



Birds of the Southeastern United States: A Historical Perspective

James G. Dickson

Historic freshwater aquatic and wetland ecosystems of the southeastern United States were predominantly rivers and streams and associated natural bottomland forests. These systems have been drastically altered through the creation of reservoirs via damming, through other alterations of water courses and their associated forests, and through conversion to other uses. In this chapter I will address historical aspects of bird communities of southeastern aquatic systems by considering the original composition of forested wetlands, the changes that have been wrought to them, and how these changes have most probably influenced bird communities.

BOTTOMLAND FORESTS

Pre-colonial bottomlands generally were portrayed by early naturalists as diverse landscapes, where forests of varying tree ages were interspersed with openings (Dickson, 1991). These forests contained a greater variety of tree ages than commonly found in present-day second-growth forests, and they contained many big and old trees, as well as decaying and fallen trees. Mast production in mature forests was high.

Pre-colonial forests typically were not stable, as they were influenced by a mixture of natural plant succession and other factors such as Native Americans, flooding, insects, diseases, ice and wind storms, and fires (Figure 1). Disturbance had, and has today, a major influence on the composition of southeastern forests. As such, the influences of



Figure 1. A flooded river bottom. Historic southern river systems have been extensively modified with accompanying effects on associated avian fauna. In many areas, human modifications to waterways and wetlands have reduced or eliminated natural cycles of seasonal flooding.

disturbance frequently created forest openings and set back plant succession.

Oak (*Quercus*)-gum (*Nyssa*)-cypress (*Taxodium*) forests predominated in the pre-colonial bottoms, though exact forest composition depended on site and other influences (Putnam et al., 1960). Eight general forest types have been recognized in the region. Cypress-tupelo gum (*N. aquatica*) and overcup oak (*Q. lyrata*)-bitter pecan (*Carya aquatica*) forests were widely distributed throughout the wettest areas. Cottonwood (*Populus*) and willow (*Salix*) type forests usually pioneered river fronts where hackberry (*Celtis*)-elm (*Ulmus*)-ash (*Fraxinus*) typically succeeded them. Sweetgum (*Liquidambar styraciflua*)-water oak (*Q. nigra*) forests were found throughout bottoms in areas with intermediate levels of moisture. The white oak-red oak-miscellaneous type forests occupied the higher bottom-land ridges. Other moist site forests such as bays, pocosins, and wet prairies occurred in eastern parts of the region. Palmetto was dense in places, and cane (*Arundinaria gigantea*) formed dense thickets. In 1900, President Theodore Roosevelt described miles of cane on ridges in Louisiana bottoms so dense that other vegetation was choked out and cutting with a bush-knife was the only way to gain access (Roosevelt, 1908). Detailed descriptions of some specific remnant old-growth forests were presented by Wharton (1977).

Since pre-colonial times, there have been extensive losses of bottomland forests of the Southeast. Of the original ten million ha (24,704,661 acres) of Mississippi River delta forests only about 3 million ha (7,412,898 acres) remained by the early 1970s (Sternizke, 1976). Most of the forests have been converted to row crops or pasture. In some locations,

reservoirs have inundated vast areas of bottomlands. For example in eastern Texas, Toledo Bend and Sam Rayburn reservoirs now occupy more than 100,000 ha (247,096 acres), much of which was once bottomland hardwood forests. From 1975 to 1986, remaining bottomland forests in eastern Texas declined by 12 percent (McWilliams and Lord, 1988). Likewise, the entire Tennessee River system has been dammed, resulting in extensive losses of native hardwood forests. Man has significantly influenced the forests that remain. Almost all have been repeatedly harvested, and stands existing today are typically dominated by trees not selected previously for harvest and by species favored by high natural regeneration capabilities.

STAND SUITABILITY FOR BIRDS

Bottomland forest stands vary in suitability as bird habitat depending on stand structure and other characteristics. In general, bird communities are associated with stand and foliage characteristics (Shugart and James, 1973). Hydroperiod also influences bird habitat and bird communities in hydric forests (Swift et al., 1984). In these forests, flooding provides nutrients and soil into riparian systems and influences physical site characteristics including vegetation and animal communities. Bottomland ridges, formed from past flooding and soil accretion, normally have diverse vertical foliage layers and diverse bird faunas. Low lying sites that are frequently flooded and have little understory and limited vertical structure support a less diverse bird community. In these areas, extended flooding during the growing season can kill trees and eliminate most foliage near the ground. This is detrimental to ground-nesting birds, such as Kentucky warblers (*Oporornis formosus*), and wintering ground foragers, such as white-throated sparrows (*Zonotrichia albicollis*) (Dickson and Noble, 1978). Conversely, extended flooding may create habitat for aquatic birds, such as the double-crested cormorant (*Phalacrocorax auritus*). Flooding may also help protect colonial nesters from mammalian predators, and kill trees which may provide woodpecker and wood duck cavity nests and woodpecker foraging sites in the short-term.

