

Mississippi's Conservation Reserve Program

CP33 - Habitat Buffers for Upland Birds

Mississippi Bird Monitoring and Evaluation Plan

Annual Report, 2006–2009



Mississippi's Conservation Reserve Program

CP33 - Habitat Buffers for Upland Birds

Mississippi Bird Monitoring and Evaluation Plan

2006 – 2009 Annual Report

Lindsey C. Singleton

Research Associate

Department of Wildlife, Fisheries and Aquaculture
Mississippi State University

Kristine Evans

Research Associate

Department of Wildlife, Fisheries and Aquaculture
Mississippi State University

Wes Burger

Professor of Wildlife Ecology

Department of Wildlife, Fisheries and Aquaculture
Mississippi State University

Rick Hamrick

Small Game Program Leader

Mississippi Department of Wildlife, Fisheries, and Parks

Dave Godwin

Turkey Program Coordinator

Mississippi Department of Wildlife, Fisheries, and Parks

Executive Summary

Northern bobwhite quail (hereafter, bobwhite) populations have been declining since 1966 as a result of loss of quality habitat. The National Bobwhite Conservation Initiative (NBCI), a range-wide, habitat-based restoration plan, was developed by the National Bobwhite Technical Committee (NBTC) in response to bobwhite population status. In 2004 the USDA-Farm Service Agency (FSA) approved a new Conservation Reserve Program (CRP) continuous sign up practice, CP33–Habitat Buffers for Upland Birds, to help address the habitat goals identified in the NBCI. CP33 is designed to benefit bobwhite and other grassland songbirds by providing idle native herbaceous habitat in agricultural systems. Because CP33 was specifically designed to address population recovery goals of the NBCI, the FSA requested that the NBTC design a large-scale monitoring program to estimate bobwhite and priority songbird population response to CP33. Subsequently, the “CP33–Habitat Buffers for Upland Birds Monitoring Protocol” was developed and monitoring of bird populations and buffer vegetation community took place from 2006–2008 on a sample of fields in 14 participating states that were allocated the majority of CP33 acreage. Mississippi State University, cooperating with the Mississippi Department of Wildlife, Fisheries, and Parks, Mississippi USDA-FSA, and Mississippi USDA-Natural Resources Conservation Service (NRCS), was responsible for implementing Mississippi’s CP33 monitoring program. Through the program, substantial conservation benefits to bobwhite and other early successional avian species have been observed and recorded. In 2009 the Association of Fish and Wildlife Agencies (AFWA) provided additional financial support for the national CP33 monitoring program through a multi-state conservation grant of the Sport Fish and Wildlife Restoration Program, extending the program an additional 3 years during contract years 4-6 (2009–2011). The extension of the monitoring program, called “Phase II” requires the continuation of breeding season bird monitoring as well as

the additional evaluation of mid-contract management (MCM) activities and the effects of these activities on bird and buffer vegetation communities. Breeding season bird surveys were conducted during June 2006–2009, on a sample of 40 paired CP33 and control fields. Data analyses were conducted using conventional distance sampling to generate density estimates. We characterized vegetation structure and community within 10 1-m² sampling plots within each CP33 buffer. We also evaluated mid-contract management and other disturbance activities through landowner inquiry and in-field assessments. Avian species richness was greatest at CP33 sites in 2006, 2007, and 2008, and at control sites in 2009. Most priority and non-priority species analyzed responded positively to the establishment of CP33 habitat buffers. Bobwhite breeding season densities were on average 508% greater at CP33 sites relative to control sites. Dickcissel were on average 323% more abundant on CP33 sites relative to control sites. Field sparrow density was slightly greater in CP33 fields in 2006 and significantly greater in 2007, 2008, and 2009. Indigo bunting exhibited high densities in both CP33 and control sites; however, densities were slightly greater at CP33 buffered sites. Eastern meadowlark density was only slightly greater at CP33 sites in 2006 and 2007 and lower at CP33 sites in 2008 and 2009 compared to control fields. Common yellowthroat were more abundant on CP33 buffered fields relative to control fields, but response varied among years. Yellow-breasted chat exhibited consistently greater densities on CP33 buffered fields relative to control fields with an average effect size of 0.04 male birds/acre. Mourning doves exhibited greater densities at CP33 sites in 2006, 2007, and 2008, but lower densities in 2009 compared to control fields. Red-winged blackbird densities varied considerably throughout the four years of sampling with relative effect sizes of 37% in 2006, -15% in 2007, 3% in 2008, and 127% in 2009. Across all buffers, native warm-season grasses (NWSG) and forbs typically dominated the

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.





Executive Summary

vegetation community; however, some exotic species did persist. Percent coverage of legumes, woody species, and bare ground were consistent across all four years of sampling exhibiting an average coverage of 13%, 2%, and 34%, respectively. Litter averaged 27% coverage from 2006–2008 and peaked in 2009 at 65%. CP33 contracts were initiated in 2005, therefore mid-contract management activities could have been implemented as early as Fall 2007/Spring 2008. By 2009, 45% of the CP33 buffers participating in this monitoring program were managed. Of these buffers managed, an average 52% of each buffer was affected by different mid-contract management activities. Mid-contract management activities included disking, burning and mowing (mowing is a non-approved activity). Excluding non-approved disturbances, an average 35% of all buffers were

managed and an average 37% of each buffer managed was affected by mid-contract management activities in 2009. NWSG and forb coverage was typically greater in those buffers managed. Exotics exhibited a consistently greater coverage in unmanaged buffers. Percent coverage of litter and bare ground varied among years and between managed and unmanaged buffers. Woody species coverage was similar between managed and unmanaged buffers the three years sampled. Through the monitoring program, CP33 habitat buffers have been shown to benefit early successional avian species of conservation concern by providing quality early successional habitat in agricultural landscapes. However, these early successional buffers need to be managed to maintain the benefits.

Table of Contents

Introduction	1
Methods	2
Results.....	3
Discussion	5
Acknowledgements.....	6
References	6

List of Figures

Figure 1. Distribution of CP33 bird monitoring points in Mississippi	7
Figure 2. Northern bobwhite breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.....	8
Figure 3. Dickcissel breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009	8
Figure 4. Indigo Bunting breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.....	9
Figure 5. Eastern meadowlark breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.....	9
Figure 6. Field sparrow breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.....	10
Figure 7. Common yellowthroat breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.....	10
Figure 8. Yellow-breasted chat breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.....	11
Figure 9. Mourning dove breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.....	11
Figure 10. Red-winged blackbird breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.....	12
Figure 11. Mean percent coverage of native and exotic grass, forb, legume, and woody species, litter, and bareground across all CP33 buffers for 2006, 2007, 2008, and 2009.....	12

Table of Contents

Figure 12. Mean percent coverage of native and exotic grass, forb, legume, and woody species, litter, and bareground for unmanaged and managed CP33 buffers for 2006, 2007, 2008, and 2009	13
Figure 13. CP33 upland habitat buffer located in Clay County, Mississippi during the first growing season (2006)	14
Figure 14. CP33 upland habitat buffer located in Clay County, Mississippi during the second growing season (2007)	14
Figure 15. CP33 upland habitat buffer located in Clay County, Mississippi during the third growing season (2008)	15
Figure 16. CP33 upland habitat buffer located in Clay County, Mississippi during the fourth growing season (2009)	15
Figure 17. Unmanaged CP33 habitat buffer located in Clay County, Mississippi	16
Figure 18. CP33 habitat buffer managed with prescribed fire located in Clay County, Mississippi	16
Figure 19. CP33 habitat buffer managed by disking located in Clay County, Mississippi	17
Figure 20. Total monthly precipitation (inches) for 2006, 2007, 2008, 2009 (National Climatic Data Center, U.S. Department of Commerce)	17

List of Tables

Table 1. Cumulative counts of birds (calling males) detected during breeding season counts at control and CP33 sites in 2006, 2007, 2008, and 2009	18
Table 2. Density (male birds/acre), 95% confidence intervals (CI), and effect sizes of breeding bird species and northern bobwhite fall coveys at control and CP33 sites in 2006, 2007, 2008, and 2009	20
Table 3. Mean percent coverage of native and exotic grass, forb, legume, and woody species, litter, and bareground for 2006, 2007, 2008, and 2009	21
Table 4. Mean percent coverage of native and exotic grass, forb, legume, and woody species, litter, and bareground for managed and unmanaged CP33 buffers in 2006, 2007, 2008, and 2009	21
Table 5. CP33 enrollment acreage by year and county	22

Introduction


Northern bobwhite quail (hereafter, bobwhite) populations have declined at an average of 3%/yr throughout their entire range and almost 4%/yr in Mississippi since 1966. These declines have presumably been a result of loss of quality habitat due to changes in land use, such as monoculture farming, intensive timber management, reforestation, urbanization, and the elimination of fire. As a result, bobwhite and other species dependent on similar habitats have exhibited precipitous population declines.

The National Bobwhite Conservation Initiative (NBCI), a range-wide, habitat-based restoration plan, was developed by the National Bobwhite Technical Committee (NBTC) in response to the current bobwhite population status. The NBCI is predicated on the assumption that creation of sufficient amounts of early successional native plant communities in working forest and agricultural landscapes will stabilize declining populations and lead to population restoration. In 2004 the USDA-Farm Service Agency (FSA) approved a new Conservation Reserve Program (CRP) continuous sign up practice, CP33–Habitat Buffers for Upland Birds, to help address the habitat goals identified in the NBCI. CP33 is designed to benefit bobwhite and other grassland songbirds by providing idle native herbaceous habitat in agricultural systems. Under this program, 30–120' habitat buffers planted to approved native warm-season grass (NWSG), forb, legume, and shrub species are established around crop fields to provide nesting, brood-rearing, winter, and foraging habitat for bobwhite and grassland birds.

Because CP33 was specifically designed to address population recovery goals of the NBCI, the FSA requested

that the NBTC design a large-scale monitoring program to estimate bobwhite and priority songbird population response to CP33 (FSA Notice CRP-479). Subsequently, the “CP33–Habitat Buffers for Upland Birds Monitoring Protocol” was developed (Burger et al. 2006) and monitoring of bird populations and buffer vegetation community took place from 2006–2008 on a sample of fields in 14 participating states that were allocated the majority of CP33 acreage. Mississippi State University, cooperating with the Mississippi Department of Wildlife, Fisheries and Parks, Mississippi USDA-FSA, and Mississippi USDA-Natural Resources Conservation Service (NRCS), was responsible for implementing Mississippi’s CP33 monitoring program. Through the program, substantial conservation benefits to bobwhite and other early successional avian species have been observed and recorded.

