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Neotropical Migratory Birds of the Kisatchie National Forest, Louisiana: Abstracts for Selected Species and Management Considerations

Robert X. Barry, Bernard R. Parresol, and Margaret S. Devall

SUMMARY

An extensive review of the literature on 13 species of neotropical migratory birds (NTMB) that breed on the U.S. Department of Agriculture, Forest Service, Kisatchie National Forest (KNF), in Louisiana, was the basis for this publication. These species were selected because they are known to breed on the KNF and represent a cross section of the various taxa of NTMB that exist in the forest. Included for each of the species are sections on distribution, biology, habitats, and density. Also discussed are population trends for the selected species and forest management practices that may influence distribution and abundance of NTMB. In addition, some areas of research that are suggested by this review and that would help fill gaps in the present state of knowledge for the selected birds are identified.

ACKNOWLEDGMENTS

The authors thank David Pashley of the Louisiana Nature Conservancy for providing information on the breeding neotropical migratory birds of the U.S. Department of Agriculture, Forest Service, Kisatchie National Forest, from which the species were selected for abstracting. Special thanks are extended to Gary Lester and Bill Vermillion of the Louisiana Department of Wildlife and Fisheries' Natural Heritage Program for contributing survey data on breeding birds, from which Statewide distributions of the abstracted species were determined. Thanks also to artist Lisa L. Barbé for the fine color illustrations. Finally, appreciation goes to USDA Forest Service personnel Jim Dickson, Richard Conner, Marq Webb, Alan Williamson, and Jack Hilland to USDI Fish and Wildlife Service biologist William "Chuck" Hunter for reviewing the manuscript and making valuable comments and suggestions. This research was supported by Forest Service funding for biodiversity research and forest management research.

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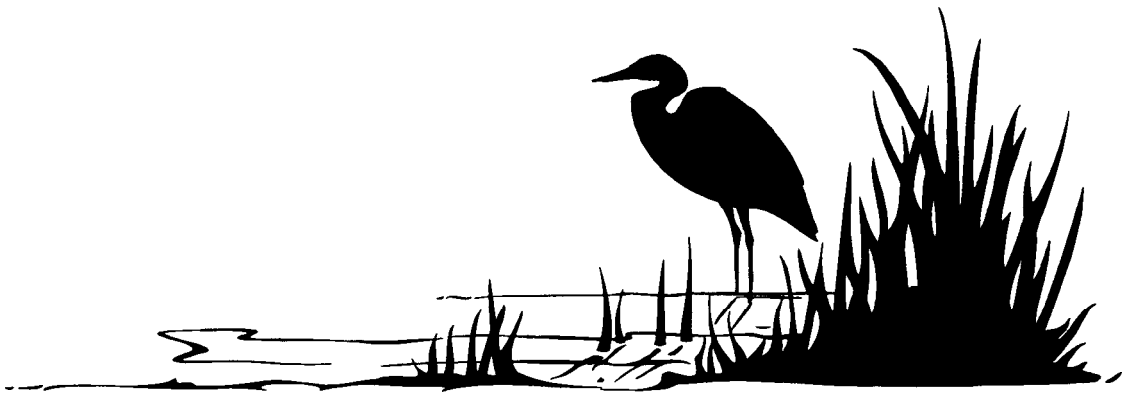
Cover art: Red-eyed vireo (*Vireo olivaceus*)



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Abstracts for Selected Species and Management Considerations

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INTRODUCTION

Recently, analyses of data on breeding-bird populations have indicated that populations of neotropical migratory birds (NTMB) have experienced declines in many areas of North America (Robbins and others 1986). The cumulative effects of forest fragmentation on the breeding grounds, tropical deforestation in wintering areas, and other habitat changes have been advanced as primary factors responsible for these declines. The U.S. Department of Agriculture, Forest Service, has been identified as a lead agency in the National Fish and Wildlife Foundation's Neotropical Migratory Bird Conservation Program, primarily because the National Forest System provides the largest amount of breeding habitat for forest-dwelling neotropical migrants under a single ownership. In support of the Foundation's program and the Forest Service's role, this report was prepared to synthesize available information and identify life history and other factors useful in managing NTMB, with a specific focus on some species that breed on the U.S. Department of Agriculture, Forest Service, Kisatchie National Forest (KNF), located in Louisiana. For a comprehensive overview of the conservation program, analyses of population trends, and factors responsible for declines, the reader is encouraged to examine the recent report by Finch (1991).

In the interest of reducing repetitious citation, scientific names of plants mentioned in the text are given in appendix A. Density estimates of each bird species have been standardized to the number of pairs per square kilometer because of the diverse nature of the units presented in the literature. Though some of these density estimates may seem extremely high, it should be noted that some of them have been converted from territory sizes and often apply only to small study areas but, nonetheless, are relative.

Population trends, effects of forest management practices, and research and information needs suggested by gaps in the available literature are provided following species accounts. Also included is an index of references cited for each species (appendix B) that should be cross-referenced to the literature cited section.

Although the authors attempted to obtain as much literature as possible on each species, many sources were undoubtedly overlooked due to the widely scattered nature of ornithological literature. Further, sources of information contained in ongoing research and in unpublished accounts such as theses and dissertations go largely untapped. The distribution maps in this report for occurrence within Louisiana were compiled from survey data on breeding birds provided by the Louisiana Department of Wildlife and Fisheries' Natural Heritage Program and are by no means complete. The maps do, however, give the reader a general idea of the distribution of species. Appendix C provides a reference map for the Louisiana Parishes listed in the text.

KISATCHIE NATIONAL FOREST

A Brief History

Following the widespread cut-and-burn logging operations in the early 1900's, purchases of cutover lands by the Federal Government began in 1929 with the Catahoula and Kisatchie purchase units. In 1930, the Kisatchie was proclaimed a national forest by the Secretary of Agriculture for administrative purposes. Acquisitions in 1934 and 1935 quadrupled the forest size, and in 1936 President Franklin D. Roosevelt designated all lands in the Catahoula, Evangeline, Kisatchie, and Vernon divisions as the Kisatchie National Forest. By 1944, the forest was composed of some 215,038 ha. Further purchases from timber companies, small landowners, and other small special purchases along with transfers from the U.S. Army and other exchanges brought the total in 1985 up to 241,914 ha.

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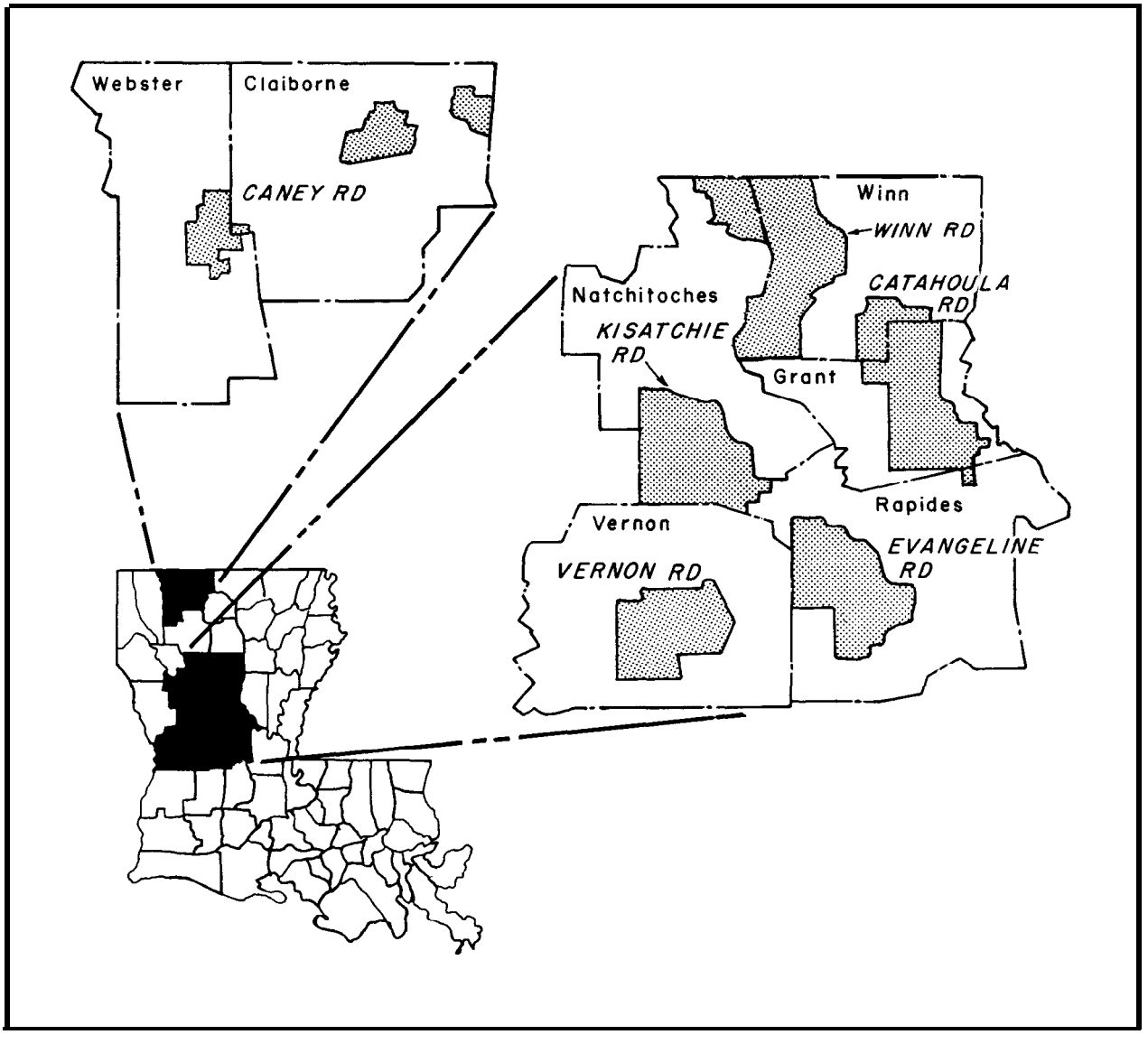


Figure 1.— *Location of the six ranger districts of the Kisatchie National Forest, Louisiana (RD=Ranger District). Parish names are given in small type.*

Organization

The KNF is composed of six districts situated mainly in central Louisiana (fig. 1). The entire forest is divided into 24 management areas to facilitate planning and management of the diverse resources (table 1). The projected timber sales for 1991-95 from the 10-year timber sale program in the Final Land and Resource Management Plan: Kisatchie National Forest (USDA FS 1985) average about 148.7 million board feet (Scribner C) annually for all districts combined (table 2). Actual sale levels have been reduced considerably, however, for several reasons, including a new policy for protecting the endangered red-cockaded woodpecker (*Picoides borealis*).

Forest types found on the KNF are summarized by district in table 3 and illustrated in figure 2. The various forest types have been simplified by being combined into three categories, which should be more useful for the management of NTMB. Although pine-dominated stands and shrub-scrub and old-field habitat types are important to some NTMB, most of the species of concern rely primarily on hardwood and mixed pine-hardwood stands. Of particular note is that, overall, only about 20 percent (40,289 ha) of the total forest composition is composed of hardwood and mixed pine-hardwood stands. In reality, the available area of suitable habitat is probably much less due to the constant modification of stand age structures by harvest operations.

Management indicator species (MIS) in the Final Land and Resource Management Plan: Kisatchie National Forest (USDA FS 1985) (fig. 3) were selected from a complete listing of the known vertebrates on

the KNF. Species used as MIS were chosen because they are permanent residents that depend on forested habitats. By guiding management practices to provide for the home range and habitat requirements of each MIS, the maintenance of habitat structure can presumably be assured, which benefits other species associated with that niche.

In reality, however, these species (with the exception of the red-cockaded woodpecker) are habitat generalists that respond to management practices at the stand level. Many other species have specific needs at the landscape level. Although the traditional stand level approach to wildlife management is changing, what is needed for effective management for NTMB is the addition of an ecosystem and biodiversity layer to the management decisionmaking process.

In the following pages, an attempt has been made to summarize the available literature and identify biological characteristics, population trends, and management practices for 13 species of NTMB that are known to breed on the KNF. The species for which abstracts were compiled were chosen because they (1) are known to winter almost exclusively in the neotropics, (2) are summer residents that breed on the KNF, and (3) represent a cross section of the NTMB taxa that are known to exist on the KNF. Accounts are presented in taxonomic order following the checklist of the American Ornithologists Union.

Each abstract contains sections on distribution, biology, habitats, and territory size/density. Data presented in each account should be useful in constructing habitat suitability index models. The length of each abstract generally reflects the amount of information

Table 1.— *Summary of the 24 management areas on the Kisatchie National Forest, Louisiana**

Mgmt. no.	Description of management area	Hectares†
1	Nonproductive land <1.4 m^3/ha/yr	2,297
2	Palustris Experimental Forest	2,917
3	Research natural areas	*884*
4	Kisatchie Hills Wilderness Area	*3,521*
5	Not physically suited for timber production	*2,724*
6	Developed recreation areas	*1,058*
7	Stuart Seed Orchard	*166*
8	Ft. Polk and Peason Ridge military use areas	*15,627*
9	England AFB bombing and gunnery range	*356*
10	England AFB bombing range safety fan	*2,128*
11	General forest area/grazing	*55,567*
12	General forest area/no grazing	*131,200*
13	Kisatchie soils	*6,365*
14	Breezy Hill/WW II artillery range-no entry	*346*
15	Breezy Hill/WW II artillery range/grazing	4,619
16	Breezy Hill/WW II artillery range/no grazing	*2,368*
17	Scenic areas	*45*
18	Administrative sites	*47*
19	Red-cockaded woodpecker	
	Colonies	1,152
	Recruitment stands	1,565
20	Aquatic and riparian areas	
	Aquatic	1,862
	Riparian	(28,540)
21	National Wild and Scenic River Study Area	(1,543)
22	Nonforest	5,100
23	Cultural resource sites	(223)
24	National wildlife preserves	(30,130)
	Total	241,914

* Information from the Final Land and Resource Management Plan: Kisatchie National Forest (USDA FS 1985).

† Hectarages in parentheses are not added to total because they are physically located within other management areas.

available for a given species; therefore, interested ornithologists are encouraged to pursue research on those species for which little published literature is available.

The species list of NTMB for KNF contains 118 species in 9 orders, all but 10 of which are land birds (appendix D). Of the 108 land birds, 57 (53 percent) are transient or winter visitors and 51 (47 percent) are permanent or summer residents. The largest order of NTMB is Passeriformes (88 species), and the other main order represented is Falconiformes (9 species). Among the 88 species of passerines, the largest groups are the warblers (33 species) followed by the flycatchers (12 species), vireos (7 species), and thrushes (6 species). The diverse avifauna of the KNF inhabits a wide variety of niches within the three main forest types (pine, hardwood, and mixed pine-hardwood). Many of these birds inhabit bottomland or upland hardwood forests, and the others inhabit pine or mixed pine-hardwood stands. Some species prefer open stands, and others may occur in forest-interior situations, forest-field edges, wooded swamps, or riparian areas. This great diversity demands that managers possess a knowledge of the biological characteristics and attributes of the species that inhabit the forest. To this end, the authors have begun the task of compiling that information in the accounts that follow.

