The Conservation Reserve Program in the Southeast: Issues Affecting Wildlife Habitat Value

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Abstract

Provision of wildlife habitat is one of the statuary objectives of the Conservation Preserve Program (CRP); however, the realized wildlife habitat benefits vary regionally in relation to specific cover crop, age, and management regimes. As of February 2005, 1,324,066 ha were enrolled in the CRP in 12 southeastern states. Approximately 57% of southeastern CRP was in 1 of 3 tree cover practices (CP3 new pine, CP3a new hardwood, or CP11 existing trees); 19% as CP10 existing grass (much of which was reenrolled CP1); 4% as CP1 cool-season grass; 3% in CP2 native warm-season grasses; and 12% in continuous-signup buffer practices. Targeted conservation practices resulted in enrollment of 75,014 ha of longleaf pine within the longleaf practice and 2,850 ha of hardwoods in the continuous bottomland hardwood practice. Plant communities on CRP fields are not static, but change over time. In the southeastern United States, natural succession progresses rapidly because of fertile soils, long growing seasons, and substantial rainfall. As such, the specific wildlife species that occur on CRP stands will vary over the life of the contract. Wildlife populations at a given point in time will be a function of conservation practice, age of the stand, establishment methods, and mid-contract management regimes. Provision and maintenance of wildlife habitat on CRP fields in the South requires active management. Planned disturbance (disking or fire) should be incorporated into the conservation plan of operation for all grass plantings in the Southeast. Exotic forage grasses may need to be eradicated to accrue substantive wildlife benefits. Tree plantings also require active management. Most pine CP11 plantings are now 15–17 years old and are characterized by closed canopies with dense litter accumulation and little herbaceous ground cover. Thinning, selective herbicide, and prescribed fire would enhance the habitat value of these stands. The CRP has had substantial impact on land use and landscape composition in the Southeast. However, the wildlife habitat value of fields enrolled in the CRP *in the Southeast has been diminished by selection of cover practices with short duration or minimal habitat value (i.e., CP1, CP1 reenrolled as CP10, CP3, CP11). Proactive management of extant CRP acreage and selective enrollment of high-value cover practices (e.g. longleaf pine) will be required to achieve the types of wildlife habitat benefits associated with the CRP in other regions.*

Introduction

The Conservation Reserve Program (CRP) was established under the Food Security Act of 1985 with the purpose of assisting owners and operators of agricultural land in conserving and improving soil, water, and wildlife resources. In 1996, Congress reauthorized the CRP with an acreage limit of 36.4 million acres. The 2002 Farm Act increased the enrollment limit to 39 million acres. Environmental goals of the CRP were expanded under the 1990 and 1996 Farm Bills, and the 2002 Farm Act included wildlife habitat as a CRP objective, explicitly requiring an equitable balance among conservation purposes of soil erosion control, water-quality protection, and wildlife habitat. Several specific programmatic changes designed to promote targeted enrollment have occurred since 2000 (USDA 2004a). In 2000, starting with continuous signup 22, signup enhancements including an up-front signup incentive payment, a 40% practice incentive payment, increased maintenance payments, and updated marginal pastureland rental rates were added to some Continuous CRP (CCRP) practices. In 2003, new marginal pastureland eligibility provisions were implemented under CCRP that allowed non-tree covers to be established under the wetland buffers (CP30) and wildlife habitat (CP29) practices (USDA 2003a). Additionally, in 2003 the bottomland hardwood tree initiative was adopted under CCRP CP31. In 2004, cost-share was permitted for selected mid-contract management practices (USDA 2003a). State technical committees were responsible for recommending a list of contract management activities that would enhance the CRP cover for the duration of the contract period (USDA 2003b). Also in 2004, a pilot program was established to allow enrollment of herbaceous crop land buffers under CCRP CP33 Habitat Buffers for Upland Wildlife. Under this practice, 250,000 acres were allocated for establishment of 30–120-foot field borders in 35 states within the range of the northern bobwhite (*Colinus virginianus*) (USDA 2004b). Starting with general CRP signup 15 in 1997, wildlife habitat was given co-equal status with water quality and soil erosion (USDA 2004a). The Environmental Benefits Index (EBI) for signup 15 was modified to selectively encourage practices with greater wildlife value. From 1998 to 2005, EBIs for subsequent general signups (16, 18, 20, 26, 29) were modified to reflect knowledge gained in previous signups and enhance ease of application.

CP11 stand, thinned, herbicided with Arsenal, and prescribe burned. Use of mid-contract management practices can produce a pine-grassland structure in CP11 stands, substantially enhancing wildlife habitat. (Wes Burger)

Insofar as provision of wildlife habitat is one of the statuary objectives of CRP, broad benefits through creation and enhancement of wildlife habitat might be an expected outcome of this program. However, the realized wildlife habitat benefits of the CRP vary considerably regionally and within region in relation to specific cover crop established, time since enrollment, and management regimes. In the southeastern United States, unlike in the Great Plains (Johnson 2000, Reynolds 2000) and the Midwest (Ryan et al. 1998, Ryan 2000), the wildlife habitat value and resulting population responses to CRP have been more equivocal and less thoroughly documented. Within the Southeast, the implementation of the program and practices established vary considerably among states and differ substantially from other regions. In the southeastern states, the wildlife benefits are less obvious and in some cases potentially negative. Burger (2000) reviewed wildlife responses to CRP in the Southeast and suggested that wildlife habitat benefits of the CRP had been limited by extensive enrollment in loblolly pine tree (*Pinus taeda*) plantings and exotic forage grasses. However, Burger (2000) reported that substantive conservation benefits had likely been achieved through hardwood restoration in floodplain regions and longleaf pine (*Pinus palustris*) restoration under the longleaf CPA. Furthermore, he observed that conservation benefits could be substantially enhanced with greater emphasis on selection of appropriate herbaceous cover crops, expanded longleaf restoration, broader implementation of herbaceous buffer practices, and active management of existing acres (thinning, prescribed burning, selective herbicide, and conversion of exotic to native species). Between 2000 and 2005, programmatic changes have facilitated many of these recommendations, and additional research has been conducted to evaluate wildlife benefits of select practices. This chapter characterizes the current CRP in the Southeast and reviews relevant new research documenting expected benefits.

CRP Enrollment in the Southeast

As of February 2005, 1,324,066 ha were enrolled in the CRP in 12 southeastern states (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia) (USDA 2005). Enrollment in the CRP was not equitably distributed among states, with Mississippi (29%) and Alabama (15%) having the highest enrollment. Georgia (9%), Kentucky (10%), Tennessee (8%), Louisiana (7%), and South Carolina (6%) had moderate enrollments, and the remaining 5 states collectively accounted for 16% of total enrollment. As of February 2005, more than 756,314 ha, or 57% of CRP in the Southeast was enrolled in 1 of 4 tree cover practices, including CP3 pine plantings (12% of total enrollment), CP3a longleaf (6% of total enrollment), CP3a hardwood plantings (10% of total enrollment), and CP11 existing trees (30% of total enrollment) (USDA 2005). Most of the 75,014 ha enrolled in CP3a longleaf pine was established as part of the national longleaf Conservation Priority Area (USDA 2005). In addition to the 129,737 ha planted to hardwoods under CP3a, 2,850 ha of floodplain hardwoods were established under the bottomland hardwood initiative, CP31. Approximately 19% (252,201 ha) of the total acreage was enrolled as CP10 existing grass, 4% (57,517 ha) in CP1 cool-season grass, 3% (38,088 ha) in CP2 native warm-season grasses, and 12% (153,546 ha) was enrolled in various buffer practices, principally CP21 filter strips and CP22 riparian forest buffer. Given the preponderance of enrollment in CP3, CP11, CP1, and CP10 (much of which was reenrolled CP1) more than 68% of total enrollment in the Southeast was in practices that have limited or short-duration wildlife benefits.

