NTMWD
Riverby Ranch Mitigation Site
Quail Monitoring Effort
Spring Call Counts 2024

WHF

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Background:

Restoration efforts on Riverby Ranch were conducted following the construction of the 16,500-acre Bois d'Arc Lake in Fannin County to mitigate environmental disturbance caused by the new reservoir's construction. These efforts by the North Texas Municipal Water District (NTMWD), led by Resource Environmental Solutions, LLC (RES), aim to restore and provide habitat for native Texan wildlife including over 200 species of birds. A number of the birds found on Riverby Ranch are of high conservation concern, including the culturally and economically important game bird, the Northern bobwhite quail (*Colinus virginianus*). Northern bobwhite quail are considered the "Canary of the Prairie", what is good for the quail is good for many other species!

Northern bobwhites have experienced an approximate 4% decrease in population annually in their native range since the 1960's due largely to habitat loss and degradation caused by urbanization, pesticide use, monoculture agriculture, and encroachment of invasive species. (Jenke & Gates, 2013; Downey et. al, 2017; Gomez & Reyna, 2017). By restoring Riverby Ranch's degraded farm and rangelands to their historical state as grasslands, deciduous forests, and wetlands, it is predicted that more suitable habitat will become available to sustain stable Northern bobwhite populations. As Northern bobwhites act as an umbrella species, their presence suggests that the areas they occupy are also suitable for other species with similar habitat preferences (Crosby et al. 2015).

In order to monitor the population of Northern bobwhite quail on the ranch post-restoration, annual spring quail call counts, as well as various other bird survey methods, have been implemented on the ranch since 2021. Previous bird surveys as well as encounters by ranch staff and visitors have confirmed the presence of Northern Bobwhites on the ranch, although in varying numbers.

Continuing the annual monitoring of Northern bobwhite quail populations on the ranch, this spring count call was conducted in May and June of 2024, two years after the end of restoration construction efforts by RES. During this period, the ecological communities reintroduced during the construction efforts have been allowed to continue their establishment with minimal anthropogenic disturbance.

It is predicted that Northern bobwhite abundance and overall bird diversity will increase as the reintroduced grassland, wetland, and forest communities are allowed to flourish.

Methods:

Study Area

This survey was conducted on Riverby Ranch located in Fannin County in Northeast Texas along the border of Oklahoma (Figure 1). This mitigation site is in response to the environmental impacts of the construction of the Bois d'Arc Lake reservoir. It consists of 15,000 acres (~ 6070 ha) of restored, enhanced, and preserved wetland and upland habitats. This ranch

was formerly used for agriculture and livestock production for over 100 years. The restoration goals are to establish multiple habitat types including native grasslands and emergent wetland habitats along with intermixed restored patches of woodland habitat. These restoration efforts have included the implementation of a variety of preferred quail habitat types including early succession woody cover and grasslands, making this site a potentially suitable location for Northern bobwhite populations (Janke & Gates 2013).