In 2009 the Association of Fish and Wildlife Agencies (AFWA) provided additional financial support for the national CP33 monitoring program through a multi-state conservation grant of the Sport Fish and Wildlife Restoration Program, extending the program an additional 3 years during contract years 4-6 (2009–2011). The extension of the monitoring program, called “Phase II” requires the continuation of breeding season bird monitoring as well as the additional evaluation of mid-contract management (MCM) activities and the effects of these activities on the avian and vegetation communities. The objectives of the Phase II 3-yr monitoring program include: (1) satisfying the FSA’s required wildlife monitoring component of CP33; and (2) evaluating the programmatic effects of CP33 and MCM activities on bobwhite and grassland bird populations in Mississippi.



Because agricultural systems are abundant in the southeast... they have been targeted as key areas for bobwhite habitat restoration.

Methods

Experimental Design

A random sample ($n=50$) of Mississippi's CP33 contracts was selected from the FSA CRP contract database. From these contracts, 40 CP33 fields were randomly selected in 9 counties within the state (Calhoun, Chickasaw, Clay, Coahoma, Itawamba, Monroe, Newton, Prentiss, and Union counties; Figure 1) for avian and vegetation sampling. A similarly cropped non-enrolled field (control), located >1 km and <3 km from each CP33 field (treatment), was also surveyed for comparison. All fields were sampled from 2006–2009 during the breeding season to determine field-level effects of CP33 implementation on bird populations.

Breeding Season Counts

The NBTC in cooperation with Partners in Flight developed a list of obligate or facultative grassland priority bird species of conservation concern to be included in the monitoring program. These species included bobwhite, dickcissel, eastern kingbird, eastern meadowlark, and indigo bunting. In addition to priority species, the presence and abundance of all species observed was documented. We conducted breeding season surveys according to the "CP33–Habitat Buffers for Upland Birds Monitoring Protocol" (Burger et al. 2006) during June, 2006–2009. All calling male birds were recorded by species, distance band (0–25 m, 25–50 m, 50–100 m, 100–250 m, 250–500 m, and >500 m), and time interval (1–3 min, 4–5 min, and 6–10 min). Two replicate surveys were conducted during 2006–2008 and three replicate surveys were conducted in 2009.

Vegetation Structure and Community

We characterized vegetation structure and community within 10 1-m² sampling plots within each CP33 buffer in which avian call counts were conducted. We sampled vegetation within these plots during all 4 yrs of avian community monitoring to document changes over time. Within each plot, we recorded percent coverage of native and exotic grass, forbs, legume, and woody species, litter, and bare ground to evaluate native warm-season grass/forb/legume establishment and quantify habitat composition and structure.

Mid-contract Management Activities

Through landowner inquiry and in-field assessments we estimated percent of buffer managed and determined type of management performed.

Data Analysis

We analyzed call count data for all priority bird species, excluding eastern kingbird, using conventional distance sampling techniques to generate estimates of density (breeding season males/acre) on CP33 and control fields in Mississippi in 2006, 2007, 2008, and 2009. The eastern kingbird exhibited an inadequate number of detections to obtain accurate density estimates. However several other non-priority species were encountered in sufficient numbers to calculate density and were included in the analysis. These species included the common yellowthroat, field sparrow, mourning dove, red-winged blackbird, and yellow-breasted chat.

Because vegetation structure of field borders could potentially influence detection probability, we compared pooled global detection functions with detection functions stratified by treatment (CP33 vs. control). We truncated species-level data at distances where detection probability was less than 0.1. We used model selection via Akaike's Information Criteria to evaluate and compare the fit of 3 key-function models (uniform, half-normal, and hazard rate) for both global and stratified detection functions with and without the addition of covariates (Bird Conservation Region (BCR), year, county, observer, time of survey, and weather variables) and adjustment terms (simple polynomial, hermite polynomial, and cosine). Breeding season estimates reported in this summary may differ from those reported in the 2006, 2007, and 2008 reports because the additional data from the 2009 breeding season counts allowed for the application of more robust models and the acquisition of more precise estimates.

For vegetation data analysis we estimated mean percent cover of native and exotic grass, forb, legume, and woody species, litter, and bare ground for 2006, 2007, 2008, and 2009. We also estimated percent of buffers and percent of each individual buffer affected by MCM activities along with assessing type of management performed.

Results

Avian Community

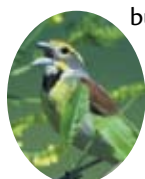
Species richness was greater at CP33 sites than control sites across all years and for each sampling year individually with the exception of the 2009 breeding season. Across the 2006–2009 breeding seasons, we observed 73 total species at control sites and 82 total species at CP33 sites. We observed 52 and 67 different species at control and CP33 sites, respectively, during the 2006 breeding season; 50 and 54 different species at control and CP33 sites, respectively, during the 2007 breeding season; 50 and 55 different species at control and CP33 sites, respectively, during the 2008 breeding season; and 52 and 47 different species at control and CP33 sites, respectively, during the 2009 breeding season. Table 1 summarizes the relative abundance of breeding bird species detected between control and CP33 sites throughout the 3 years of sampling.

Most priority avian species responded positively to the establishment of CP33 habitat buffers (all densities are referenced in Table 2). Bobwhite exhibited significantly greater densities



around CP33 buffered fields relative to control fields with an effect size ranging from 0.03 male birds/acre in 2009 to 0.07 male birds/acre in 2006 (Figure 2). They were on average 508% more abundant on CP33 buffered fields relative to control fields. Dick-

cissel also seemed to benefit from the establishment of CP33 buffers. Dickcissel exhibited significantly greater densities on CP33



buffered fields relative to control fields with an effect size ranging from 0.17 male birds/acre in 2007 and 2009 to 0.24 male birds/acre in 2006 and 2008 (Figure 3). They were on average 323% more abundant on CP33 sites relative to control sites and in

2008 they exhibited a density on CP33 sites that was 512% greater than control sites. Indigo bunting exhibited high densities in



both CP33 and control sites; however, densities were slightly greater at CP33 sites (Figure 4). Relative effect size ranged from a 9% greater density in 2007 to a 35% greater density in 2006. Eastern meadow-

lark density was only slightly greater at CP33 sites in 2006 and 2007 with an average effect size of 0.003 male birds/acre (Figure 5). Eastern meadowlarks exhibited lower densities in CP33 fields in 2008 (-0.7% relative effect size) and 2009 (-23% relative effect size) compared to control fields.

All non-priority species analyzed responded positively to the establishment of CP33 buffers. Field sparrow density was slightly greater in CP33 fields in 2006 and significantly greater in 2007, 2008, and 2009 (Figure 6). Effect size ranged from 0.007 male birds/acre in 2006 to 0.025 male birds/acre in 2008. Field sparrow densities were 21%, 43%, 391% and 102% greater around buffered fields relative to non-buffered fields in 2006, 2007, 2008, and 2009, respectively. Common yellowthroat were more abundant on CP33 buffered fields relative to control fields, but response varied among years (Figure 7). Relative effect size was 30% in 2006, 7% in 2007, 227% in 2008, and 160% in 2009. Yellow-breasted chat exhibited consistently greater densities on CP33 buffered fields relative to control fields with an average effect size of 0.04 male birds/acre (Figure 8). The 2009 effect size of 0.04 represents a 150% greater density, whereas the effect sizes for 2006, 2007, and 2008 represent an average 72% greater density. Mourning doves exhibited significantly greater densities (an average 76% greater density) on CP33 buffered fields in 2006, 2007, and 2008 (Figure 9). However, in 2009 mourning doves exhibited a 16% lower density on CP33 buffered fields relative to control fields. Red-winged blackbird densities varied considerably throughout the four years of sampling (Figure 10). Relative effect sizes were 37% in 2006, -15% in 2007, 3% in 2008, and 127% in 2009.

Vegetation Community

The vegetation community varied throughout the four years of sampling and among managed and unmanaged buffers (results are reference in Tables 3 and 4 and illustrated in Figures 11 and 12). Across all buffers, NWSG and forbs dominated the vegetation community. NWSG coverage peaked in 2007 at an average 63% and averaged 44% (NWSGs estimate was not available for 2009). Forb coverage followed the same trend as NWSG, exhibiting the greatest coverage in 2007 at 41%. Percent coverage of legumes and woody species were consistent across all four years of sampling exhibiting an average coverage of 13% and 2%, respectively. Bare ground coverage was also consistent throughout the four years of sampling averaging 34%. Litter averaged 27% coverage from 2006-2008 and peaked in 2009 at 65%. Figures 13, 14, 15, 16 illustrate the changes in vegetation throughout each growing season in the Southeastern Coastal Plain of Mississippi.

CP33 contracts were initiated in 2005, therefore mid-contract management activities could have been implemented as

Results

early as Fall 2007/Spring 2008. By 2009, 45% of the CP33 buffers in our sample were managed. Of these managed buffers, an average 52% of each was affected by different mid-contract management activities. Mid-contract management activities included disking, burning and mowing (mowing, except in preparation for disking is not an approved mid-contract management activity). Landowners that mowed buffers tended to mow 100% of each buffer. Excluding mowing activities, an average 35% of all buffers were managed and an average 37% of each buffer managed was affected by mid-contract management activities in 2009.

NWSG exhibited consistently greater coverage in those buffers managed with an average difference of 15% and exotics exhibited consistently greater coverage in unmanaged buffers

with an average difference of 9%. Legume and forb coverage varied among years and among managed and unmanaged buffers. Percent coverage of litter was greater in managed buffers in 2006-2008 and unmanaged buffers in 2009. Percent coverage of bare ground varied among years and between managed and unmanaged buffers. Bare ground coverage was greatest in unmanaged buffers in 2006 and 2008 exhibiting an average difference of 19% and 4%, respectively and was greatest in managed buffers in 2007 and 2009 exhibiting an average difference of 3% and 10%, respectively. Woody species coverage was similar between managed and unmanaged buffers all three years sampled. Figures 17, 18, and 19 illustrate buffers under different management regimes.



Bobwhite Quail



Dickcissel
Photo courtesy of Jim Rathert, Missouri Department of Conservation



Eastern Kingbird



Eastern Meadowlark



Indigo Bunting

Discussion

Through Phase I of the CP33 monitoring program, CP33–‘habitat buffers for upland birds’ has been shown to provide early successional habitat that supports grassland birds in agricultural landscapes. Bobwhite along with many early successional songbird species, including dickcissel, indigo bunting, field sparrow, Eastern meadowlark, common yellowthroat, yellow-breasted chat, mourning dove, and red-winged blackbird, have exhibited greater population densities in landscapes where CP33 buffers have been established. Three of the species listed above are of regional conservation concern according to Partner’s In Flight and five are exhibiting declining population trends according to the US Geological Survey, Breeding Bird Surveys. CP33 fields supported an average of 0.048 coveys/ha or 0.57 bobwhites/ha (assuming 12 bobwhites/covey) which is greater than the MS NBCI short-term goals of 0.037 coveys/ha or 0.444 bobwhites/ha. This demonstrates that the MS NBCI short-term goals are achievable with a single conservation practice and further exemplifies the value of CP33 habitat buffers. CP33 buffers are valuable in that they provide a regionally scarce habitat in an otherwise common landscape.

