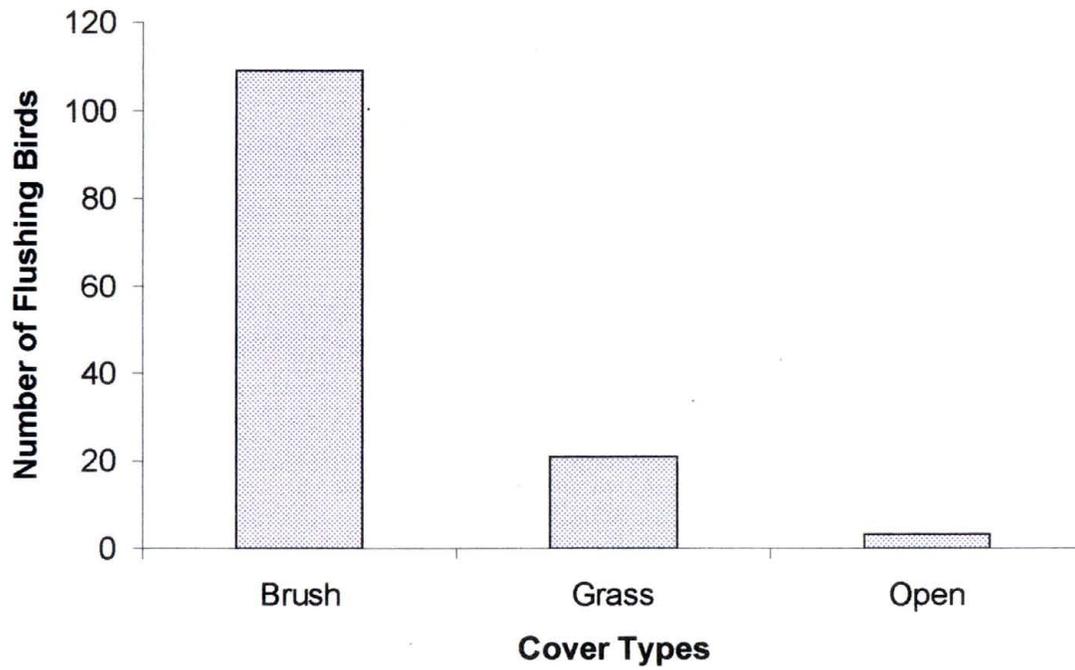


Figure 4. Number of northern bobwhites flushing from grass to brush, grass, and open cover types on the Double D Ranch hunting preserve in Bastrop County, Texas, 2001-2002.