Table 2.— *Summary of projected timber sales on the Kisatchie National Forest, Louisiana, 1991–95**

Ranger district	1991	1992	1993	1994	1995	Total
	-------- *Million board feet-Scribner C* --------					
Catahoula	*36.59*	*35.88*	*35.34*	*33.90*	*33.57*	*175.28*
Evangeline	*21.84*	*21.66*	*21.67*	*21.40*	*22.20*	*108.77*
Kisatchie	19.60	19.00	19.30	20.18	21.00	99.08
Winn	51.20	51.50	51.80	52.80	53.58	260.88
Vernon	10.91	10.60	10.40	10.32	10.27	52.50
Caney	10.01	7.93	8.17	10.20	10.64	46.95
Total	150.15	146.57	146.68	148.80	151.26	743.46
Revised†	113.00	97.00	87.00	87.00	87.00	471.00

* From appendix B in the Final Land and Resource Management Plan: Kisatchie National Forest (USDA FS 1985).

† Webb, T.M. 1993. [Verbal communication]. April 13. Located at: U.S. Department of Agriculture, Forest Service, Kisatchie National Forest, Pineville, LA 71361. Reasons for reduced sale levels are (1) new red-cockaded woodpecker policy, (2) losses sustained during southern pine beetle epidemic of 1985-86, (3) amendments to the land management plan concerning management of national wildlife management preserves (two on the forest), (4) streamside management zone coordination, and (5) listing of the Louisiana pearlshell mussel as an endangered species. This mussel may be downlisted to threatened because new colonies have recently been found.

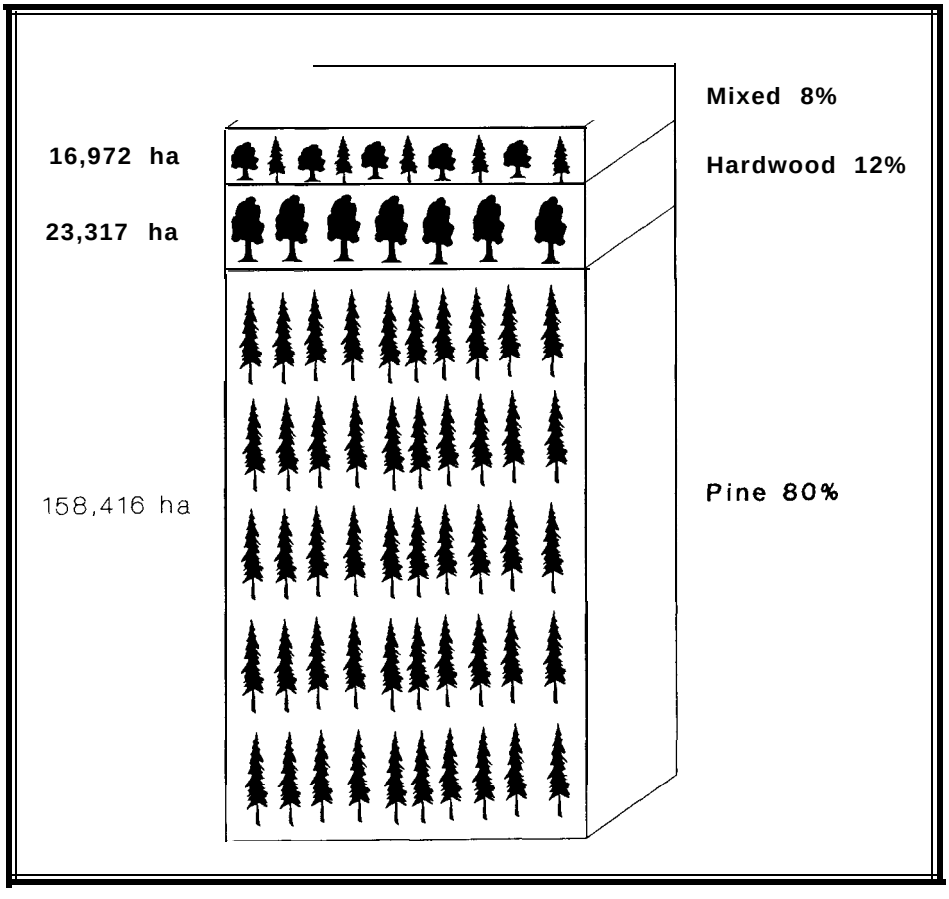


Figure 2.-*Approximate proportions of three general forest types found on the Kisatchie National Forest, Louisiana.*

Table 3.— *Total area of three forest types on each ranger district of the Kisatchie National Forest, Louisiana**

Ranger district	Pine	Hardwood	Mixed pine–hardwood	Total
	-------- *Hectares (percent)* --------			
Catahoula	35,814 (78.3)	5,439 (11.9)	4,478 (9.8)	45,731
Evangeline	24,244 (78.0)	4,660 (15.0)	2,183 (7.0)	31,087
Kisatchie	24,119 (77.3)	3,707 (11.9)	3,357 (10.8)	31,183
Winn	53,267 (84.0)	5,036 (7.9)	5,119 (8.1)	63,422
Vernon	13,169 (79.5)	2,182 (13.2)	1,214 (7.3)	16,565
Caney	7,803 (72.8)	2,293 (21.4)	621 (5.8)	10,717
Total	158,416 (79.7)	23,317 (11.7)	16,972 (8.6)	198,705

* Hectarages are current as of 7/15/91; data from U.S. Department of Agriculture, Forest Service, Kisatchie National Forest, Pineville, LA 71361.

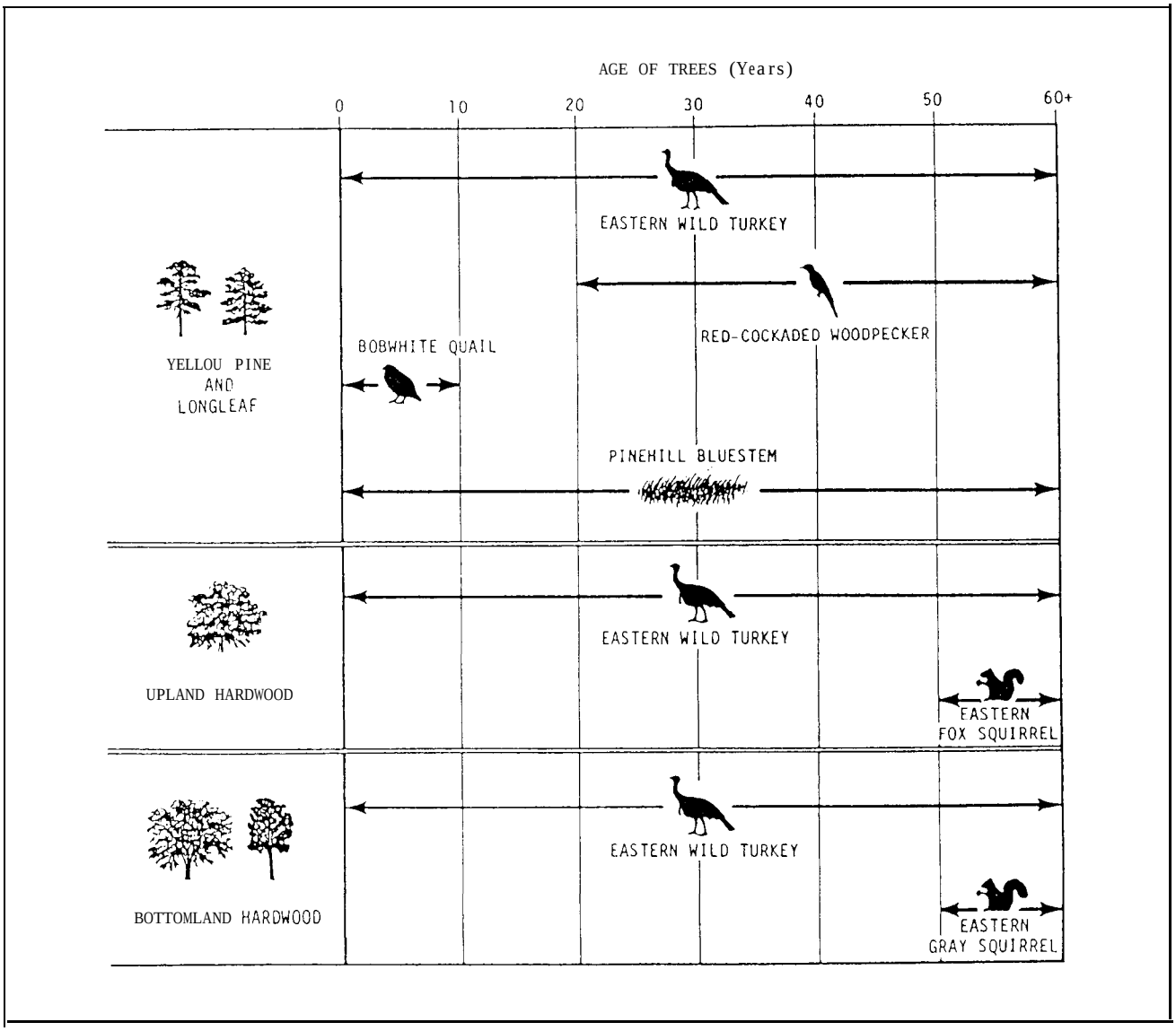
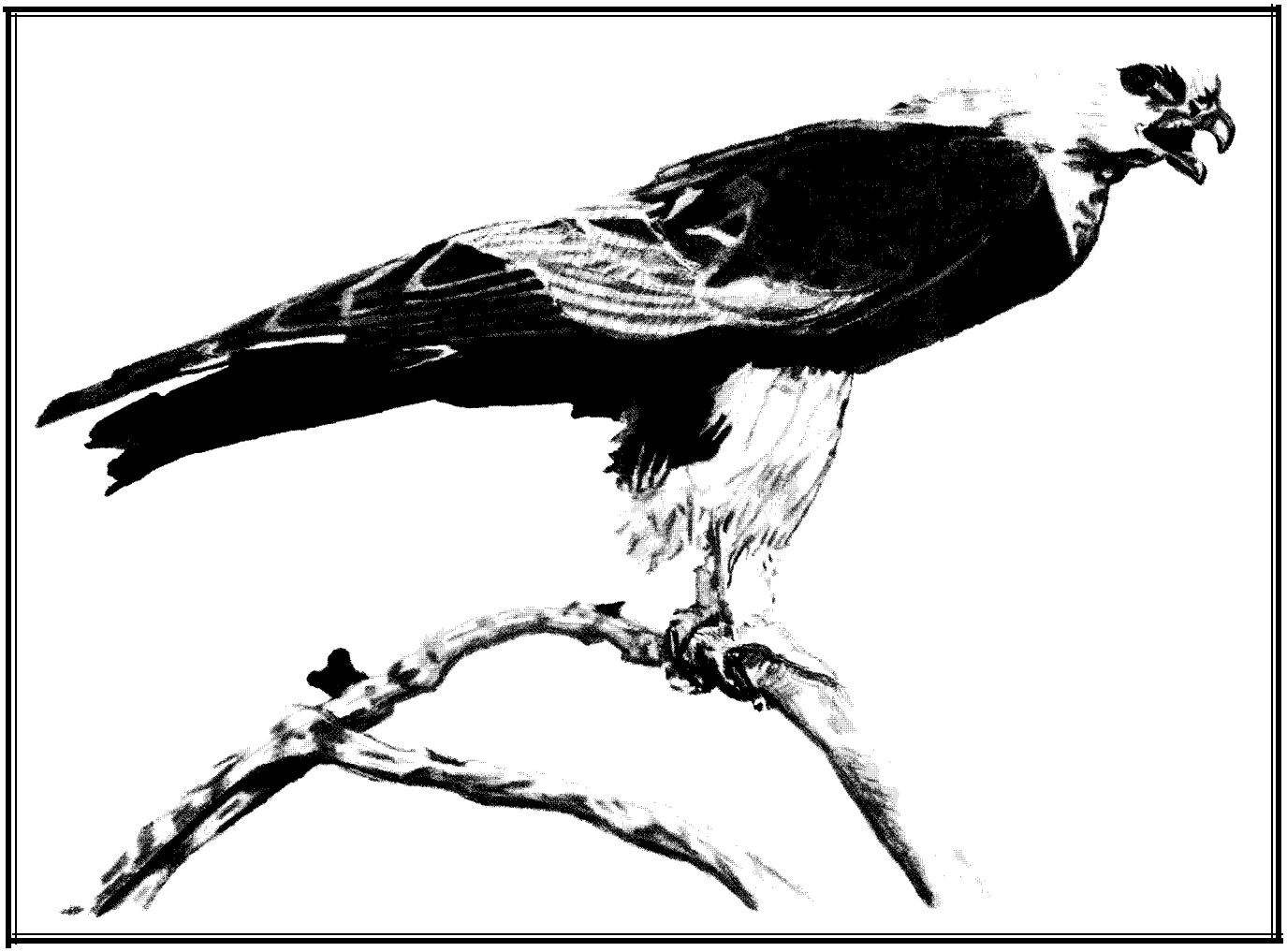


Figure 3.— *Management indicator species by forest type and stand age. Redrawn from Final Land and Resource Management Plan: Kisatchie National Forest (USDA FS 1985).*