Within the Southeast, the distribution of enrollment among various cover practices differed substantially among states. Kentucky (79% of state enrollment) and Tennessee (81% of state enrollment) enrolled principally grass practices (CP1, CP2, CP4, CP10), whereas Alabama (66% of state enrollment), Mississippi (68% of state enrollment), Louisiana (72% of state enrollment), South Carolina (72% of state enrollment), Florida (93% of state enrollment), and Georgia (94% of state enrollment) enrolled primarily tree practices (CP3, CP3a, CP11). Only Kentucky (15,433 ha) and Tennessee (16,726 ha) enrolled substantive amounts of CP2, native warm-season grasses. However, Kentucky and Tennessee continued to enroll substantial acreage of CP1, cool-season exotic grass (35,837 ha and 12,786 ha, respectively). Existing grass (CP10) totaled 252,201 ha, with most occurring in Alabama (46,968 ha), Kentucky (56,642 ha), Mississippi (52,822 ha), and Tennessee (56,076 ha). Additional incentives associated with national priorities areas and continuous signup were seemingly effective in some states in increasing enrollment in practices with higher perceived environmental benefits. Enrollment in the CP3a longleaf practice was substantive in Georgia (48,682 ha) and Alabama (17,888 ha), but only moderate in Florida (4,640 ha) and North Carolina (3,020 ha). Enrollment in various continuous signup buffer practices was high in Mississippi (56,607 ha), Kentucky (20,453 ha), Arkansas (18,018 ha), North Carolina (14,106 ha), and South Carolina (13,719 ha).

Wildlife Benefits

Burger (2000) reported that the evaluation of wildlife responses to the CRP in the SE has been neither as extensive nor as thorough as in the Midwest (Best et al. 1997, 1998; Ryan et al. 1998; Ryan 2000), that few studies had directly monitored wildlife populations on CRP fields, and even fewer have documented population performance. However, numerous studies throughout the region had characterized wildlife populations on non-CRP lands established with management practices similar to those implemented under the CRP (e.g., pine plantations, hardwood afforestation). From these accounts, Burger (2000) inferred likely wildlife benefits of the principal CRP practices in the Southeast. This update summarizes general conclusions from Burger (2000) and expands upon recent research findings, where available.

Wildlife and Tree Planting Practices

Pine Plantations

Avian community composition in regenerating pine stands is influenced by stand age, site-preparation methods, competition control methods, and landscape context. Burger (2000), summarizing the extant literature, concluded that in southern pine plantations, overall avian diversity and species richness tend to increase with age (Johnson and Landers 1982, Repenning and Labisky 1985, Dickson et al. 1993, Wilson and Watts 2000), but may decline during the pole stage, finally peaking during the sawtimber stage. In general, avian abundance increases with age until canopy closure at 7–9 years (Johnson and Landers 1982, Dickson et al. 1993), then declines and remains low through the early pole stage (Darden et al. 1990, Dickson et al. 1993, Wilson and Watts 2000), then increases as the stand approaches sawtimber size (Darden et al. 1990).

Effects of Stand Age

Of the extant CP3 acres in the Southeast, 81% were enrolled between 1998 and 2001 and, as such, are currently 3–6 years old (Burger 2006). No studies were identified in the extant literature that specifically monitored birds on young pine plantations established under CRP; however, plant and bird communities on recently established pine plantations have been characterized (Johnson and Landers 1982, Dickson et al. 1993, Wilson and Watts 2000). Young pine plantings are characterized by low-growing grasses and forbs and, as such, are occupied by grassland and early successional bird species (Wilson and Watts 2000). Wilson and Watts (2000) studied bird communities on pine plantations 1–35 years of age in North Carolina. Over all age classes, they reported 68 different species of birds using pine plantations. They documented 30 bird species using pine plantations during the first 2 years after planting. Wilson and Watts (2000) observed 33 species using pine plantations 3–4 years old, 28 species in stands 5–6 years old, and 33 species in stands 9–11 years old.

Longleaf pine planting as part of a CRP contract. (J. Vanuga, USDA-NRCS)

During the establishment period, bird communities in pine plantings are dominated by grassland and early successional species, such as eastern meadowlark (*Sturnella magna*), eastern bluebird (*Sialia sialis*), Bachman's sparrow (*Aimophila aestivalis*), northern bobwhite, and mourning dove (*Zenaida macroura*) (Dickson et al. 1993). As the stand ages, herbaceous plants are replaced by shrubby species, and height and structural complexity increase. In response to these vegetational changes, grassland and early successional bird species such as eastern meadowlark and northern bobwhite decline, and shrub-successional species such as indigo bunting (*Passerina cyanea*), yellow-breasted chat (*Icteria virens*), common yellowthroat (*Geothlypis trichas*), and prairie warbler (*Dendroica discolor*) increase, peaking 3–10 years following establishment (Dickson et al. 1993).

Wilson and Watts (2000) reported that some generalist species, such as the common yellowthroat, gray catbird (*Dumetella carolinensis*), white-eyed vireo (*Vireo griseus*) and eastern towhee (*Pipilo erythrophthalmus*) occurred throughout much of the 30–35-year rotation, whereas other species tended to occur only within a given successional window. For example, killdeer (*Charadrius vociferus*) and eastern meadowlark were principally associated with stands during the first 2 years. Eastern bluebird, eastern kingbird (*Tyrannus tyrannus*), blue grosbeak (*Passerina caerulea*), indigo bunting, and field sparrow (*Spizella pusilla*) were associated with stands during the first 4 years after planting. American goldfinch (*Carduelis tristis*) was associated with stands 1–6 years old, prairie warblers were associated with stands 1–11 years old, and yellow-breasted chats occurred in stands that were 3–6 years old (Wilson and Watts 2000). As the stand matures, grassland birds disappear, shrub-successional species decline, and forest birds such as red-eyed vireos (*Vireo olivaceus*), white-eyed vireos, pine warblers (*Dendroica pinus*), Carolina wrens (*Thryothorus ludovicianus*), and hooded warblers (*Wilsonia citrina*) begin to permanently occupy the site (Dickson et al. 1993).

When pine stands reach 7–10 years after planting, the young pine trees form a dense, closed canopy and light penetration to the forest floor is reduced. During this period, herbaceous and shrub ground cover declines. Consequently, closed-canopy mid-rotation pine plantings provide relatively poor wildlife habitat and support a relatively simple faunal community between the time of canopy closure and the first thinning. The majority (91.5%) of CP11 acreage in the Southeast was enrolled between 1998 and 2000. Presuming most of these contracts were reenrolled following an initial 10-year contract, these stands are currently 15–17 years old and in the middle of this closed-canopy window unless recently thinned. Thinning opens the canopy, allows sunlight to penetrate to the forest floor, and stimulates development of herbaceous and shrub ground cover. Wilson and Watts (2000) reported that during the latter portion of the rotation, following thinning, species typical of second-growth and mature forest habitats predominated, including downy woodpecker (*Picoides pubescens*), Carolina wren, blue-gray gnatcatcher (*Polioptila caerulea*), Acadian flycatcher (*Empidonax virescens*), ovenbird

(*Seiurus aurocapilla*), Carolina chickadee (*Poecile carolinensis*), eastern wood-peewee (*Contopus virens*), great crested flycatcher (*Myiarchus crinitus*), tufted titmouse (*Baeolophus bicolor*), worm-eating warbler (*Helmitheros vermivorum*), pine warbler, summer tanager (*Piranga rubra*), and northern cardinal (*Cardinalis cardinalis*). The short-term overlap between the grassland/shrub-successional bird species and the forest species produces the high species richness prior to the pole stage (occurring during mid-rotation, characterized by closed canopy, low plant species diversity, and little herbaceous ground cover). The early successional species decline following canopy closure, leaving the early colonizing forest bird species. This pattern of colonization/extinction contributes to the reduced species richness associated with pole-aged stands. Although total avian diversity increases with age of plantations, diversity and abundance of regionally declining grassland and early successional species will decline with stand age.