BREEDING BIRD COMMUNITIES

Historic riparian forests probably harbored abundant and diverse breeding bird communities as indicated by recent studies of bird communities in mature stands. For instance, in a relatively recent study of Louisiana oak-gum floodplain birds, about half the species of summer birds were neotropical migrants and about half were permanent residents (Dickson, 1978a). The proportion of migrant breeders was lower than that found in more northerly, and seasonally harsher areas.

In eastern Texas, estimated bird density was higher in a mature bottomland hardwood stand (1,050 per km² = 2,720 per square mile) than in a pine (835 per km² = 2,163 per square mile) or pine-hardwood stand (422 per km² = 1,093 per square mile) (Anderson, 1975). Bird species richness and diversity were similar in the bottomland hardwood and pine-hardwood stands, but higher than in the pine stand. Results of bird censuses from six pine, four pine-hardwood, and three bottomland stands in the Louisiana-East Texas area yielded similar results (Dickson, 1978b). Bird densities in the mature bottomland hardwoods were two to four times greater than densities in the upland pine and pine-hardwoods of different ages. Flooded forests also supported more birds than upland forests in

the Midwest (Stauffer and Best, 1980) and in New England (Swift et al., 1984).

Riparian oak-gum-cypress forests provided and still provide important or critical habitat for many species which have evolved with these forests (Dickson 1978a, 1978b, 1988; Hamel, 1992). Breeding bird censuses (Dickson et al., 1980) showed that yellow-billed cuckoos (*Coccyzus americanus*), Acadian flycatchers (*Empidonax virescens*), tufted titmice (*Parus bicolor*), Carolina wrens (*Thryothorus ludovicianus*), red-eyed vireos (*Vireo olivaceus*), and northern cardinals (*Cardinalis cardinalis*) were consistently abundant in mature oak-gum-cypress forests. Other species regularly inhabit these stands (Table 1), and some have strong associations with this forest habitat. Many long-legged waders nest and forage in aquatic woodlands. Wood storks (*Mycteria americana*), which are now endangered, nest in tall cypress and hardwoods, and feed in associated aquatic systems. Purple gallinules (*Porphyrio martinica*) and common moorhens (*Gallinula chloropus*) also are found in aquatic habitats.

Several raptors inhabit riparian hardwood forests. Mississippi (*Ictinia mississippiensis*) and American swallow-tailed (*Elanoides forficatus*) kites, bald eagles (*Haliaeetus leucocephalus*), and ospreys (*Pandion haliaetus*) frequent this habitat, and red-shouldered hawks (*Buteo lineatus*) and barred owls (*Strix varia*) prefer forested wetlands. Bald eagle and osprey populations previously have declined, apparently due to egg shell thinning caused by pesticide accumulations. Restriction of pesticides seems to have benefited these, and probably other raptors as well.

Many species of birds excavate cavities in decayed trees for nests, and other birds use already excavated cavities. Decayed wood also harbors avian arthropod prey. There was probably a high density of cavity nesters in the pristine forests, where decayed and dead trees were numerous (Tomialojc, 1991). For example, in the early 1900s in Louisiana, Theodore Roosevelt thought that woodpeckers were characteristic species of the bottoms (Roosevelt, 1908). The ivory-billed woodpecker (*Campephilus principalis*), now probably extinct in North America, once thrived in old oak-gum forests, foraging on recently dead trees (Tanner, 1942). Cavity nesting birds, such as American kestrel (*Falco sparverius*), great crested flycatcher (*Myiarchus crinitus*), and red-headed woodpecker (*Melanerpes erythrocephalus*), were abundant in early forests in eastern Texas (Truett and Lay, 1984).