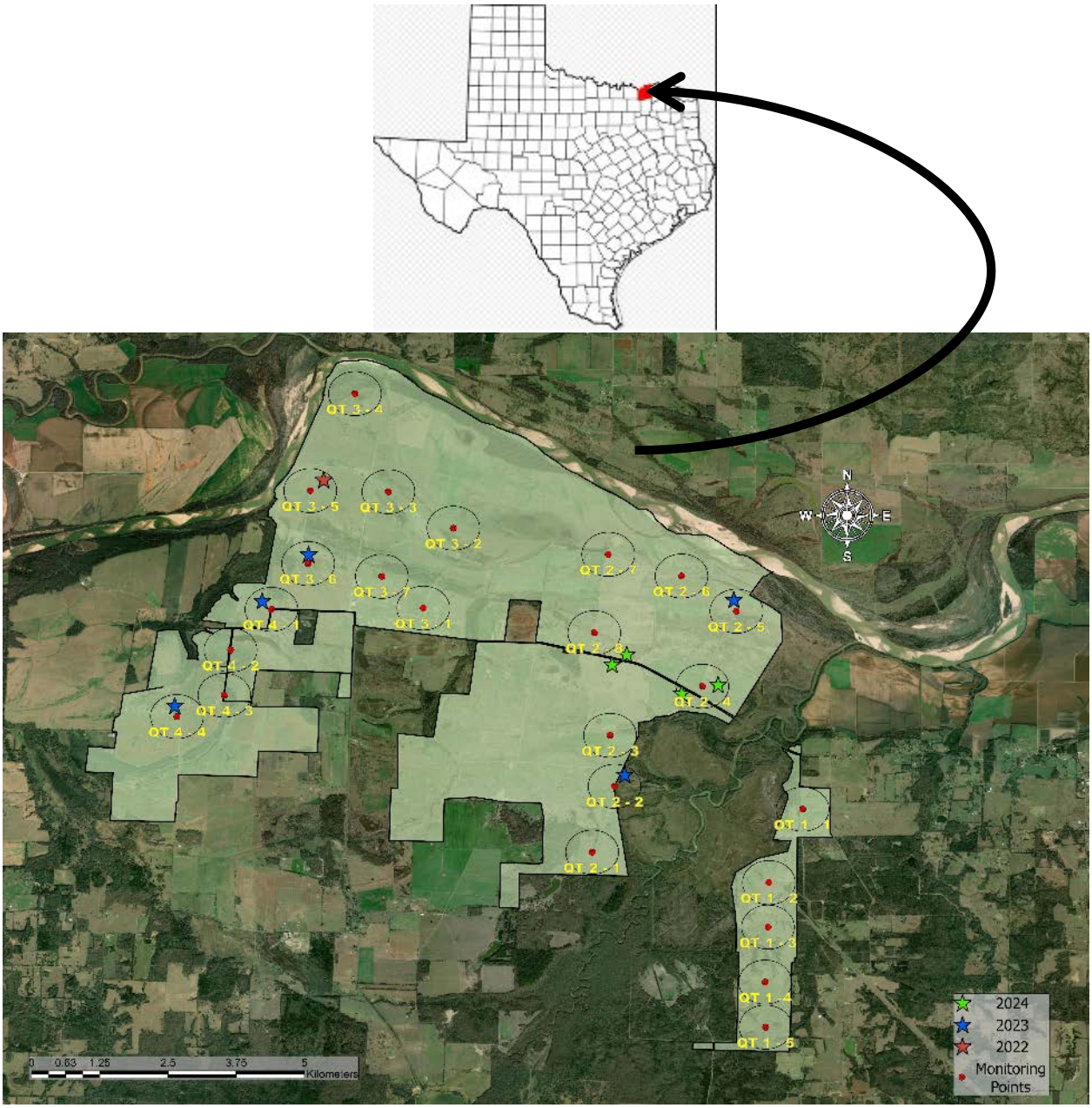

Figure 1. Map of Northern Bobwhite observations by year and monitoring points located on Riverby Ranch Mitigation site. Map created in ArcGIS Pro with spatial data provided by RES and WHF.

Indirect Count

Following the Indirect Count method (Rollins et al., 2005), stationary t-posts were marked and set up on 24 individual points (Figure 1). Each point was spaced at least 0.5 mile apart. Call counts were conducted beginning at sunrise and continued for approximately 1.5 hours. This survey was conducted over two days to assure the completion before this timeframe. Distance of male Northern bobwhite call counts were documented within 0.5 miles from each monitoring point. Anecdotally, we also collected all bird observations (acoustic and visual) at each point. Each point was monitored for a total of 5 minutes. This survey was conducted three times over a three-week period in May and June of 2024.

Data Analysis:

Analysis of data collected during this call count was conducted using the "vegan" package in R Studio (Oksanen, 2022). Abundance, richness, and Shannon's Diversity indices were calculated at each point and averaged in order to quantify avian diversity. These calculations were then compared to previous monitoring events performed from 2022 and 2023. **These biodiversity indices are only a snapshot of the diversity on Riverby Ranch taken during this quail survey.**

Results:

Mean abundance, species richness, and Shannon's Diversity for all species at all sites are displayed in Table 1. Abundance, species richness, and Shannon's diversity are compared over each year in figures 2, 3, and 4 respectively.