Some species, such as yellow-breasted chat and indigo bunting, occur during early successional stages and again 1–2 years after first and second thinnings (Wilson and Watts 2000). Other early successional species, such as northern bobwhite, mourning doves, eastern bluebirds, and meadowlarks, may occur both in very young plantations (1–2 years) and in mature, open, pine/grasslands (Repenning and Labisky 1985). As an example, in South Carolina, Bachman's sparrows were relatively abundant in 1–3-year-old replanted clearcuts and mature (>80 years) stands but occurred in low density in young plantings (6–12 years) and middle-aged (22–50 years) stands (Dunning and Watts 1990). The ground cover and understory composition and structure of mature, fire-maintained stands provides the herbaceous and shrub communities utilized by many grassland and shrub/successional bird species. Thus, as stands reach economic or ecological maturity, they may once again provide habitat for grassland/shrub-successional species, particularly if thinned and burned.

Mid-contract Management

Starting with CRP signup 15, participants that wished to re-enroll CP3 pine tree plantings (as CP11) had the opportunity to increase their Environmental Benefits Index (EBI), and hence their probabilities of having their bids accepted, by agreeing to thin the pine planting within the first 3 years of the second contract period. Prospective program participants could further increase the EBI of their offer by agreeing to convert 15–20% of the stand to early successional habitat. Although avian diversity in pine plantations tends to decline during the mid-rotation period, thinning may enhance habitat quality for many regionally declining species. Wilson and Watts (2000) reported that thinned pine plantations had greater species richness than unthinned plantations of similar age. They reported that of the 68 species documented using pine plantations during the study, 7 species (10%) were detected exclusively in stands before thinning and 11 species (16%) were detected exclusively in thinned stands. Several species (e.g., indigo bunting and yellow-breasted chat) occurred in young stands and again 1–2 years after the first and second thin. One species, brown-headed nuthatch (*Sitta pusilla*), occurred in greater density in stands 1–2 years following thins (Wilson and Watts (2000).

In one of the few southeastern studies in which bird communities were surveyed in pine plantations enrolled in CRP, Schaefbauer (2000) documented 30 bird species using mid-rotation stands in Georgia. During 1998–1999, breeding bird communities were sampled using point counts in 6 CRP stands, 2 of which were third row-thinned, 2 of which were strip-thinned plus row-thinned, and 2 controls. Species richness, diversity, and total abundance were generally similar among thinning treatments in both years. Schaefbauer (2000) anticipated increased species richness following thinning. The lack of evidence for increased richness was attributed to a lag time in response between thinning implementation and colonization by early successional and grassland species. The most abundant species included northern cardinal, indigo bunting, eastern towhee, great crested flycatcher, gray catbird, pine warbler, tufted titmouse, and mourning dove. The number of species detected per year and treatment varied from 5 to 25. Total relative abundance (indexed by point counts) in CP11 stands under all treatments was relatively low, ranging from 0.22 to 2.0 birds/ha and did not differ among treatments. Only indigo bunting abundance differed among treatments and was higher in strip + row-thinned stands than in control during the second year of the study (Schaefbauer 2000).

Parnell et al. (2002) monitored habitat use of radiomarked bobwhite in a forest–agricultural matrix in Georgia. They observed that northern bobwhite selectively used fallow fields and thinned pine forests, including those enrolled in the CRP. They reported an avoidance of agricultural fields and closed-canopy pine plantations. Parnell et al. (2002) concluded that thinning regimes that open the canopy and encourage herbaceous ground cover would create habitats preferred by bobwhites. In the context of this study, an EBI that provides incentive to simultaneously thin CP11 stands to an open structure and convert portions to fallow herbaceous vegetation would provide preferred bobwhite habitat and increase usable space in a forest–agricultural matrix.

In pine CRP stands in Georgia, Schaefbauer (2000) documented nesting by 8 bird species in a first year and 12 species in a second year. In the first year of the study, more species were documented nesting in the row-thinned stands (8.5) than in either strip-thinned plus row-thinned (5), or control stands (4). Nesting activity increased the second year following thinning. Nests of eastern towhee, mourning dove, brown thrasher, northern cardinal, and summer tanager were located in all thinning treatments (row-thinned, strip-thinned plus row-thinned, control). Indigo bunting, pine warbler, and blue grosbeak nests were located in both row-thinned and strip-thinned plus row-thinned stands. American crow (*Corvus brachyrhychos*) and white-eyed vireo nests were found in control stands and stands strip- plus row-thinned. Field sparrow and Carolina wren nests were located only in stands strip- plus row-thinned, and gray catbird nests were found only in unthinned control stands. Blue grosbeak, field sparrows, indigo buntings, pine warblers, and summer tanagers apparently benefited from thinning in that these species did not nest in unthinned control stands. Overall apparent nest success was 6.2% in the first year and 24.2% in the second year (Schaefbauer (2000). Apparent nest success of individual species ranged from 0.0% to 66.7%. Only for northern cardinals was a sufficient number of nests located to estimate Mayfield success (32%).

Effective 2004, FSA approved cost-share for mid-contract management activities, including prescribed fire, disking, and herbicidal control of invasive species. In thinned mid-rotation pine plantations, recolonization by early successional species may be accelerated by thinning and burning, thereby enhancing the herbaceous and shrub ground cover. For example, Bachman's sparrows typically occur in both mature pine forests with scattered shrubs and extensive herbaceous ground cover and in recently regenerated pine stands (1–5 years). Previous studies had reported Bachman's sparrows were absent from pine plantations during mid-rotation. However, in northern Florida, Bachman's sparrows extensively used mid-rotation (17–28-year-old) slash pine (*Pinus elliottii*) stands that had been thinned (Tucker et al. 1998). Bachman's sparrows were more abundant in thinned plantations that had been burned than in similar-aged stands that were unburned.

An ongoing study in central Mississippi is examining breeding bird abundance in 24 thinned mid-rotation (19–23-year-old) loblolly pine plantations under 4 different management regimes (thin only, thin/burn, thin/Imazapyr herbicide, thin/Imazapyr herbicide/burn). During the first breeding season following treatment application, 34–39 breeding bird species were observed in these stands, including 14 shrub-successional species (Thompson 2002). Total breeding bird abundance, bird species diversity, and total avian conservation value (TACV; Nuttle et al. 2003) were highest in control (thin only) plots and lowest in herbicide treatments during the first year following treatment. However, as the herbaceous community recovered following herbicide and fire treatments, more high-priority early successional bird species colonized treated stands, and by the second growing season following treatments, total bird abundance and TACV were highest in stands that were thinned, herbicided, and burned. In the second growing season following treatment, species associated with the midstory (white-eyed vireo and Kentucky warbler [*Oporornis formosus*]) were most abundant in control stands, whereas early successional, shrub, and open forest birds (northern bobwhite, eastern wood-pewee, gray catbird, common yellowthroat, and indigo bunting) were most abundant in herbicide/burned stands (Thompson 2002). Two pine–grassland species (Bachman's sparrow and brown-headed nuthatch) were detected only in herbicide/burned stands. By the third and fourth growing seasons following treatments, total bird abundance, TACV, bird species richness, and diversity were highest in herbicide/burned stands and lowest in control stands (Woodall 2005). Black-and-white warbler (*Mniotilta varia*) and hooded warbler (*Wilsoni citrina*) were most abundant in control stands, whereas common yellowthroat, eastern towhee, indigo bunting, northern bobwhite, red-headed woodpecker (*Melanerpes erythrocephalus*), tufted titmouse, and eastern wood-peewee were most abundant in herbicide/burned stands (Woodall 2005). In this study, the herbicide/prescribed burn treatment combination created an open forest structure that mimicked regionally scarce pine–grasslands and resulted in colonization by regionally declining early successional and pine–grassland bird species. Although some species declined following mid-rotation management (i.e., Kentucky warbler), the net effect was a more diverse bird community characterized by regionally declining species with high conservation value. Similar conservation benefits might be accrued by broadly implementing mid-contract management practices on extant CP11 CRP stands.

