Mississippi's Conservation Reserve Program

CP33 - Habitat Buffers for Upland Birds

Mississippi Bird Monitoring and Evaluation Plan

2007 Annual Report

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Kristine Evans
Research Associate
Department of Wildlife and Fisheries
Mississippi State University

Rick Hamrick
Small Game Program Leader
Mississippi Department of Wildlife, Fisheries and Parks
Department of Wildlife and Fisheries
Mississippi State University

Wes Burger
Professor of Wildlife Ecology
Department of Wildlife and Fisheries
Mississippi State University

Dave Godwin
Small Game Coordinator
Mississippi Department of Wildlife, Fisheries and Parks
Department of Wildlife and Fisheries
Mississippi State University

Executive Summary

Populations of northern bobwhite and other upland birds have experienced precipitous range-wide declines for several decades. To address these declines the Southeast Quail Study Group (SEQSG) developed the Northern Bobwhite Conservation Initiative (NBCI) to outline a plan for the recovery of bobwhite populations. To help meet the objectives of the NBCI the SEQSG advocated the establishment of a native grass habitat buffer practice specifically for bobwhite and other grassland wildlife under the Conservation Reserve Program (CRP). In 2004, the USDA-Farm Service Agency (FSA) initiated the Habitat Buffers for Upland Birds practice, CP-33, as part of the continuous sign-up CRP, specifically to provide habitat for bobwhite and other upland birds in cropland areas. The FSA allocated 250,000 CP-33 acres to 35 states to be actively managed over a period of 10 years and charged the SEQSG with the development of a monitoring program to generate measures of bobwhite and priority songbird population response to CP-33 establishment. Mississippi was allocated 9,404 CP-33 acres of which 2,179 acres have been enrolled, and is one of 14 states participating in the national CP-33 monitoring program. Mississippi State University, in cooperation with the Mississippi Department of Wildlife, Fisheries and Parks, Mississippi FSA, and Mississippi USDA-Natural Resources Conservation Service (NRCS) has implemented Mississippi's CP-33 monitoring program on 40 CP-33 fields in 9 counties within the state (Calhoun, Chickasaw, Clay, Coahoma, Itawamba, Monroe, Newton, Prentiss, and Union counties). Sample fields were randomly selected from the pool of all CP-33 contracts in the state FSA CRP contract database December 31 2005. To evaluate effects of CP-33 habitat buffers, similarly cropped control fields located >1 km and <3 km from a surveyed CP-33 field were selected for comparison. Following the procedural guidelines outlined in the CP33 – Habitat Buffers for Upland Birds Monitoring Protocol breeding season bird surveys were conducted during June 2006-2007, and fall covey call surveys were conducted during October-November 2006-2007 on paired CP-33 and control fields. State-level breeding season and fall covey data analyses were conducted using distance sampling to generate density estimates, while regional level (by Bird Conservation Region) analyses were conducted using a poisson regression to generate measures of relative abundance. Breeding season bobwhite densities were 700% greater in 2006 and 545% greater in 2007 on CP-33 sites relative to control sites. Density of fall bobwhite coveys were 79% greater on CP-33 sites than control sites in 2006, and 35% greater on CP-33 sites than control sites in 2007. Densities of dickcissels were greater on CP-33 sites compared to control sites in both years, but showed the greatest response in 2007 with close to twice the density on CP-33 sites than controls. Indigo buntings were more than twice as abundant on CP-33 sites compared to control sites in 2006 and 2007. Eastern meadowlark densities were only slightly higher (12%) in 2006 and 2007 on CP-33 compared to control sites. Field sparrows exhibited similar trends in density as eastern meadowlark exhibiting densities only an average of 30% more abundant on CP-33 sites compared to control sites in 2006 and 2007. Given the annual and regional variation in avian density and relative abundance, CP-33 buffer habitats have produced positive benefits to several species in agricultural landscapes in the first 2 years following establishment. This positive response may be the result of increased and variable nesting or foraging cover provided by, or the changing insect community or seed base associated with CP-33 buffers. As vegetative structural cover in CP-33 buffers continues to improve in subsequent years, it is expected that more positive population effects will be measured.

This report was funded by the Multistate Conservation Grant Program (Grant MS M-1-T), a program supported with funds from the Wildlife and Sport Fish Restoration Program and jointly managed by the Association of Fish and Wildlife Agencies and the U.S. Fish and Wildlife Service, 2006.

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Introduction

Populations of northern bobwhite (hereafter, bobwhite) and other grassland songbird species have experienced dramatic declines over the past several decades. Declines of bobwhite populations in Mississippi are particularly severe, averaging 5% per year since 1980. These declines are presumably caused by a loss of quality habitat resulting from the combined effects of intensification of monoculture farming, intensive timber management, reforestation, urbanization and fire-exclusion. To reverse this decline, the Northern Bobwhite Conservation Initiative (NBCI; Dimmick et al. 2002) was developed to outline a plan for the recovery of bobwhite populations to stable pre-1980 levels. In the NBCI the Southeast Quail Study Group (SEQSG) stressed a need to focus restoration efforts on bobwhite populations in agricultural landscapes. In 2004, following recommendation by the SEQSG, the United States Department of Agriculture-Farm Service Agency (FSA) implemented the Habitat Buffers for Upland Birds practice CP-33 as part of the continuous-signup Conservation Reserve Program (CRP) to provide habitat for bobwhite and other upland birds in cropland areas. CP-33 is unique in that it is the first CRP practice designed specifically to address population recovery goals of a large-scale wildlife conservation initiative. CP-33 provides economic incentives to agricultural producers to create 30-120′ mixed native warm-season grass, forb, and legume buffers along edges of cropped fields. Landowners who enroll in CP-33 receive sign-up incentives, an annual rental payment based on county-specific soil rental rates and cost-share assistance for management activities for the duration of a 10-year contract period. Of the 250,000 CP-33 acres allocated by the FSA to 35 states, Mississippi was allocated 9,404 acres, and has enrolled 2,179 acres.

When CP-33 was initiated, the FSA raised concerns about the lack of information regarding effects of CRP practices on wildlife populations. To address these concerns, the FSA requested that the SEQSG develop a large-scale CP-33 monitoring program to estimate bobwhite and priority songbird population response to implementation of CP-33 over a 3-year sampling period. Subsequently, the "CP33-Habitat Buffers for Upland Birds Monitoring Protocol" (Burger et al. 2006) was created. CP-33 monitoring was implemented in 2006 breeding season and will continue through the fall of 2008. There are currently 16 states conducting CP-33 monitoring, with 14 of those, including Mississippi, participating in the CP-33 Monitoring Program coordinated by the Mississippi State University Forest and Wildlife Research Center.

