United States Department of Agriculture

NRCS Natural Resources Conservation Service

Technical Note No. ____

December 2005

Bird Use of Longleaf Pine Restoration

Issued December 2005

Additional information is available from:

Dr. John P. Carroll (jcarroll@smokey.forestry.uga.edu)
Dr. Robert Cooper (rcooper@smokey.forestry.uga.edu)
Warnell School of Forest Resources
University of Georgia
Athens, GA 30602

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

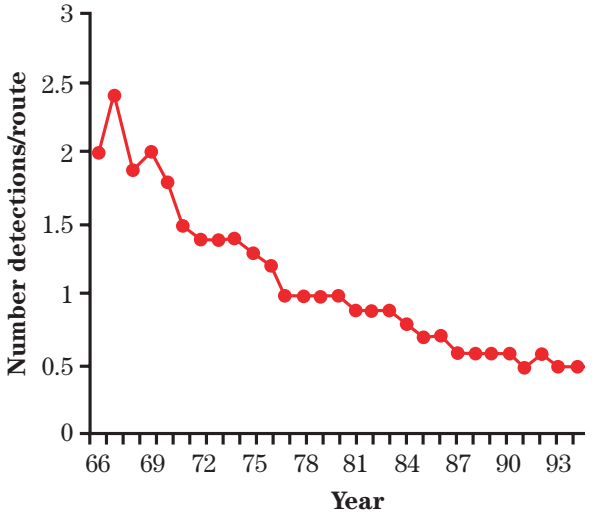
Bird Use of Longleaf Pine Restoration

Background

Early successional songbirds are those species associated with open habitats, such as grasslands, old fields (abandoned farmland), bogs, flood plains, open oak and pine savannas including longleaf pine savannas. Populations of many of these early successional songbirds have been in decline for the last 50 years in eastern North America (fig. 1). The loss of one type of habitat, pine-grassland, has possibly contributed to some of these widespread population declines. These wide-scale population trends indicate a need to manage habitat in such a way as to increase or maintain songbird populations, particularly in the southeastern United States.

Congress approved the Conservation Reserve Program (CRP) as part of the 1985 Farm Bill. The CRP, directed by Farm Services Agency, aims to encourage private landowners to convert unproductive, environmentally sensitive agricultural fields to non-invasive or native grasses, wildlife plantings, trees, filter-strips, or riparian buffers. In 1998, changes in the CRP called for the establishment of a National Longleaf Pine Conservation Priority Area (CPA). The goal of this program is to encourage landowners to re-establish the longleaf pine habitat by converting old agricultural fields to longleaf pine stands. Nearly three-fourths of the counties in Georgia are included in the Longleaf Pine CPA.

Figure 1 The Grasshopper Sparrow is an example of a grassland bird species in the Southeast that has had a steady population decline since 1966, according to the annual Breeding Bird Survey.



The Longleaf Pine CPA provides landowners an opportunity to manage these agricultural fields in such a way that could provide significant habitat for grassland and shrub-scrub birds. In the long-term, proper management should allow these areas to mimic the pine-savannah ecosystems that would continue to provide habitat for these species.

In this document we assess and report on initial vegetative and avian response to the conversion of crop fields to young stands of longleaf pine in Georgia.

Longleaf pines and birds

More than 68 species of birds can be found in the longleaf pine ecosystem, many of which are in decline. The reduction of human-induced and natural disturbances have lead to a decrease in available natural early successional habitat that supports these birds. This has lead to diminishing populations in some species including threatened or endangered species, as well as those which, although still common and widespread, are currently experiencing substantial declines.

The bird community in southeastern regenerated pine stands is determined by both the age of the stand and the methods used for its site preparation. Typically, the number of early successional species is high for several years after planting; however, with typical commercial stands, canopy closure changes the stand's habitat characteristics causing these species to disappear because their associated habitat type no longer exists. The result is a decline in the number of bird species within the stand. When the stand approaches saw timber size and there is more open space in the mid- and understory, the species diversity typically increases again. Restoration of longleaf pines as outlined in the Longleaf Pine CPA might result in a different scenario because planting densities and seedling survival

will be lower than generally found in slash and loblolly pine stands and complete canopy closure would not occur. Therefore, many of the habitat characteristics would remain the same and early successional bird species would not be forced to leave.