To specifically address bird response to mid-contract management on CRP CP11, an ongoing study in central Mississippi is characterizing bird abundance and community structure on 24 pine stands enrolled in CRP CP11 (L. W. Burger, unpublished data). This study, in its third year, compares breeding bird communities in thinned CP11 stands treated with Imazapyr and prescribed fire to those in CP11 stands thinned, but not herbicided or burned. Half of the stands are in the upper coastal plain and half are in the lower coastal plain. During the first year post-treatment, 31 bird species were detected using control stands in the upper coastal plain, whereas 36 species were detected using treated stands. In the lower coastal plain, 29 species were detected using control stands, whereas 33 species were detected using treated stands. During the second year post-treatment, 33 bird species were detected using control stands in the upper coastal plain, whereas 38 species were detected using treated stands. In the lower coastal plain, 31 species were detected using control stands, whereas 30 species were detected using treated stands. The most abundant species in control stands included eastern towhee, northern cardinal, indigo bunting, hooded warbler, yellow-breasted chat, pine warbler, Carolina chickadee, and Carolina wren. The most abundant species in herbicided and prescribe-burned stands included indigo bunting, eastern towhee, yellow-breasted chat, northern cardinal, pine warbler, Carolina wren, and northern bobwhite. During the first 2 growing seasons following treatment, community metrics were similar between treated and control stands. However, during the second year following treatment, brown-headed nuthatch, Bachman's sparrow, eastern bluebird, and northern bobwhite were detected in treated stands, but not in untreated stands. If CP11 pine stands exhibit similar patterns to those reported in Thompson (2002) and Woodall (2005), plant and bird communities on sites treated with Imazapyr and prescribed fire will continue to diverge from those in untreated stands, and treated sites will be characterized by a pine overstory with a rich herbaceous understory occupied by early successional, shrub, and pine–grassland bird species.

Mammals and Herpetofauna in Pine Plantations

No studies were identified that specifically documented mammal or herpetofaunal populations in pine stands enrolled in CRP. However, Hood (2001) sampled both small mammals and herpetofauna in 24 mid-rotation pine plantations under 4 management regimes (thin only, thin/burn, thin/Imazapyr herbicide, thin/Imazapyr herbicide/burn) in east-central Mississippi. Small mammal and herpetofaunal abundance was largely independent of mid-rotation management practice. She documented 21 mammalian species using mid-rotation pine plantations: white-tailed deer (*Odocoileus virginianus*), armadillo (*Dasypus novemcinctus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus floridanus*), swamp rabbit (*Sylvilagus aquaticus*), eastern gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), cotton mouse (*Peromyscus gossypinus*), eastern harvest mouse (*Reithrodontomys humulis*), golden mouse (*Peromyscus nuttalli*), house mouse (*Mus musculus*), white-footed mouse (*Peromyscus leucopus*), pine vole (*Pitymys pinetorum*), rice rat (*Oryzomys palustris*), hispid cotton rat (*Sigmodon hispidus*), eastern mole (*Scalopus aquaticus*), least shrew (*Cryptotis parva*), and shorttailed shrew (*Blarina brevicauda*). In the same stands, Hood (2001) documented 12 amphibian and 15 reptile species. Amphibians included American toad (*Bufo americanus*), eastern narrowmouth toad (*Gastrophryne carolinensis*), Fowler's toad (*Bufo woodhousii fowleri*), gray treefrog (*Hyla chrysoscelis*), green treefrog (*Hyla cinerea*), southern cricket frog (*Acris gryllus gryllus*), southern leopard frog (*Rana utricularia*), spring peeper (*Pseudacris crucifer*), upland chorus frog (*Pseudacris feriarum*), Mississippi slimy salamander (*Plethodon mississippi*), smallmouth salamander (*Ambystoma texanum*), and central newt (*Notophthalmus viridescens louisianensis*). Reptiles included corn snake (*Elaphe guttata*), eastern hognose snake (*Heterodon platirhinos*), speckled kingsnake (*Lampropeltis getula holbrooki*), midland brown snake (*Storeria dekayi wrightorum*), Mississippi ringneck snake (*Diadophis punctatus stictogenys*), rough green snake (*Opheodrys aestivus*), southern black racer (*Coluber constrictor priapus*), cottonmouth (*Agkistrodon piscivorus*), southern copperhead (*Agkistrodon contortrix contortrix*), timber rattlesnake (*Crotalus horridus*), western pygmy rattlesnake (*Sistrurus miliarius streckeri*), five-lined skink (*Eumeces fasciatus*), green anole (*Anolis carolinensis*), ground skink (*Scincella lateralis*), and northern fence lizard (*Sceloporus undulatus hyacinthinus*). Similar aged pine plantations in a similar landscape context might be expected to support many of these species.

Pine Summary

In summary, pine plantations created under the CRP will provide habitat that will be used by a variety of bird, mammal, and herpetofaunal species. As the stand structure and composition changes over the life of the contract, the specific assemblage of bird species occupying pine plantations will change. Grassland and early successional species will occupy the stand during the first 1–3 years, then will be replaced by bird species associated with shrub-successional and young forest communities. Avian diversity and abundance may decline during the mid-rotation period. Much of the mid-rotation pine plantations enrolled in the CRP can be expected to support populations of regionally abundant and stable forest bird species such as northern cardinal, Carolina wren, pine warbler, and indigo bunting. Although an understanding of bird responses to management in pine plantations is still incomplete, thinning, prescribed fire, and in some cases selective herbicide can enhance the conservation value of these stands by creating a stand structure that mimics regionally scarce pine–grassland communities. When mid-contract management practices are applied to create this open pine structure, regionally declining bird species of high conservation concern, such as Bachman's sparrow, brown-headed nuthatch, and northern bobwhite, will benefit. Pine plantations managed for an open structure will support a bird community with greater total avian conservation value than unmanaged stands. As such, thinning, prescribed burning, and selective herbicide practices should be encouraged through the use of incentives and regulations. The longleaf pine ecosystem has been identified as critically endangered and of highest conservation priority in the region. The CRP longleaf conservation priority area provides a programmatic opportunity to facilitate longleaf restoration in the Southeast to help achieve regional conservation objectives. (It should be noted that the restoration of longleaf pine, an important management objective in the Southeast that CRP can help to accomplish, is not specifically addressed in this paper.)

Hardwood Plantations

Conservation of the bottomland hardwood ecosystem in the Southeast has been identified as requiring highest priority for avian conservation (Hunter et al. 1993). Bottomland hardwoods are regionally scarce forest communities in the Southeast and support a particularly diverse avian community (>70 species), including numerous Neotropical migrants of international conservation concern. As such, restoration of hardwood bottomland has been established as a conservation priority by numerous public, private, and interagency groups (Myers 1994). The CRP provides an important programmatic vehicle for restoring bottomland hardwoods. Collectively, more than 253,041 ha of hardwoods, most in bottomlands, have been established under CP3a, CP22, and CP31. Additionally, some unknown portion of CP11 contracts are hardwoods initially established under CP3a. Although no studies have directly assessed avian response to bottomland afforestation under the CRP, numerous recent studies have evaluated avian use, abundance, and productivity on hardwood afforestation sites and provide a very good approximation to expected benefits of CRP plantings.