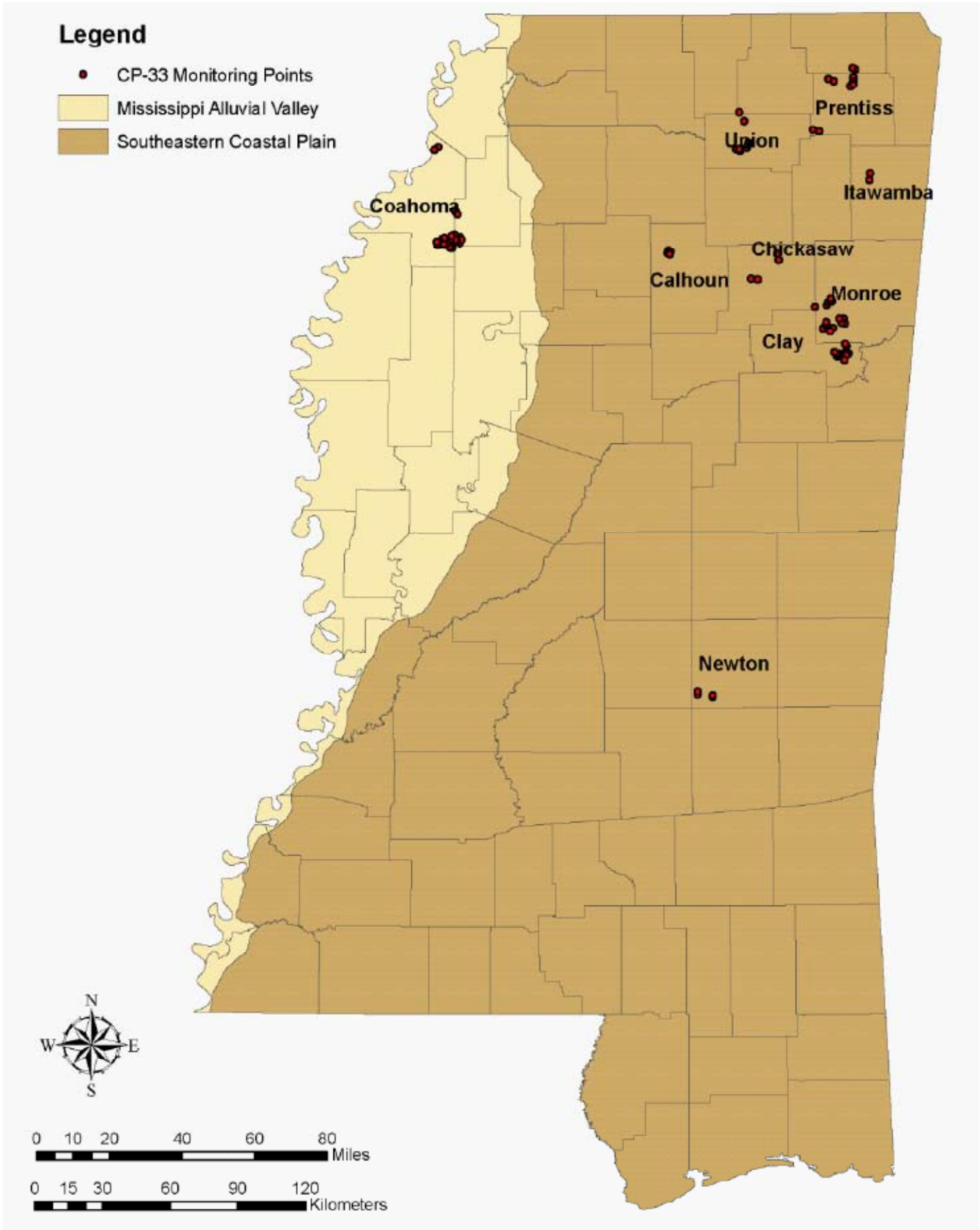
Mississippi State University, in cooperation with the Mississippi Department of Wildlife, Fisheries and Parks, Mississippi FSA, and Mississippi USDA-Natural Resources Conservation Service (NRCS) has implemented Mississippi's CP-33 monitoring program on 40 CP-33 fields in 9 counties within the state (Calhoun, Chickasaw, Clay, Coahoma, Itawamba, Monroe, Newton, Prentiss, and Union counties; Figure 1). These 9 counties represent both Bird Conservation Regions (BCRs) in Mississippi, which include the Mississippi Alluvial Valley (MAV) and the Southeastern Coastal Plain (SCP) (Figure 1). BCRs are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. Monitored CP-33 fields were randomly selected from the pool of all CP-33 contracts in the state FSA CRP contract database December 31, 2005. Objectives of the 3-year monitoring program include satisfying the FSA's required wildlife monitoring component of the CP-33 conservation practice, and evaluating the long-term programmatic effects of CP-33 on bobwhite and grassland bird populations.

Methods

The Mississippi CP-33 monitoring program includes annual breeding season bird surveys and fall bobwhite covey surveys on 40 CP-33 fields from 2006-2008. To evaluate effects of CP-33 habitat buffers, 40 similarly cropped control fields located >1 km and <3 km from a surveyed CP-33 field were selected for comparison. Breeding season bird surveys were conducted at one survey point per field during June 2006-2007. All singing, calling, or observed male birds (of all species) were recorded at an established survey point along the field edge for a 10-minute interval. Two replicate surveys were conducted at most fields each breeding season. Fall covey call surveys were conducted during October-November 2006-2007 on paired CP-33 and control fields from 45 min before sunrise to 5 min before sunrise or until covey calls had ceased. Covey locations, time of calling, and weather variables were recorded on datasheets containing aerial photos of the survey location. Distance was later measured from georeferenced NAIP imagery in ARCGIS to generate an exact radial distance from the point to the estimated location of the calling covey. All bird surveys were conducted following the procedural guidelines outlined in the CP33–Habitat Buffers for Upland Birds Monitoring Protocol.

The SEQSG in cooperation with Partners in Flight developed a list of priority bird species for each BCR represented in the CP-33 monitoring program. Priority species selected are grassland-obligate or facultative species whose populations are experiencing moderate to sharp declines. Priority species for both the MAV and SCP include bobwhite, dickcissel, eastern meadowlark, indigo bunting, field sparrow, and eastern kingbird. Last year we reported breeding season and fall covey relative abundances (mean number of males per point, mean number of coveys per point) of all priority bird species with adequate numbers of detections for analysis. For the breeding season data, these included bobwhite, dickcissel, eastern meadowlark, and indigo bunting. We have since re-analyzed the 2006 data and analyzed the 2007 data using distance sampling techniques to generate estimates of density (males per hectare, coveys per hectare). Distance sampling is advantageous in that it accounts for variability in detection and incorporates a detection probability into a density estimate for a species. This technique produces a more realistic and robust estimate of density than can be produced by calculating relative abundances. We used distance sampling to estimate the breeding season density of 5 priority bird species (bobwhite, dickcissel, eastern meadowlark, indigo bunting, and field sparrow) on CP-33 and control fields in Mississippi. We also estimated density of fall bobwhite coveys. We adjusted for variation in calling rate influenced by number of adjacent calling coveys, 6-hr change in barometric pressure, percent cloud cover, and wind speed (Wellendorf et al. 2004). Because of differences in land use and landscape composition between the MAV and SCP BCRs, we also sought to estimate density separately in these regions. However, because distance sampling requires a fairly large sample size (>60 detections), we were unable to produce separate density estimates for the SCP and MAV. For BCR-level analysis, we therefore generated estimates of relative abundance using a Poisson logistic regression (log link function) while controlling for paired treatments and controls.