Table 1: Mean Abundance, Species Richness, and Shannon's Diversity

Year	Abundance	Richness	Shannon's Diversity
2022	**28.42**	**7.21**	**1.55**
2023	**42.21**	**8.92**	**1.62**
2024	**45.50**	**10.96**	**1.71**

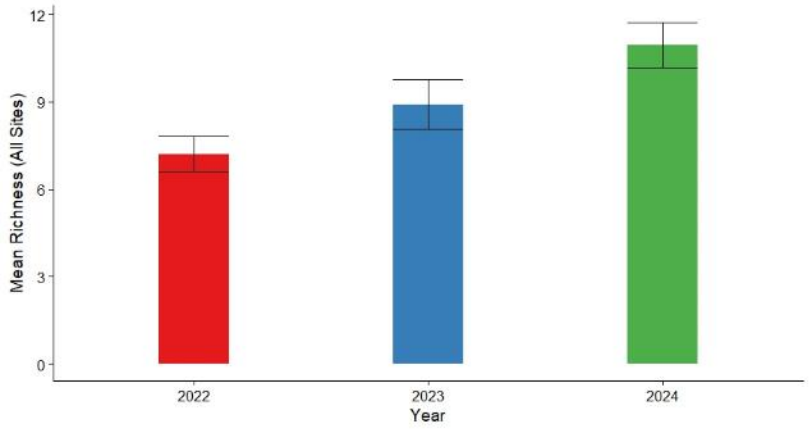

Figure 2: Comparison of mean richness for all sites from 2022 – 2024.

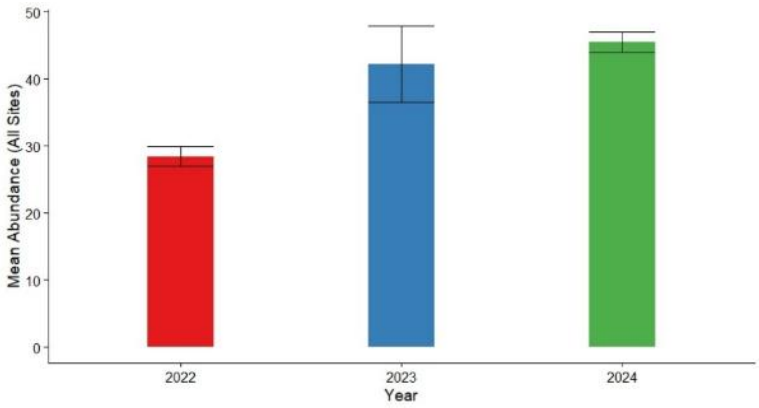

Figure 3: Comparison of mean abundance for all sites from 2022 – 2024.

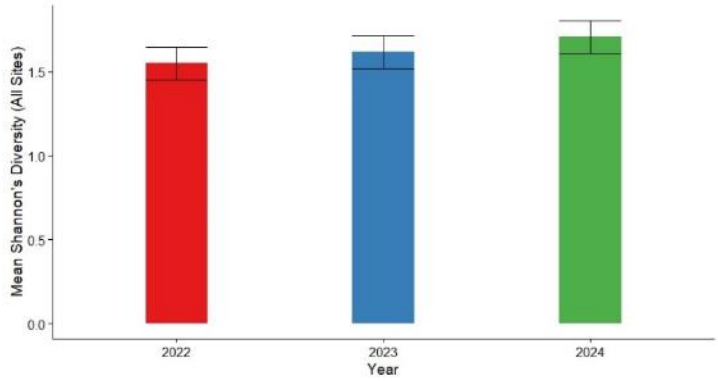

Figure 4: Comparison of mean Shannon's Diversity for all sites from 2022 – 2024.

During this monitoring season, two Northern bobwhites were documented acoustically at QT 2-4 on June 14, 2024. At least one of these quail were reported visually and acoustically in the same area over the next several weeks following the monitoring event by ranch staff. Incidentally, outside of the monitoring events, at least two Northern bobwhites were reported and confirmed

visually and acoustically outside of the Cowboy Motel throughout May and June of 2024. Calculations of biodiversity indices in the location of the Northern bobwhite observed during the monitoring period are displayed in Table 2.

Table 2: Instances of Northern Bobwhites Encountered by Site, Date, and Shannon's Diversity Indices Calculated at Each Site

Species	Site	Date	Abundance*	Richness*	Shannon's Diversity*
Northern Bobwhite (2)	QT 2-4	6/14/2024	42	10	1.76

**Calculated for all species present at site during monitoring season*

This survey along with incidental observations by the authors documented at least four confirmed Northern bobwhites present on Riverby Ranch during the spring of 2024, and added 9 avian species to the bird species list compiled during monitoring seasons from 2022 – 2024.