Effects of Stand Age

Agricultural lands afforested with hardwoods undergo successional processes similar to pine stands; however, the rate of succesional changes and attainment of canopy closure is slower in hardwoods. During the first 4 years after establishment, hardwood plantings support high densities of grassland birds, such as red-winged blackbird (*Agelaius phoeniceus*) and dickcissel (*Spiza americana*), and may also be occupied by northern bobwhite, eastern meadowlark, and northern mockingbird (*Mimus polyglottos*) (Nuttle and Burger 1996). Peak abundance of shrub-successional species, such as yellow-breasted chat, indigo bunting, and common yellowthroat, occurs 7–15 years after planting. However, with the exception of indigo bunting, none of the previously identified species persist in older plantations (>20 years of age) (Nuttle and Burger 1996). Thus, hardwood plantings established for bottomland hardwood conservation will provide temporary habitat for some regionally declining grassland and shrub-successional species, particularly during winter (Hamel et al. 2002). In a study of wintering bird communities, Hamel et al. (in press) detected 36 bird species on recently afforested sites (still in grassland/herbaceous stage) in the Mississippi Alluvial Valley (MAV). They reported a mean density of 13.0 birds/ha as measured by Project Prairie Bird survey methods or 3.0 birds/ha as estimated by Winter Bird

Population Study surveys. The most commonly detected species included northern harrier (*Circus cyaneus*; 9.5/100 ha), red-tailed hawk (*Buteo jamaicensis*; 6.0/100 ha), loggerhead shrike (*Lanius ludovicianus*; 3.1/100 ha), Carolina wren (0.6/100 ha), sedge wren (*Cistothorus platensis*; 5.3/100 ha), northern mockingbird (1.0/100 ha), eastern towhee (1.2/100 ha), field sparrow (0.8/100 ha), Savannah sparrow (*Passerculus sandwichensis*; 56.6/100 ha), fox sparrow (*Passerella iliaca*; 1.0/100 ha), song sparrow (*Melospiza melodia*; 25.6/100 ha), swamp sparrow (*Melospiza georgiana*; 96.8/100 ha), red-winged blackbird (57.6/100 ha), and eastern meadowlark (21.0/100 ha). The duration of grassland habitat in hardwood afforestation sites will vary from 4 to 15 years depending on the specific requirements of the species and the establishment practices.

The long-term objective of hardwood bottomland afforestation is to produce a forest that is similar in structure and function to mature hardwood bottomlands. Nuttle (1997) characterized breeding bird communities in afforested sites in the MAV. When compared to bird communities in mature hardwood bottomland hardwood forests, Morisita's index of similarity was 2.6–4.6% for plantations 0–4 years of age, 35–42% for plantations 7–15 years of age, and 74–85% for plantations 21–27 years of age (Nuttle 1997). Thus, within 20 years after planting, hardwood plantations are supporting many bird species characteristic of natural sawtimber stands. However, much of this similarity is attributable to high abundance of many habitat generalists, including Carolina wren and northern cardinal. Older plantations still lacked certain species that are considered area-sensitive (require large tracts of forested habitat) or require late-successional forest (Nuttle and Burger 1996).

The benefits of afforestation to forest birds are positively associated with the speed at which afforestation and succession occur. As such, rapid afforestation has been assumed to be beneficial to wildlife (Hamel et al. 2002). This assumption is based on the premise that many bird species of highest conservation concern in the MAV are late-successional species (Ribbeck and Hunter 1994). Toward this end, Twedt and Portwood (1997) suggested that the addition of fast-growing, early successional species, such as cottonwood (*Populus deltoides*), willow (*Salix sp.*), sycamore (*Platanus occidentalis*), and green ash (*Fraxinus pennsylvanica*) to oak (*Quercus sp.*) plantings, would accelerate the development of a 3-dimensional forest structure and facilitate earlier colonization by forest bird species. They reported that 5–7 years after planting cottonwood plantations supported 36 species of birds, including forest birds such as yellow-billed cuckoo (*Coccyzus americanus*), Acadian flycatcher, yellow-breasted chat, warbling vireo (*Vireo gilvus*), indigo bunting, orchard oriole (*Icterus spurius*), and Baltimore oriole (*Icterus galbula*). Conversely, 6-year-old oak plantings only supported 9 species, which were mostly grassland species such as dickcissel, red-winged blackbird, and eastern meadowlark. Cottonwood stands 5–9 years old support greater species richness (16.7) and territory density (411.9/100 ha) than similar-aged oak plantings (species richness 8.1, territory density 257.3/100 ha)(Twedt et al. 2002).

The intent of rapid afforestation is to accelerate the development of vertical wooded structure to more quickly attain a plant and bird community that resembles mature bottomland hardwood forests. The rate of vegetation development in bottomland afforestation sites varies among establishment methods. Hamel et al. (2002) characterized vegetation structure on afforestation sites in the MAV. These sites were afforested using 1 of 4 techniques: natural regeneration, sown Nuttall oak (*Quercus texana*) acorns, planted Nuttall oak seedlings, and planted cottonwood stem cuttings. Five years after establishment, cottonwood trees on the site established with cottonwood cuttings were >10 m in height. Nuttall oak saplings were 3–4 m in height on the site planted to Nuttall oak seedlings, and 1–3 m in height on the site sown with Nuttall acorns. On the naturally regenerated site few woody stems exceeded 1–3 m. Vegetation structure in afforested sites is a function of the intensity of management at establishment, age of the propagules at planting, and growth rates of the species planted (Hamel et al. 2002). Not surprisingly, vegetation structure develops more rapidly when more intense effort is applied to establishing vegetation (Hamel et al. 2002).

During rapid afforestation, the early successional window is shorter than under natural succession. Wintering birds, in particular, use the early successional herbaceous communities in recently afforested hardwood sites. Hamel et al. (2002) characterized wintering bird communities on sites afforested using different establishment methods. The mean number of bird species detected was greatest in sites afforested with cottonwood cuttings (30), followed by sites planted to oak seedlings (13). A similar mean number of species (11) were detected in sites naturally regenerated or sown with acorns (Hamel et al. 2002). A total of 47 species were detected in cottonwood cutting stands, 19 in oak seedling stands, 14 in oak acorn stands, and 17 in naturally regenerated stands. As woody vegetation develops, some high conservation–priority bird species associated with herbaceous ground cover disappear. Although bird species richness increased with vegetation structure (rapid afforestation), the average conservation priority score does not because of loss of several high-priority species. Hamel et al. (2002) concluded that "… rapid afforestation provides winter habitat for a number of species quickly, at the expense of a few high-priority species found in early successional habitats." Given that the rate of structural development is a function of afforestation efforts and will subsequently determine bird community structure, management goals should seek to provide bird habitat through the whole successional continuum. This may require using a variety of afforestation methods to achieve various management objectives and intentionally maintaining some early successional communities through planed disturbance.

The conservation value of a given hardwood planting has been indexed by weighting measures of avian abundance with a measure of species-specific regional conservation value (Partners in Flight conservation scores)(Nuttle 1997). Indexed in this manner, during the breeding season hardwood plantings 0–4 years of age provide 34% the conservation value of mature natural hardwood bottomlands. Plantings 7–15 years of age have 46% the conservation value of mature natural bottomlands, and plantings 21–27 years provide 65% the conservation value of mature natural bottomlands. Highest-priority species are most abundant in natural forest stands; thus mature natural stands have the greatest conservation value. During the breeding season, newly established hardwood plantings are relatively species-poor, and the species present in this age class are relatively common species such as red-winged blackbird and eastern meadowlark. Restoration plots 11–12 years old are populated by a few high-priority shrubland birds such as yellow-breasted chat and painted bunting (*Passerina ciris*), and high-priority grassland bird species such as dickcissel, and consequently will have intermediate conservation value. As restoration stands reach 22 to 27 years old, they will be populated by high-priority forest species, such as prothonotary warbler (*Prothonotaria citria*) and yellow-billed cuckoo, contributing to their increased conservation value (Nuttle 1997.) Similarly, Twedt et al. (2002) indexed conservation value of oak plantings 5–9 years old and cottonwood plantings 0–4 and 5– 9 years old by weighting territory density (territories/100 ha) by Partners in Flight prioritization scores. They reported that the conservation value of 5–9-year-old cottonwood stands were generally twice as large as those of oak stands less than 10 years old. Younger cottonwood stands had conservation values intermediate between oak-dominated and older cottonwood stands.