Figure 1. Distribution of CP33 habitat buffers bird monitoring points in Mississippi.



Results

Species richness was greater on CP-33 fields than control sites in Mississippi in 2006 and 2007. In the MAV, we detected 35 and 39 different species at control and CP-33 sites, respectively, during the 2006 breeding season, and 28 and 39 different species at control and CP-33 sites, respectively, during the 2007 breeding season. In the SCP, we detected 50 and 59 different species at control and CP-33 sites, respectively, during the 2006 breeding season, and 47 and 48 different species at control and CP-33 sites, respectively, during the 2007 breeding season.

Response to CP-33 was generally positive for each priority bird species in Mississippi, but varied by year and by BCR. Bobwhite were notably more abundant on CP33 than control fields during the 2006 and 2007 breeding seasons, with an effect size of 0.21 males/ha in 2006 and 0.13 males/ha in 2007 (Figure 2). Density was 700% and 545% greater on Mississippi CP-33 fields in 2006 and 2007, respectively, when compared to control fields. Mean breeding season bobwhite relative abundance was greater at CP-33 sites than control sites in both BCRs in 2006 and 2007 (Figure 3). Relative abundances of breeding season bobwhites were greater in the MAV than the SCP on both control and CP-33 sites in both years. Density of fall bobwhite coveys was 79% greater on CP-33 sites than control sites in 2006, and 35% greater on CP-33 sites than controls in 2007 (Figure 4). This trend was also apparent in coveys within each BCR. Bobwhite covey relative abundance declined on CP-33 sites in 2007 compared to 2006; however, there remained a positive effect of CP-33 in both BCRs in both years, with the greatest effect occurring in the MAV in 2007 (Figure 5).

Statewide, dickcissel density was 40% greater on CP-33 sites compared to control sites in both years (Figure 6). Mean dickcissel relative abundance was also greater at CP-33 sites than control sites in both BCRs in both years (Figure 7). Dickcissel relative abundance was two-times greater in 2006 and four-times greater in 2007 on CP-33 sites in the SCP. Indigo bunting density more than doubled on CP-33 sites compared to control sites in 2006. The magnitude of the effect size declined from 2006 – 2007, however, but still exhibited a 71% greater density on CP-33 sites than controls (Figure 8). Mean relative abundance estimates for indigo buntings were quite different from density estimates in both years. Indigo buntings were greater on CP-33 sites in the SCP in 2006, but were nearly identical or slightly greater on control sites in the SCP in 2007 and in the MAV in both years (Figure 9).

Eastern meadowlark had virtually no difference in density in 2006 and 2007 only increasing 1% on CP-33 relative to control sites state-wide (Figure 10). Relative abundance estimates by BCR for eastern meadowlark reflected this same trend. There were slightly greater meadowlark relative abundances on control sites in both BCRs in 2006, but nearly 3 times greater abundances on CP-33 sites in both BCRs in 2007 (Figure 11). Field sparrows exhibited nearly identical trends as eastern meadowlark exhibiting only a 2% greater density on CP33 sites than on control sites (Figure 12). Due to limited sample size, only state-wide estimates of density could be generated for this species. Eastern Kingbirds were also not detected in sufficient numbers to estimate meaningful relative abundance or density in 2006 or 2007. No Eastern Kingbirds were recorded in the MAV in both years, and only 13 were recorded in the SCP (n = 3 at CP33 sites, and n = 10 at control sites) in 2006, and 10 were recorded in the SCP (n = 5 at CP33 sites, and n = 7 at control sites) in 2007.

Discussion

We observed a positive overall response to establishment of CP-33 buffers by bobwhite populations, as well as populations of several priority songbird species in Mississippi in the first 2 years of the CP-33 monitoring program. However, population response varied annually and regionally. The annual variation in response is likely due to a multitude of factors, which include variation in establishment and growth of the buffers, timing of colonization by local avifauna, and differences in regional habitat preferences by the bird community. Lack of cover establishment in 2006 may explain a delayed response by some species, which responded well in 2007. Bobwhite, dickcissel, eastern meadowlark, and field sparrow all showed measurably greater densities on CP-33 sites than control sites by 2007. We also observed regional variability in response by bobwhite and priority songbird species at CP-33 and control sites in the MAV and SCP. However, this is not surprising, given landscape-level habitat differences between the two regions and annually varying weather. Bobwhite and dickcissel relative abundances on both CP-33 and control sites were greater in the MAV than SCP in both years, although response was positive in both regions. Relative abundance of indigo buntings was slightly greater in the SCP than the MAV, while the magnitude of the effect size declined in 2007. Bobwhite coveys reflected more annual than regional variation, with slightly reduced response on CP-33 sites in both BCRs in 2007.

Despite the annual and regional variation in avian density and relative abundance, this monitoring program clearly demonstrates that CP-33 habitat buffers have produced positive benefits to several bird species in agricultural landscapes. These species, which cover a range of habitat preferences from grassland obligate to grass-shrub and edge species, exhibit a distinct preference for crop fields bordered by CP-33 compared to edge-to-edge cropping methods. This positive response may be the result of increased and variable nesting or foraging cover provided by, or additional food resources associated with CP-33 buffers. As vegetative structural cover in CP-33 buffers continues to improve in subsequent years, it is expected that more positive population effects will be measured. However, the quality of habitat produced by implementation of CP-33 will depend on weather conditions and application of proper mid-contract management practices over the 10-year duration of the contracts. Nevertheless, the positive results witnessed in the first two years of this study suggest that further research is critical to fully understand all the effects CP-33 buffers will have on populations of bobwhite and other priority avian species.

Figure 2. Breeding season density of male bobwhites at control and CP-33 sites in Mississippi, June 2006-2007. Error bars represent 95% bootstrap confidence intervals.