Mississippi Kite *(Ictinia mississippiensis)*

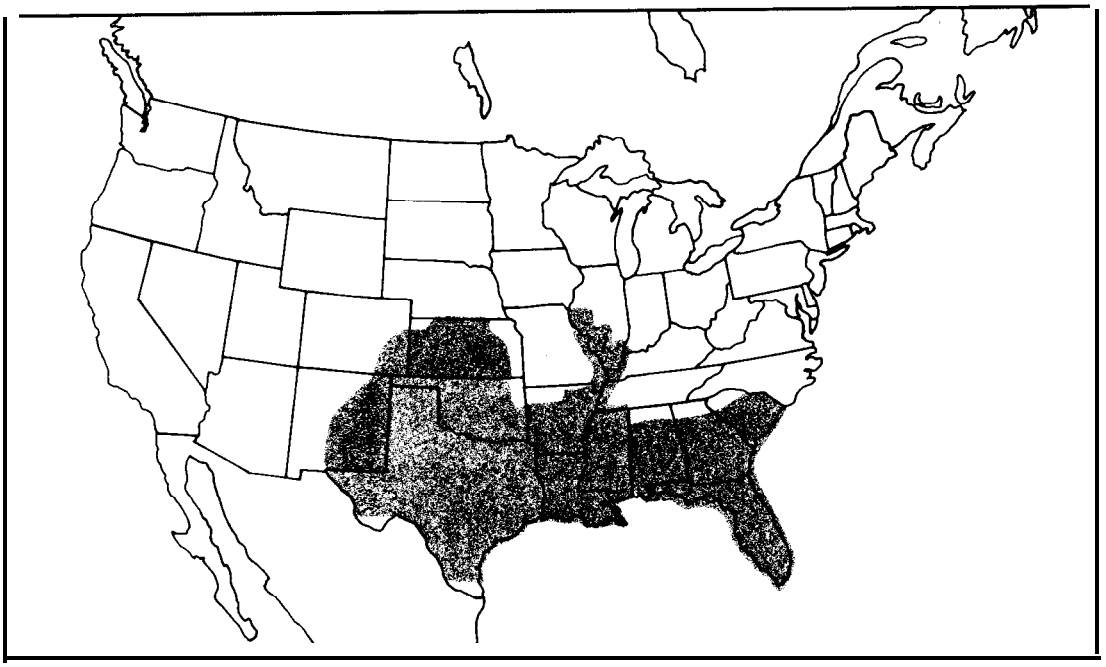


Figure 4.-Distribution *of the Mississippi kite (shaded areas) in the United States.*

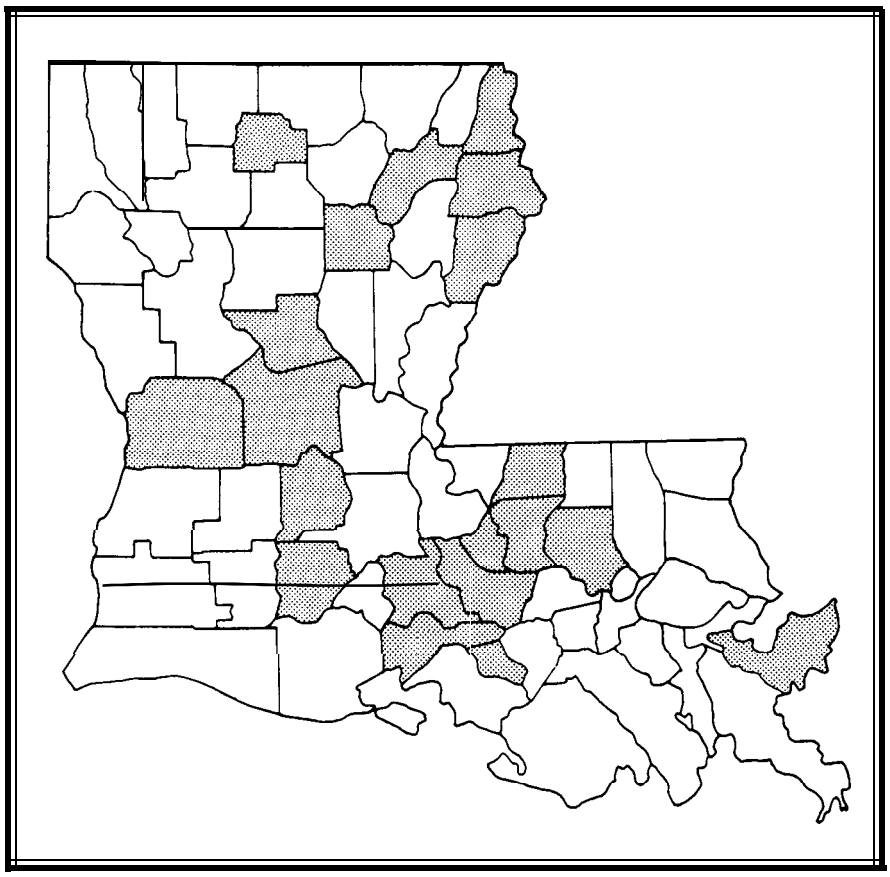


Figure 5.-Louisiana *parishes (shaded* **areas)** *in which the Mississippi kite has been recorded as breeding.*

Distribution

The current distribution of the Mississippi kite in the United States is given in figure 4. In Louisiana, Lowery (1974) reported counts of 50-plus kites along the Atchafalaya Basin, the Bonnet Carré Spillway near New Orleans, and Highway 190 just west of Port Allen. On the KNF, Mississippi kites have been observed on the Catahoula District by Hamilton and Lester (1987), but not on the Vernon District, by Hamilton and Yurkunas (1987) or on the Kisatchie District by Tucker (1980). Biologists of the Louisiana Natural Heritage Program have reported occurrences of Mississippi kites as shown in figure 5.

Biology

The Mississippi kite, a fairly common summer resident of Louisiana, arrives in the State during mid-April to late April from its wintering grounds in the neotropics (Hamel and others 1982, Lowery 1974) and is most common along the batture areas adjacent to the Mississippi River and other large streams. Bent (1937) reported that the prey items of this raptor include locusts, cicadas, toads, mice, lizards, and frogs. Skinner (1962) observed kites capturing May beetles (*Phyllphaga* spp.), the Carolina locust (*Dissosterra carolina*), and undetermined species of grasshoppers and dragonflies. Similarly, Glinski and Ohmart (1983) reported that the principal prey of kites in Arizona was cicadas. Although Bent and Skinner agreed that the majority of foraging activity occurred during flight, Glinski and Ohmart noted that most prey captures by kites in Arizona were accomplished by hawking from a stationary perch.

The breeding season extends from May through July, with the peak period in early June (Hamel and others 1982). Pair formation is thought to occur during the late wintering or migration periods, and most adult kites attempt to nest (Glinski and Ohmart 1983). A platform nest of sticks and grasses is usually constructed high in the crotch of a loblolly pine, sweetgum, or cottonwood tree, and a single clutch of one to three (usually two) plain white eggs is laid (Bent 1937). Reproductive success of kites in Arizona has been estimated to be 0.60 fledgling per nesting attempt (Glinski and Ohmart 1983). Although most adult kites attempt to nest, these authors found that 44 percent of all nesting failures occurred during courtship and nest building, 40 percent during incubation, and 16 percent during the nestling stage. Though eggshell thinning due to pesticide contamination has posed problems to the reproductive success of other raptors, Parker (1976) found that the amount of thinning in Mississippi kite eggs in Kansas, Oklahoma, and Texas was minimal and unlikely to affect regional reproductive success.

Young kites reach maturity at approximately 2 years of age, although they are capable of breeding at 1 year (Parker and Ogden 1979). Where suitable nesting habitat is limited, these raptors may nest colonially (Parker 1974, Parker and Ogden 1979, Skinner 1962). This phenomenon is most notable in the southern Great Plains where Mississippi kites make extensive use of windbreaks planted to protect agricultural crops (Love and others 1985, Parker 1974, Skinner 1962). Parker and Ports (1982) have also documented the presence of yearling helpers at nests of kites in Oklahoma and Kansas. This strategy may improve nesting success and possibly benefit helpers as well. Most Mississippi kites depart Louisiana by mid-September, although a few have been seen during the fall months (Lowery 1974).

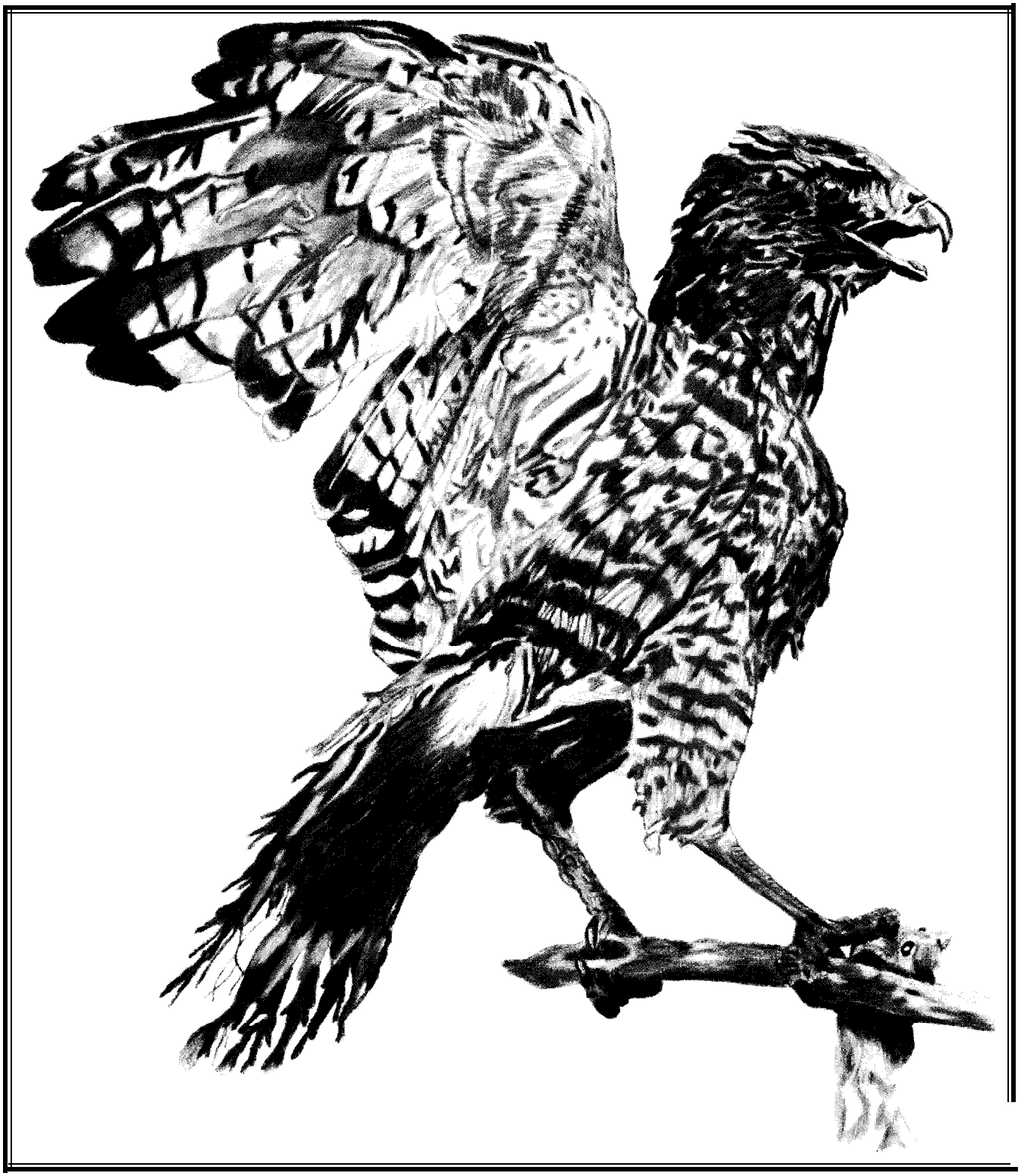
Habitats

As mentioned previously, this raptor is most commonly found along the riparian zones and batture areas of major rivers. In the relatively xeric Great Basin, central Arizona, and New Mexico, kites are found most closely associated with riparian zones and windbreaks (Allan and Sime 1943, Glinski and Ohmart 1983, Parker 1974, Parker and Ogden 1979). Riparian areas are usually dominated by cottonwoods, and windbreaks are composed of cottonwoods, oaks, black locust, eastern redcedar, elms, and green ash (Allan and Sine 1943, Glinski and Ohmart 1983, Love and others 1985).

In western Tennessee, Kalla and Alsop (1983) reported that 74 percent of 162 sightings of kites occurred over wooded areas within the Mississippi River floodplain, 15 percent over wooded areas outside the floodplain, and the remaining 11 percent over nonwooded areas. Although Mississippi kites require large trees for nesting, they do forage over open country, especially in a heavily fragmented landscape such as that found along the Mississippi alluvial plain. This raptor will also nest and forage in urban settings such as the cities of Baton Rouge and New Orleans in Louisiana.

Territory Size/Density

Although no data have been published on the size of the home ranges of the kite, Kalla and Alsop (1983) reported that the smallest wooded area where kites were sighted was 75 ha and that the average was approximately 400 ha. Allan and Sime (1943) reported sighting 169 kites during 552 km of traveling in the Texas panhandle. They also estimated, based on their experience, that a pair of kites occupies about 5 km^2 in suitable habitat.



Broad-Winged Hawk *(Buteo platypterus)*

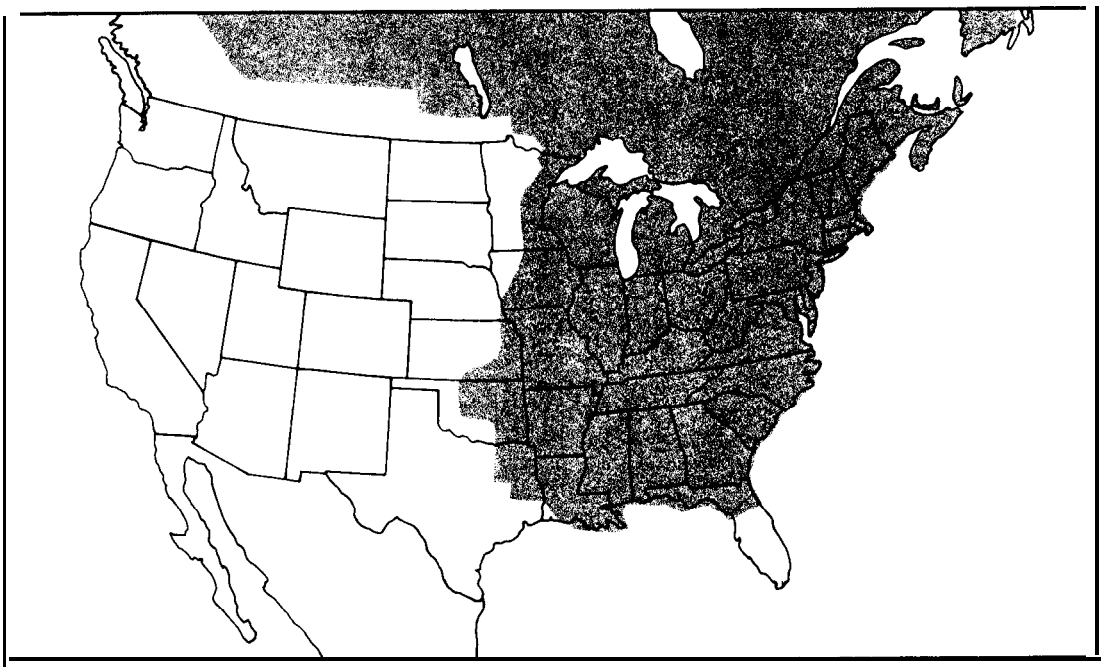


Figure 6.—*Distribution of the broad-winged hawk (shaded areas) in the United States and southern Canada.*