Biodiversity calculations suggest a general upward trend in overall mean biodiversity metrics over three years of monitoring.

Discussion and Recommendations:

The 2024 call count saw one less confirmed Northern bobwhite than 2023, but followed a general trend of increasing biodiversity in the avian community between yearly monitoring events. It is believed that continued rainfall impacted early nesting season attempts and success of quail. Field conditions were extremely wet and saturated throughout most of May when monitoring efforts occurred. All quail that were heard during the 2024 monitoring efforts were heard on the June 14-15 census (drier conditions).

Comparing the locations of quail heard during this 3-year time frame on the map shows that here is a general trend for quail to be located along the western side of the WRP and along the eastern side of the Ragsdale Creek and Red River, areas that hold lower successional plant communities (fence lines, sand bars, etc.).

As the reintroduced grassland, forest, and wetland communities flourish, following the end of construction efforts in 2022, it is predicted that more suitable habitat will become available for Northern bobwhites and other bird species which should be reflected in calculated biodiversity metrics.

Original strategies for the restoration efforts on the Riverby Ranch involved the establishment of native grass species in order to meet the metrics required by the COE permit. It was known that the successful establishment of these species would require multiple control of weedy species (Johnson grass, Bermudagrass, Marestail, etc) which would be detrimental to forb growth, thus no forbs were included in the original planting mixtures. Restoration plans called for adding this class of species once native grasses were established at the required levels. No-Till Drill planting into areas that received prescribed burning was one possible scenario for the addition of forbs but would require additional expense for seed sources that is not necessary.

With the resulting development of good to excellent native grass plant communities there is adequate nesting cover for quail and other grassland dependent wildlife species. An enhancement of biodiversity by manipulating plant succession is needed in order to provide food and cover for quail and other mid-successional species in the form of forbs and annual grasses that will provide insects, seed, cover and open space.

A proven, yet effective, way to disturb the soil and stimulate early successional growth in grassland habitats is through the use of "Strip Disking" with normal farm equipment to break up plants and their roots, and to "shuffle" the soil during a fall-winter timeframe.

Twelve-foot-wide strips should be plowed to a depth no greater than 3 inches in the fall and winter months to set back succession of the established native grass stands, which will encourage annual forb and grass growth. Plow no more than 5-15% of an area during any given year (Stephens, 2008), avoiding the primary nesting season of ground nesting birds (March 1st-July 15st) and majority of the fawning season for white-tailed deer.

Never plow the same area two years in a row. Planning the placement of these strips in a systematic order will allow for alternating locations in subsequent years. For example, if 25% of an area would be plowed in any given year it would be year 5 before the first plowed strip would be plowed again.

Additional monitoring of the presence/absence of grassland bird species is recommended and required to determine if the upward trends in quail and other grassland bird species will continue.

Literature Cited:

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Appendix A. Bird List for Riverby Ranch Mitigation Site Spring Quail Monitoring Survey 2024