Many vireos and warblers associated with mature bottomland forests must have been abundant in pre-colonial forests. Red-eyed and yellow-throated vireos (*Vireo flavifrons*) inhabit canopy foliage and white-eyed vireos (*Vireo griseus*) inhabit low, shrubby foliage in riparian forests. Many warblers live in riparian habitats, some with special affinities. Prothonotary (*Protonotaria citrea*), Swainson's (*Limnothlypis swainsonii*), northern parula (*Parula americana*), Kentucky, and hooded (*Wilsonia citrina*) warblers are strongly associated with bottomland habitat. Prothonotary warblers nest in cavities, often in small flood-killed trees. Northern parulas nest in Spanish moss (*Tillandsia usneoides*) in moist woods in the South. The Swainson's warbler is associated primarily with understory thickets of southern river floodplains and the southern Appalachian Mountains (Meanly, 1971). Habitat of the rare (or extinct) Bachman's warbler (*Vermivora bachmanii*) includes bottomlands and headwater swamps subject to disturbances (Hooper and Hamel, 1977). Both Swainson's and Bachman's warblers were historically associated with cane thickets, which were once extensive in southern bottomland forests (Meanly, 1971). Kentucky and hooded warblers usually are found in the moist understory of bottomland hardwoods

(Dickson and Noble, 1978), as well as in other habitats. Other warblers often found in forested riparian stands include black-and-white (*Mniotilta varia*), worm-eating (*Helminthos vermivorus*), yellow-throated (*Dendroica dominica*), ovenbird (*Seiurus aurocapillus*), American redstart (*Setophaga ruticilla*), and Louisiana waterthrush (*Seiurus motacilla*) (Hamel et al., 1982).

Bird community composition of forest openings and young brushy stands, which were probably common in pre-colonial forests, would have been quite different than that of mature stands. Species associated with early successional vegetation, such as the yellow-breasted chat (*Icteria virens*), indigo bunting (*Passerina cyanea*), painted bunting (*Passerina ciris*), prairie warbler (*Dendroica discolor*), common yellowthroat (*Geothlypis trichas*), white-eyed vireo, and northern cardinal (*Cardinalis cardinalis*) would have been characteristic. William Bartram in his travels through the pre-colonial Southeast noted birds associated with early successional stands, such as the yellow-breasted chat and blue linnet (indigo bunting) (Van Doren, 1928).

WINTER BIRD COMMUNITIES

Densities of wintering birds probably were very high in historic mature forests. Many species were probably attracted to the diverse forests and the abundant, high-energy acorns produced by large oaks. The oak-dominated bottoms at one time supported over one billion passenger pigeons (Truett and Lay, 1984). The demise of old-growth forests due to logging and overharvest coupled with the species' social reproductive behavior, probably caused this pigeon's extinction. Carolina parakeets were widely distributed in southern old-growth forests, where they fed on the fruits of giant bald cypress and other species (Van Doren, 1928). The depredation of settlers' crops and an unwary nature rendered the parakeet vulnerable to the gun (Truett and Lay, 1984).

Recent studies have shown that mature southern riparian forests support dense bird populations during the critical winter period. Many species, such as common grackles (*Quiscalus quiscula*) and red-headed woodpeckers, feed extensively on acorns in oak stands. For example, in a mature oak-gum stand in Louisiana, monthly estimated winter bird populations ranged from 1,400 to 2,000 birds per km² (3,626 to 5,180 per square mile) (Dickson, 1978a). Winter visitors dominated the bird community, comprising 73 to 89 percent of the total number of birds, and 55 to 60 percent of the total number of species. Mean winter density of white-throated sparrows approached 500 per km² (1,295 per square mile). Winter monthly population estimates for common grackles varied between approximately 100 and 1,000 per km² (259 and 2,590 per square mile) (Dickson, 1978a). Red-headed woodpeckers, which inhabit forest openings during the breeding season, were common during winter. Yellow-bellied sapsuckers (*Sphyrapicus varius*), blue jays (*Cyanocitta cristata*), brown thrashers (*Toxostoma rufum*), American robins (*Turdus migratorius*), hermit thrushes (*Catharus guttatus*), and ruby-crowned kinglets (*Regulus calendula*) were other common winter birds.