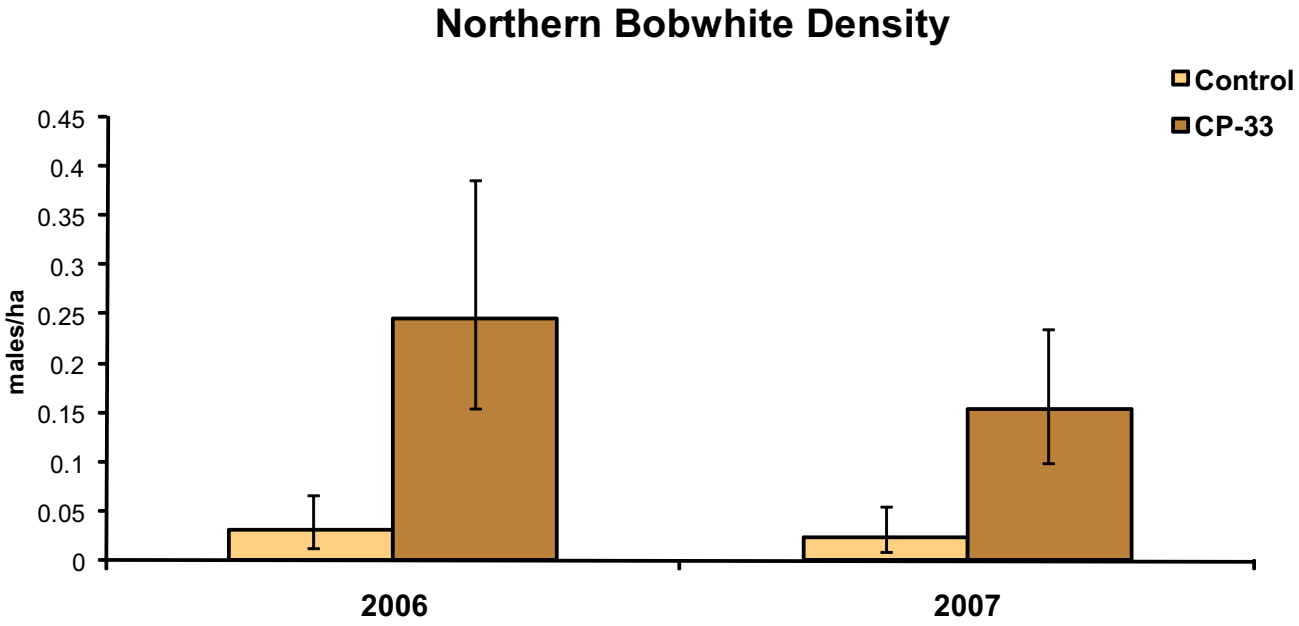
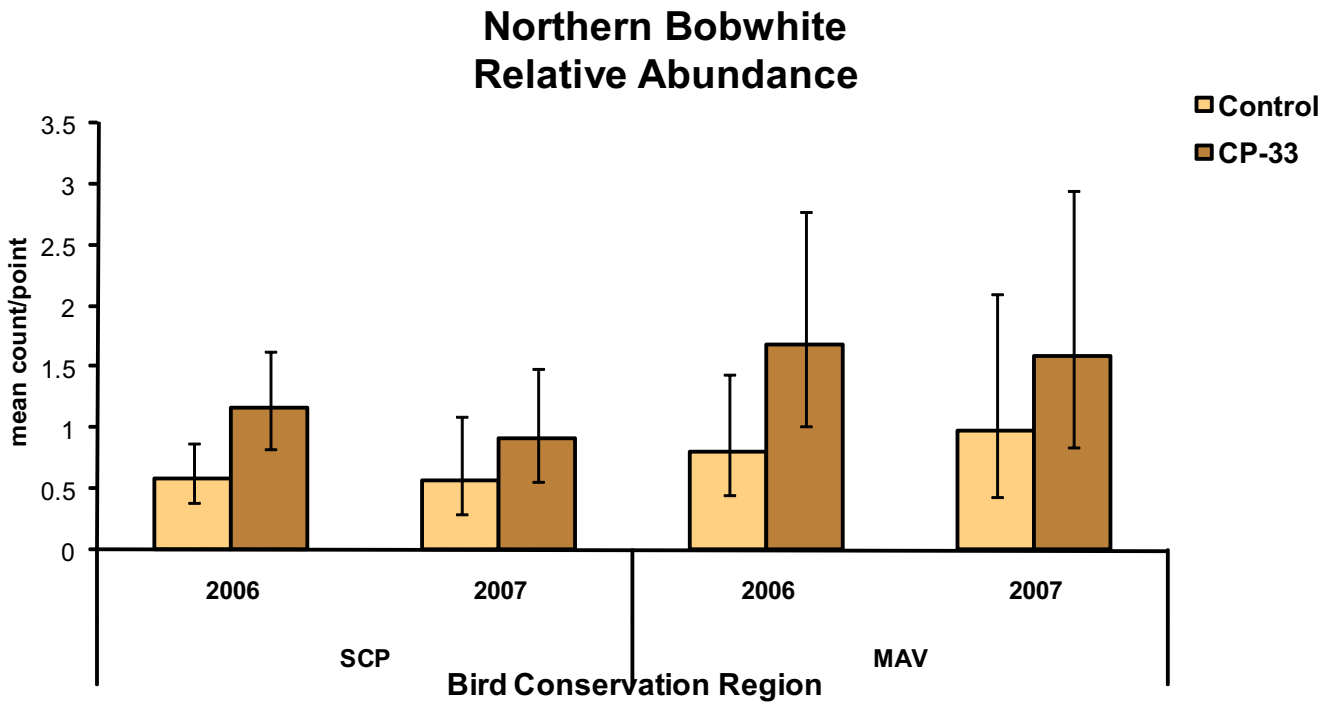
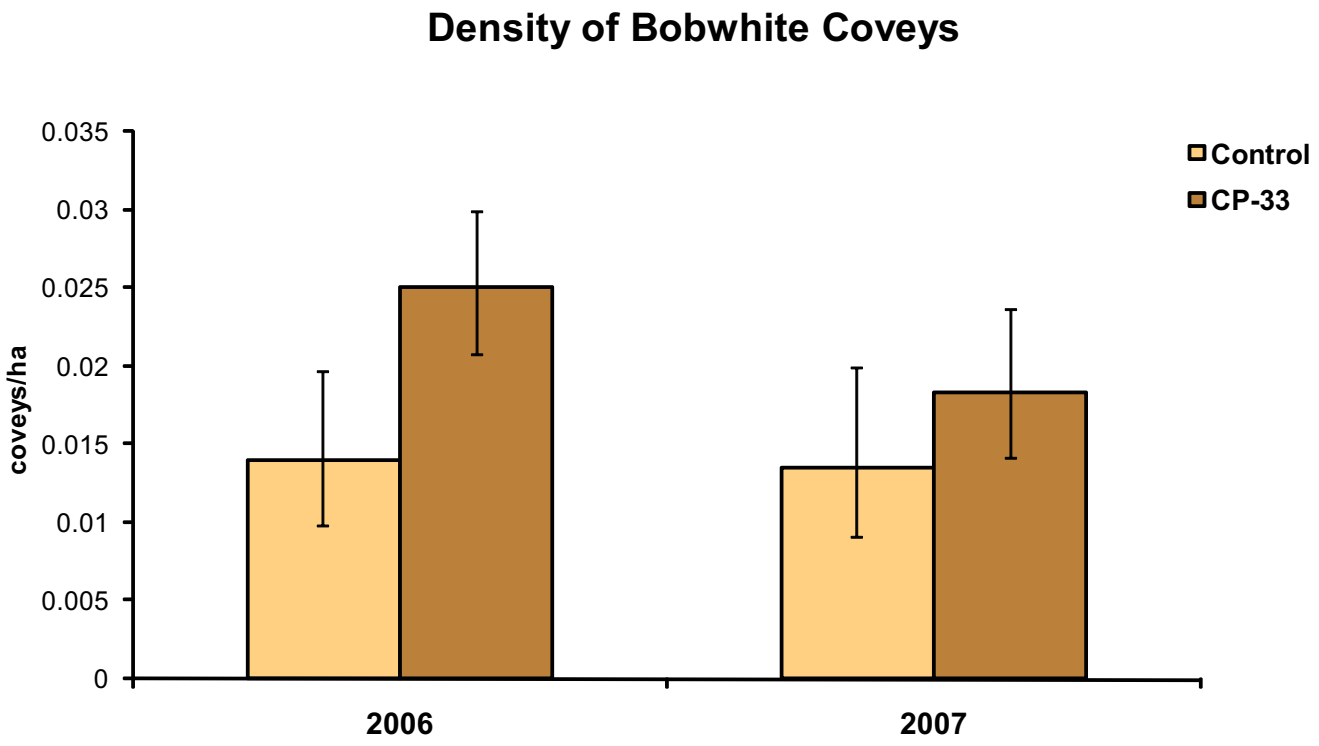