Longleaf pine density and canopy closure are not the only habitat components important to early successional bird species. The understory community also provides important feeding and nesting habitat. For example, wiregrass communities are common ground cover in longleaf pine stands and contain a wide variety of plant species important to some species of birds. Grassland and early successional bird species such as Eastern Meadowlark, Eastern Bluebird, Northern Bobwhite, and Mourning Dove are the most abundant species during the establishment period. As the stand develops in the absence of disturbance or fire, the herbaceous understory plants are replaced by shrubby species, and height and structural complexity increase. These vegetational changes are accompanied by corresponding changes in the avian community. Grassland and early successional bird species such as Eastern Meadowlark and Northern Bobwhite decline, whereas shrub-successional species such as Indigo Bunting, Yellow-breasted Chat, Common Yellowthroat, and Prairie Warbler increase, peaking 3 to 10 years after stand establishment. As the stand continues to age, grassland birds disappear, shrub-successional species decline, and forest birds begin to occupy the site. Therefore, although total bird species diversity increases with the age of the stands, species diversity and abundance of declining grassland and early successional bird species decrease.

Restoring longleaf pines in agricultural fields

Restoring longleaf pine ecosystems on old agricultural fields involves more than just planting trees. Years of agricultural management changes other components of the fields' plant communities and the characteristics of the soils. In addition, many years of succession will be required to mimic the animal and plant communities originally present in these areas.

However, it is possible that wildlife communities could respond relatively quickly and positively to management implemented by the Longleaf Pine CPA. Therefore, we examined the avian communities found in 41 restoration fields in southern Georgia (fig. 2). These fields had been entered into the program for 1-2 years. There was a wide diversity of management and histories of the fields that resulted in different seed banks and provided a wide range of herbaceous plant communities.

- Our initial work looked at the birds found in restoration fields using two survey methods, point and line-transect counts, during 2001-2002.
- We also measured the vegetative community using small quadrats to assess what types of plants might be responding to the planting of longleaf pines at low densities in these areas.

Vegetative response

We found more than 70 plant species during both years of our study; however, many were exotic species often associated with agriculture either as cultivated species or as pests (tables 1 and 2). We also found that some important species for wildlife, such as beggar weed or partridge pea, were absent.

Average vegetation height for the 41 fields was calculated for both years of the study with greater height found in 2002 than in 2001. The vegetation structure for all fields was similar in both years. Vegetation was thicker (more plant structure) from the ground to 0.5m and decreased as height increased. The

Figure 2 Young longleaf pine planting

Table 1 Vegetation found in longleaf pine restoration fields. Presence was detected either in the core of the field, the field border, or both.

Common name	Field core	Field border
aster species	x	
baccharis species	x	
bahiagrass	x	
bermudagrass	x	x
bitterweed		x
black cherry	x	
broomsedge	x	
butterfly pea	x	x
camphor weed	x	x
cat briar	x	
Chinaberry	x	
collard green	x	
corn	x	
crabgrass	x	x
croton	x	x
dallisgrass	x	
dandelion	x	
dogfennel	x	
flea bane	x	
Florida pussley	x	x
goldenrod	x	
greenbriar	x	
hawthorn	x	
horseweed	x	x
ironweed	x	
johnsongrass	x	
lamb's quarters	x	x
lespedeza	x	x
lovegrass	x	x
maypop	x	
morning glory	x	x
mushroom	x	x
native grass species	x	x
nightshade	x	x
nutgrass	x	x
oat	x	
oatgrass	x	
palmetto	x	
panicgrass	x	x
partridge pea	x	x
pearl millet	x	
pecan	x	
persimmon	x	
pigweed	x	
pine weed	x	
pokeberry	x	
polyganum	x	
primrose	x	x
rabbit tobacco	x	x
ragweed	x	x
blackberry	x	
rush	x	x
rustweed	x	x
rye	x	
ryegrass	x	x
sandburgrass	x	x
sedge	x	
sicklepod	x	x
slash pine		x
thistle	x	
vaseygrass	x	
verbena	x	
Virginia creeper	x	
watermelon	x	
wheat	x	
wild lettuce	x	
wild plum	x	
wild sorrell	x	
winged sumac	x	
yellow wood sorrell	x	x