Avian productivity in hardwood plantings has received less research focus than avian abundance and species composition. Twedt et al. (2001) reported that in the Lower Mississippi Alluvial Valley, nest success of blue-gray gnatcatcher (18%), eastern towhee (28%), indigo bunting (18%), northern cardinal (22%), and yellow-bellied cuckoo (18%) did not differ between mature bottomland hardwood forests and cottonwood plantations. However, nest success of open cup nests of 19 bird species in natural bottomland hardwoods (27%) was greater than that of 18 species in cottonwood plantations (15%). Differences in nest success were attributed to differences in predator community and species composition of bird communities. Rates of parasitism by brown-headed cowbirds (*Molothrus ater*) were greater in cottonwood plantations than in bottomland hardwood forests (Twedt et al. 2001).

Hardwood Summary

In summary, hardwood bottomlands are a regionally scarce resource of high priority for conservation of avian diversity. The CRP provides a programmatic vehicle for creating long-term conservation benefits on bottomland hardwood sites. The availability of continuous enrollment and automatic acceptance of eligible offers under the bottomland hardwood initiative (CP31) increases the opportunities for hardwood restoration. However, participation in this practice to date has been relatively small. During the first 5 years after establishment, and particularly during winter, hardwood plantings provide ephemeral habitats for regionally declining early successional grassland and shrub-successional species, thus contributing to regional avian conservation. Over time, hardwood plantings established under CRP will likely provide substantial benefits for conservation of high-priority forest bird species. Colonization of hardwood plantings by forest birds may be accelerated by interplanting with fast-growing early successional species such as cottonwood. However, management goals that include a variety of establishment methods and management regimes will provide long-term conservation for a broader avian community.

Wildlife and Grassland Plantings

In the Great Plains (Johnson 2000, Reynolds 2000) and Midwest (Ryan et al. 1998, Ryan 2000), grasslands created through the CRP have undoubtedly provided habitat for many grassland bird species and in some case altered population trajectories. However, in the Southeast, avian communities on CRP grasslands have received less research attention and consequently the conservation benefits are less clear. This is, in part, because the Southeast has relatively few breeding grassland bird species and also because grassland practices are a relatively small component of total CRP enrollment. However, grasslands created under CRP may provide regionally scarce resources for grassland and early successional bird species during both the breeding and winter seasons. Bird use of these grasslands will likely be influenced by the type of cover established, the age of the stand, and the management regime implemented over the life of the contract (Burger et al. 1990).

Effects of Grassland Cover Type

Throughout the Southeast, much of the CP1 and CP10 acreage was established in exotic forage grasses such as Kentucky tall fescue (*Lolium* *arundinaceum*), Bermuda grass (*Cynodon dactylon*), or bahia grass (*Paspalum notatum*). CRP fields planted to tall fescue have dense vegetation with little bare ground and low plant species diversity (Barnes et al. 1995; Greenfield et al. 2001, 2002, 2003). Fescue stands typically provide few food resources for granivorous birds (Barnes et al. 1995; Greenfield et al. 2001, 2003). Although tall fescue may support abundant and diverse insect communities, these food resources may be unavailable to ground-foraging birds because of the dense vegetation structure. It is generally acknowledged that exotic forage grasses, including tall fescue, provide poor habitat for bobwhites and other ground foraging granivores because it lacks the proper vegetation structure, floristic composition, and sufficient quality food resources. CRP fields revegetated through natural succession or with planted native species may provide better wildlife habitat than those established in exotic forage grasses (Washburn et al. 2000).

Native warm-season grasses are generally presumed to have greater wildlife benefits than exotic forage grasses (Washburn et al. 2000). Despite consistent promotion of native warm-season grasses (NWSG) by southeastern state fish and wildlife agencies, enrollment in CP2–native warm-season grasses amounted to only 3% of the total CRP enrollment in the Southeast. Only Kentucky and Tennessee enrolled substantial amounts of native grass cover, yet even within these states, CP2 enrollment accounted for only 11% and 15% of the respective total state enrollment.

In Tennessee, Dykes (2005) documented breeding bird use of 45 NWSG plantings established under the CRP. Bird communities on CRP CP2 fields were compared to those in remnant native grasslands at Fort Campbell Military Reservation. Dykes (2005) documented 85 species of birds using restored NWSG CRP fields. Although vegetation communities in planted NWSG fields and remnant native grasslands were both predominantly native grasses and forbs, planted fields had taller vegetation. Field size was the best predictor of bird species richness, with larger fields supporting a richer bird community. Most grassland bird species were positively associated with field size. Additionally, many species exhibited a negative relationship with vegetation height and NWSG cover, and a positive relationship with bare ground. Planted NWSG fields were occupied by regionally declining, high conservation–priority species such as Henslow sparrow (*Ammodramus henslowii*), eastern meadowlark, dickcissel, and northern bobwhite.

Program participants interested in re-enrollment of grass CRP contracts could increase their Environmental Benefits Index (EBI) by enhancing the wildlife habitat value of the existing cover. Washburn et al. (2000)

evaluated efficacy of various combinations of glyphosate and imazapic herbicides in eradicating tall fescue and establishing native warm-season grasses. They assumed that reductions in fescue coverage, establishment of native warm-season grasses, increases in plant species richness, and increases in bare ground were beneficial to bobwhites. They reported that 1 year post-treatment, all herbicide treatments reduced fescue coverage and enhanced bobwhite habitat quality relative to control plots. Furthermore, the spring burn, followed by imazapic application and seeding of native warm-season grasses treatment was most efficacious in eliminating fescue and establishing native warm-season grasses.

From 1997 to 2001, Smith (2001) and Szukaitus (2001) used radiotelemetry to monitor bobwhite habitat use, survival and reproduction on a 2,370-ha public wildlife management area in east-central Mississippi. This property included 781 ha of fields enrolled in CRP CP1 from 1987 to 1997. CRP fields were initially planted to fescue and at the start of the study comprised solid stands of fescue or a broomsedge (*Andropogon sp.*) overstory with a dense fescue understory. Annual mowing from 1987 to 1996 had produced low plant diversity and dense litter layers in all CRP fields (Greenfield et al. 2001). In 1997, annual mowing was ceased, a 3-year rotation prescribed fire regime was introduced, and a systematic program of herbicidal fescue eradication was implemented. From 1997 to 2001, an average of 259 ha were burned annually. Additionally, between 1997 and 2002, 314 ha were herbicidally treated to eradicate fescue. Fields were recolonized by native *Andropogon sp.*, legumes, and broad-leaved forbs. During 1997–2001, second-order habitat selection (habitat selection in establishment of seasonal ranges) varied somewhat among years; however, bobwhite consistently demonstrated selection of managed grasslands over other available habitats (woods, row crop, old fields, odd). Mean breeding season survival of bobwhite during 1997–2001 was 35% (range 20–48%; Smith 2001, Szukaitus 2001). From 1997 to 2001, mean apparent nest success of incubated nests was 52%. Twenty-four percent of nests were in managed grasslands (previously CRP fields) that had been burned the previous spring, 60% of nests were in managed grasslands burned ≥1 year prior, and 19% of nests were in other habitats (Smith 2001, Szukaitus 2001). From 1996 to 1998, breeding season relative abundance doubled and fall density increased by a factor of 4. Populations remained approximately stable from 1998 to 2000, then declined from 2000 to 2002 in response to prolonged drought, poor ground cover conditions, and associated high nest and adult predation (L. W. Burger, unpublished data).