Figure 3. Breeding season relative abundance of male bobwhites at control and CP-33 sites in the Mississippi Alluvial Valley (MAV) and Southeastern Coastal Plain (SCP), June 2006-2007. Means were estimated with Poisson regression (log link function) controlling for paired treatments and controls. Error bars represent 90% confidence intervals (asymmetric after exponential back transformation).



CP33 buffer planted to native warm-season grasses during the first growing season after planting.

Figure 4. Density of bobwhite coveys at control and CP-33 sites in Mississippi, October-November 2006-2007 adjusted for calling rate (number of adjacent coveys, 6-hr change in barometric pressure, percent cloud cover, and wind speed). Error bars represent 95% bootstrap confidence intervals.



During winter, native grasses in CP33 buffers provide roosting, foraging, and escape habitat for grassland birds.

Figure 5. Relative abundance of bobwhite coveys at control and CP-33 sites in the Mississippi Alluvial Valley (MAV) and Southeastern Coastal Plain (SCP), October-November 2006-2007. Means were estimated with Poisson regression (log link function) controlling for paired treatments and controls. Error bars represent 90% confidence intervals (asymmetric after exponential back transformation).

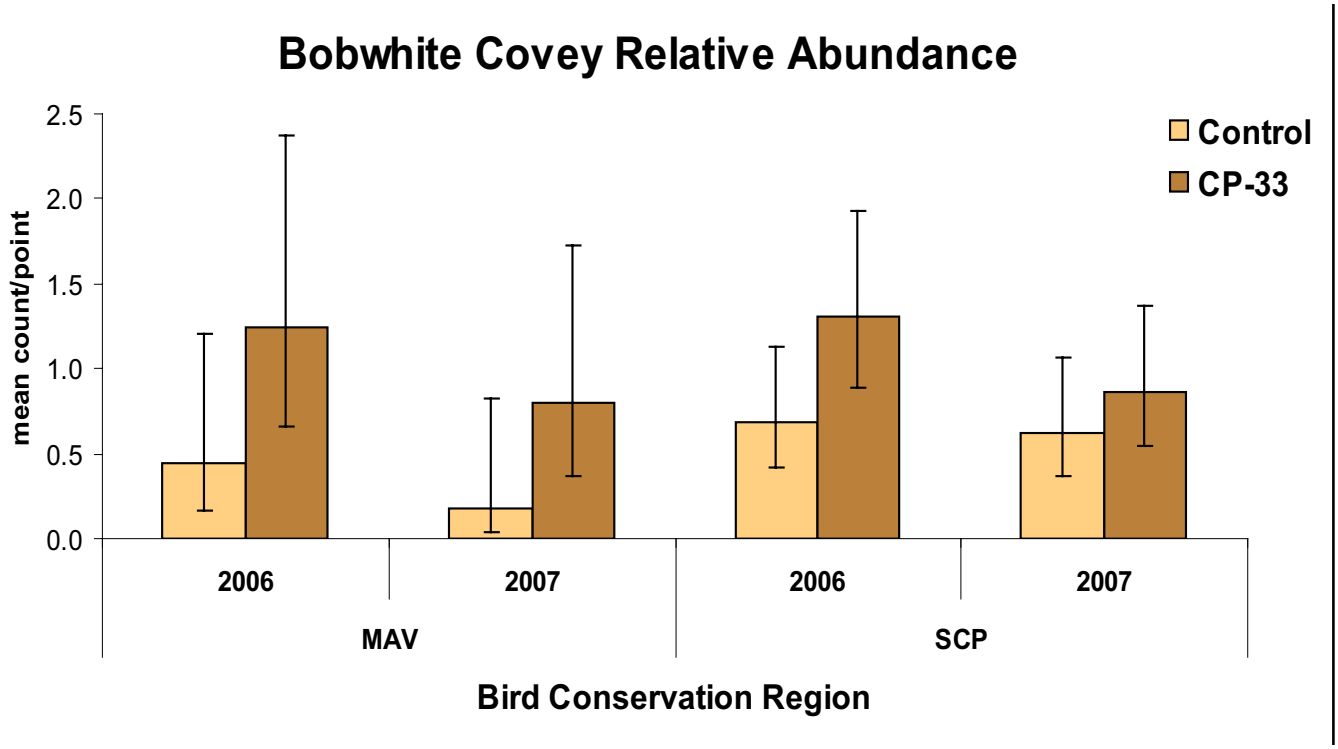


Figure 6. Breeding season density of dickcissels at control and CP-33 sites in Mississippi, June 2006-2007. Error bars represent 95% bootstrap confidence intervals.