Table 2 Percentage of desirable native ground vegetation and exotic pest species in 1-2 year-old longleaf pine restoration fields during 2001-2002 on the Upper Coastal Plain or Georgia (41 fields)

Species	Percentage	Origin
broomsedge	1.60	Native
partridge pea	0	Native
ragweed	5.40	Native
blackberry/raspberry species	0.50	Native
ticktrefoil species	0	Native
bahiagrass	4.70	Exotic
bermudagrass	17.90	Exotic
crabgrass	5.40	Exotic
sicklepod	23.70	Exotic
bare ground	88.30	-
debris	88.30	-
miscellaneous forb	31.70	-
miscellaneous grass	58.50	-
miscellaneous legume	1.60	-
woody species	7.20	-

ground cover for all fields was also somewhat similar in both years as well. Overall, forb cover was greatest and woody cover was lowest in both years. However, the ground cover results in 2002 were slightly more variable than in 2001.

Bird community in restoration fields

During the study we detected four important and declining grassland species. This general group of birds represents the greatest number of declining species, particularly in the Southeast. Grasshopper Sparrows and Eastern Meadowlarks were detected both years, whereas Horned Larks were detected in only in 2001, and Savannah Sparrows were detected only in 2002 (table 3).

Ten shrub-scrub species were detected in 2001, and 15 were detected in 2002. Eastern Kingbirds, Field Sparrows, Indigo Buntings, Mourning Doves, and Northern Bobwhites were counted in both years (fig. 3). Painted Buntings were only found during 1 year. We also observed American Goldfinches, Bobolinks, Common Yellowthroats, Eastern Towhees, and Loggerheaded Shrikes in 2002.

There were 10 non-early successional/shrub-scrub species (other) detected in 2001 of which four have undergone significant population declines. These include Chimney Swift, Brown-headed Cowbird, Red-winged Blackbird, and Common Grackle. Nine of the 20 other bird species found in 2002 have undergone significant population declines. These include the four species detected in 2001, as well as the Barn Swallow, Blue Jay, Brown Thrasher, Northern Mockingbird, and Yellow-billed Cuckoo.

Our analysis of the bird community data suggested that these Longleaf Pine CPA restoration fields are important for a variety of species that likely use the fields for different reasons. For example:

- Grassland species are likely nesting and foraging in these areas because they mimic grasslands.
- Shrub-scrub species are likely nesting in adjacent habitats and foraging in the fields for seeds and insects.
- Dominant species found in the fields were early successional and grassland species.

When we examined the number of birds associated with the different habitats (grassland, shrub-scrub, other) we found that most species were readily detectable, but whether a bird was present in a field varied greatly among species. We also found that shrub-scrub species tended to occur more in the Longleaf Pine CPA fields than the grassland species. Even so, declining grassland species such as the Grasshopper Sparrow still occurred in more than one-fourth of the fields.

The effects of field size, past agricultural practices, and inclusion in Bobwhite Quail Initiative management (BQI, a state program that includes additional management on longleaf fields) were variable. Among the selected species, BQI management, which enhances early successional vegetation through disking of 10m wide strips, seemed to have some positive impact on Blue Grosbeak. Cropping history and cover influenced field use by Field Sparrows and Eastern Meadowlarks. However, vegetative structure was important to both grassland and shrub-scrub species.

Figure 3 The Indigo Bunting is one declining early successional species we found in fields of planted longleaf pines.

Table 3 Songbird species detected during 2 years of surveys in 41 longleaf pine restoration fields. The star represents a significant trend.