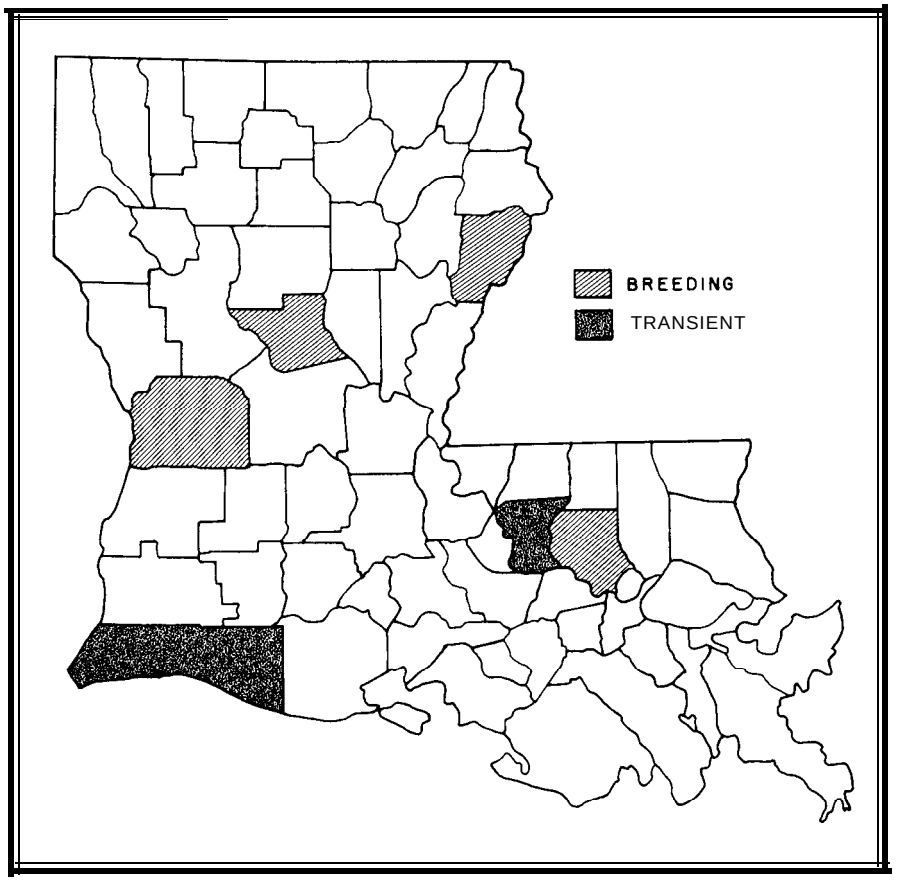


Figure 7.—*Louisiana parishes in which the broad-winged hawk has been recorded as breeding or transient.*

Distribution

The distribution of the broad-winged hawk (fig. 6) is restricted to forested areas of the Eastern United States and the boreal forests of Canada. Data for Louisiana are sketchy at best (fig. 7), but this raptor has been reported as a breeding bird on the Catahoula and Vernon Districts of the KNF (Hamilton and Lester 1987. Hamilton and Yurkunas 1987).

Biology

This locally common to uncommon raptor arrives from mid-March to mid-April and resides in the heavily forested portions of the State (Hamel and others 1982, Lowery 1974). Broad-wings are most numerous in Louisiana during fall migration (September through October) when large aggregations, enroute to Central and South America, pass through the southwest portion of the State (Kerlinger and Gauthreaux 1985).

Broad-wings are generally sit-and-wait predators but will also spot prey from soaring flight (Hamel and others 1982). Apparently, the diets of broad-wings are dependent upon geographic location. The various authors cited in Sherrod (1978) reported widely different proportions of the major taxonomic groups in the diets of broad-wings at different locations. For instance, proportions of mammals ranged from 6.9 to 62.0 percent and invertebrates ranged from 2.0 to 77.8 percent of the diet. In Alberta, Canada, Rusch and Doerr (1972) found that mammals comprised 72 percent and 53 percent and birds comprised 24 percent and 25 percent of the diets of the broad-winged hawk during 1966 and 1968, respectively. Mosher and Matray (1974) reported that mammals were the most frequent prey items (46.1 percent) in the diets of broad-wings in New York, followed by amphibians (27.9 percent), birds (21.0 percent), and reptiles (5.7 percent).[1] Janik and Mosher (1982) also found that mammals were preferred items in the diets of broad-winged hawks in Maryland. Food items of broad-wings in Kansas (Fitch 1974), in order of importance, were reptiles and amphibians, mammals, birds, and insects.

The breeding season generally extends from mid-April to mid-June, with the peak period extending from early to mid-May (Hamel and others 1982). Courtship and pair formation occur in early spring, and both sexes participate in nest construction (Matray 1974). The shallow platform nest is usually placed in the first main crotch of a hardwood tree averaging 26 to 54 cm in diameter at breast height (d.b.h.) (Keran 1978, Matray 1974). Nest heights reported by Matray (1974), Rosenfield (1984), and Titus and Mosher (1981) averaged 13.3, 8.2, and 13.4 m, respectively. Keran (1978) measured stand densities around 10 nest sites in Minnesota and found an average stand density of 504 trees per hectare, and Titus and Mosher (1981) found most nest sites in stands that were nearly half as dense with 278 trees per hectare. Rosenfield (1984) reported the minimum distance between active nests as 1.5 km. Further, Titus and Mosher (1981) reported that broad-winged hawks tended to place nests closer to water and forest openings than other woodland hawks.

Egg laying generally coincides with refoliation of trees (Matray 1974), and average clutch size is 2.4 eggs per nest (Rosenfield 1984, Rusch and Doerr 1972). The incubation period is at least 28 days; during this time the female is primarily responsible for incubation while the male does most of the hunting for food (Matray 1974). Rosenfield (1984) reported a nesting success of 79 percent, with an average of 1.5 young fledged for each of 70 active nests in Wisconsin. Rusch and Doerr (1972) reported that 83 percent of 12 young from 5 nests in Alberta, Canada, survived to fledging. Matray (1974) reported 80-percent survival for 4 weeks for nine nestlings in New York. In Maryland, Janik and Mosher (1982) found that young were successfully produced in 86 percent of 36 nests, with an average of 1.7 young per active nest.

Habitats

Though most of the following information on habitats may not be applicable to broad-wings nesting in Louisiana, the paucity of information on this species in the State seems to justify the inclusion of data from other parts of its range. It is likely that the most extensive and mature hardwood and mixed pine-hardwood stands could hold broad-wings. Conversely, if a stand harbors broad-wings, it is probably safe to assume that such a stand is of high enough quality for other NTMB as well. Thus, the broad-wing should be thought of as a good indicator of a healthy hardwood forest ecosystem.

Rosenfield (1984) found most broad-wing nests in trembling aspen (51 percent) and white birch (29 percent) in Wisconsin. Matray (1974) reported that most (86 percent) of the nests were in yellow birch trees in New York. In Maryland, Titus and Mosher (1981) found 79 percent of all nests in oaks and 50 percent of those in white oaks. Burns (1911) reported American chestnut as the most frequent nesting tree in the Northeastern United States. Keran (1978) reported

[1] Percentages do not add to 100 in Mosher and Matray (1974) due to averaging of 2 years of data.

that nests in Minnesota and Wisconsin were found in aspen (21 percent) and oak (41 percent).

Dominant tree species found on Rosenfield's (1984) study area in Wisconsin were trembling aspen, white birch, balsam fir, and black ash. Rusch and Doerr's (1972) study area in Alberta, Canada, was aspen-dominated deciduous forest. Matray's New York study area was mainly hardwood (60 percent) dominated by sugar maple, American beech, and yellow birch, with the remainder in red spruce and eastern hemlock (20 percent) and marshes, swamps, and other forest types (20 percent).

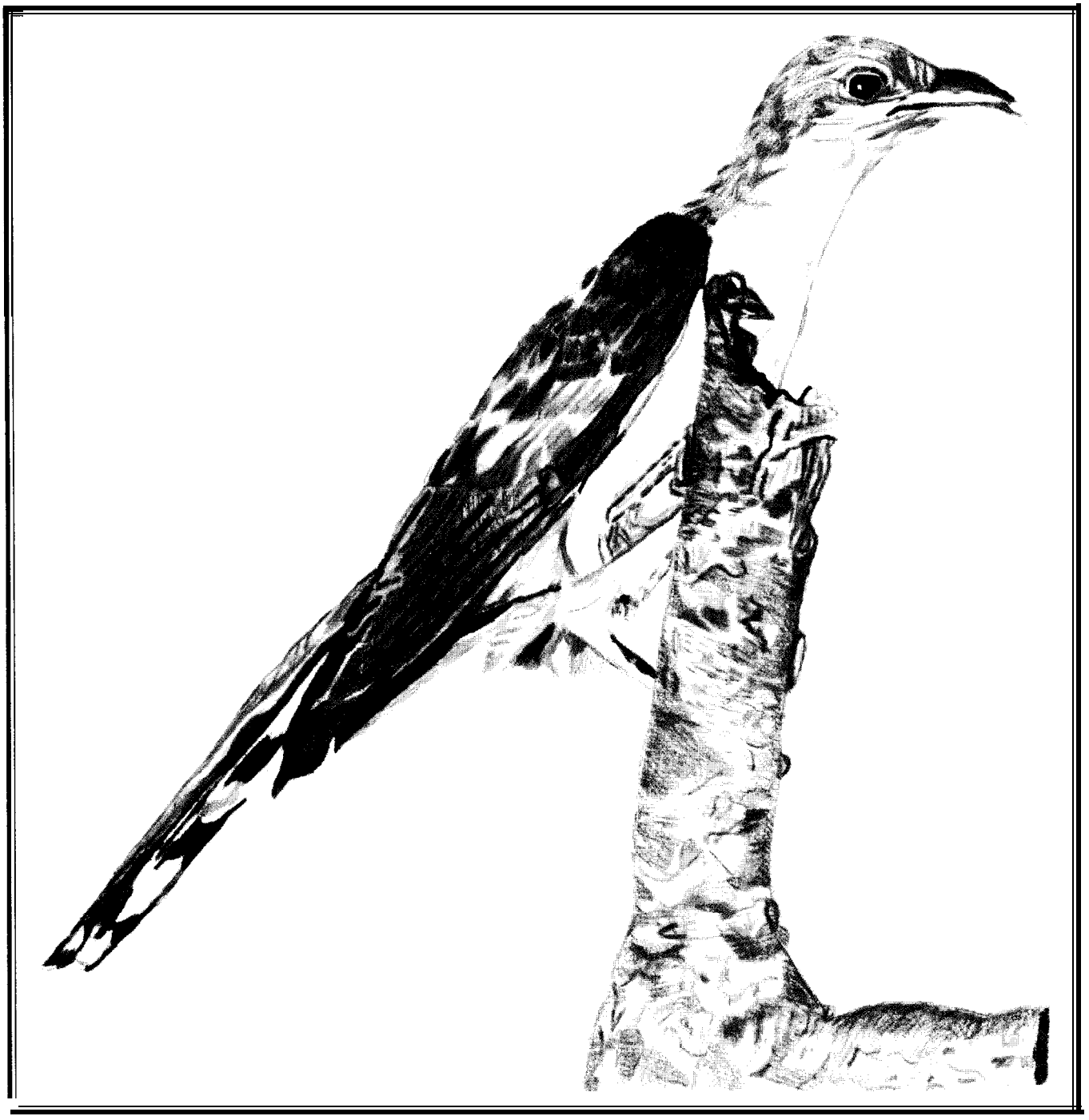
In Kansas, Fitch's (1974) study area in the northwestern part of the State was more xeric than the previous study sites. Dominant woodland species were honeylocust and Osage-orange, with thickets of roughleaf dogwood, plums, sumacs, and crabapples; elms, hickories, and oaks dominated the mesic sites. Titus and Mosher (1981) and Janik and Mosher (1982) studied woodland raptors in two Maryland forests, One area was composed of white oak, red oak, and hickories, with an understory of flowering dogwood, The other Maryland area was dominated by red oak, red and sugar maples, hickories, black and yellow birches, American beech, American basswood, and eastern hemlock.

Territory Size/Density

Territory sizes of raptors are undeniably influenced by many factors, including the availability of suitable nest sites and the abundance of preferred prey species. To meet all of their needs during the breeding season, raptors require large tracts of land. Therefore, investigators studying broad-winged hawks have reported widely varying estimates of breeding densities (table 4), which average one pair per 11.5 km^2.

Table 4.—*Territory size estimates for broad-winged hawks by location*

State or province	Territory size	Reference
	km^2/pair	
New York	2.3	Matray 1974
Wisconsin	2.4	Rosenfield 1984
Maryland	8.9	Janik and Mosher 1982
Alberta, Canada	9.0	Rusch and Doerr 1972
Maryland	14.6	Titus and Mosher 1981
Wisconsin/Minnesota	32.0	Keran 1978



Yellow-Billed Cuckoo (*Coccyzus americanus*)

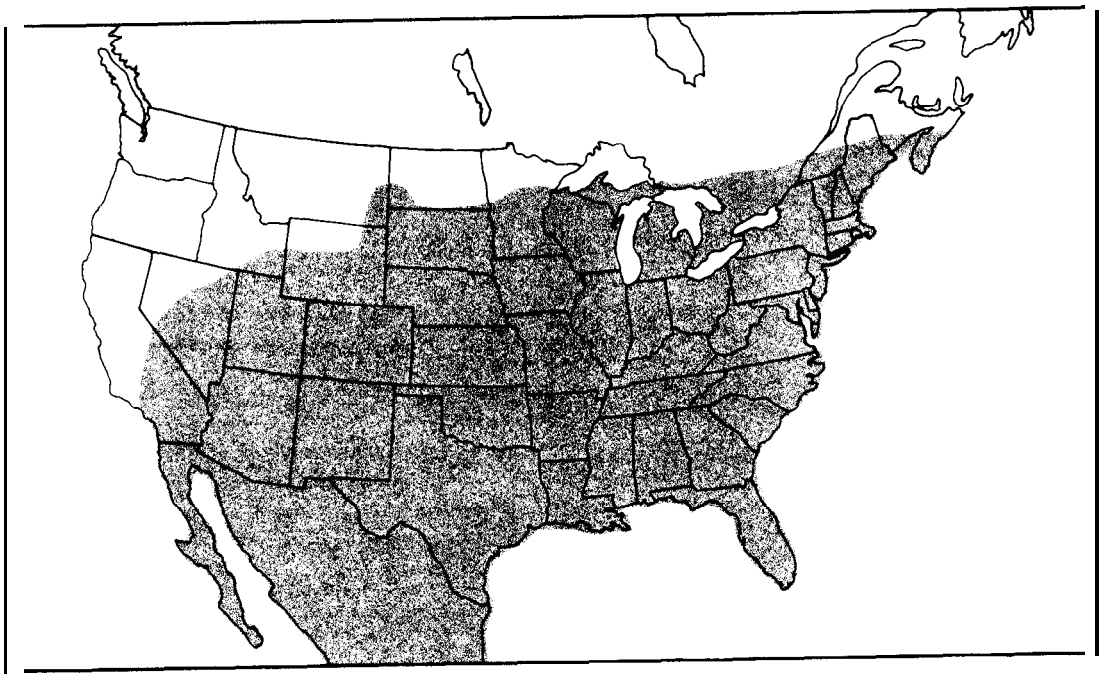


Figure B.-Distribution of the yellow-billed cuckoo (shaded areas) in the United States and southern Canada.