Through natural successional processes, herbaceous communities tend towards woody and hardwood dominated stands. Periodic disturbance is required to maintain buffers in herbaceous cover. Therefore, through Notice-479, the FSA required the periodic maintenance of CP33 buffers through disking and/or prescribed fire. Phase II of the Cp33 monitoring program continued to focus on monitoring breeding bird populations along with evaluating mid-contract management effects on the avian and vegetation communities.

By 2009, 45% of the CP33 buffers participating in this monitoring program were managed and 35% were managed

using approved mid-contract management practices.

Disturbance was typically applied to 1/3 of each buffer. Disking and prescribed fire were common practices implemented; however, mowing, a non-approved activity, did occur on a small percentage of buffers. Differences in the vegetation communities between managed and unmanaged buffers were observed. However, because only a portion of each buffer (e.g. 1/3) was managed, effects on field-level vegetation metrics were relatively small. Approved MCM activities did set back succession, increase forbs and bare ground, and reduce litter, maintaining the diverse native herbaceous vegetation community.

Without disturbance, benefits to songbirds dependent on early successional habitats will slowly decline with each growing season. Disturbance should maximize benefits of CP33 habitat buffers for those avian species. With some management implemented, continued benefits to songbirds have been observed. For most species, the magnitude of effects was either consistent with previous years or improved in 2009. Bobwhite, dickcissel, indigo bunting, field sparrow, and common yellowthroat exhibited variable but consistent relative effect sizes over all four years of sampling. Red-winged blackbird and yellow-breasted chat populations were greater in 2009 relative to control fields. Eastern meadowlark and mourning dove populations declined by 2009. Eastern meadowlark require large contiguous patches of habitat composed of shorter grasses and mourning dove require a significant amount of bare ground for foraging. Both may have responded to the initial establishment of the native plant community but are finding more suitable habitat as the vegetation develops.

Although the magnitude of effects have been consistent throughout all four years, a decline in the population numbers



Common Yellowthroat



Brown-headed Cowbird
Photo courtesy of Marshall Bell



Yellow-breasted Chat



Mourning Dove



Red-winged Blackbird

Discussion

for most bird species sampled has been observed on both control and treatment sites in 2007 and 2009. Changes in annual and monthly precipitation may explain the variation in density across these years. Figure 20 illustrates the changes in precipitation over the four years of sampling. In 2007, Mississippi exhibited a dryer season, specifically in the months prior to spring and fall monitoring possibly affecting timing of the nesting season. In 2009, Mississippi received an unusually high amount of precipitation in May, the month before bird monitoring began. This extreme increase in precipitation could have influenced timing of migration for neotropical migrants, the establishment of territories, or the initiation of nesting for both resident and migratory species.

Through the monitoring program, CP33 habitat buffers have been shown to benefit early successional avian species many of which are of conservation concern. The NBCI short-term goals are achievable through this single conservation program.

However, since the program's initiation on October 4, 2004, only 2,206 acres of the 3,400 acres (USDA FSA CRP Notice-654 announced the reduction of Mississippi's allotted CP33 acreage from 9,400 acres to 3,400 acres) allotted to Mississippi have been enrolled throughout 22 counties in Mississippi (Figure 21). Given the demonstrable economic and environmental benefits of CP33, the remaining 1,200 acres of available CP33 in Mississippi present an opportunity for bobwhite and grassland songbird population restoration not yet realized. Not only do we need to enroll the remaining allotted acreage, but the established buffers need to be managed to maintain the benefits already accrued.

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. We appreciate the efforts of numerous technicians and agency personnel in carrying out the breeding

season and fall surveys. Without their hard work, this research could not have been successful. Funding for the Mississippi CP33 monitoring program was provided by grants from the Mississippi Department of Wildlife, Fisheries, and Parks, and the Association of Fish and Wildlife Agencies Sport Fish and Wildlife Restoration Program.

References

Burger, L. W., M. D. Smith, R. Hamrick, B. Palmer, and S. Wellendorf. 2006. CP33—habitat buffers for upland birds monitoring protocol. Southeast Quail Study Group and Southeast Partners in Flight miscellaneous publication.

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

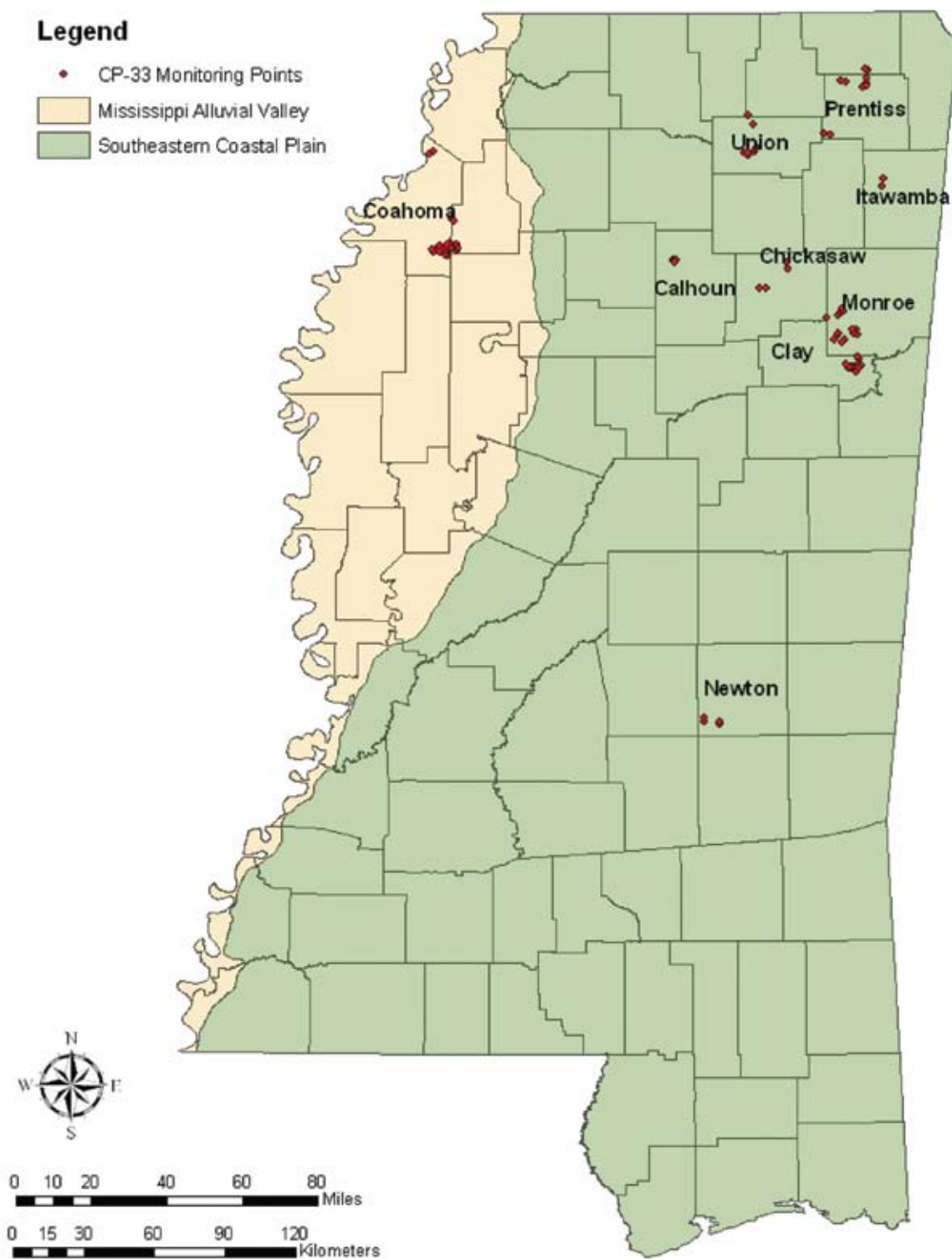


Figure 2. Northern bobwhite breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.

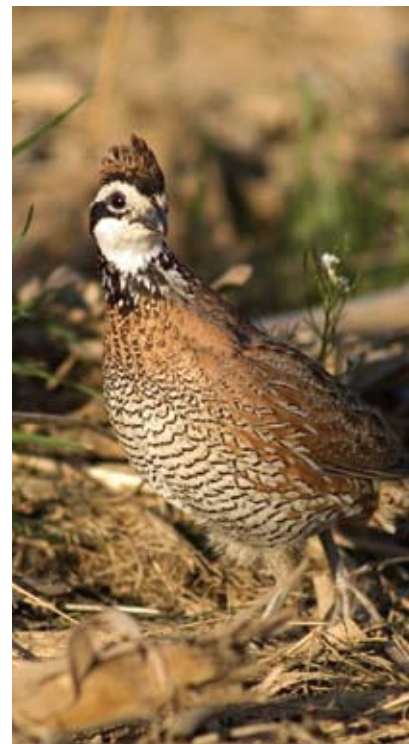
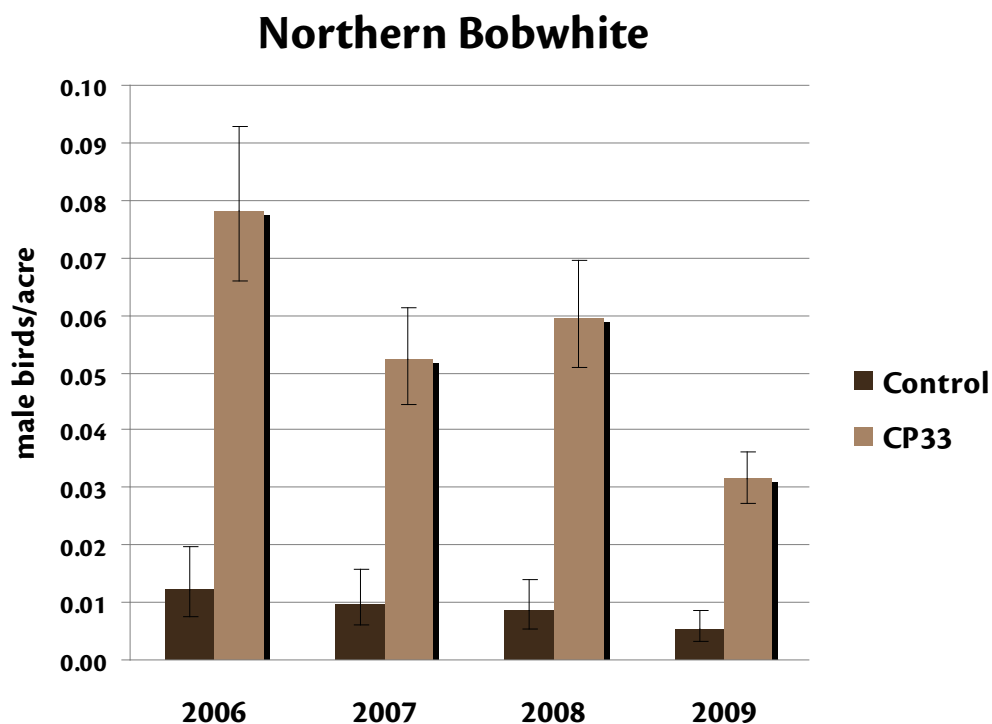


Figure 3. Dickcissel breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.