Common Name	Habitat type	Population trend
Eastern Meadowlark	Grassland	Declining*
Grasshopper Sparrow	Grassland	Declining*
Horned Lark	Grassland	Declining*
Savannah Sparrow	Grassland	Declining*
American Goldfinch	Shrub-scrub	Declining*
Blue Grosbeak	Shrub-scrub	Increasing*
Bobolink	Shrub-scrub	Declining*
Common Ground Dove	Shrub-scrub	Declining
Common Yellowthroat	Shrub-scrub	Declining*
Eastern Bluebird	Shrub-scrub	Increasing*
Eastern Kingbird	Shrub-scrub	Declining*
Eastern Towhee	Shrub-scrub	Declining*
Field Sparrow	Shrub-scrub	Declining*
Indigo Bunting	Shrub-scrub	Declining*
Loggerhead Shrike	Shrub-scrub	Declining*
Mourning Dove	Shrub-scrub	Declining*
Northern Bobwhite	Shrub-scrub	Declining*
Northern Cardinal	Shrub-scrub	Increasing
Painted Bunting	Shrub-scrub	Declining*
Yellow-breasted Chat	Shrub-scrub	Declining
American Crow	Other	Increasing*
Barn Swallow	Other	Declining*
Blue Jay	Other	Declining*
Brown Thrasher	Other	Declining*
Brown-head Cowbird	Other	Declining*
Cattle Egret	Other	Increasing
Chimney Swift	Other	Declining*
Chipping Sparrow	Other	Increasing
Common Grackle	Other	Declining*
Cooper's Hawk	Other	Increasing*
Eastern Phoebe	Other	Increasing*
Great Egret	Other	Increasing*
Great-crested Flycatcher	Other	Increasing
House Finch	Other	Increasing
Northern Mockingbird	Other	Declining*
Northern Rough-winged Swallow	Other	Increasing
Orchard Oriole	Other	Declining
Purple Martin	Other	Declining
Red-bellied Woodpecker	Other	Increasing*
Red-winged Blackbird	Other	Declining*
Ruby-throated Hummingbird	Other	Increasing*
Summer Tanager	Other	Declining

Restoring longleaf pine on farmland

Although returning ground cover was made up of a variety of vegetation types (forbs, grasses, woody cover) and no one type seemed to dominate, the presence of invasive exotic species is a problem. If pasture grasses are not controlled, they may quickly begin to dominate and alter the quality of the field (figs. 4 and 5).

Our initial survey of songbirds and vegetation in longleaf pine CPA fields suggests that these fields are providing habitat for important and declining grassland and shrub-scrub birds. The relationship between bird species use of fields and herbaceous plant composition is difficult to tease out; however, it is obvious that previous history of these fields has a significant impact on the vegetative community. The paucity of native forbs responding to management suggests that there might be a need to actively re-introduce some of these native plant species.

Evidence from the Breeding Bird Survey, a long-term monitoring program designed to monitor the status and trends of birds in North America, suggests that many grassland-bird species populations are in decline. All of the grassland species we detected have significantly declining populations on a regional scale. Twenty-seven of the shrub- scrub bird species in the United States have significantly declining trends, six of which were detected in our surveys. Our initial results suggest that an early successional longleaf pine community that is managed properly creates valuable habitat for these species and could potentially assist in slowing or halting population declines. Planting or promoting native grasses and forbs, as well as controlling invasive species such as bermudagrass, can assist in making the longleaf pine CPA a significant program that maximizes early successional wildlife habitat.

Recommendations

The Longleaf Pine CPA offers enormous opportunities for the re-establishment of critical habitat for a large number of grassland and shrub-scrub songbirds. However, there are a number of challenges and management opportunities to make it better.

- Ground vegetation management is critical to restoring the value of these stands to birds. Control of agricultural pasture plants such as bahiagrass and bermudagrass is critical to allow native vegetation to compete.

Figure 4 Quadrat sampling of herbaceous vegetation. This quadrat is dominated by an exotic forage grass, bermudagrass. Invasive exotic species will impact community development over time.

Figure 5 Invasive species such as bahiagrass and bermudagrass are common in longleaf pine restoration fields

- Planting strips of native forbs and grasses is important in those areas where seed banks are minimal.
- Complete ground vegetation control should be discouraged unless it is a precursor to the planting of native ground vegetation (fig. 6).
- Larger fields were beneficial to some grassland species in this landscape matrix of open and forested habitats. Therefore, encouragement of larger field sizes in the program is warranted.