WILD TURKEY

The diverse forests of the pre-colonial Southeast supported abundant wild turkeys. In the late 1700s, William Bartram described the countryside near coastal St. Augustine as a

Table 1. List of bird species present in southern oak-gum-cypress forests.¹**Permanent Residents**

double-crested cormorant	pileated woodpecker
American anhinga	red-bellied woodpecker
great blue heron	red-headed woodpecker
green heron	hairy woodpecker
little blue heron	downy woodpecker
cattle egret	great crested flycatcher
great egret	eastern phoebe
snowy egret	blue jay
tricolored heron	American crow
black-crowned night-heron	fish crow
yellow-crowned night-heron	Carolina chickadee
wood stork	tufted titmouse
glossy ibis	white-breasted nuthatch
white ibis	Carolina wren
wood duck	marsh wren
turkey vulture	gray catbird
black vulture	brown thrasher
Cooper's hawk	blue-gray gnatcatcher
red-shouldered hawk	white-eyed vireo
short-tailed hawk	black-and-white warbler
bald eagle	northern parula
osprey	yellow-throated warbler
wild turkey	prairie warbler
limpkin	ovenbird
black rail	common yellowthroat
king rail	American redstart
purple gallinule	eastern meadowlark
common moorhen	red-winged blackbird
mourning dove	boat-tailed grackle
eastern screech-owl	common grackle
great horned owl	brown-headed cowbird
barred owl	northern cardinal
ruby-throated hummingbird	indigo bunting
belted kingfisher	painted bunting
northern flicker	rufous-sided towhee

Breeding Season Residents

American swallow-tailed kite	eastern wood-pewee
Mississippi kite	barn swallow
yellow-billed cuckoo	purple martin
chimney swift	wood thrush
Acadian flycatcher	yellow-throated vireo

Table 1. Continued.

Breeding Season Residents — continued

red-eyed vireo	Louisiana waterthrush
prothonotary warbler	Kentucky warbler
Swainson's warbler	yellow-breasted chat
worm-eating warbler	hooded warbler
Bachman's warbler	summer tanager
black-throated green warbler	blue grosbeak

Winter Residents

mallard	ruby-crowned kinglet
hooded merganser	water pipit
sharp-shinned hawk	cedar waxwing
northern harrier	European starling
Virginia rail	solitary vireo
sora	orange-crowned warbler
yellow rail	yellow-rumped warbler
American woodcock	northern waterthrush
short-eared owl	rusty blackbird
whip-poor-will	purple finch
yellow-bellied sapsucker	pine siskin
tree swallow	Savannah sparrow
brown creeper	grasshopper sparrow
house wren	Le Conte's sparrow
winter wren	white-throated sparrow
sedge wren	fox sparrow
American robin	Lincoln's sparrow
hermit thrush	swamp sparrow
golden-crowned kinglet	song sparrow

¹ Modified from Hamel et al. (1982), scientific names of listed birds can be found in American Ornithologists' Union (1983).

“universal shout” for hundreds of miles from the turkey cocks at dawn (Van Doren, 1928; page 89). Native Americans in the Southeast apparently had little trouble harvesting these birds, and turkeys were used for food and adornments (Mosby and Handley, 1943). Early colonists made extensive use of turkeys as a food staple (Mosby and Handley, 1943). Turkeys remained abundant into the nineteenth century when hunting for market became common. By the late 1800s, serious declines had occurred throughout virtually all of the southeastern range of the eastern wild turkey.

The wild turkey has made a remarkable comeback, and now numbers some 4 million in the United States. Better protection, maturing of the forests, and trap and transplant of wild turkeys have been responsible for this return (Figure 2).

Present riparian forests are prime habitat for the wild turkey as they often provide the



Figure 2. Wild turkey, apparently very abundant in much of the pre-colonial forests, were exploited and extirpated from most of the region. With the help from trap-transplant programs, wild turkeys have now been restored throughout much of the Southeast.

only mature forested habitat in substantially altered landscapes. Wild turkeys use stream-side zones extensively as travel corridors and foraging areas, where they feed on soft and hard mast (Burk et al., 1990).

WATERFOWL

Riparian forests are prime habitat for several waterfowl species during some life stages. Wood ducks, appropriately named, are associated closely with forested wetlands. They wintered by the millions in southern flooded bottoms, and were drastically reduced by indiscriminate harvest in the last part of the 1800s and early 1900s. Since this time they have recovered substantially (Bellrose, 1990). Wood ducks nest in tree cavities. Prior to the nesting season females feed extensively on high protein macroinvertebrates in flooded forests (Batema et al., 1985). Although mallards do not normally nest in forested wetlands in the South, they winter regularly there. Mallards, as well as wood ducks, feed extensively on acorns produced in many bottomland oak stands, and certainly these species have suffered as a result of the loss of bottomland hardwoods. The hooded merganser (*Lophodytes cucullatus*), green-winged teal (*Anas crecca*), gadwall (*Anas strepera*), and American wigeon (*Mareca americana*) are other species that use flooded bottoms during winter.