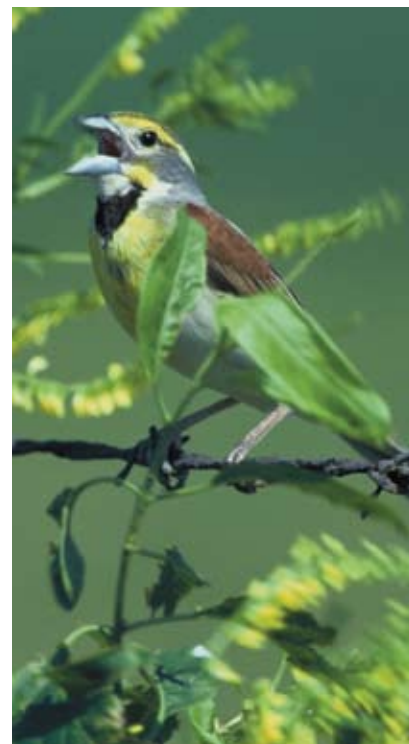
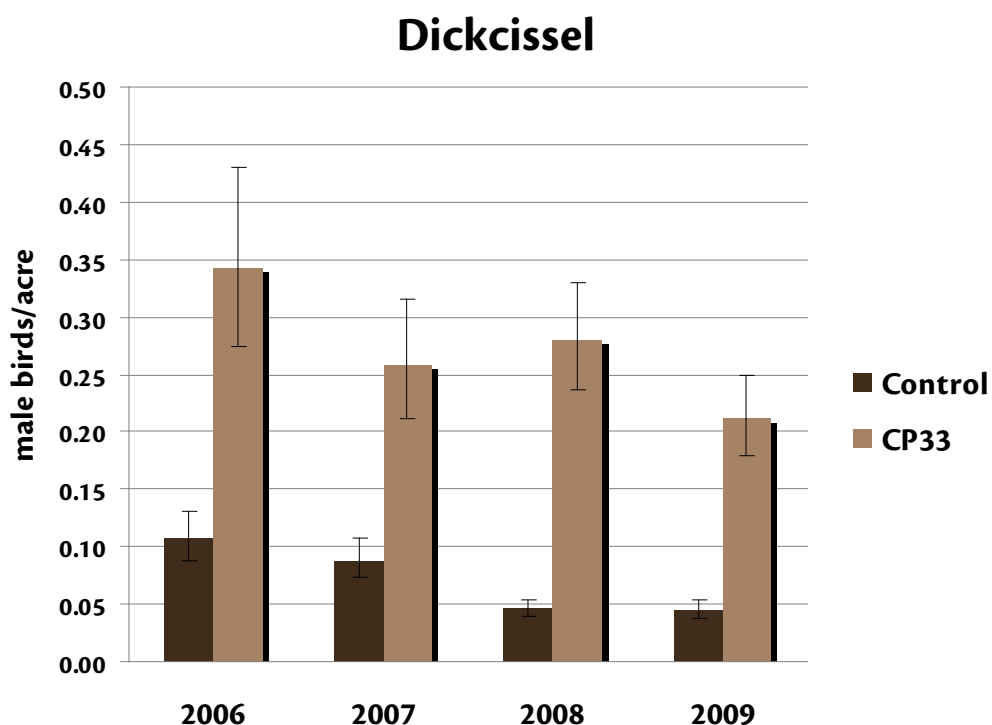


Figure 4. Indigo bunting breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.

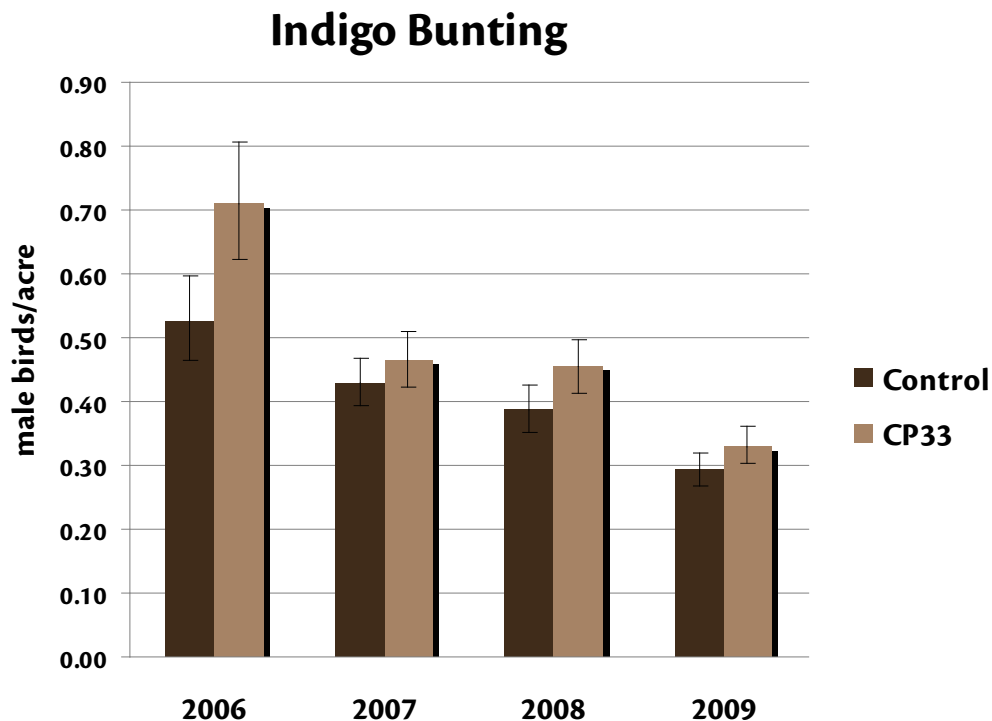


Figure 5. Eastern meadowlark breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.

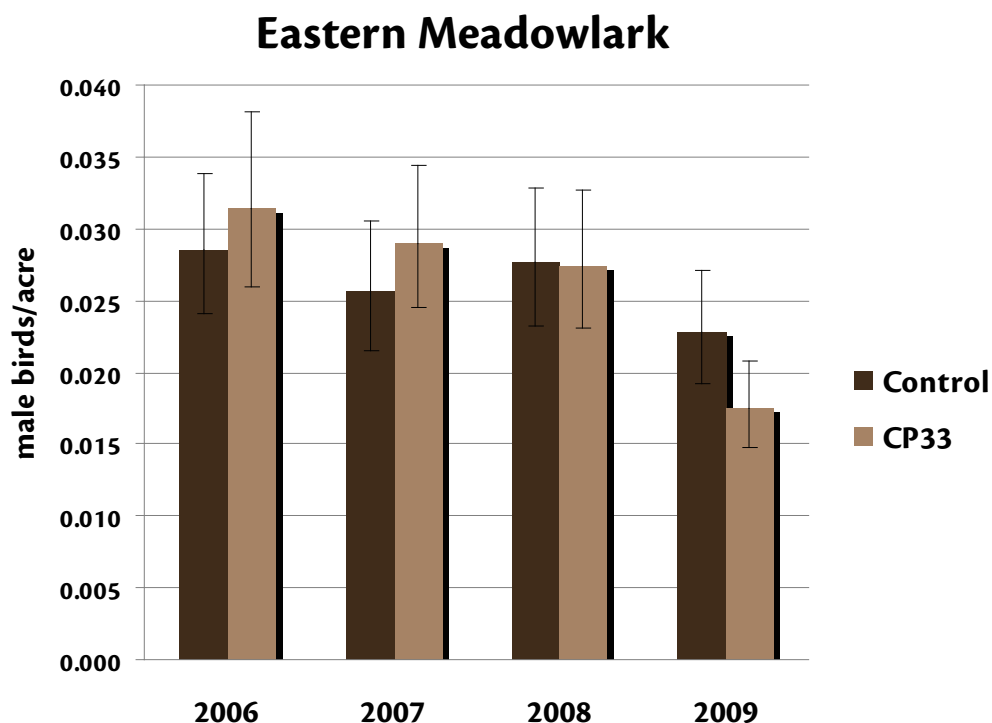


Figure 6. Field sparrow breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.

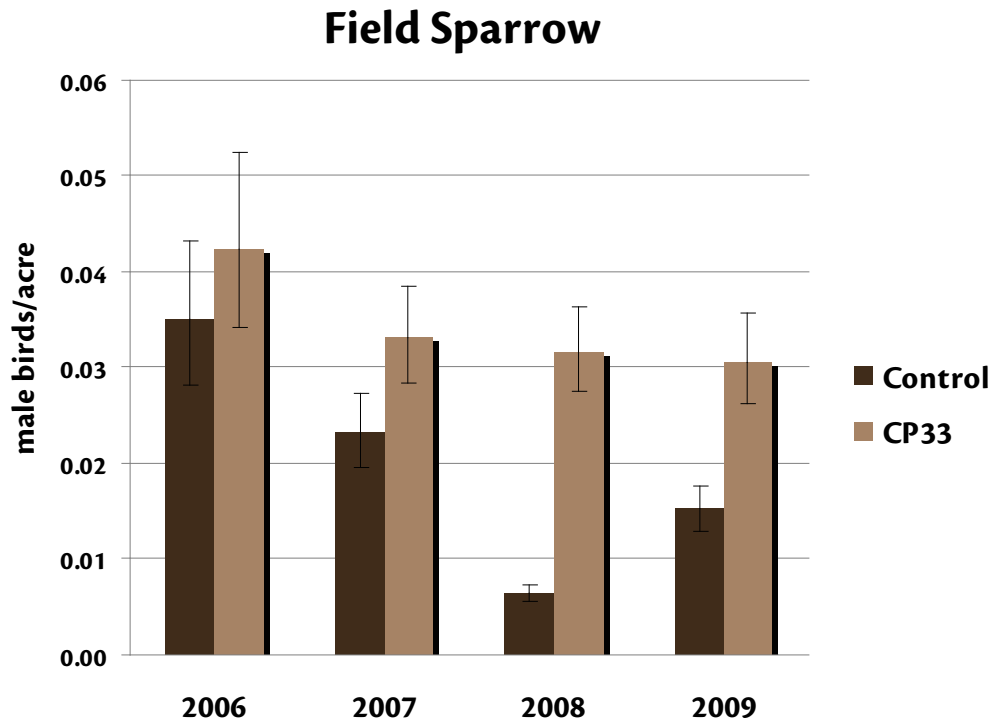


Figure 7. Common yellowthroat breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.