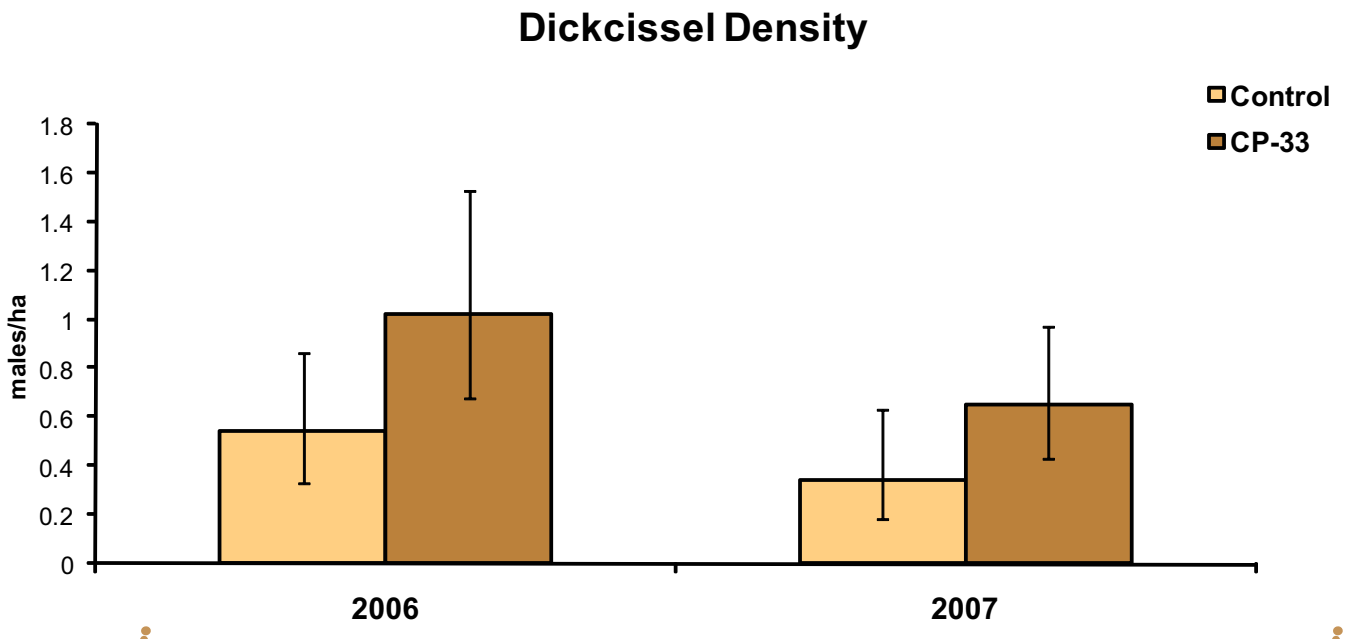


Figure 7. Breeding season relative abundance of male dickcissels at control and CP-33 sites in the Mississippi Alluvial Valley (MAV) and Southeastern Coastal Plain (SCP), June 2006-2007. Means were estimated with Poisson regression (log link function) controlling for paired treatments and controls. Error bars represent 90% confidence intervals (asymmetric after exponential back transformation).

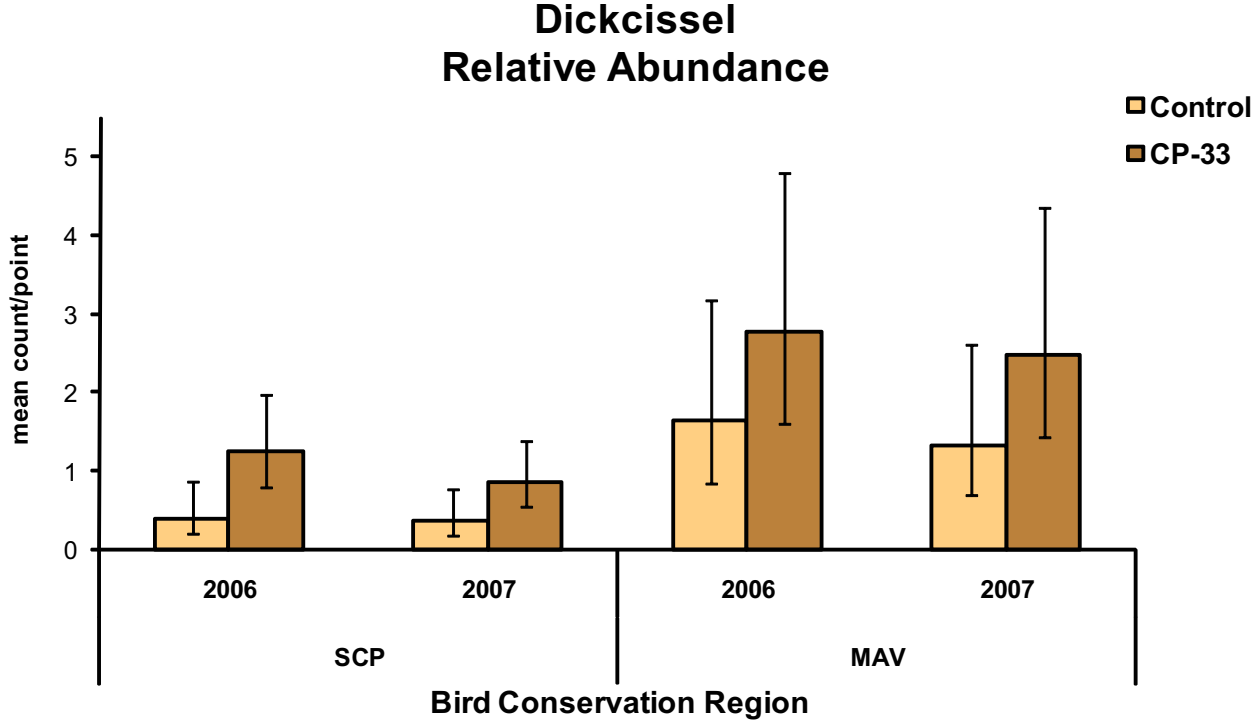


Figure 8. Breeding season density of indigo buntings at control and CP-33 sites in Mississippi, June 2006-2007. Error bars represent 95% bootstrap confidence intervals.