Effects of Stand Age

Plant communities on CRP grasslands are not static, but rather change in species composition and structure over the 10-year lifespan of the contract. McCoy et al. (2001) studied vegetation changes on 154 CRP grasslands in northern Missouri and reported that during the first 2 years following establishment, fields are characterized by annual weed communities with abundant bare ground and little litter accumulation. Within 3–4 years, CRP fields became dominated by perennial grasses with substantial litter accumulation and little bare ground. They suggested that vegetation conditions 3–4 years after establishment might limit the value of enrolled lands for many wildlife species and some form of disturbance, such as prescribed fire or disking, might be required to maintain the wildlife habitat value of CRP grasslands.

Effects of Management Regime

Mowing or clipping is the most common management practice implemented on CRP grasslands. McCoy et al. (2001) reported that mowing had short-term effects on vegetation structure (reduced height within the year and increased litter accumulation) and resulted in accelerated grass succession and litter accumulation. As a result of longer growing seasons and greater rainfall, the rate of natural succession on CRP grasslands throughout the Southeast likely exceeds that observed in the Midwest, making planned disturbance even more important for maintaining habitat quality for early successional species. Dykes (2005) characterized vegetation structure on 45 CP2 fields in Tennessee and reported that litter cover and depth were greater on fields that had been mowed than those that had been burned. Litter cover and depth were intermediate on unmanaged fields. Conversely, forb coverage was greatest on burned fields, followed by unmanaged and mowed fields (Dykes 2005).

Madison et al. (1995) examined the effects of fall, spring, and summer disking and burning, and spring herbicide (Roundup®) treatments on bobwhite brood habitat quality in fescue-dominated, idle grass fields in Kentucky. They reported that during the first growing season following treatment, fall disking significantly enhanced brood habitat quality by increasing insect abundance, plant species richness, forb coverage, and bare ground relative to control plots. However, the benefits of disking were relatively short-lived, with diminished response during the second growing season. During the second growing season following treatment, herbicide treatments provided the best brood habitat quality. Greenfield et al. (2001, 2003), examining the effects of disking, burning, and herbicide on bobwhite brood habitat in fescue-dominated CRP fields in Mississippi, likewise reported that disking and burning improved vegetation structure for bobwhite broods during the first growing season after treatment. However, the benefits were short-lived (1 growing season). Herbicide treatment in combination with prescribed fire enhanced quality of bobwhite brood habitat for the longest duration (Greenfield et al. 2001).

Winter Bird Communities in Grasslands

Our understanding of bird responses to CRP is mostly based on studies of grassland birds conducted in the midwestern and plains states during the nesting season (summarized in Allen 1994, Ryan et al. 1998). Best et al. (1998) reported extensive use of midwestern CRP fields by birds during winter; however, numerous temperate nesting, migrant grassland bird species (e.g., sparrows) winter in the Southeast, and grasslands created under the CRP potentially provide substantial benefits for these wintering populations. Unfortunately, use of CRP by nonbreeding grassland birds has not been assessed in the Southeast.

Mammals in CRP Grasslands

Bond et al. (2002) estimated movements and habitat use of radiomarked cottontails on the same managed CRP grasslands studied by Smith (2001) and Szukaitus (2001). Although cottontails used a diversity of habitats, they exhibited consistent selection for managed CRP grasslands across multiple spatial scales, sexes, seasons, and diel periods (Bond et al. 2002). Additionally, movement rates of cottontails in managed CRP grasslands were less than those observed in hayfields or croplands (Bond et al. 2001).

Grassland Summary

Relative to the Midwest there is little information on responses of grassland-dependent birds to CRP in the Southeast. However, CP2 fields in Mid-South states are clearly used by a diversity of bird species, including high-priority, regionally declining grassland species. Larger NWSG CRP fields seemingly support greater bird diversity and fields managed with prescribed fire instead of mowing have more desirable plant species composition and structure (Dykes 2005). Several studies (Barnes et al. 1995; Madison et al. 1995; Greenfield et al. 2001, 2002, 2003; Washburn et al. 2000) have assessed the suitability of CRP grasslands or similar habitats for bobwhites. The primary conclusions of these studies were that (1) the habitat value of fields established in exotic forage grasses is low, (2) periodic disturbance is necessary to enhance or maintain quality early successional habitats, (3) disking and prescribed fire produce short-lived habitat enhancement, whereas herbicidal eradication of exotic forage grasses produces longer-lived benefits. In addition to birds, managed CRP fields can provide high-quality habitat for cottontails (Bond et al. 2001, 2002).

Wildlife and Upland Habitat Buffers

Conservation buffer practices (field borders, filter strips, and riparian corridors) constituted a relatively small (12%) component of CRP in the Southeast, but may provide substantial benefits for wildlife in intensive agricultural systems. In 2004, USDA announced the availability of a new

Herbaceous field border around a crop field in Georgia. (D. Paul, USDA-NRCS)

upland buffer practice under the continuous CRP. The CP33–Habitat Buffers for Upland Wildlife practice allows creation of 30–120-feet herbaceous field borders around the entire perimeter of crop fields that meet program eligibility criteria. This practice is designed to provide habitat for northern bobwhite and other grassland bird species. Although the practice was only recently approved, a number of recent studies had evaluated wildlife response to herbaceous idle field borders.

Although no study has directly evaluated wildlife population response to CP21, CP22, or CP33, several studies in North Carolina have evaluated use of fallow field borders by northern bobwhite and passerines. Results of these studies have application to field margin, non-crop vegetation created under CP21, CP22, or CP33.

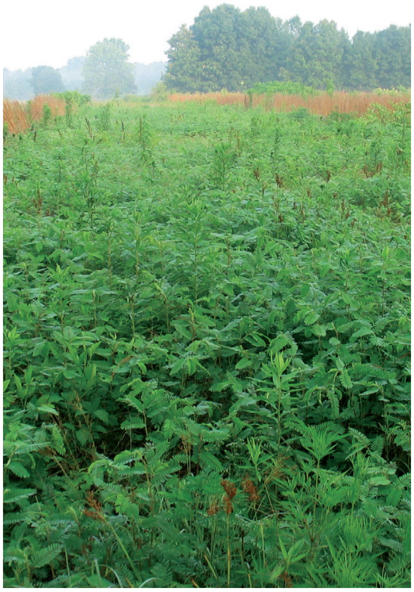
Puckett et al. (1995) examined habitat use and reproductive success of radiomarked bobwhites on 4 farms in Dare County, North Carolina. On 2 of these farms, 9.4-m-wide, fallow vegetative filter strips were established along field borders and ditch banks. Spring capture rate of bobwhite and number of nests/female were greater on sites with filter strips, but nest success did not differ. Bobwhite on non-filter strip sites exhibited greater movement from capture to first nest location. Filter strips increased use of row-crop fields by bobwhite throughout the breeding season. In a related study of 24 farms in North Carolina, farms with filter strips (n = 12) supported higher bobwhite density in fall than farms without filter strips (W. Palmer, Tall Timbers Research Station, personal communication). Filter strips apparently benefited bobwhite populations by increasing usable space during the early breeding season, holding bobwhites on the landscape until cover in crop fields developed, increasing access and use of crop fields by bobwhites, and providing nesting and brood-rearing habitat.