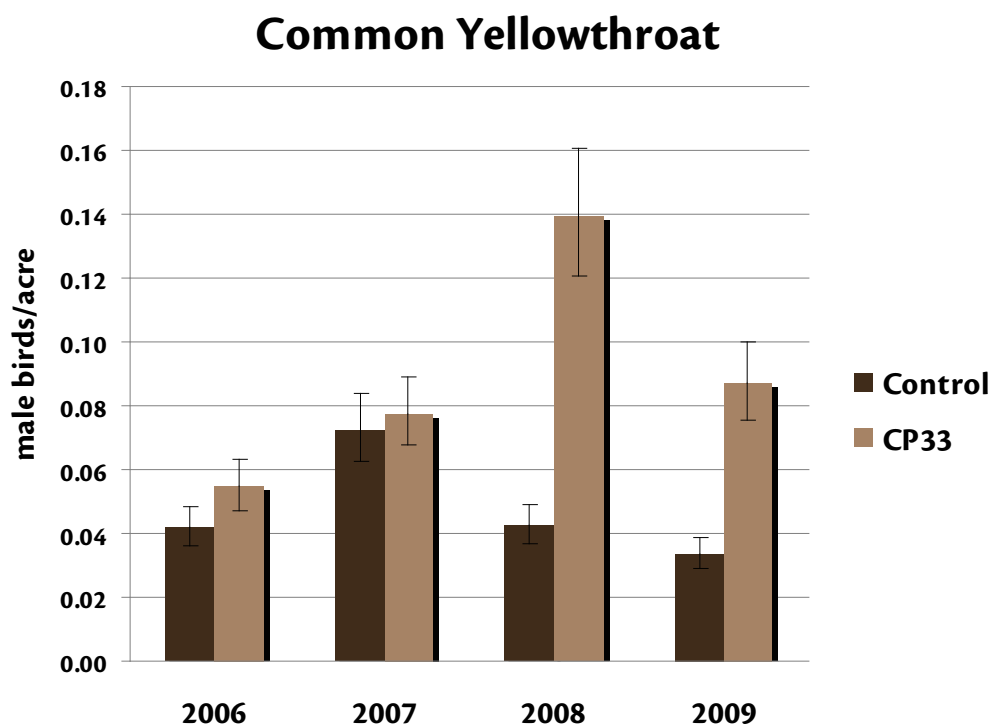


Figure 8. Yellow-breasted chat breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.

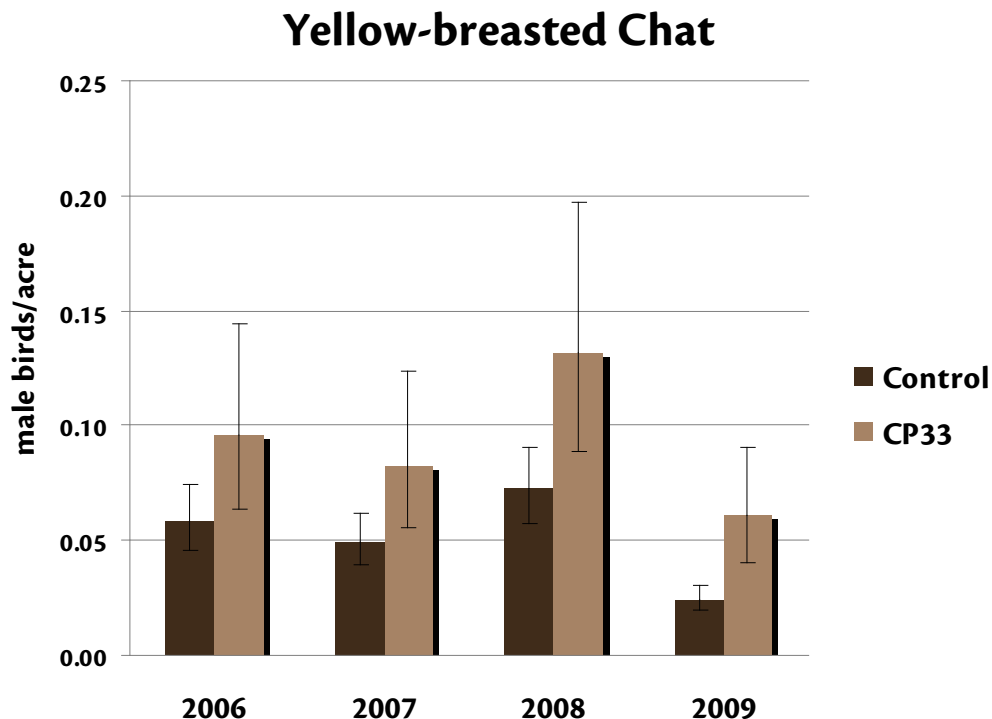


Figure 9. Mourning dove breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.

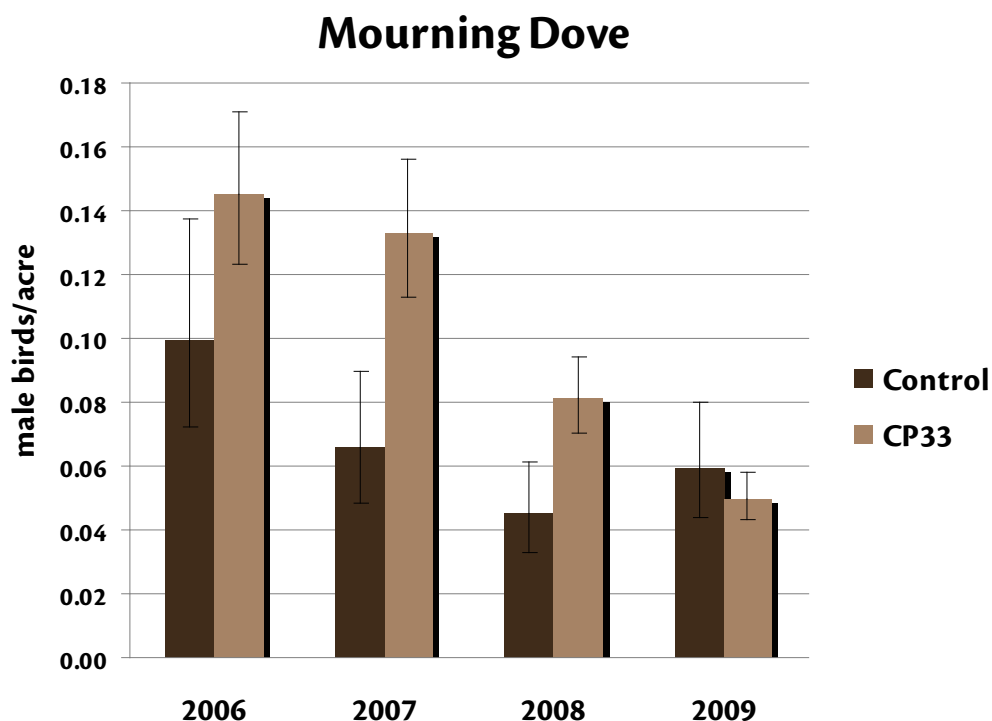


Figure 10. Red-winged blackbird breeding season density with 95% confidence intervals on control and CP33 sites in Mississippi, June 2006-2009.

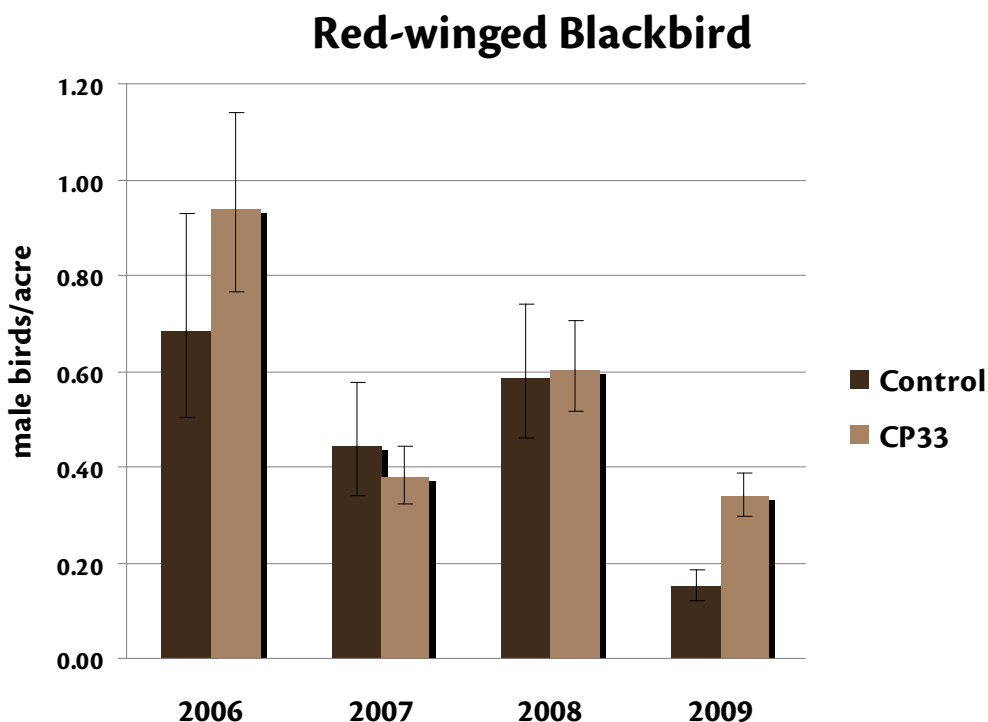


Figure 11. Mean percent coverage of native and exotic grass, forb, legume, and woody species, litter, and bareground across all CP33 buffers for 2006, 2007, 2008, and 2009.