Common Name	Scientific Name
American Crow	*Corvus brachyrhynchos*
Black Vulture	*Coragyps atratus*
Blue Grosbeak	*Passerina caerulea*
Blue Gray Gnatcatcher	*Polioptila caerulea*
Carolina Chickadee	Poecile carolinensis
Carolina Wren	Thryothorus ludovicianus
Dickcissel	Spiza americana
Eastern Wood Peewee	*Contopus virens*
Great Crested Flycatcher	*Myiarchus crinitus*
Indigo Bunting	*Passerina cyanea*
Killdeer	*Charadrius vociferus*
Mourning Dove	*Zenaida macroura*
Northern Cardinal	*Cardinalis cardinalis*
Northern Mockingbird	*Mimus polyglottos*
Red Bellied Woodpecker	*Melanerpes carolinus*
Red Winged Blackbird	*Agelaius phoeniceus*
Scissor Tail Flycatcher	*Tyrannus forficatus*
Summer Tanager	*Piranga rubra*
Tufted Titmouse	*Baeolophus bicolor*
Yellow Breasted Chat	*Icteria virens*
Barn Swallow	*Hirundo rustica*
Brown Headed Cowbird	*Molothrus ater*
Cliff Swallow	*Petrochelidon pyrrhonota*
Painted Bunting	*Passerina ciris*
Baltimore Oriole	*Icterus galbula*
Common Yellowthroat	*Geothlypis trichas*
Eastern Meadowlark	*Sturnella magna*
Prairie Warbler	*Setophaga discolor*
White Eyed Vireo	*Vireo griseus*
Yellow Throated Warbler	*Setophaga dominica*
Yellow Billed Cuckoo	*Coccyzus americanus*
Canada Goose	*Branta canadensis*
Great Egret	*Ardea alba*
Red Eyed Vireo	*Vireo olivaceus*
Warbling Vireo	*Vireo gilvus*
Bell's Vireo	*Vireo bellii*
Bewick's Wren	*Thryomanes bewickii*
Chuck Will's Widow	*Antrostomus carolinensis*
Eastern Phoebe	*Sayornis phoebe*
Northern Bobwhite	*Colinus virginianus*
Prothonotary Warbler	*Protonotaria citrea*
Cattle Egret	*Bubulcus ibis*
Downy Woodpecker	*Picoides pubescens*
Great Blue Heron	*Ardea herodias*
Little Blue Heron	*Egretta caerulea*
Red Tailed Hawk	*Buteo jamaicensis*

Appendix B. Complete Bird List for Riverby Ranch Mitigation Site Spring Quail Monitoring Surveys (2022 – 2024)

Common Name	Scientific Name
American Crow	*Corvus brachyrhynchos*
American Goldfinch	*Spinus tristis*
Baltimore Oriole*	*Icterus galbula*
Bell's Vireo	*Vireo bellii*
Bewick's Wren*	*Thyomanes bewickii*
Black Poll Warbler	*Setophaga striata*
Black-chinned Hummingbird	*Archilochus alexandri*
Blue Grosbeak	*Passerina caerulea*
Blue Jay	*Cyanocitta cristata*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Blue-winged Teal	*Spatula discors*
Brown-headed Cowbird	*Molothrus ater*
Canada Goose	*Branta canadensis*
Carolina Chickadee	*Poecile carolinensis*
Carolina Wren	*Thryothorus ludovicianus*
Cattle Egret*	*Bubulcus ibis*
Chipping Sparrow	*Spizella passerina*
Chuck-Will's Widow*	*Antrostomus carolinensis*
Cliff Swallow	*Petrochelidon pyrrhonota*
Common Yellowthroat	*Geothlypis trichas*
Dickcissel	*Spiza americana*
Eastern Kingbird	*Tyrannus tyrannus*
Eastern Meadowlark	*Sturnella magna*
Eastern Pheobe*	*Sayornis phoebe*
Eastern Towhee	*Pipilo erythrophthalmus*
Grasshopper Sparrow	*Ammodramus savannarum*
Great Blue Heron	*Ardea herodias*
Great crested flycatcher	*Myiarchus crinitus*
Great Egret	*Ardea alba*
Great Horned Owl	*Bubo virginianus*
Greater Yellowlegs	*Tringa melanoleuca*
House Wren	*Troglodytes aedon*
Indigo Bunting	*Passerina cyanea*
Killdeer*	*Charadrius vociferus*
Lincoln's Sparrow	*Melospiza lincolnii*
Little Blue Heron*	*Egretta caerulea*
Mourning Dove	*Zenaida macroura*

Northern Bobwhite	*Colinus virginianus*
Northern Cardinal	*Cardinalis cardinalis*
Northern Flicker	*Colaptes auratus*
Northern Mockingbird	*Mimus polyglottos*
Orchard Oriole	*Icterus spurius*
Painted Bunting	*Passerina ciris*
Pileated Woodpecker	*Dryocopus pileatus*
Prairie Warbler*	*Setophaga discolor*
Prothonotary Warbler	*Protonotaria citrea*
Purple Martin	*Progne subis*
Red-bellied Woodpecker	*Melanerpes carolinus*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Red-shouldered Hawk	*Buteo lineatus*
Red-tailed Hawk	*Buteo jamaicensis*
Red-winged Blackbird	*Agelaius phoeniceus*
Scissor-tail Flycatcher	*Tyrannus forficatus*

*Newly documented bird species (2024)