Field borders may also produce substantial benefits for breeding and wintering passerines. During 1997 and 1998, fields on farms in the coastal plain of North Carolina with field borders (n = 4) supported greater abundance of wintering sparrows than fields on farms with mowed field margins or no borders (*n* = 4) (Marcus et al. 2000). Marcus et al. (2000) reported that, during winter, herbaceous field borders support nearly 3 times more wintering sparrows than mowed field edges. Most (93%) birds detected using field margins were sparrows, although northern cardinals, American robins (*Turdus migratorius*), and yellow-rumped warblers (*Dendroica coronata*) were also observed. In one study area, the most commonly observed sparrows (in rank order) were dark-eyed juncos, song sparrows, white-throated sparrows (*Zonotrichia albicollis*), Savannah sparrows, field sparrows, and chipping sparrows (*Spizella passerina*). Song sparrows, Savannah sparrows, and swamp sparrows were most abundant on a second study area. Field, chipping, and white-throated sparrows were observed only in field borders and not in mowed edges. Field borders may also increase use of interior portions of fields. For example, they may enhance the habitat value of agricultural fields by providing thermal and escape cover, increasing access to food resources in crop stubble, and increasing the proportion of agricultural landscapes available for use by grassland birds.

Conover et al. (2005) estimated density of grassland birds on narrow (7–10-m) and wide (20–40-m) NWSG field borders during winter and summer in an intensive agricultural landscape in the MAV. During winter, Conover et al. (2005) observed 59 bird species using managed NWSG field margins and associated cropland and wooded edges. The most abundant birds detected were mourning dove (18%), European starling (*Sturnus vulgaris*; 16%), red-winged blackbird (7%), common grackle (6%), and northern cardinal (6%). The most abundant sparrows were song sparrow (5%), white-throated sparrow (4%), and swamp sparrow (3%). Winter sparrows were more than 2 times as abundant along narrow field borders (8.1/ha) and more than 7 times more abundant along wide field borders (21.3/ha) as unbordered field margins (3.3/ha). In adjacent crop fields, sparrow densities were similar between non-bordered (1.2/ha) and narrow-bordered margins (1.8/ha). However, sparrow density in crop fields were much higher adjacent to wide-bordered margins (10.6/ha) (Conover et al. 2005).

During the breeding season, 73 species were observed using field margins and associated croplands and wooded edges. The most abundant species were red-winged blackbird (30%), northern cardinal (10%), common grackle (8%), mourning dove (5%), blue jay (5%), indigo bunting (5%), and dickcissel (5%) (Conover et al. 2005). Indigo buntings and northern cardinals were 3 times more abundant in bordered margins. Despite being forest birds, these 2 species exploited field borders for cover, nesting, and foraging. Dickcissel was completely absent from field margins without field borders. Over 3 breeding seasons, 434 total nests of 8 bird species were located in field borders. Red-winged blackbird (78%) and dickcissel (19%) represented the majority of nesting occurrences. Other birds that nested in field borders included northern cardinal, blue grosbeak, yellow-billed cuckoo, indigo bunting, mallard (*Anas platyrhynchos*), northern mockingbird, and northern bobwhite. Birds nested in both narrow and wide field borders, but had disproportionately higher nest densities in wide-bordered margins. The exceedingly low nest density of narrow-bordered field margins implies that increased border width substantially enhanced the attractiveness of field borders as nesting habitat. Overall, apparent nest success in all field borders was low at 22.4% (all years combined). Birds nesting in narrow borders experienced greater nesting success (29.2%) than wide borders (21.6%)(Conover et al. 2005).

Smith (2004) evaluated grassland songbird and northern bobwhite response to fallow herbaceous field borders in the Black Prairie Physiographic Region of east-central Mississippi. In his study, bordered and non-bordered field margins adjacent to large blocks of grass, grass strips, large blocks of woods, and wood strip habitats were sampled. During the breeding season, 53 species were observed using field borders and associated crop and edge habitats. The 6 most abundant species were mourning dove (8%), northern cardinal (7%), indigo bunting (15%), dickcissel (13%), red-winged blackbird (20%), and common grackle (6%). Dickcissel and indigo bunting were nearly twice as abundant where field borders were established, regardless of adjacent plant community type or width. Although indigo buntings are primarily a forest bird, the field borders provided an herbaceous plant community along existing wooded areas, edges making these areas more favorable for foraging, loafing, and nesting sites. Species richness was greater along bordered than non-bordered edges; however, diversity did not differ. Overall bird abundance was greater along bordered linear habitats than along unbordered similar edges. However, addition of field borders along larger patches of grasslands or woodlands did not alter the number of birds using these edges (Smith 2004).



Stripdisking in established grass CRP reduces litter, stimulates germination of annual forbs and legumes, and enhances wildlife habitat value. (Wes Burger)

During winter, 71 bird species were observed in field borders and associated croplands and field margins (Smith et al. in press). The 5 most abundant species were red-winged blackbird (45%), American pipit (*Anthus rubescens*; 11%), song sparrow (7%), Savannah sparrow (6%), and American robin (5%). Across most adjacent plant communities, song, field, and swamp sparrows occurred in higher density on bordered field margins than on unbordered. Song sparrow and swamp sparrow densities were greater where field borders were established along existing grasslands. Song sparrow densities were also greater along field borders adjacent to wooded strip habitats than comparable wooded strips without a field border. All other sparrows (pooled) were 4 times more abundant along bordered edges than along non-bordered (Smith et al. in press).

Upland Habitat Buffer Summary

In intensive agricultural ecosystems of the Southeast, field margins provide some of the only available idle herbaceous plant communities. Herbaceous conservation buffers, such as CP33, can provide important breeding and wintering habitats for grassland and early successional birds. Field borders may provide nesting, foraging, roosting, loafing, and escape cover. During winter, field borders may provide important habitat in southern agricultural systems where most short distance migrants overwinter. The availability of field borders may increase local abundance and species richness. Bird density, species richness, and nest survival may be influenced by border width. Wider borders are more likely to make substantive contributions to avian conservation in agricultural systems.

Conclusions

Although systematic evaluations of wildlife benefits of the CRP in the Southeast are lacking, probable patterns of wildlife occupancy and use may be inferred from studies of similar management practices on non-CRP lands. In contrast to the Midwest where grass establishment practices dominated CRP enrollment, in the Southeast 57% of CRP acres were enrolled in tree planting practices, primarily loblolly pine. During the first 1–3 years following establishment, pine plantations are characterized by low-growing grasses and forbs and provide habitat for grassland and early successional bird species. As the stand matures, herbaceous plants are replaced by shrubs and the developing pines. Avian diversity typically increases with stand age as bird species associated with shrubs colonize the stand. During the pole stage (mid-rotation 15–20 years), when canopy closure eliminates herbaceous ground cover, avian richness generally declines. In mid-rotation stands (15–20 years), thinning, prescribed fire, and selective herbicide may increase herbaceous ground cover, thereby enhancing habitat quality for regionally declining grassland, shrub, and pine–grassland birds. Bottomland hardwood plantings established under the CRP should be expected to support high densities of grassland birds during the first 5 years after establishment. Peak abundance of shrub-successional species will occur 7–15 years after planting. Stands over 20 years of age should support 75–85% of the avian community characteristic of mature bottomland hardwoods. Interplanting of rapidly growing tree species, such as cottonwood, sycamore, or green ash, would dramatically accelerate colonization by forest bird species. Grassland CRP in the Southeast is predominantly enrolled in CP1 or CP10 practices and is primarily established in exotic forage grasses. The wildlife conservation value of these fields has not been evaluated. However, CRP fields planted to native warm-season grasses in the Mid-South support diverse communities that include grassland species of regional conservation priority. Upland conservation buffers provide an important programmatic tool for adding idle herbaceous habitats to intensive agricultural landscapes. Recent studies have demonstrated that upland habitat buffers can support diverse and abundant bird communities on working landscapes during both winter and summer. In the Southeast, plant communities change rapidly through natural succession. Proactive management of extant CRP acreage and selective enrollment of high value cover practices will be required to achieve the types of wildlife habitat benefits associated with the CRP in other regions.

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