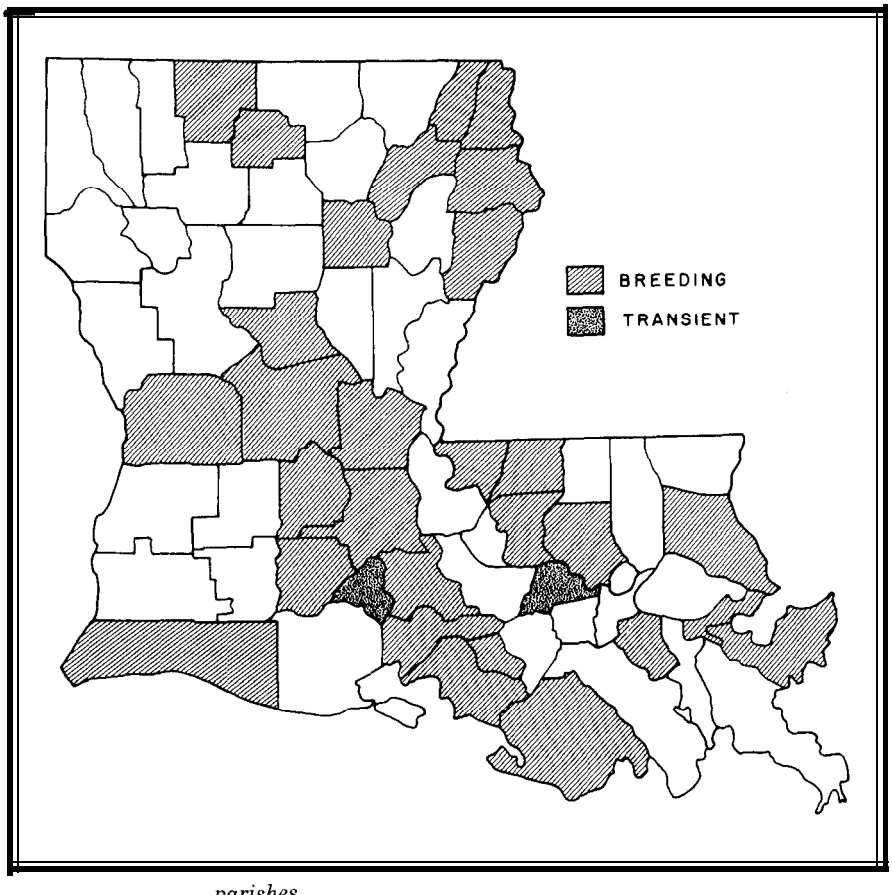


Figure 9.-Louisiana parishes in which the yellow-billed cuckoo has been recorded as breeding or transient.

Distribution

The yellow-billed cuckoo is one of the most widespread of the neotropical migrants that occur on the KNF (fig. 8). Although it occurs as far west as the central valley of California, it is considered monotypic (Banks 1988). Biologists of the Louisiana Natural Heritage Program have recorded the presence of breeding cuckoos in the parishes marked in figure 9. Further, yellow-billed cuckoos have been recorded as breeding birds on the Catahoula, Vernon, and Kisatchie Districts of the KNF by Hamilton and Lester (1987), Hamilton and Yurkunas (1987), and Tucker (1980), respectively.

Biology

This common summer resident of Louisiana arrives in the State in late March to late April (Lowery 1974). The yellow-billed cuckoo is known to forage mostly on caterpillars (Lepidoptera), notably the eastern tent caterpillar (*Malacosoma americana*) (Hamilton and Hamilton 1965, Lowery 1974, Nolan and Thompson 1975). Also of importance in the diet are periodical (*Magicicada* spp.) and annual (*Tibicen* spp.) cicadas (Nolan and Thompson 1975). The foraging mode of this bird has been described by Nolan and Thompson (1975) as hawklike or waiting motionless for prey to reveal itself.

There is strong evidence that the timing of yellow-billed cuckoo breeding activities coincides closely with the occurrence of peaks in local food abundance (Hamilton and Hamilton 1965, Nolan and Thompson 1975). Moreover, the data of Fleischer and others (1985) suggest that cuckoos increase clutch size in response to an eruption of periodical cicadas. The breeding season extends from mid-April to mid-September, with the peak period extending from early June to early July (Hamel and others 1982). Both adults participate in construction of the rather flimsy platform nest of twigs and leaves on the fork of a horizontal branch 4 to 10 m above the ground (Hamilton and Hamilton 1965, Lowery 1974, Potter 1980).

Incubation of the two to six unmarked bluish-green eggs begins with the first egg laid, lasts 9 to 11 days, and is shared by both adults. Potter (1980) reported a 9-day incubation period in North Carolina, and Hamilton and Hamilton (1965) reported 10- to 11-day periods in Arizona. Although estimates of nesting and fledging success are lacking in most of the available literature, Potter (1980) found that young cuckoos leave the nest at 7 or 8 days of age. Yellow-billed cuckoos generally depart Louisiana by early October but have been known to leave as late as the middle of November (Lowery 1974).

Habitats

The yellow-billed cuckoo generally favors dense thickets near watercourses, second-growth woodlands, open woods, and riparian areas at low elevations. Many of the published studies specifically addressing the yellow-billed cuckoo were conducted in California (Gaines 1974, Jay 1911, Shelton 1911), where this bird occurs primarily in areas of riparian vegetation composed of western cottonwood and willows. Hamilton and Hamilton (1965) and Rosenberg and others (1982) found cuckoos in similar habitats in Arizona. Gaines (1974) reported that cuckoos were found in riparian areas that were at least 100 m wide and 300 m long. In Indiana, Nolan (1963) studied the nesting success of breeding birds in a deciduous scrub habitat and found cuckoos nesting in American elm and hawthorn scrub types. Preble (1957) observed cuckoos nesting in redcedars on Gibraltar Island, in Ohio, and Potter (1980) reported on the nesting of yellow-billed cuckoos in a red oak in North Carolina.

Conner and others (1979) found cuckoos in western Virginia, where the dominant tree species were pitch pine, chestnut oak, Table Mountain pine, red oak, white pine, white oak, and red maple. Dickson (1978b) found cuckoos in a Louisiana bottomland hardwood forest composed of water oak, sweetgum, hackberry, cherrybark oak, swamp chestnut oak, green ash, and American elm. Dickson and others (1980) also found cuckoos to occur most commonly in oak-gum-cypress, loblolly-shortleaf pine, and oak-pine forest types throughout the Southeast. Johnston and Odum (1956) and Evans (1978) found cuckoos to be most abundant in oak-hickory climax forests and mature (100-year-old) pine stands. Meyers and Johnson (1978) reported the highest densities of cuckoos in 25-plus-year-old loblolly-shortleaf pine, mixed pine-hardwood, and mature hardwood stands. Temple and others (1979) also found that cuckoos occur in deciduous, mixed, and coniferous forest types in Wisconsin.

In Tennessee, Anderson and Shugart (1974) found that, of 28 habitat variables examined, the presence of yellow-billed cuckoos was significantly related only to the number of saplings on the plot. Blake and Karr (1987) found that cuckoo abundance was significantly correlated to woodlot area, tree density, and amount of shrub vegetation in Indiana. Robbins and others (1989) examined 15 environmental variables and found that 5 were significant predictors of yellow-billed cuckoo relative abundance in the Middle Atlantic States. These five were: (1) number of tree species in a 0.04-ha area around the sample point and (2) area of forest (both of which were positively correlated with relative abundance) and (3) percentage of forest within 2 km of the sample point, (4) slope, and (5) canopy cover by coniferous trees (these last three were inversely correlated with relative abundance). These

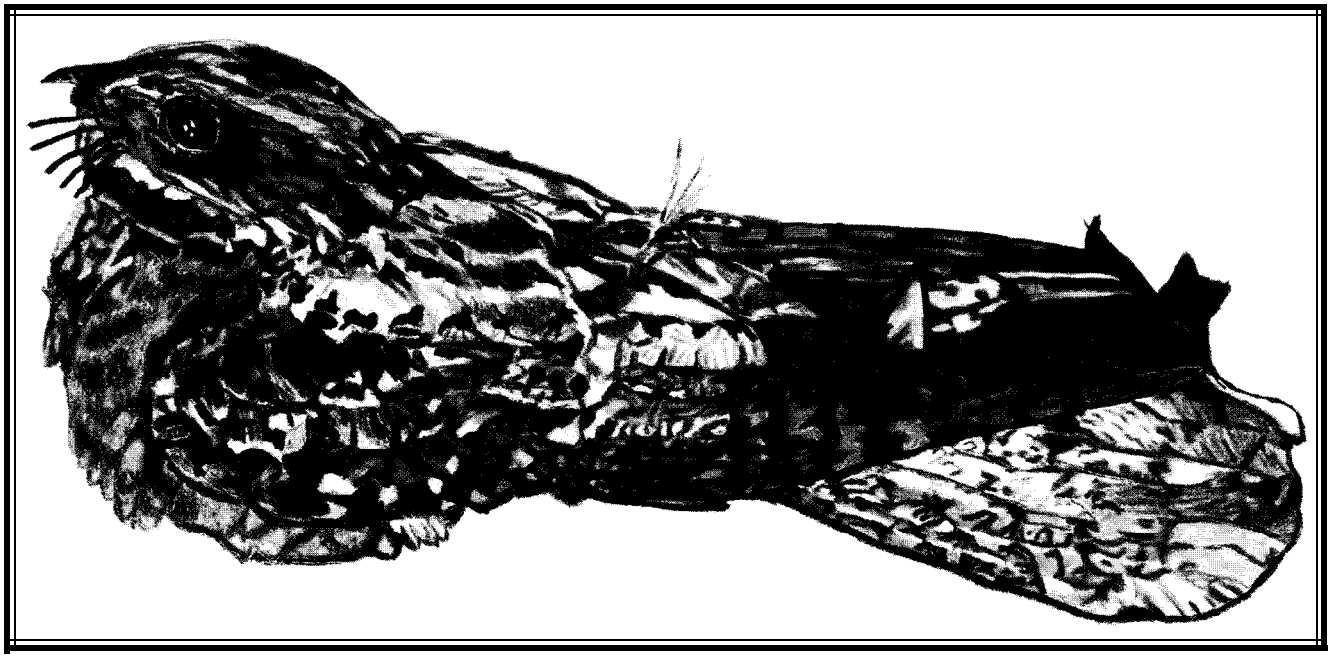
authors also predicted a probability of occurrence of slightly more than 50 percent in a forest of 100 ha.

Territory Size/Density

As previously mentioned, nesting of yellow-billed cuckoos may be influenced by the abundance of local food sources; this may also influence the size of local cuckoo populations (Hamilton and Hamilton 1965). The variation in the abundance of local food sources may serve to explain the wide range of densities across the range of this bird (table 5). Averaging the estimates in the table yields a density of 20 pairs per square kilometer.

Table 5.— *Density estimates for yellow-billed cuckoos by location*

State or region	Density	Reference
	Pairs/km²	
Louisiana	*2*	Hamilton and Yurkunas 1987
Southeastern States	*3*	Shugart and others 1978
Illinois	*5*	Graber and Graber 1963
Indiana	*8*	Nolan 1963
Southeastern States	*13*	Meyers and Johnson 1978
Louisiana	*21*	Dickson 1978a
Georgia	*23*	Johnston and Odum 1956
East Texas	*53*	Whiting and Fleet 1987
Louisiana/east Texas	*55*	Dickson 1978b



Chuck-Will's-Widow *(Caprimulgus carolinensis)*

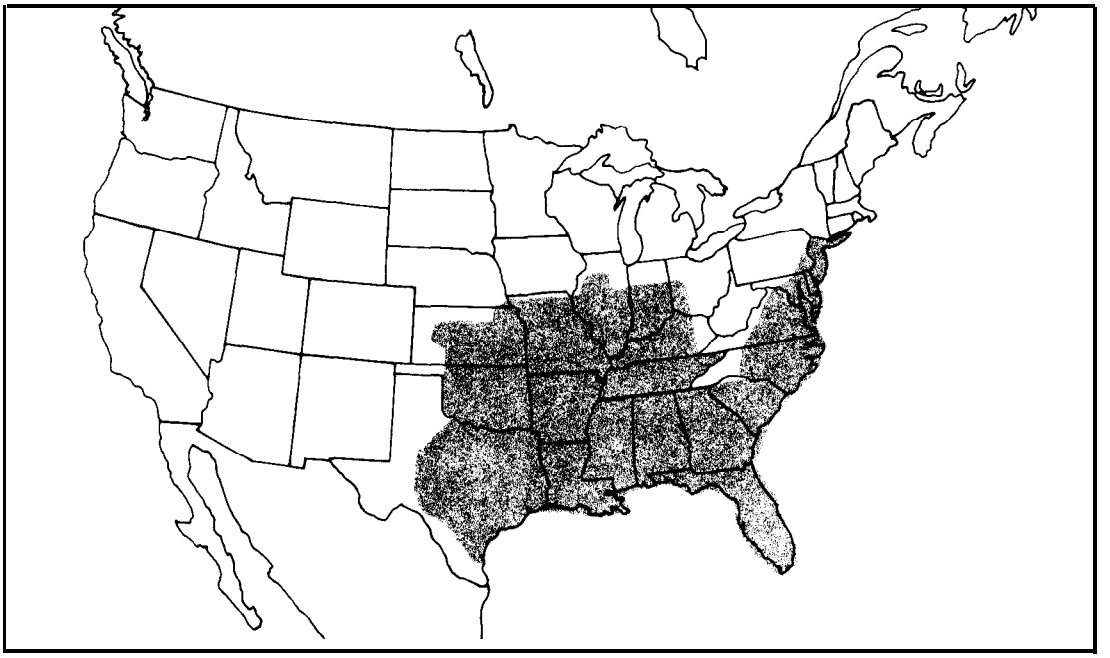


Figure 10.—*Distribution of the chuck-will's-widow (shaded areas) in the United States.*