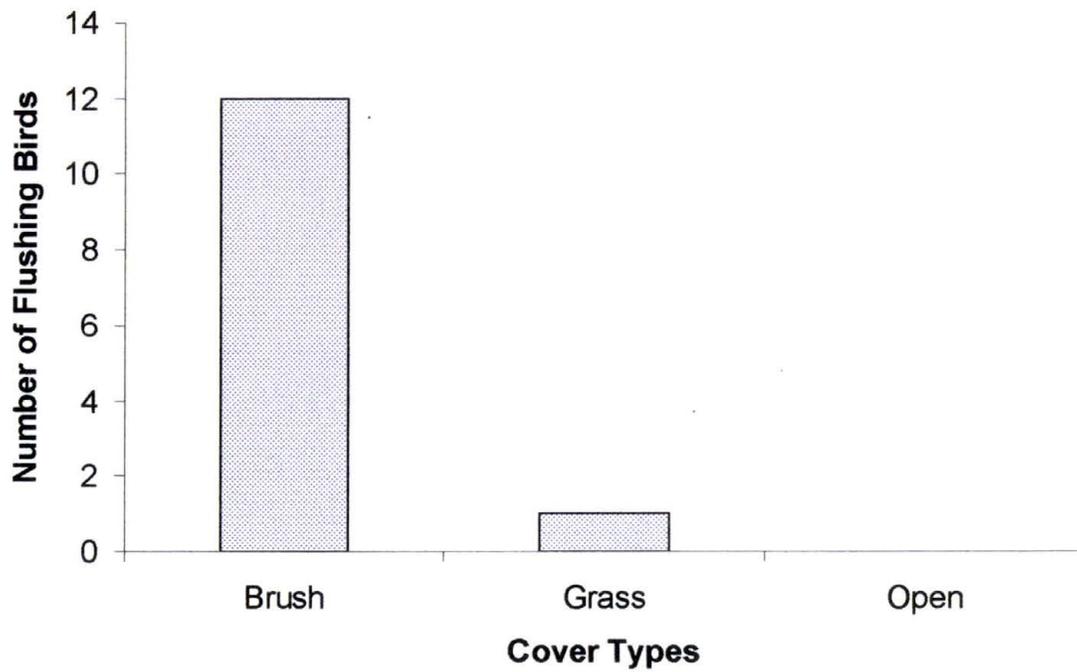


Figure 5. Number of northern bobwhites flushing from the open to brush, grass, and open cover types on the Double D Ranch hunting preserve in Bastrop County, Texas, 2001-2002.

Table 1. Variation in the mean densities of the vertical profile of vegetation in three cover types (Brush, Grass, Open) at four different heights at the Double D Ranch Hunting Preserve in Bastrop County, Texas, 2001-2002

Layer (m)	Cover Category	X Density	F-value	Significance level
0.0-0.5	Brush	5.0	160.27	P < 0.001
	Grass	3.8		
	Open	1.0		
0.5-1.0	Brush	3.8	27.47	P < 0.001
	Grass	2.0		
	Open	1.0		
1.0-1.5	Brush	2.7	11.01	P < 0.001
	Grass	1.4		
	Open	1.0		
1.5-2.0	Brush	1.6	6.05	P < 0.100
	Grass	1.0		
	Open	1.0		

DISCUSSION

With declining northern bobwhite populations in North America, hunters have resorted to the release of pen-reared birds. Pen-raised birds have been used primarily to provide hunting opportunity in areas having low populations of game birds and a high level of hunting pressure (Lobdell and Giles 1972). Dollar (1969) reported that released birds flushed fast, strong, and offered a challenge to the average sportsman. The proper design of hunting preserves can result in better habitat for wildlife species as well as hunting pen-raised birds. White-tailed deer (*Odocoileus virginianus*) and wild turkey (*Meleagris gallopavo*) are two game species observed while releasing birds. Tufted titmouse (*Parus bicolor*), northern cardinal (*Cardinalis cardinalis*), red-tailed hawks (*Buteo jamaicensis*), and other non-game species were observed during hunts. Range management practices beneficial to northern bobwhite, such as prescribed fire, replacing exotic vegetation with native forbs and grasses, and proper stocking densities for livestock, enhance range productivity and improve ranch income (Dimmick et al. 2002). While hunting pressure is rapidly increasing and available hunting land is decreasing, the use of pen-raised quail as a game management practice may warrant more consideration in the future (Dollar 1969).

Hunting pen-reared birds in a manner that promotes the greatest sport depends on the availability of several things. Dickey (1959) found that stopping (escape) cover was one of the most important factors when designing a preserve. By determining the preference for flushing or stopping cover, birding preserves can be designed or manipulated through brush sculpting, mowing, and general habitat management to enhance the aesthetics and hunting pleasure of hunters. The overall layout of the hunting

preserve, initial release of birds, and the performance of hunting dogs are essential to providing the optimum hunting experience.

The overall layout of the hunting preserve is the most important factor in simulating a wild northern bobwhite hunt. The layout is essential for aesthetic reasons as well as for more natural bird behavior. Northern bobwhites in this study consistently flushed to the closest brush cover. Therefore, the interspersion of brush on a hunting preserve will determine the dispersal of flushing coveys. By distributing brush cover approximately 45 to 54 m apart, the bird will flush a distance that allows the hunter a first and second shot. Areas of brush cover too close together cause flushing birds to flush short distances and does not provide hunters enough time for shots. When areas of brush cover are too far apart, excessive time will be spent hunting singles or birds will leave the preserve.