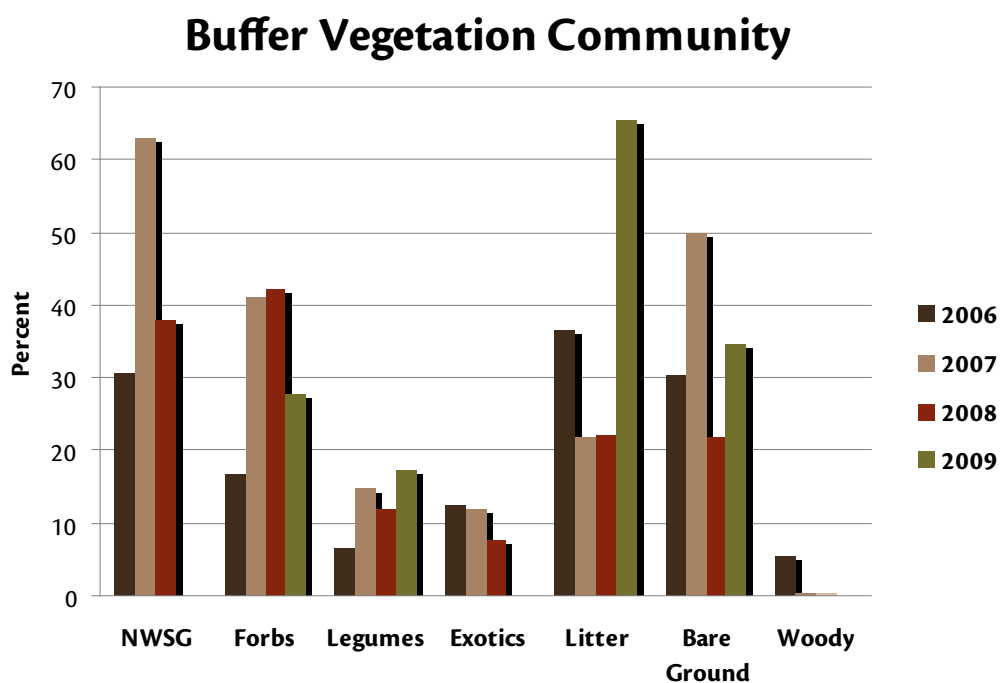


Figure 12. Mean percent coverage of native and exotic grass, forb, legume, and woody species, litter, and bareground for unmanaged and managed CP33 buffers for 2006, 2007, 2008, and 2009.

Buffer Vegetation Community for Unmanaged and Managed CP33 Buffers

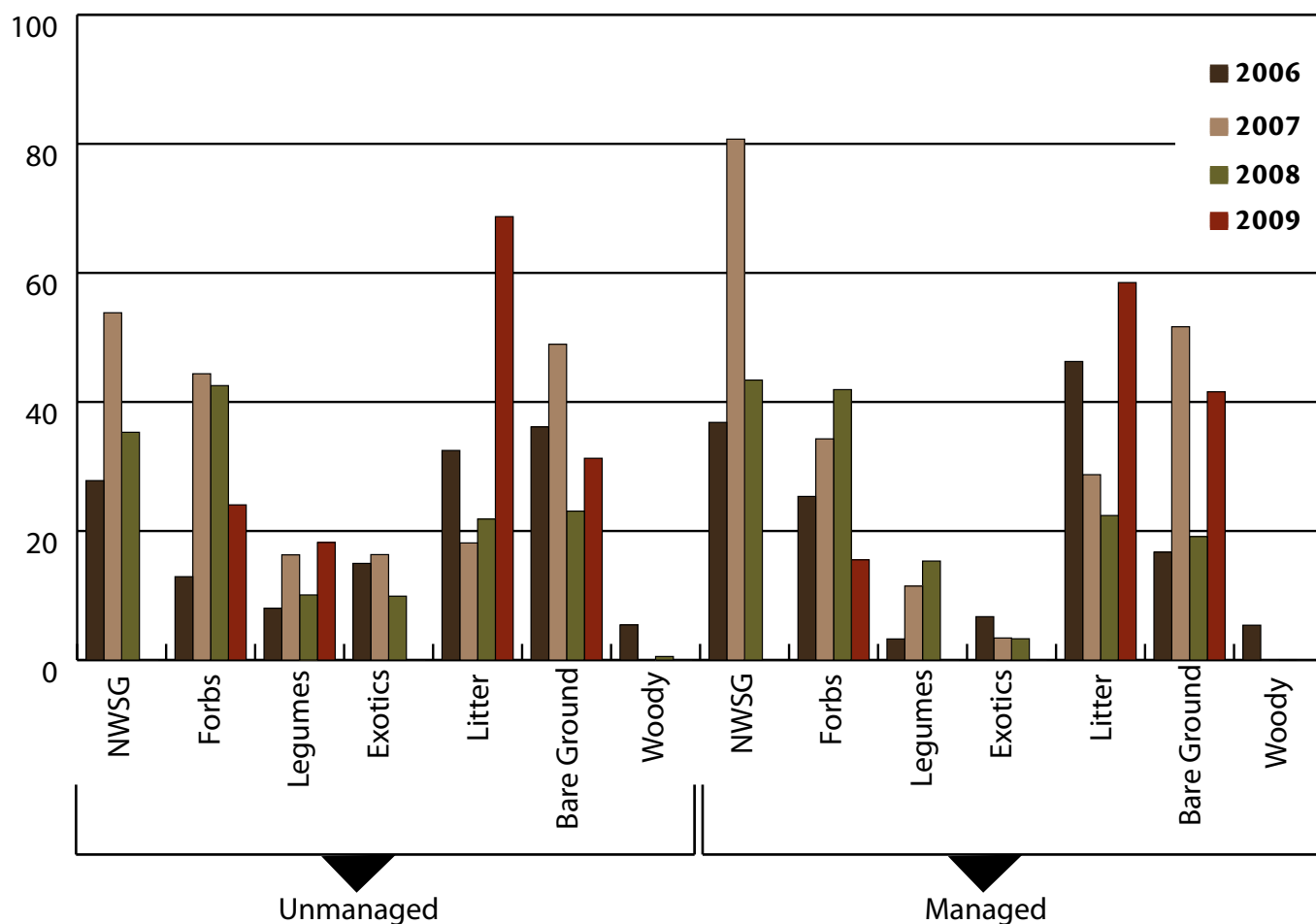


Figure 13. CP33 upland habitat buffer located in Clay County, Mississippi during the first growing season (2006).



Figure 14. CP33 upland habitat buffer located in Clay County, Mississippi during the second growing season (2007).



Figure 15. CP33 upland habitat buffer located in Clay County, Mississippi during the third growing season (2008).



Figure 16. CP33 upland habitat buffer located in Clay County, Mississippi during the fourth growing season (2009).



Figure 17. Unmanaged CP33 habitat buffer located in Clay County, Mississippi.



Figure 18. CP33 habitat buffer managed with prescribed fire located in Clay County, Mississippi.



Figure 19. CP33 habitat buffer managed by disking located in Clay County, Mississippi.



Figure 20. Total monthly precipitation (inches) for 2006, 2007, 2008, 2009 (National Climatic Data Center, U.S. Department of Commerce)

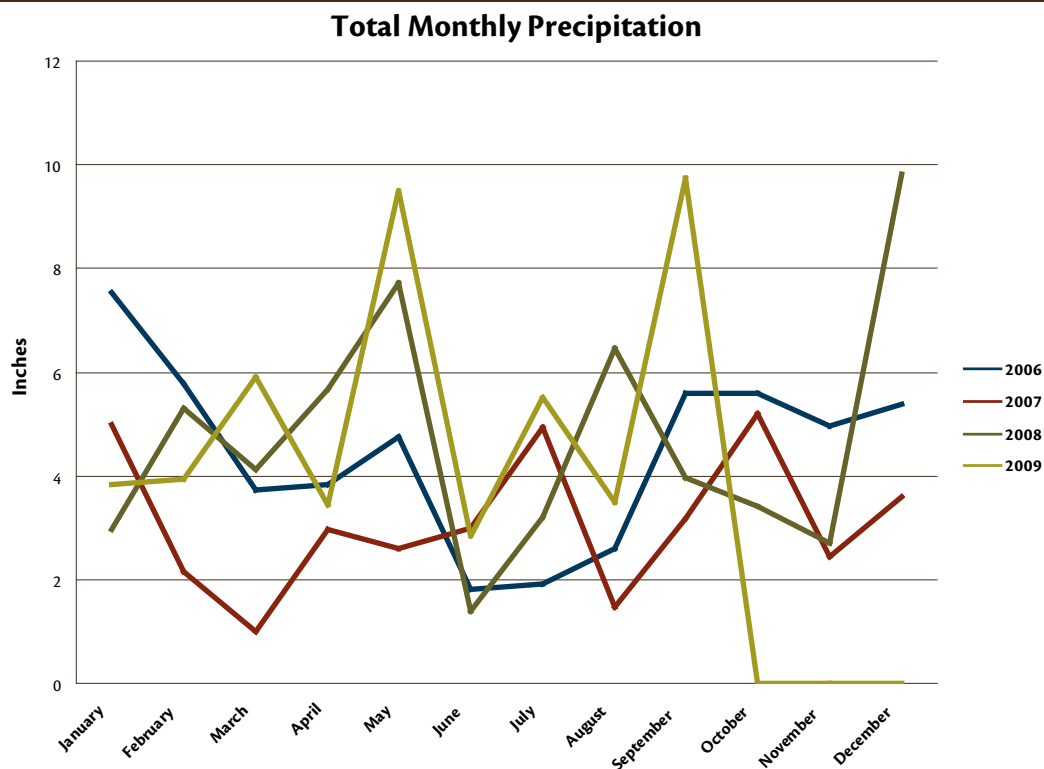


Table 1. Cumulative counts of birds (calling males) detected during breeding season counts at control and CP33 sites in 2006, 2007, 2008, and 2009.