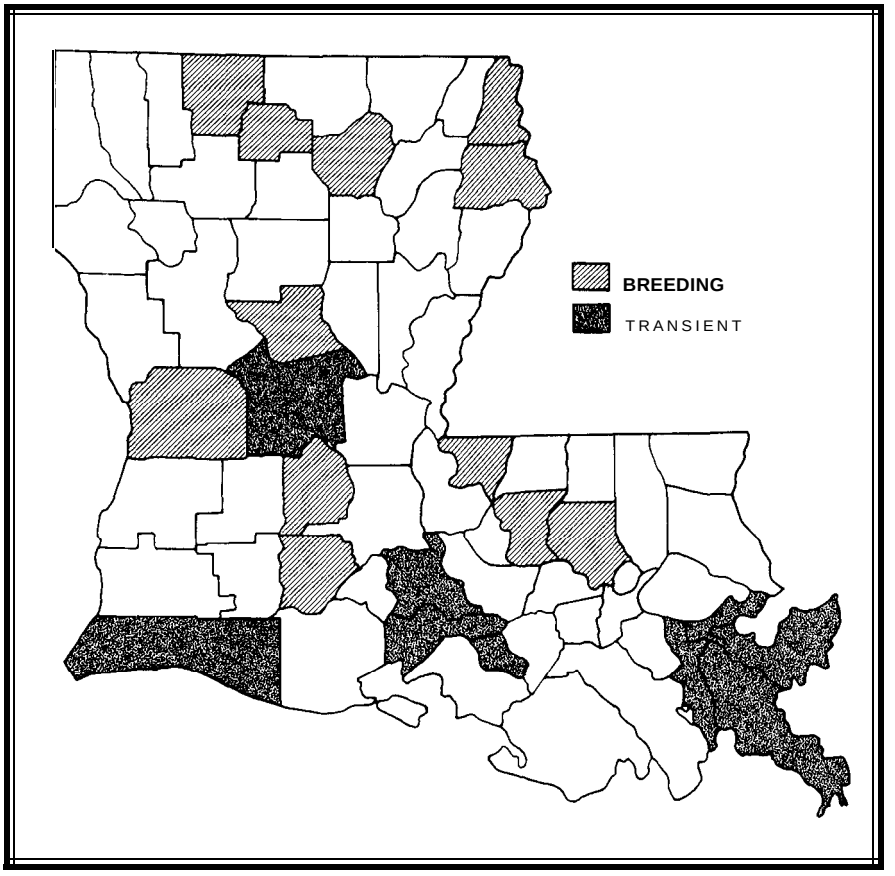


Figure 11.— *Louisiana parishes in which the chuck-will's-widow has been recorded as breeding or transient.*

Distribution

The distribution of the chuck-will's-widow in the United States is given in figure 10. In Louisiana, this caprimulgid (also referred to as a goatsucker or nightjar) has been located on breeding-bird surveys in the parishes shown in figure 11 by biologists of the Natural Heritage Program. Knowledge of the distribution of this bird is probably less complete than that of any of the diurnal species because most breeding-bird studies do not include night surveys. On the KNF, Hamilton and Lester (1987) and Hamilton and Yurkunas (1987) noted the presence of this bird on the Catahoula and Vernon Districts.

Biology

The largest goatsucker in the United States, the chuck-will's-widow arrives in numbers in the first part of April (Lowery 1974). Like other nightjars, the food of this species consists almost entirely of insects caught in flight. The authors were not able to locate any references regarding the range of breeding dates for this bird. The nest, however, is usually a shallow cup formed in leaf litter or pine needles. Incubation of the two pinkish-white eggs, which are marbled or spotted with brown, lasts about 20 days (Hoyt 1953, West and others 1960). Lowery (1974) presumed that most of these birds leave the State by the middle of October, although once calling activity ceases, it is difficult to determine whether they are present or not. Because so little work on the life history of this nocturnal bird has been conducted, aspects of nest-site selection and reproductive success are virtually nonexistent.

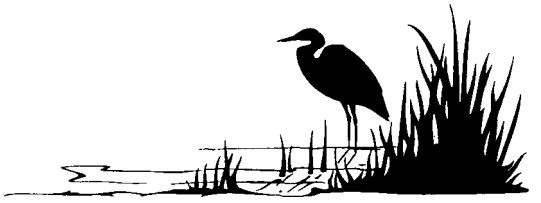
Habitats

Lowery (1974) stated that the chuck-will's-widow is the common goatsucker of the wooded upland portions of the State, preferring mesic, mixed pine-oak habitats. Mengel and Jenkinson (1971) studied the vocalizations of this bird in northeastern Kansas but did not provide any description of the vegetational characteristics of the area. Cooper (1981) looked at relative abundances of caprimulgids in Georgia (based on call counts) and found that there was no significant difference in the counts of chuck-will's-widows among suburban, pasture, and forest habitats. Again, no descriptions of vegetational characteristics were provided. However, in comparison to the whip-poor-will (*Caprimulgus vociferus*), the chuck-will's-widow prefers more open habitats. Harper (1938) intimated that habitat preferences for the purposes of roosting, singing, and nesting were islands and riverbanks in the Okefenokee Swamp in southern Georgia and northern Florida.

Whiting and Fleet (1987) found few chuck-will's-widows in pole and sawtimber stands of loblolly-shortleaf pines in east Texas, and Hamilton and Yurkunas (1987) reported this bird as occurring in longleaf-slash pine forests in Vernon Parish, Louisiana. Johnston and Odum (1956) found this bird in 25- to 100-year-old pine and in mature oak-hickory climax forests in the Piedmont of Georgia. In the Ozark Highlands of Arkansas, Shugart and James (1973) reported the presence of the chuck-will's-widow in forests dominated by black, post, and white oaks, but Shugart and others (1978) reported the preferred habitat to be mixed coniferous-deciduous forests.

Territory Size/Density

Mengel and Jenkinson (1971) stated that their data on population density would be published elsewhere, but the authors of this report could not locate that reference, although Mengel and others (1972) discussed the function of wing clapping in territorial behavior. Though the actual size of the territory occupied by this species is unknown, Cooper's (1981) call counts, conducted at 20 stations along approximately 16 km of roads near Athens, Georgia, do provide some basis for estimating density. On 18 nights from April through July 1975, counts averaged about 16 birds over the 20 stations or 1 bird per kilometer.



Acadian Flycatcher *(Empidonax virescens)*

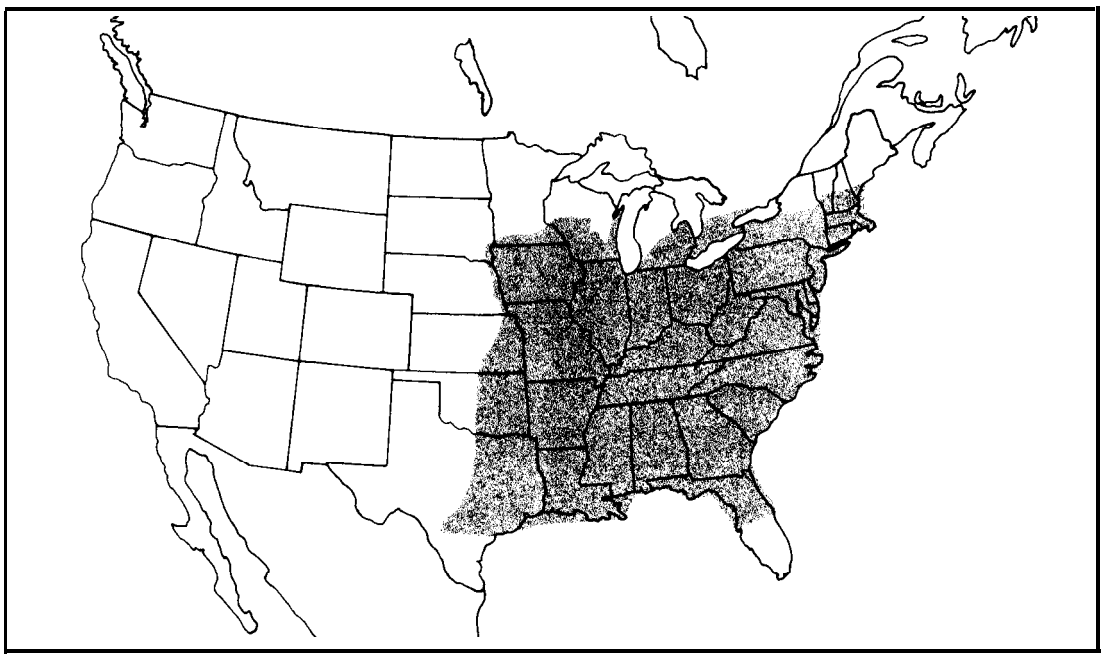


Figure 12.-Distribution of the Acadian flycatcher (shaded areas) in the United States and southern Canada.

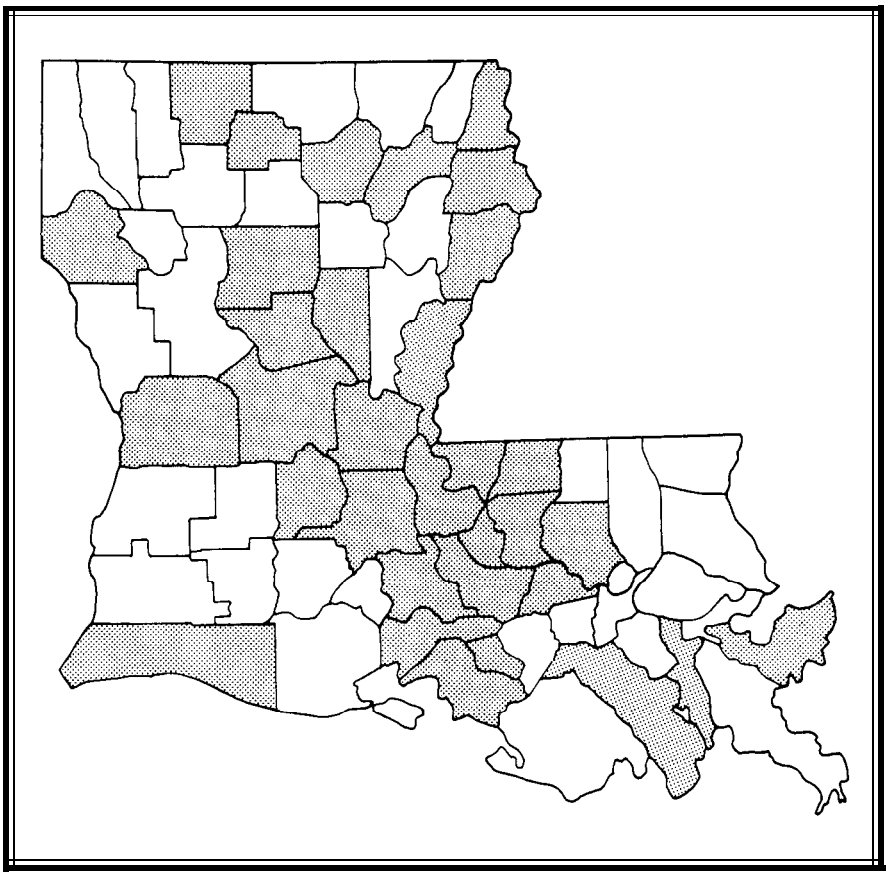


Figure 13.-Louisiana parishes (shaded areas) in which the Acadian flycatcher has been recorded as breeding.

Distribution

The distribution of the Acadian flycatcher in the United States is given in figure 12. This is the only species of *Empidonax* flycatcher found breeding in Louisiana, and it occurs in moist deciduous woodlands and small riparian zones throughout the State (fig. 13). Hamilton and Lester (1987), Hamilton and Yurkunas (1987), and Tucker (1980) recorded this flycatcher on census routes on the Catahoula, Vernon, and Kisatchie Districts of the KNF, respectively.

Biology

The Acadian flycatcher is a common summer resident throughout its range and arrives in Louisiana from early April to early May (Hamel and others 1982, Lowery 1974). As the name implies, this bird forages on airborne insects (primarily hymenopterans) (Bent 1942). Maurer and Whitmore (1981) found that flycatching (also called hawking) and hovering accounted for over 90 percent of all the foraging maneuvers utilized by Acadian flycatchers, regardless of forest type (young vs. mature). These authors also reported that foraging height was related to forest type, with mean heights of 5.2 m in young forests and 8.1 m in mature forests.

The breeding season of the Acadian flycatcher extends from late April to late June, with the peak period extending from late May to mid-June (Hamel and others 1982). The rather flimsy nest of twigs and cobwebs lined with fine grasses is usually placed near the end of a long sweeping branch in a horizontal fork 1 to 4 m above the ground (Lowery 1974, Walkinshaw 1966).

The female alone incubates the clutch of two to four finely spotted, whitish eggs for 13 to 15 days, after which fledging takes a similar period of time (Walkinshaw 1966). Most pairs in Walkinshaw's (1966) Michigan study attempted to raise two broods. Eggs hatched in 72.7 percent and young birds fledged in 64.5 percent of the 121 nests observed; however, some of these nests were parasitized by cowbirds (*Molothrus ater*). In the same study, eggs hatched in 80.2 percent and young birds fledged in 70.8 percent of the unparasitized nests. Following breeding activity, Acadian flycatchers depart Louisiana by the middle of October (Lowery 1974).

Habitats

The Acadian flycatcher can be found in moist bottomland hardwood forests throughout its range and prefers habitats with mature trees, closed canopies, and open understories for foraging. In Michigan, Walkinshaw (1966) found these flycatchers in bottomland habitat composed chiefly of maples, eastern hemlock, oaks, and American beech. Hespenheide (1971) located this bird in hardwood, mixed pine-hardwood, or pine stands undergrown with hardwoods in North Carolina, Virginia, Ohio, and Wisconsin. Mature red oaks were the dominant trees in Newman's (1958) study in Ohio. The study areas of Maurer and Whitmore (1981) were dominated by red oak, swamp chestnut oak, and maples. Whiting and Fleet (1987) found the Acadian flycatcher in loblolly-shortleaf pine sawtimber and mixed stands in east Texas. In south central Louisiana, Dickson (1978[13]) found Acadian flycatchers on the Thistlewaite Wildlife Management Area, which was dominated by water oak, sweetgum, and hackberry.