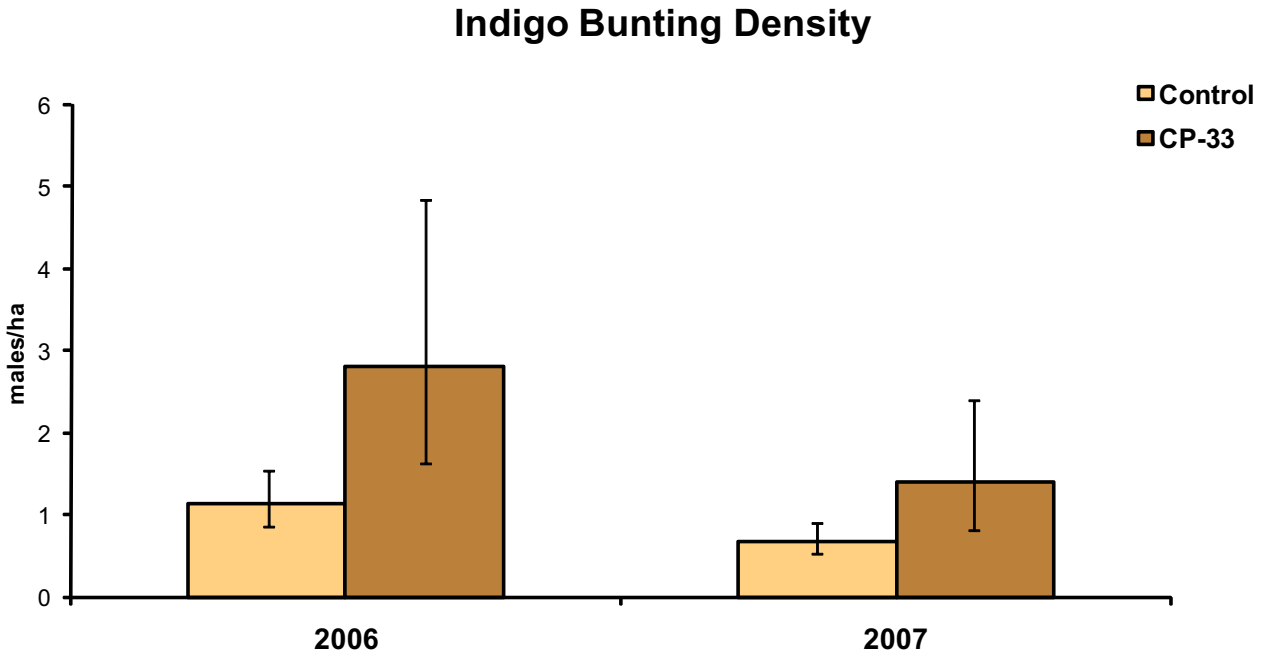


Figure 9. Breeding season relative abundance of male indigo buntings at control and CP-33 sites in the Mississippi Alluvial Valley (MAV) and Southeastern Coastal Plain (SCP), June 2006-2007. Means were estimated with Poisson regression (log link function) controlling for paired treatments and controls. Error bars represent 90% confidence intervals (asymmetric after exponential back transformation).

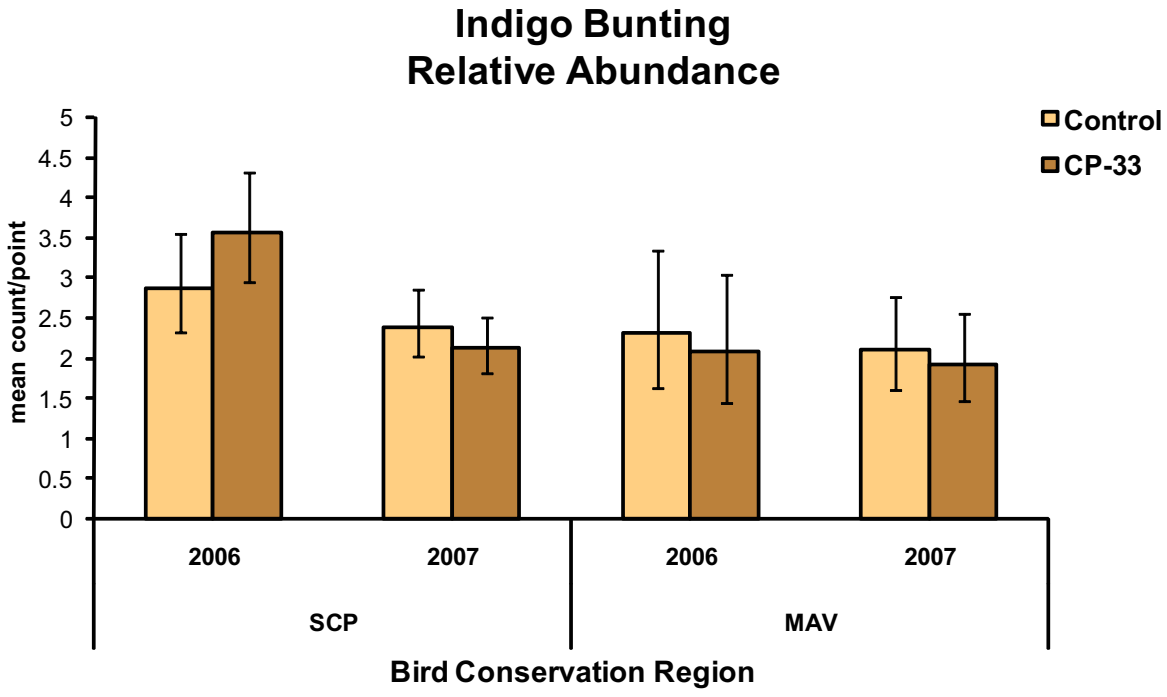


Figure 10. Breeding season density of eastern meadowlarks at control and CP-33 sites in Mississippi, June 2006-2007. Error bars represent 95% bootstrap confidence intervals.

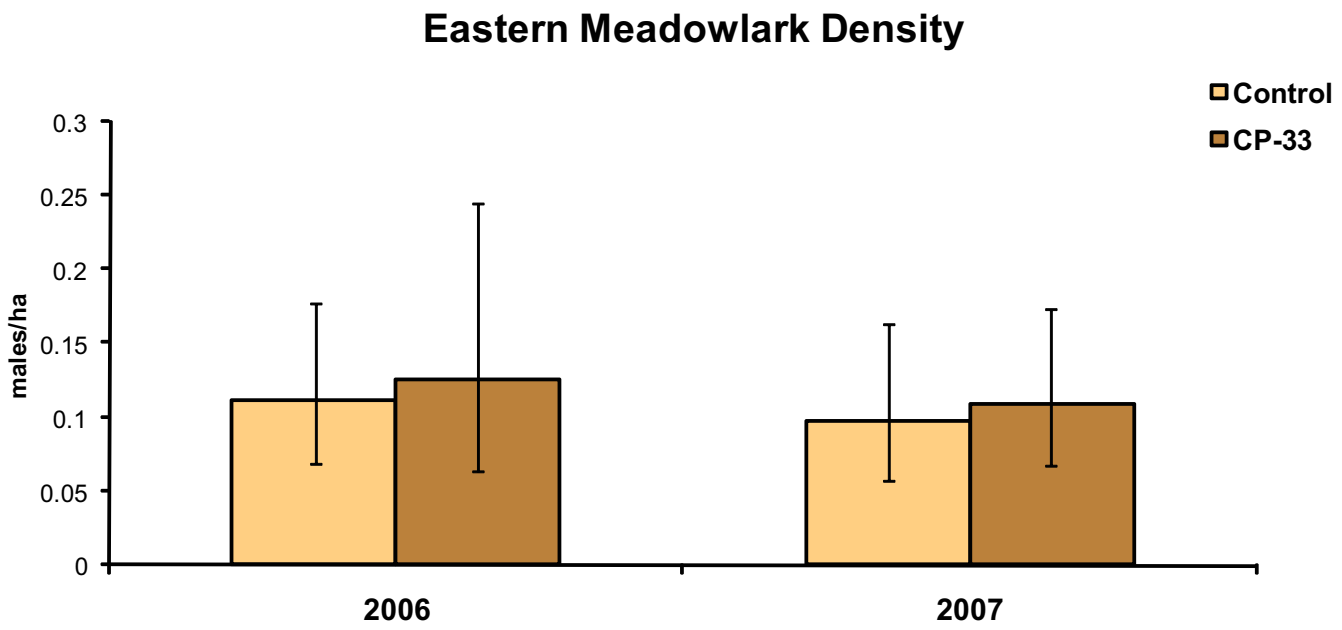


Figure 11. Breeding season relative abundance of male eastern meadowlarks at control and CP-33 sites in the Mississippi Alluvial Valley (MAV) and Southeastern Coastal Plain (SCP), June 2006-2007. Means were estimated with Poisson regression (log link function) controlling for paired treatments and controls. Error bars represent 90% confidence intervals (asymmetric after exponential back transformation).