Common Name	2006* Control	2006* CP33	2007* Control	2007* CP33	2008* Control	2008* CP33	2009# Control	2009# CP33
Acadian Flycatcher	0	0	0	1	1	0	2	0
American Crow	84	90	41	39	13	21	87	85
American Goldfinch	0	1	0	0	0	1	2	0
American Robin	0	1	2	2	0	0	1	0
Bank Swallow	0	4	0	0	0	0	0	0
Baltimore Oriole	2	4	0	0	0	1	0	0
Barn Swallow	17	20	1	0	0	0	9	7
Barred Owl	0	0	0	0	0	1	0	2
Belted Kingfisher	1	1	0	0	1	0	0	0
Blue-gray Gnatcatcher	7	7	9	10	2	8	8	6
Brown-headed Cowbird	19	18	17	22	13	17	12	23
Blue Grosbeak	3	1	14	20	9	28	12	8
Blue Jay	23	31	25	28	20	17	45	28
Black Vulture	1	0	0	0	0	0	0	0
Brown Trasher	0	3	0	4	0	1	3	1
Broad-winged Hawk	0	1	0	0	0	0	0	0
Carolina Chickadee	11	3	10	6	18	9	5	11
Cattle Egret	16	7	0	0	1	0	0	0
Carolina Wren	58	51	33	35	46	41	58	49
Chimney Swift	3	13	15	2	0	0	0	2
Cliff Swallow	0	0	3	0	0	0	10	0
Common Ground-Dove	1	3	0	0	0	0	0	0
Common Grackle	9	12	1	2	0	0	0	0
Cooper's Hawk	0	2	0	0	0	0	0	0
Common Yellowthroat	22	27	31	45	22	63	31	81
Dickcissel	59	133	47	104	27	111	65	163
Downy Woodpecker	8	7	9	4	3	1	0	6
Eastern Bluebird	14	8	7	11	9	5	6	8
Eastern Kingbird	10	3	7	5	8	4	2	2
Eastern Meadowlark	31	35	23	32	35	27	53	44
Eastern Pheobe	0	0	2	0	1	5	2	2
Eastern Towhee	24	33	34	43	33	37	35	50
Eastern Wood-Pewee	7	4	5	5	9	4	11	6
Eurasian Collared-Dove	0	2	0	3	0	0	0	0
Eastern Tufted Titmouse	18	18	23	23	32	38	47	31
European Starling	2	3	0	0	0	0	0	0
Fish Crow	0	1	0	0	0	0	1	0
Field Sparrow	40	48	22	37	16	39	49	91
Great Blue Heron	8	5	0	0	5	0	3	0
Great-crested Flycatcher	0	0	4	6	2	4	0	0
Great-horned Owl	0	0	0	1	1	0	0	0
Gray Catbird	0	2	0	1	2	1	1	0
Green Heron	0	1	0	0	0	3	0	0
Grasshopper Sparrow	5	2	3	0	3	1	2	0
Hairy Woodpecker	0	1	2	1	0	0	0	0
Horned Lark	19	23	14	17	31	9	6	3
Hooded Warbler	0	0	0	0	1	1	2	0

Table 1 (continued). Cumulative counts of birds (calling males) detected during breeding season counts at control and CP33 sites in 2006, 2007, 2008, and 2009.

Common Name	2006* Control	2006* CP33	2007* Control	2007* CP33	2008* Control	2008* CP33	2009# Control	2009# CP33
Indigo Bunting	206	249	154	163	141	159	223	243
Kentucky Warbler	0	0	0	0	0	1	0	2
Killdeer	43	30	24	23	24	12	70	48
Lark Sparrow	0	0	0	0	3	0	0	0
Little Blue Heron	0	1	0	0	0	0	0	0
Loggerhead Shrike	2	0	0	2	2	3	0	0
Mallard	0	0	1	1	0	0	0	0
Mourning Dove	66	85	39	70	28	54	96	112
Northern Bobwhite	61	126	47	87	37	96	58	100
Northern Cardinal	109	116	100	102	117	115	127	144
Northern Harrier	1	0	0	0	0	0	0	0
Northern Mockingbird	40	71	27	26	25	41	35	25
Northern Parula	0	0	0	0	1	2	0	0
Northern Rough-winged Swallow	0	2	0	0	0	0	0	0
Orchard Oriole	1	0	1	5	2	6	3	1
Painted Bunting	0	0	0	2	0	1	0	0
Pine Warbler	0	0	0	0	2	2	1	0
Pileated Woodpecker	3	8	4	3	2	2	2	1
Prairie Warbler	0	0	0	1	0	2	0	1
Purple Martin	8	10	3	1	0	0	3	0
Red-bellied Woodpecker	16	35	27	27	15	18	46	67
Red-eyed Vireo	4	3	4	5	7	12	1	2
Red-headed Woodpecker	3	1	4	2	0	1	1	1
Rock Dove	0	10	0	0	0	0	0	0
Red-shouldered Hawk	0	5	3	2	3	2	0	2
Red-tailed Hawk	8	5	3	2	0	1	7	5
Ruby-throated Hummingbird	1	5	1	2	0	0	1	0
Red-winged Blackbird	142	213	95	107	98	143	125	185
Song Sparrow	0	1	1	0	0	0	0	0
Summer Tanager	9	6	0	3	2	5	3	1
Turkey Vulture	0	2	0	0	0	0	0	0
Unknown	3	1	0	0	0	0	0	2
White-eyed Vireo	9	11	5	17	23	23	15	21
Wild Turkey	0	1	0	0	0	0	0	4
Wood Duck	0	1	0	0	0	1	1	0
Wood Thrush	0	2	3	8	1	5	1	13
Whip-poor-will	0	0	0	0	1	0	1	0
White-throated Sparrow	0	0	0	0	0	1	0	1
Yellow-breasted Chat	43	58	41	57	55	78	65	117
Yellow-billed Cuckoo	42	44	38	36	21	39	28	26
Yellow-shafted Flicker	1	0	3	0	0	0	0	0
Yellow-tailed Vireo	0	0	0	1	1	2	0	0

* Based on 2 repetitions

Based on 3 repetitions

Table 2. Density (male birds/acre), 95% confidence intervals (CI), and effect sizes of breeding bird species and northern bobwhite fall coveys at control and CP33 sites in 2006, 2007, 2008, and 2009.

Species	2006				
	Control		CP33		Effect Size
	Density	CI	Density	CI	
Northern Bobwhite *	0.0123	(0.0077, 0.0197)	0.0783	(0.0660, 0.0928)	0.0660
Dickcissel *	0.1073	(0.0876, 0.1315)	0.3430	(0.2738, 0.4295)	0.2357
Indigo Bunting *	0.5264	(0.4653, 0.5956)	0.7081	(0.6213, 0.8071)	0.1817
Eastern Meadowlark *	0.0285	(0.0240, 0.0338)	0.0314	(0.0259, 0.0381)	0.0029
Common Yellowthroat	0.0421	(0.0364, 0.0486)	0.0547	(0.0473, 0.0632)	0.0126
Field Sparrow	0.0350	(0.0282, 0.0433)	0.0423	(0.0342, 0.0524)	0.0074
Mourning Dove	0.0995	(0.0721, 0.1372)	0.1453	(0.1234, 0.1712)	0.0459
Red-winged Blackbird	0.6824	(0.5013, 0.9289)	0.9356	(0.7675, 1.1404)	0.2532
Yellow-breasted Chat	0.0584	(0.0459, 0.0744)	0.0959	(0.0638, 0.1442)	0.0375
	2007				
Northern Bobwhite *	0.0098	(0.0061, 0.0158)	0.0522	(0.0445, 0.0612)	0.0424
Dickcissel *	0.0887	(0.0727, 0.1083)	0.2579	(0.2113, 0.3148)	0.1692
Indigo Bunting *	0.4281	(0.3927, 0.4666)	0.4651	(0.4234, 0.5108)	0.0370
Eastern Meadowlark *	0.0256	(0.0215, 0.0305)	0.0290	(0.0245, 0.0344)	0.0034
Common Yellowthroat	0.0725	(0.0627, 0.0838)	0.0774	(0.0675, 0.0889)	0.0049
Field Sparrow	0.0231	(0.0196, 0.0273)	0.0330	(0.0284, 0.0385)	0.0099
Mourning Dove	0.0657	(0.0481, 0.0896)	0.1327	(0.1129, 0.1561)	0.0670
Red-winged Blackbird	0.4424	(0.3405, 0.5747)	0.3768	(0.3220, 0.4409)	-0.0656
Yellow-breasted Chat	0.0491	(0.0392, 0.0615)	0.0828	(0.0556, 0.1233)	0.0336
	2008				
Northern Bobwhite *	0.0086	(0.0054, 0.0139)	0.0594	(0.0508, 0.0694)	0.0507
Dickcissel *	0.0458	(0.0385, 0.0544)	0.2799	(0.2372, 0.3302)	0.2341
Indigo Bunting *	0.3867	(0.3519, 0.4250)	0.4533	(0.4130, 0.4976)	0.0666
Eastern Meadowlark *	0.0276	(0.0233, 0.0328)	0.0274	(0.0230, 0.0327)	-0.0002
Common Yellowthroat	0.0426	(0.0370, 0.0490)	0.1395	(0.1209, 0.1608)	0.0968
Field Sparrow	0.0064	(0.0056, 0.0074)	0.0316	(0.0274, 0.0364)	0.0252
Mourning Dove	0.0450	(0.0331, 0.0612)	0.0811	(0.0701, 0.0939)	0.0361
Red-winged Blackbird	0.5850	(0.4621, 0.7406)	0.6031	(0.5166, 0.7040)	0.0181
Yellow-breasted Chat	0.0722	(0.0576, 0.0904)	0.1319	(0.0884, 0.1968)	0.0597
	2009				
Northern Bobwhite *	0.0055	(0.0034, 0.0087)	0.0314	(0.0272, 0.0361)	0.0259
Dickcissel *	0.0449	(0.0377, 0.0534)	0.2109	(0.1786, 0.2489)	0.1660
Indigo Bunting *	0.2937	(0.2692, 0.3204)	0.3299	(0.3018, 0.3606)	0.0362
Eastern Meadowlark *	0.0228	(0.0192, 0.0271)	0.0175	(0.0148, 0.0207)	-0.0053
Common Yellowthroat	0.0334	(0.0289, 0.0387)	0.0870	(0.0758, 0.0998)	0.0535
Field Sparrow	0.0152	(0.0130, 0.0177)	0.0306	(0.0261, 0.0358)	0.0154
Mourning Dove	0.0591	(0.0436, 0.0802)	0.0499	(0.0431, 0.0579)	-0.0092
Red-winged Blackbird	0.1490	(0.1201, 0.1850)	0.3379	(0.2959, 0.3858)	0.1889
Yellow-breasted Chat	0.0243	(0.0194, 0.0304)	0.0607	(0.0407, 0.0905)	0.0364

* Priority Species

Table 3. Mean percent coverage of native and exotic grass, forb, legume, and woody species, litter, and bareground for 2006, 2007, 2008, and 2009.

Type	2006	2007	2008	2009
Native Grass Species	30.49	62.89	38.00	N/A*
Exotic Grass Species	12.53	11.99	7.71	N/A*
Forb	16.62	40.98	42.33	27.84
Legume	6.62	14.68	11.85	17.35
Woody	5.43	0.14	0.40	N/A*
Litter	36.58	21.71	22.04	65.40
Bare Ground	30.36	49.86	21.76	34.63

* Data is not available.