Blake and Karr (1987) found that abundance of Acadian flycatchers was significantly correlated to woodlot area. Conner and Adkisson (1975), Conner and others (1979), and Evans (1978) found this flycatcher to be relatively more abundant in poletimber and mature hardwoods than in younger stands. Dickson and others (1980) found the Acadian flycatcher to be most abundant in mature oak-gum-cypress and oak–pine stands throughout the Southeast. Hooper (1978) reported that this bird nests at medium densities in second-growth sawtimber and at low densities in virgin hemlock and hardwoods of cove forests in the Appalachians. Johnston and Odum (1956) found Acadian flycatchers associated with only oak-hickory climax forests in Georgia. Meyers and Johnson (1978) reported that the highest densities were in mature hardwoods and that the lowest densities were in mixed and 35-plus-year-old pine stands. Robbins and others

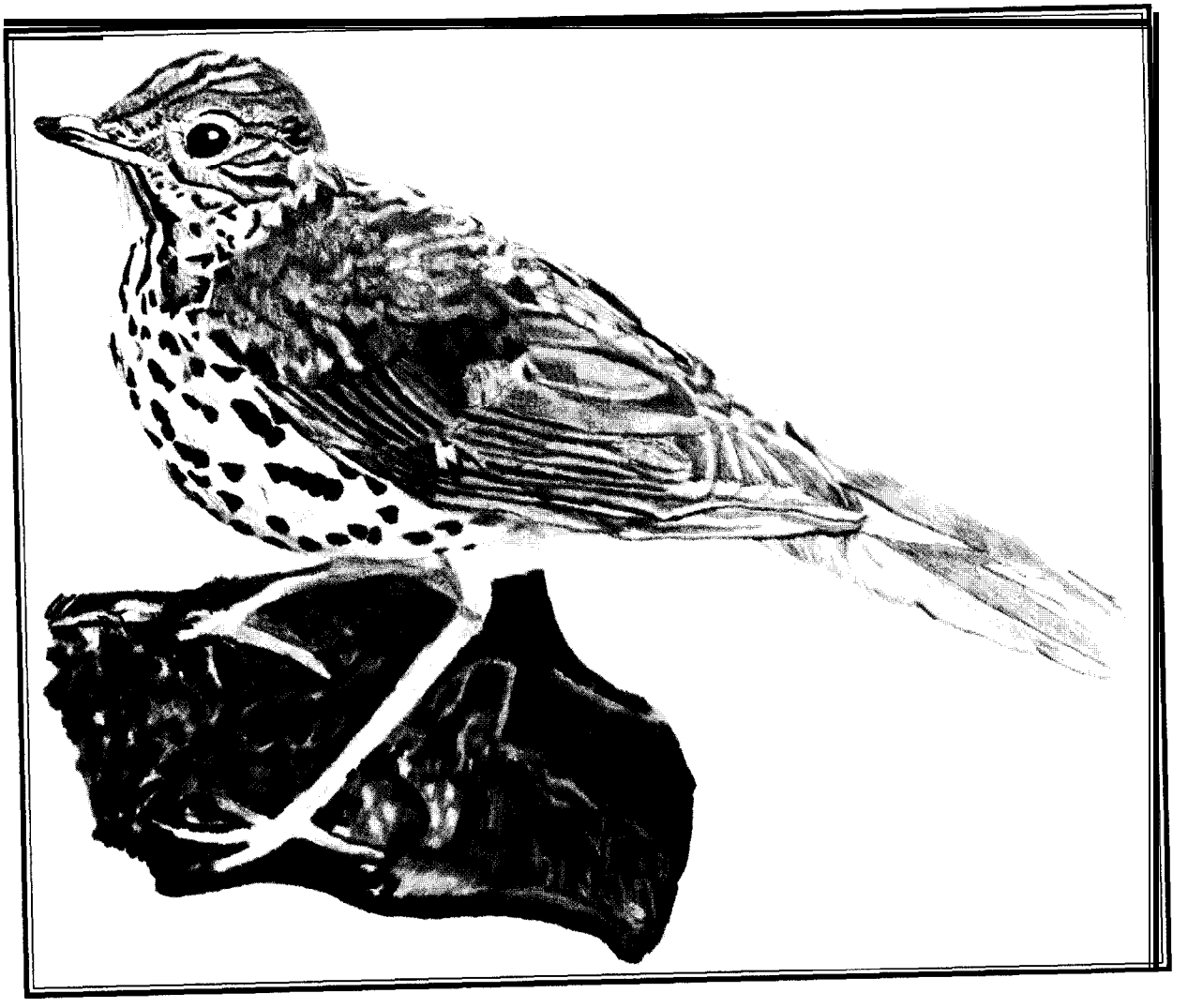
(1989) found that the probability of detecting Acadian flycatchers at a given random point in a forest was maximum (58 percent) in forests of more than 3,000 ha.

Territory Size/Density

Average estimates of population density gleaned from the literature are presented in table 6. Tucker's (1980) estimate on the Bayou Boeuf Research Natural Area of the Kisatchie District and that of Hamilton and Yurkunas (1987) on the Vernon District are the only density estimates available for the KNF. Although the average density from table 6 is about 44 pairs per square kilometer, the actual number of pairs is probably considerably lower due to the preference of this bird for moist forest types.

Table 6.— *Density estimates for Acadian flycatchers by location*

State or region	Density	Reference
	Pairs/km²	
Louisiana	2	Hamilton and Yurkunas 1987
Georgia	13	Johnston and Odum 1956
Illinois	20	Graber and Graber 1963
Louisiana	23	Dickson 1978a
Southeastern States	23	Shugart and others 1978
Southeastern States	25	Meyers and Johnson 1978
Arkansas	35	Shugart and James 1973
East Texas	60	Whiting and Fleet 1987
Louisiana	60	Tucker 1980
Michigan	83	Walkinshaw 1966
Louisiana/east Texas	142	Dickson 1978b



W ood Th rush (*Hylocichla mustelina*)

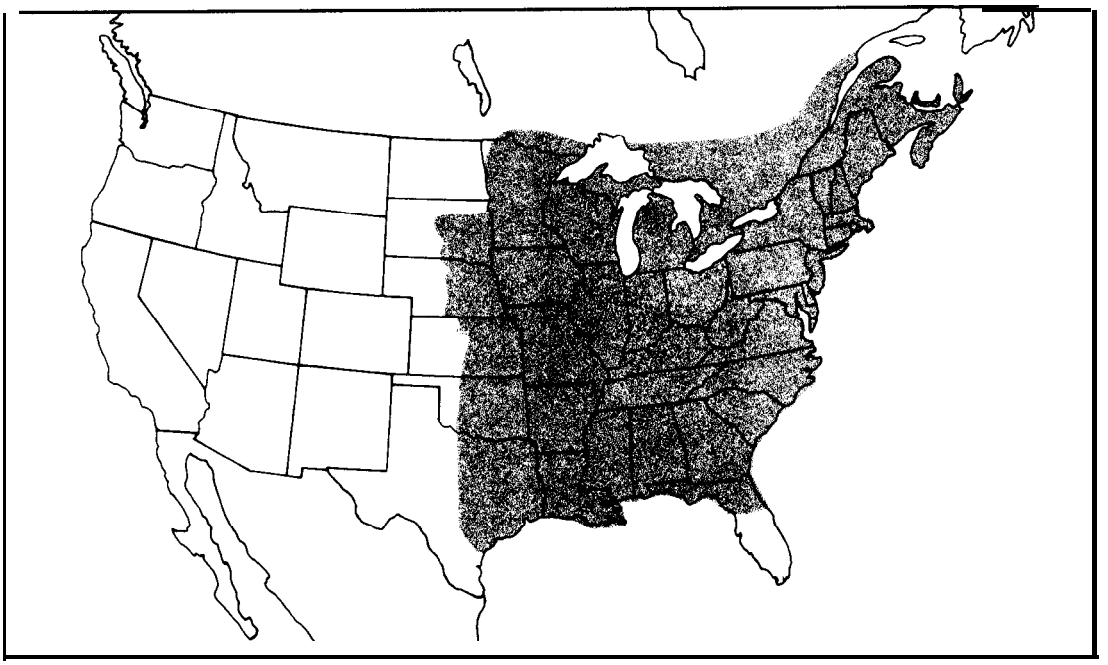


Figure 14.-Distribution of the wood thrush (shaded areas) in the United States and southern Canada.

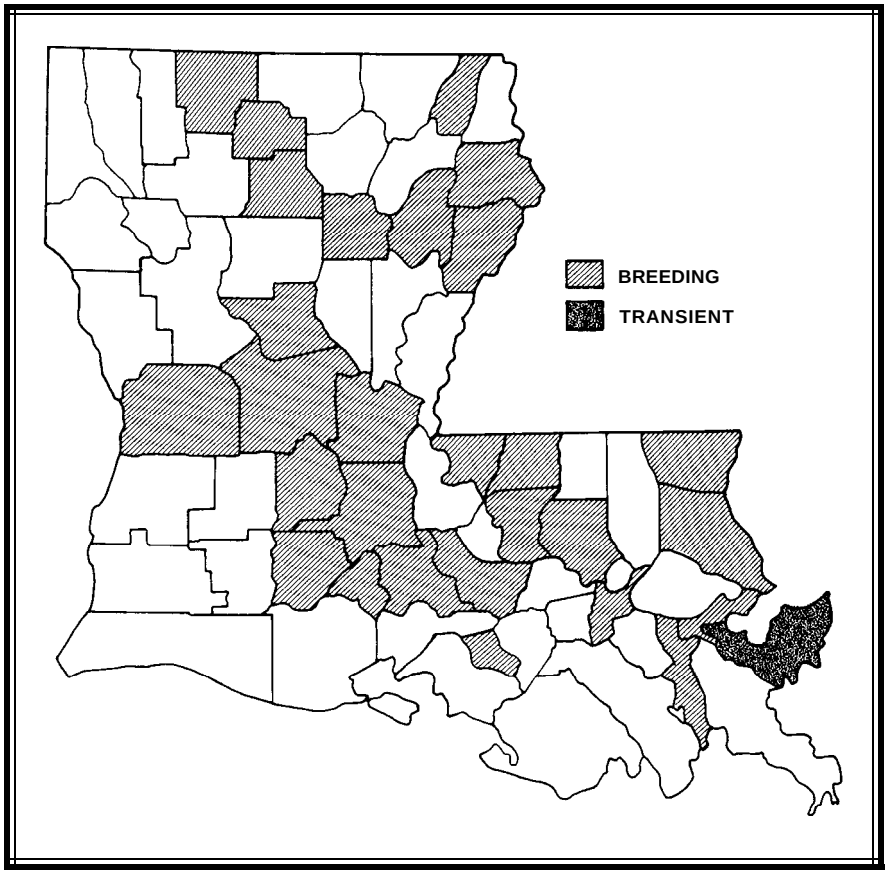


Figure E-Louisiana parishes in which the wood thrush has been recorded as breeding or transient.

Distribution

The distribution of the wood thrush in the United States is given in figure 14. This bird is found in all portions of Louisiana except the coastal areas (Lowery 1974). Biologists of the Louisiana Natural Heritage Program have recorded this thrush in the parishes shown in figure 15. On the KNF, Hamilton and Lester (1987), Hamilton and Yurkunas (1987), and Tucker (1980) recorded this bird on study areas on the Catahoula, Vernon, and Kisatchie Districts, respectively,

Biology

This common summer resident of deciduous, mixed pine-hardwood, and residential areas arrives in the State by the last week of March (Lowery 1974). The wood thrush forages mainly on the forest floor, taking insects, worms, berries, and other small fruits. Holmes and Robinson (1988) found that most (92 percent) of the wood thrush's foraging activity is done within 0.2 m of the ground by probing beneath the leaf litter. The most commonly taken food items and the percentage of the diet that each comprises were beetles (Coleoptera), 38 percent; flies (Diptera), 18 percent; and ants (Hymenoptera), 17 percent.

The breeding season extends from late April to early August, with a peak period extending from mid-May to early June (Hamel and others 1982). The nest is constructed of sticks plastered together with mud and is usually placed 1.5 to 5.0 m above the ground in shrubs or on open branches of understory trees (Hamel and others 1982, James and others 1984, Lowery 1974). The three to five greenish-blue, unspotted eggs, which are similar to those of the American robin (*Turdus migratorius*), require about 14 days of incubation, and the young fledge after an additional 2 weeks (Dilger 1956, Lowery 1974).

Habitats

Utilizing data from breeding-bird surveys, Dilger (1956) generalized the habitat preference of the wood thrush as being strongly associated with undisturbed, moist deciduous woodlands. Dilger also asserted that wood thrushes are most abundant in edge situations and that abundant sapling growth is associated with optimum conditions for this species. Morse (1971) found this thrush in pine, hardwood, and mixed habitats in Maine. In his study of breeding habitats in western Connecticut, Bertin (1977) found that wood thrush territories were clustered along streams and in wet places dominated by sugar maple, white ash, red oak, and chestnut oak. Bertin also found wood thrushes, though fewer, in mature bowland forests of eastern hemlock, white pine, and red maple. Pauland Roth (1983) found high densities of this bird in oak–sweetgum-tuliptree forests in Delaware.

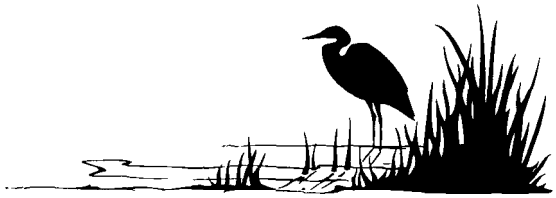
James and others (1984) characterized wood thrush habitats as mesic deciduous forests dominated by white oak, red oak, sugar maple, yellow birch, American beech, tuliptree, and sweetgum. Moreover, they reported values for percentage of ground cover (39 to 71 percent), percentage of canopy cover (81 to 98 percent), and average canopy height (16 to 26 m) for wood thrush territories. Blake and Hoppes (1981) captured significantly more wood thrushes in forest interiors than in tree-fall gaps. Robbins and others (1989) found that the wood thrush occurs with maximum probability (80 percent) in forest tracts of at least 500 ha.