IMPOUNDMENTS

While forest-associated birds have dwindled as their wooded habitat has been reduced, other species associated with aquatic systems probably have benefited from impoundments. Impoundments have drastically altered duck habitat. Suitability for waterfowl depends on the water regime, which controls aquatic vegetation (duck habitat) and determines duck species distribution and relative abundance (Johnson and Swank, 1981). As a result of the conversion of flooded bottoms to reservoirs, some species of diving ducks, such as ring-necked ducks (*Aythya collaris*), canvasbacks (*Aythya valisineria*), buffleheads (*Bucephala albeola*), and ruddy ducks (*Oxyura jamaicensis*) may have benefited from the increase in open water conditions. In eastern Texas now, canvasbacks and ring-necked ducks are very abundant on reservoirs during winter and spring (M. Conway, Stephen F. Austin State University, pers. comm.). Before reservoirs existed in this region, these birds probably were uncommon.

Bald eagles, white pelicans (*Pelecanus erythrorhynchos*), and double-crested cormorants feed extensively on forage fish in open water and appear to have increased in numbers in recent years. Great egrets (*Casmerodius albus*), great blue (*Ardea herodias*), snowy (*Egretta thula*), and tricolored herons (*Egretta tricolor*), and other birds forage regularly around the extensive edges of impoundments, as well as a variety of other shallow water sites. American coots (*Fulica americana*) use lakes with aquatic vegetation and appear to have increased as a result of the creation of impoundments. For example, American coots are now very abundant on East Texas reservoirs during all seasons except summer (M. Conway, Stephen F. Austin State University, pers. comm.). Forster's terns (*Sterna forsteri*) and ring-billed gulls (*Larus delawarensis*) forage regularly on man-created, large impoundments. Also, some small shore birds, such as least sandpipers (*Calidris minutilla*) and killdeer (*Charadrius vociferus*) use impoundments when the shallow edges are exposed. These two species are very common wintering birds now along edges of East Texas reservoirs (B. Willhouse, Stephen F. Austin State University, pers. comm.). Wintering horned (*Podiceps auritus*) and pied-billed (*Podilymbus podiceps*) grebes also make regular use of man-made impoundments. Extensive flooding kills trees, and some cavity nesting species, such as red-headed woodpeckers, tree swallows (*Tachycineta bicolor*), and great crested flycatcher, use flood-killed trees for nesting sites until they fall.

CONCLUSIONS

Freshwater ecosystems throughout the Southeast have been drastically altered. While there were abundant and diverse bird communities in historic riparian forests, bird communities changed as forests were cut and converted to other land uses or allowed to develop into second-growth forests. Species that are faring well today include those associated with open water, some generalists that have benefited from forest cutting, and birds benefiting from protection and restoration. Forest-associated species, particularly those with low tolerance to human activities, low reproductive rates, or with narrow niches, have declined in numbers, and a few have become extinct. To secure these delicate ecosystems and their components, the few remaining old-growth forests should be maintained in an old-growth state, especially large remaining areas and old-growth corridors. In addi-

tion, some second-growth forests should be allowed to mature and some early successional stands should be maintained where they are limited. Representative species that have been extirpated should be restored. Ecosystem research should be expanded to increase our knowledge of the complex systems as well as to develop methods to protect and maintain their function and values.