Table 4. Mean percent coverage of native and exotic grass, forb, legume, and woody species, litter, and bareground for managed and unmanaged CP33 buffers in 2006, 2007, 2008, and 2009.

Unmanaged				
Type	2006	2007	2008	2009
Native Grass Species	27.81	53.83	35.31	N/A*
Exotic Grass Species	14.98	16.35	9.90	N/A*
Forb	12.92	44.38	42.53	24.06
Legume	8.04	16.31	10.10	18.22
Woody	5.44	0.02	0.56	N/A*
Litter	32.48	18.15	21.86	68.72
Bare Ground	36.13	48.95	23.08	31.28
Managed				
Type	2006	2007	2008	2009
Native Grass Species	36.84	80.73	43.39	N/A*
Exotic Grass Species	6.73	3.42	3.31	N/A*
Forb	25.36	34.28	41.91	35.69
Legume	3.27	11.46	15.35	15.54
Woody	5.41	0.38	0.08	N/A*
Litter	46.27	28.73	22.40	58.50
Bare Ground	16.73	51.65	19.13	41.58

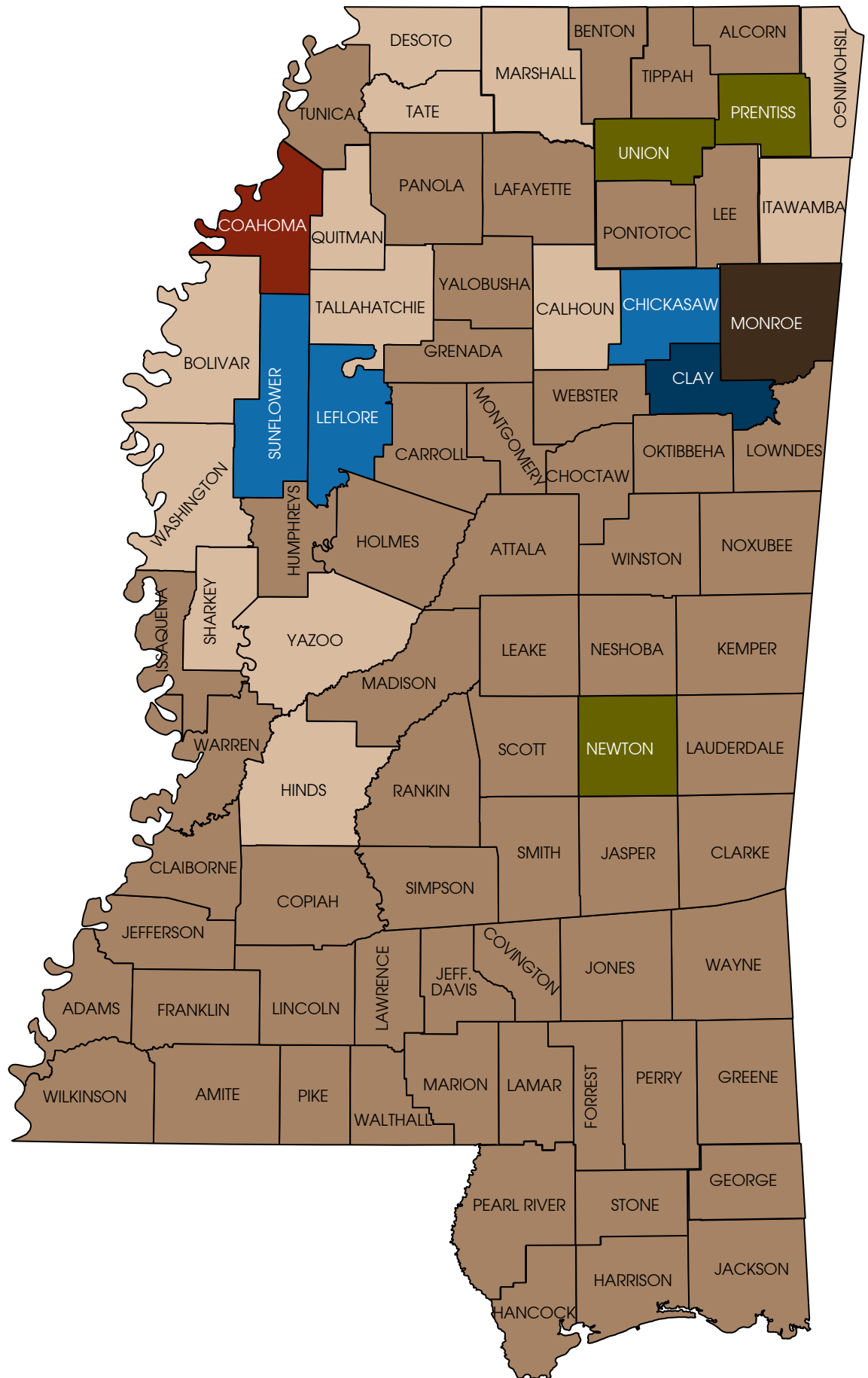
* Data was not collected.

Table 5. CP33 enrollment acreage by year and county.

County	2005	2006	2007	2008	2009
Adams	0.0	0.0	0.0	0.0	0.0
Alcorn	0.0	0.0	0.0	0.0	0.0
Amite	0.0	0.0	0.0	0.0	0.0
Attala	0.0	0.0	0.0	0.0	0.0
Benton	0.0	0.0	0.0	0.0	0.0
Bolivar	0.0	30.4	30.4	30.4	30.4
Calhoun	0.0	9.8	9.8	9.8	9.8
Carroll	0.0	0.0	0.0	0.0	0.0
Chickasaw	0.0	64.5	79.3	79.3	79.3
Choctaw	0.0	0.0	0.0	0.0	0.0
Claiborne	0.0	0.0	0.0	0.0	0.0
Clarke	0.0	0.0	0.0	0.0	0.0
Clay	206.2	206.2	320.1	320.1	320.1
Coahoma	56.0	56.0	180.4	233.6	233.6
Copiah	0.0	0.0	0.0	0.0	0.0
Covington	0.0	0.0	0.0	0.0	0.0
De Soto	0.0	0.0	9.5	9.5	9.5
Forrest	0.0	0.0	0.0	0.0	0.0
Franklin	0.0	0.0	0.0	0.0	0.0
George	0.0	0.0	0.0	0.0	0.0
Greene	0.0	0.0	0.0	0.0	0.0
Grenada	0.0	0.0	0.0	0.0	0.0
Hancock	0.0	0.0	0.0	0.0	0.0
Harrison	0.0	0.0	0.0	0.0	0.0
Hinds	0.0	0.0	25.0	25.0	25.0
Holmes	0.0	0.0	0.0	0.0	0.0
Humphreys	0.0	0.0	0.0	0.0	0.0
Issaquena	0.0	0.0	0.0	0.0	0.0
Itawamba	0.0	37.6	37.6	37.6	37.6
Jackson	0.0	0.0	0.0	0.0	0.0
Jasper	0.0	0.0	0.0	0.0	0.0
Jefferson	0.0	0.0	0.0	0.0	0.0
Jefferson Davis	0.0	0.0	0.0	0.0	0.0
Jones	0.0	0.0	0.0	0.0	0.0
Kemper	0.0	0.0	0.0	0.0	0.0
Lafayette	0.0	0.0	0.0	0.0	0.0
Lamar	0.0	0.0	0.0	0.0	0.0
Lauderdale	0.0	0.0	0.0	0.0	0.0
Lawrence	0.0	0.0	0.0	0.0	0.0
Leake	0.0	0.0	0.0	0.0	0.0
Lee	0.0	0.0	0.0	0.0	0.0

County	2005	2006	2007	2008	2009
Leflore	0.0	71.4	85.1	85.1	94.8
Lincoln	0.0	0.0	0.0	0.0	0.0
Lowndes	0.0	0.0	0.0	0.0	0.0
Madison	0.0	0.0	0.0	0.0	0.0
Marion	0.0	0.0	0.0	0.0	0.0
Marshall	0.0	0.0	1.0	1.0	1.0
Monroe	0.0	399.7	657.4	708.8	708.8
Montgomery	0.0	0.0	0.0	0.0	0.0
Neshoba	0.0	0.0	0.0	0.0	0.0
Newton	0.0	109.1	109.1	109.1	109.1
Noxubee	0.0	0.0	0.0	0.0	0.0
Oktibbeha	0.0	0.0	0.0	0.0	0.0
Panola	0.0	0.0	0.0	0.0	0.0
Pearl River	0.0	0.0	0.0	0.0	0.0
Perry	0.0	0.0	0.0	0.0	0.0
Pike	0.0	0.0	0.0	0.0	0.0
Pontotoc	0.0	0.0	0.0	0.0	0.0
Prentiss	19.3	128.2	146.4	156.1	156.1
Quitman	0.0	0.0	34.5	34.5	34.5
Rankin	0.0	0.0	0.0	0.0	0.0
Scott	0.0	0.0	0.0	0.0	0.0
Sharkey	15.8	15.8	15.8	15.8	15.8
Simpson	0.0	0.0	0.0	0.0	0.0
Smith	0.0	0.0	0.0	0.0	0.0
Stone	0.0	0.0	0.0	0.0	0.0
Sunflower	0.0	0.0	48.4	59.7	59.7
Tallahatchie	0.0	31.3	31.3	31.3	31.3
Tate	0.0	11.3	11.3	11.3	11.3
Tippah	0.0	0.0	0.0	0.0	0.0
Tishomingo	0.0	0.0	19.0	19.0	19.0
Tunica	0.0	0.0	0.0	0.0	0.0
Union	19.0	160.9	160.9	160.9	160.9
Walthall	0.0	0.0	0.0	0.0	0.0
Warren	0.0	0.0	0.0	0.0	0.0
Washington	0.0	2.5	2.5	2.5	2.5
Wayne	0.0	0.0	0.0	0.0	0.0
Webster	0.0	0.0	0.0	0.0	0.0
Wilkinson	0.0	0.0	0.0	0.0	0.0
Winston	0.0	0.0	0.0	0.0	0.0
Yalobusha	0.0	0.0	0.0	0.0	0.0
Yazoo	0.0	0.0	0.0	37.2	37.2

Mississippi Active Enrollment in 2009





MISSISSIPPI STATE
UNIVERSITY™



Discrimination based upon race, color, religion, sex, national origin, age, disability, or veteran's status is a violation of federal and state law and MSU policy and will not be tolerated. Discrimination based upon sexual orientation or group affiliation is a violation of MSU policy and will not be tolerated.