Figure 6 1-year-old longleaf pine stand with significant control of vegetation to allow establishment. How this and other management techniques impact future community development is still under investigation.

References

Askins, R.A. 2000. Restoring North America's birds: lessons from landscape ecology. Yale University, New Haven, CT, USA.

Boyer, W.D. 1990. Pinus palustris Mill. longleaf pine. *In* Silvics of North America. Vol. 1, Conifers, tech. Cords. R.M. Burns and B.H. Honkala. USDA Forest Service, Washington, D.C.

Conservation Reserve Program Manual [2-CRP (Rev. 3)]. 2001. Available: *http://www.fb-net.org/crp.htm*.

Darden, T.L., Jr., G.A. Hurst, and R.C. Warren. 1990. Bird community indices and habitat conditions in pine stands. Journal of the Mississippi Academy of Science 35: 1-6.

Dickson, J.G., F.R. Thompson, III, R.N. Conner and K.E. Franzreb. 1993. Silviculture in central and Southeastern Oak-Pine Forests. Pages 245-265 in T.E. Martin and D.M. Finch, Eds. Ecology and Management of Neotropical Migratory Birds. Oxford University Press, New York, NY, USA.

Hardin, E.D. and D.L. White. 1989. Rare vascular plant taxa associated with wiregrass (Arisida stricta) in the southeastern United States. Natural Areas Journal 9: 234-245.

Heard, P.L., A.W. Allen, L.B. Best, S.J. Brady, W. Burger, A.J. Esser, E. Hackett, D.H. Johnson, R.L. Pederson, R.E. Reynolds, C. Rewa, M.R. Ryan, R.T. Molleur, P. Buck. 2000. A Comprehensive Review of Farm Bill Contributions to Wildlife Conservation, 1985–2000, Technical Report. United States Department of Agriculture/Natural Resource Conservation Service/Wildlife Habitat Management Institute. Available: *http://www.ms.nrcs.usda.gov/whmi/crfb.htm*.

Hunter, W.C., D.A. Buehler, R.A. Canterbury, J.L. Confer, and P.B. Hamel. 2001. Conservation of disturbance-dependent birds in eastern North America. Wildlife Society Bulletin 29: 440-455.

Johnson, A.S., and J.L. Landers. 1982. Habitat relationships of summer resident birds in slash pine flatwoods. Journal of Wildlife Management 46: 416-428.

Litvaitis, J.A. 1993. Response of early successional vertebrates to historic changes in land use. Conservation Biology 7: 866-873.

Litviatis, J.A. D.L. Wagner, J.L. Confer, M.D. Tarr, and E.J. Snyder. 1999. Early-successional forest and shrub-dominated habitats: landuse artifact or critical community in the Northeastern United States/Northeast Wildlife 54: 101-118.

Rounsaville, M.G. 1989. Woodpeckers, recreationists and lumbermen cheer the success of artificial regeneration of longleaf pine. In Proceedings of the National Silviculture Workshop: Silviculture for all resources; 1987 May 11-14; Sacramento, CA. Washington, D.C.: U.S. Department of Agriculture, Forest Service, Timber Management: 104-114.

Robbins, C.S., D.K Dawson, and B.A Dowell. 1989. Habitat Area Requirements of Breeding Forests Birds of the Middle Atlantic States, Wildlife Monographs 103: 1-34.

Sauer, J.R., J.E. Hines, I. Thomas, J. Fallon, and G. Gough. 2000. The North American Breeding Bird Survey, results and analysis 1966-1999. Version 98.1. United States Geological Survey, Patuxent Wildlife Research Center, Laurel, MD, USA.

United States Department of Agriculture. 2001. Farm Bill Fact Sheet. Available: *http://www.usda.gov/farmbill/cons.htm.* Johnson, A.S., and J.L. Landers. 1982. Habitat relationships of summer resident birds in slash pine flatwoods. Journal of Wildlife Management 46: 416-428.