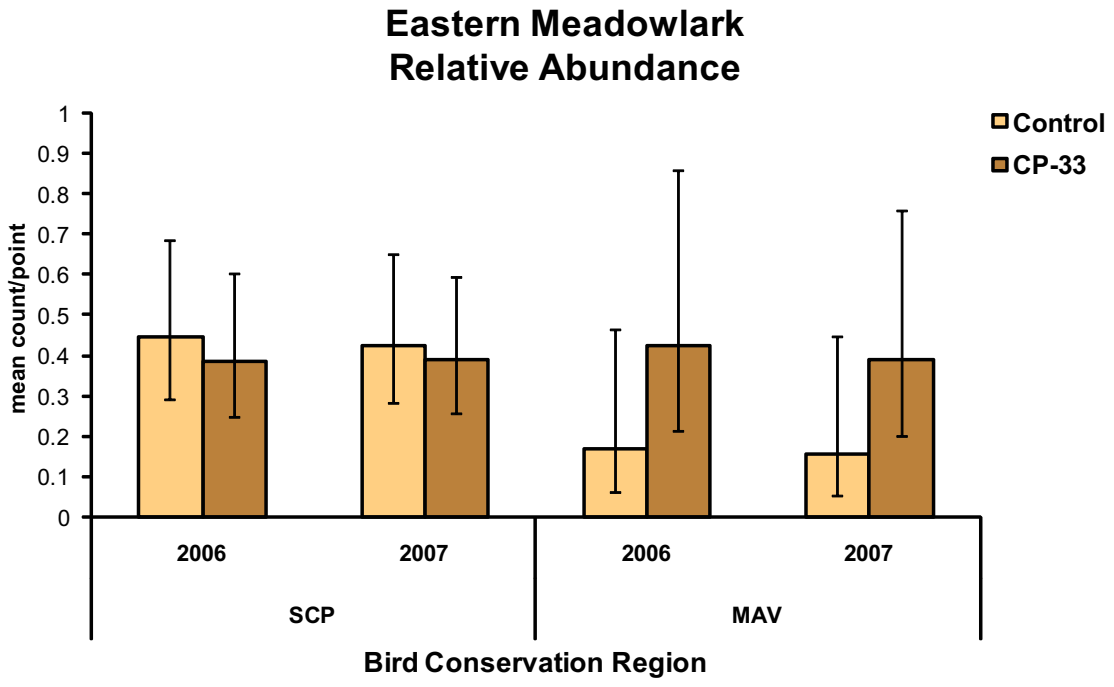
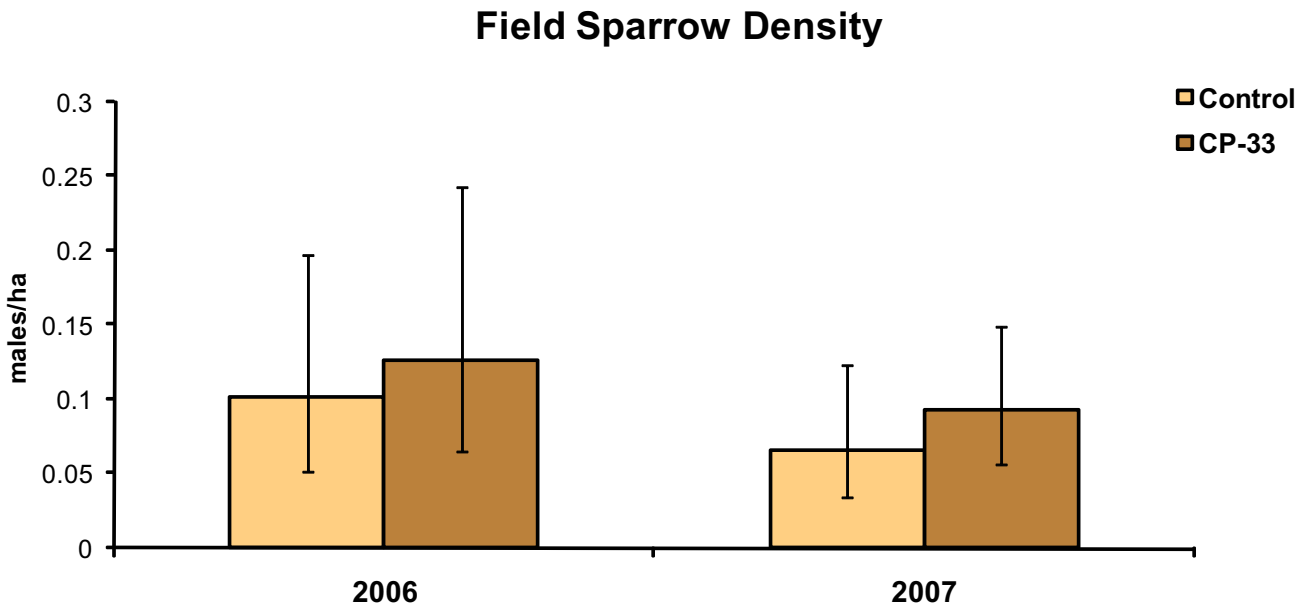


Figure 12. Breeding season density of field sparrows at control and CP-33 sites in Mississippi, June 2006-2007. Error bars represent 95% bootstrap confidence intervals.



Acknowledgements

Our sincere thanks go to all of the cooperators who graciously allowed us access to their property in order to conduct this research. Thanks go to the numerous personnel in the USDA-Farm Service Agency and USDA-Natural Resource Conservation Service Agency county offices who assisted with logistical support. Finally, we would like to thank Philip Barbour, Adam Efird, Joanna Mowdy, Heidi Puckett, Melinda Ragsdale, Sam Riffell, Chris White, and Lee Woodall who assisted in data collection for this research. Without their hard work, this research could not have been successful. Funding for the Mississippi CP-33 monitoring program was provided by grants from the Mississippi Department of Wildlife, Fisheries, and Parks, the Association of Fish and Wildlife Agencies, and Federal Aid in Sport Fisheries and Wildlife Restoration.

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NRCS

USDA Farm Service Agency

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