REFERENCES

- American Ornithologists' Union. 1983. *Check-list of North American birds, 6th Edition*. Port City Press, Baltimore, MD.
- Anderson, R. M. 1975. Bird populations in three kinds of eastern Texas forests. M.S. Thesis, Stephen F. Austin State University, Nacogdoches, TX.
- Batema, D. L., G. S. Henderson, and L. H. Fredrickson. 1985. Wetland invertebrate distribution in bottom land hardwoods as influenced by forest type and flooding regime. In *Proceedings of the Central Hardwoods Conference*. J. O. Dawson, and K. A. Majeruf (eds.). Department of Forestry, University of Illinois, Urbana-Champaign, IL, p. 196-202.
- Bellrose, F. E. 1990. The history of wood duck management. In *Proceedings 1388 North American Wood Duck Symposium*. L. H. Fredrickson, G. V. Burger, S. P. Havera, D. A. Grober, R. E. Kirby, and T. S. Taylor (eds.). St. Louis, MO, p. 13-20.
- Burk, J. D., G. A. Hurst, D. R. Smith, B. D. Leopold, and J. G. Dickson. 1990. Wild turkey use of streamside management zones in loblolly pine plantations. *Proceedings of the National Wild Turkey Symposium* 6:84-89.
- Dickson, J. G. 1978a. Seasonal bird populations in a south central Louisiana bottom-land hardwood forest. *Journal of Wildlife Management* 42:875-883.
- Dickson, J. G. 1978b. Forest Bird communities of the bottom land hardwoods. In *Proceedings of the Workshop: Management of Southern Forests for Nongame Birds*. R. M. DeGraaf (technical coordinator). General Technical Report SE-14, U.S. Forest Service, Asheville, NC, p. 66-73.
- Dickson, J. G. 1988. Bird communities in oak-gum-cypress forests. In *Bird Conservation 3*. J. A. Jackson (ed.). International Council for Bird Preservation, University of Wisconsin Press, Madison, WI, p. 51-62.
- Dickson, J. G. 1991. Birds and mammals of pre-colonial southern old-growth forests. *Natural Areas Journal* 11:26-33.
- Dickson, J. G., R. N. Conner, and J. H. Williamson. 1980. Relative abundance of breeding birds in forests in the Southeast. *Southern Journal of Applied Forestry* 4: 174-179.
- Dickson, J. G., and R. E. Noble. 1978. Vertical distribution of birds in a Louisiana bottom land hardwood forest. *Wilson Bulletin* 90: 19-30.
- Hamel, P. B. 1992. Land manager's guide to birds of the South. The Nature Conservancy, Chapel Hill, NC.
- Hamel, P. B., H. E. LeGrand, J., M. R. Lennartz, and S. A. Gauthreaux, J. 1982. Bird-habitat relationships on southeastern forest land. General Technical Report SE-22, U.S. Forest Service, Asheville, NC, 417 p.
- Hooper, R. G., and P. B. Hamel. 1977. Nesting habitat of Bachman's Warbler — A review. *Wilson Bulletin* 89:373-379.

- Johnson, F. A., and W. G. Swank. **1981**. Waterfowl habitat selection on a multipurpose reservoir in East Texas. *Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies* **35**:38-48.
- McWilliams, W. H., and R. G. Lord. 1988. Forest resources of East Texas. Resource Bulletin SO-136, U.S. Forest Service, New Orleans, LA, 61 p.
- Meanly, B. 1971. Natural history of the Swainson's Warbler. North American Fauna Number 69, U.S. Department of the Interior, Washington, D.C., 90 p.
- Mosby, H. S., and C. O. Handley. 1943. The wild turkey in Virginia: Its status, life history and management. Virginia Commission of Game and Inland Fisheries, Richmond, VA.
- Putnam, J. A., G. M. Furnival, and J. S. M&night. 1960. Management and inventory of southern hardwoods. Agriculture Handbook 18 1, U.S. Forest Service, U.S. Government Printing Office, Washington, D.C.
- Roosevelt, T. 1908. In the Louisiana Canebrakes. Scribners Magazine. [Reprinted in 1962 as Wildlife Education Bulletin 59, Louisiana Wildlife and Fisheries Commission, Baton Rouge, LA, 11 p.]
- Shugart, H. H., Jr., and D. James. 1973. Ecological succession of breeding bird populations in northwestern Arkansas. *Auk* **90**:62-77.
- Stauffer, D. F., and L. B. Best. 1980. Habitat selection by birds of riparian communities: Evaluating effects of habitat alterations. *Journal Wildlife Management* **44**: 1-15.
- Sternitzke, H. S. 1976. Impact of changing land use on delta hardwood forests. *Journal of Forestry* **74**:25-17.
- Swift, B. L., J. S. Larson, and R. M. DeGraaf. 1984. Relationship of breeding bird density and diversity to habitat variables in forested wetlands. *Wilson Bulletin* **96**:48-59.
- Tanner, J. T. 1942. The Ivory-billed woodpecker. National Audubon Society Resource Paper Number 1, National Audubon Society, New York, NY, 111 p.
- Tomialojc, L. 1991. Characteristics of old growth in the Bialowieza Forest, Poland. *Natural Areas Journal* **11**:7-18.
- Truett, J. C., and D. W. Lay. 1984. *Land of Bears and Honey: A Natural History of East Texas*. University of Texas Press, Austin, TX.
- Van Doren, M. (ed.). 1928. *The Travels of William Bartram*. Dover Publications, New York, NY.
- Wharton, C. H. 1977. The natural environments of Georgia. Georgia Department of Natural Resources, Atlanta, GA.