The initial release of birds depends on the species and distribution of cover. If efficient cover is not present, predator species, such as the red-tailed hawks and other raptors, will prey on released birds before they can be hunted. During this study, birds released in brush cover before the hunt tended to remain in the brush, while those released in grass cover usually moved to adjacent brush cover.

Time of year and condition of the vegetation play a major role in the overall hunting of released birds. During the hunting season, some species of brush lose foliage resulting in a decrease of beneficial cover. When scheduling hunts, the cover value of brush should be considered. The cover value of live oak and yaupon changed very little during the study. Grass cover value changed throughout the year. Grass cover should be examined for overhead cover and if they have a “bottom” for northern bobwhites (Gary

Rose personal communication). Areas with a bottom are those that provide overhead cover as well as a thick mat of grass below. Grass cover containing a bottom persists throughout the year compared to those without a bottom. The amount of pollen released from the vegetation also is a major factor in the location of birds. With an increase in pollen released from plants, pointing dogs apparently have a much harder time pinpointing birds.

Areas with differing cover types and densities can provide increased challenge and sport to different hunters. With inexperienced hunters, hunting grass areas with little or no tall brush vegetation may allow more swinging time to aim and fewer hurried shots. Hunters with higher skill levels may prefer denser vegetation with more difficult shots.

Vegetation along riparian areas should remain unaltered for travel corridors for native wildlife. Travel corridors are necessary for many species of wildlife. These corridors provide protection for wildlife moving from surrounding clearings. If natural water such as creeks or lakes are not available for watering dogs, troughs should be distributed across the preserve that are easily accessible.

The number of birds released should be related to the number of hunters, the size of the hunting area, and the amount of time the area will be hunted. Cover type, number of hunters, and the type of shotgun being used should determine the number of birds released in each covey. In heavier brushy cover, a higher percentage of birds will not be shot at as a result of obscurity caused by the vegetation. The number of birds in a covey should not exceed the number of hunters and the number of shots available. The chance of harvesting seven birds in a covey is small. Time spent hunting singles will consume more time with less results than multi-bird coveys.

MANAGEMENT IMPLICATIONS

Many landowners are faced with making payments on their land in order to maintain ownership. In order to receive the optimum monetary return from their land in central Texas, many landowners resort to stocking cattle and goats on their property. In many instances these stocking rates are too high, resulting in overgrazing, erosion, and overall degradation to the habitat. The proper design of hunting preserves can result in better habitat for wildlife species as well as hunting pen-raised birds. By proper set up and implementation of hunting preserves, landowners can earn money from hunting, rotate cattle, and promote proper habitat management. Through the use of bird preserves hunting pressure on wild populations is reduced, resulting in higher survival and more nesting females. By improving habitat for hunting pen-reared birds, we can assist in restoring native populations of northern bobwhites.

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VITA

James Fitzpatrick Logsdon was born in Austin, Texas, on July 23, 1975, son of Sally and John Logsdon. After completing his work at McCallum High School, he entered Stephen F. Austin State University in Nacogdoches, Texas. He received his Bachelor of Science in Forestry with an emphasis in Wildlife Management in May 1998. During his years at Stephen F. Austin he worked for the Forest Service and assisted in many graduate research projects. After graduation he completed an internship on a game ranch in Northeast Michigan. In May of 2001, he entered the Graduate School of Southwest Texas State University, San Marcos, Texas. James was a member of Tri Beta Biological Honor Society, and presided as the President of the Student Chapter of the Wildlife Society 2001-2002. During the summer of 2001 he interned with Texas Parks and Wildlife where he worked with waterfowl and alligators. James taught the Wildlife Techniques class while attending Southwest Texas State University.

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