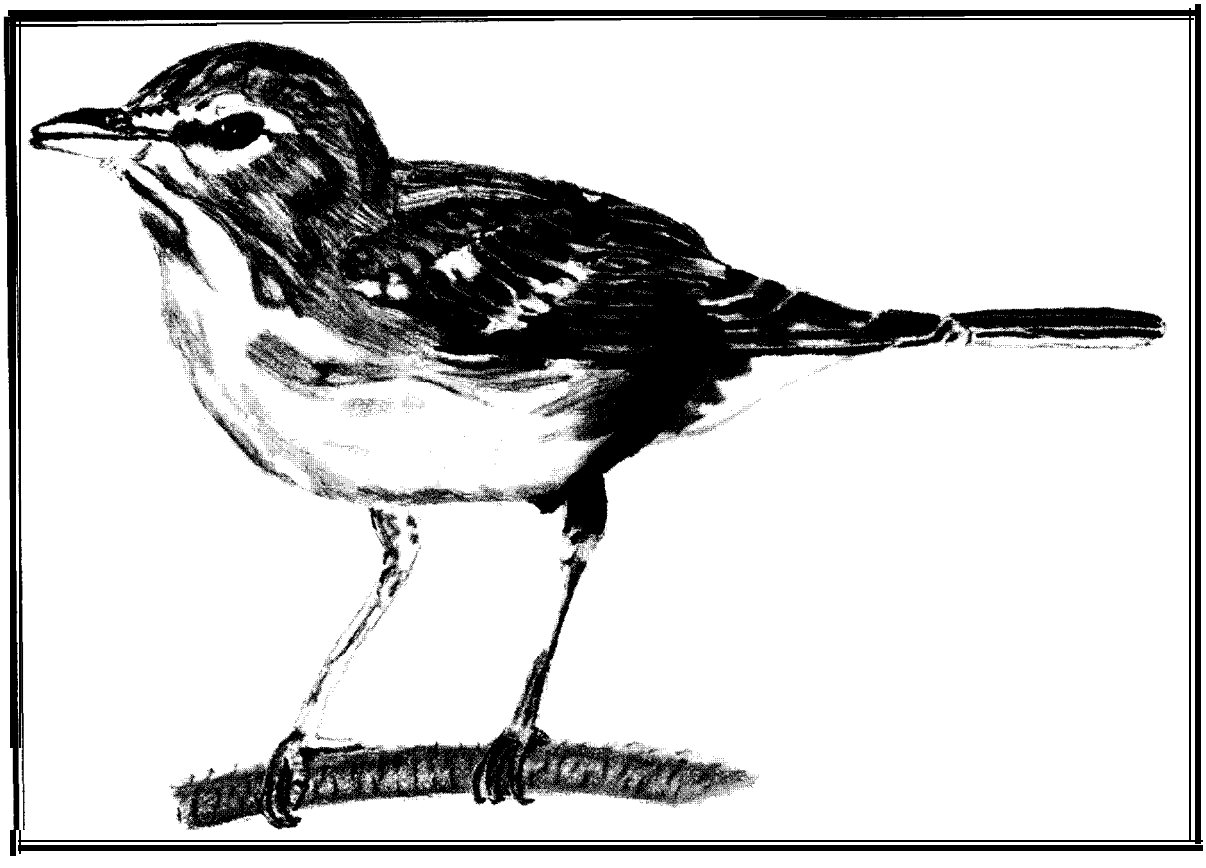
Territory Size/Density

Densities of wood thrushes are highly variable, declining from the Northeast toward the Gulf of Mexico (James and others 1984). This generality seems to be borne out by the data in table 7. The lowest densities were observed in Louisiana (Dickson 1978a, 1978b), and the highest density was observed in a Delaware woodlot (Pauland Roth 1983). Although the apparent trend in the data remains to be verified, the average density over the entire range (excluding Pauland Roth 1983) is about 22 pairs per square kilometer. Because the wood thrush prefers moist sites, the actual density is expected to be much lower.

Table 7.— *Density estimates for wood thrushes by location*

State or region	Density	Reference
	Pairs/km²	
Louisiana	6	Dickson 1978b
Louisiana	7	Dickson 1978a
Southeastern States	13	Meyers and Johnson 1978
Illinois	15	Graber and Graber 1963
Arkansas	25	Holmes and Sherry 1988
Rangewide	27	James and others 1984
Georgia	38	Johnston and Odum 1956
Tennessee/ North Carolina	44	Wilcove 1988
Delaware	200	Pauland Roth 1983





Yellow-Throated Vireo (*Vireo flavifrons*)

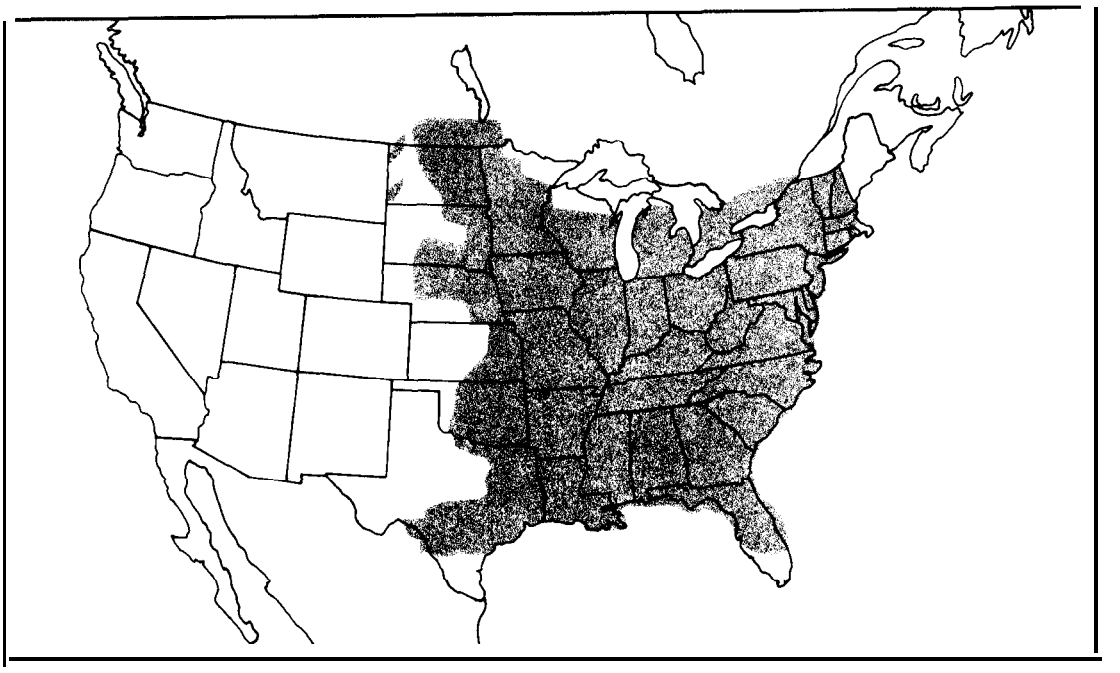


Figure 16.-Distribution of the yellow-throated vireo (shaded areas) in the United States and southern Canada.

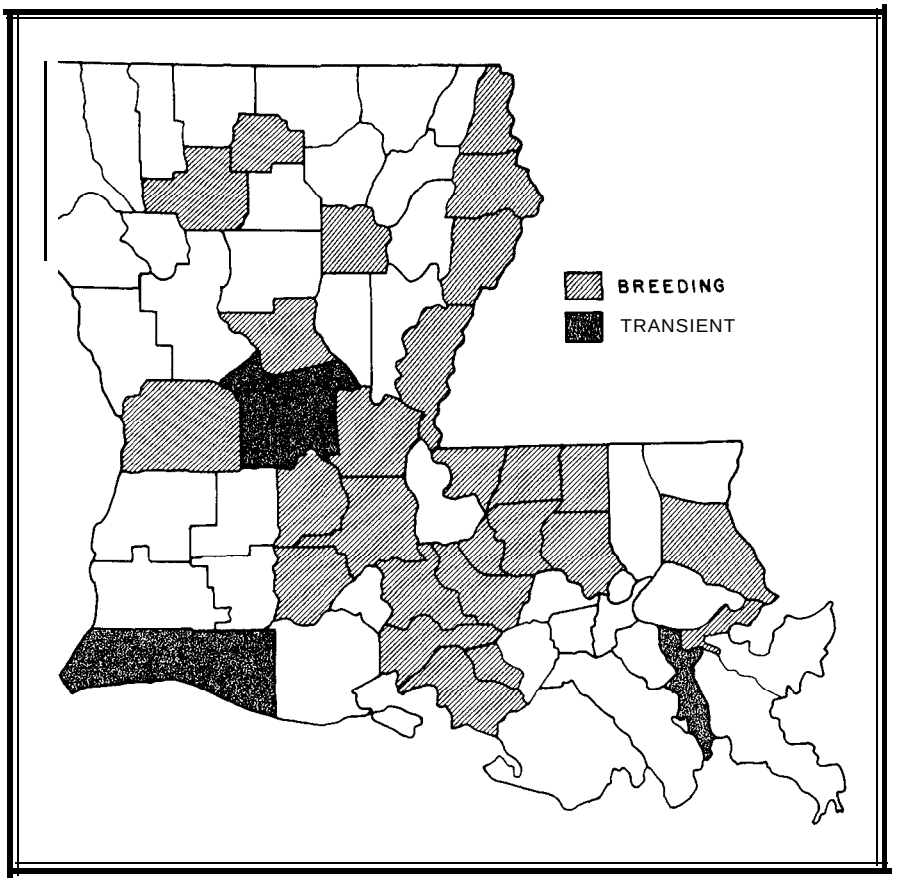


Figure 17.—Louisiana parishes in which the yellow-throated vireo has been recorded as breeding or transient.

Distribution

The distribution of the yellow-throated vireo in the United States is given in figure 16. According to Lowery (1974), this vireo is found throughout Louisiana north of the coastal marshes. Biologists conducting breeding-bird surveys for the Louisiana Natural Heritage Program have recorded the yellow-throated vireo in the parishes marked in figure 17. Hamilton and Lester (1987), Hamilton and Yurkunas (1987), and Tucker (1980) found this vireo on the Catahoula, Vernon, and Kisatchie Districts of the KNF, respectively.

Biology

This common summer resident arrives in Louisiana during the first or second week of March from its wintering areas in the neotropics (Lowery 1974). Williamson (1971) found that this vireo gleaned arthropods from twigs and branches less than 7.5 cm in diameter. In addition, James (1976) found that yellow-throated vireos gleaned prey from dead branches in the central portion of trees. Hamel and others (1982) reported that this vireo forages in hardwoods at heights generally above 6 m and is rarely seen at heights below 5 m.

The breeding season of the yellow-throated vireo extends from late April to mid-July, with the peak period extending from mid-May to early June (Hamel and others 1982). The nest is usually suspended from the joint of a forked twig. Williamson (1971) reported an average nest height of 8.7 m (range of 3 to 18 m) for 36 nests in Maryland, and James (1976) reported an average height of 13.4 m (range of 9 to 15 m) for 10 nests in Ontario, Canada. The usual clutch size is four eggs, but the range is three to five eggs. Data are not available on nesting success or survival of young.

Habitats

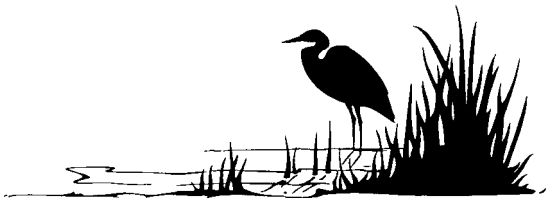
The yellow-throated vireo can be found in a wide variety of hardwood and mixed pine-hardwood forest types throughout its range. It is generally associated with mature, moist deciduous forests and prefers woodlands with partially open canopies. In Ontario, Canada, the study area used by James (1976) was dominated by sugar maple, American elm, red oak, balsam poplar, trembling aspen, and white birch. Ambuel and Temple (1983) reported the yellow-throated vireo in forests dominated by white oak, red oak, sugar maple, and basswood in Wisconsin. Williamson's (1971) study area in Maryland was dominated by beech, white oak, red maple, hickories, and sweetgum. Johnston and Odum (1956) found this vireo in 60-plus-year-old pine and oak-hickory climax forests in Georgia, and Dickson (1978b) recorded this bird in bottomland hardwoods dominated by water oak, sweetgum, hackberry, cherrybark oak, green ash, and American elm in Louisiana.

Territory Size/Density

Williamson (1971) stated that yellow-throated vireos generally have larger territories than other congenerics. Stewart and Robbins (1958) and Williamson (1971), both working in Maryland, report densities of 25 pairs per square kilometer (table 8). This compares with the lower end of reported density estimates for red-eyed vireos (table 9). The average density (from table 8) is 15 pairs per square kilometer.

Table 8.— *Density estimates for yellow-throated vireos by location*

State or region	Density	Reference
	Pairs / km²	
Illinois	5	Graber and Graber 1963
Southeastern States	8	Shugart and others 1978
Louisiana	9	Dickson 1978a
Southeastern States	13	Meyers and Johnson 1978
Georgia	13	Johnston and Odum 1956
Louisiana/east Texas	22	Dickson 1978b
Maryland	25	Stewart and Robbins 1958
Maryland	25	Williamson 1971



Red-Eyed Vireo *(Vireo olivaceus)*

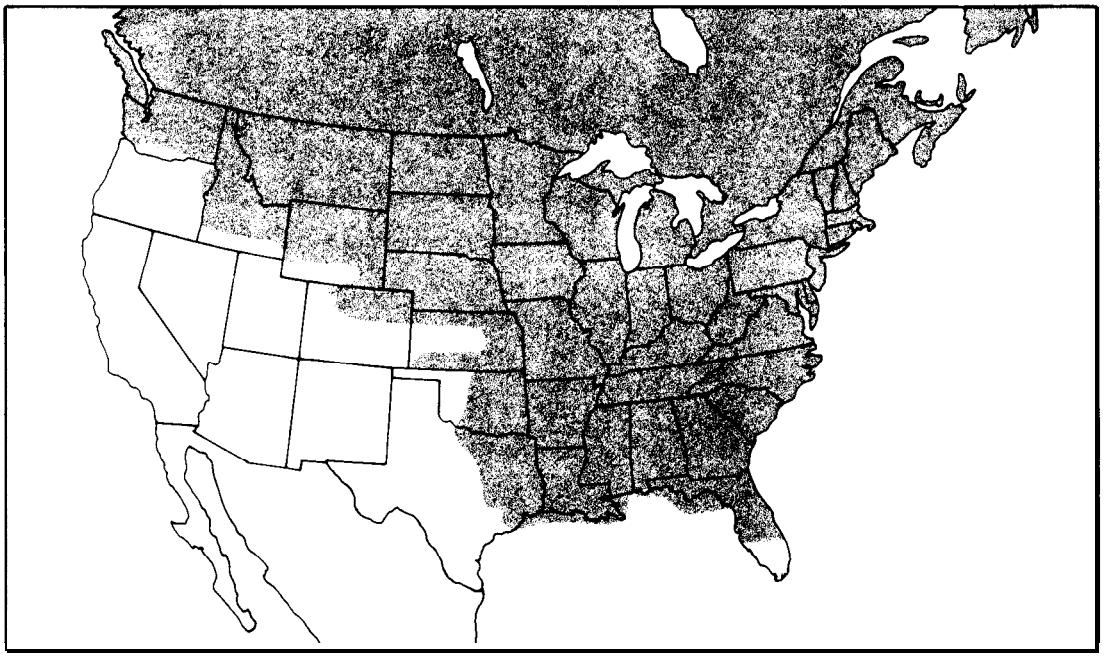


Figure *M-Distribution of the red-eyed vireo (shaded areas) in the United States and southern Canada.*

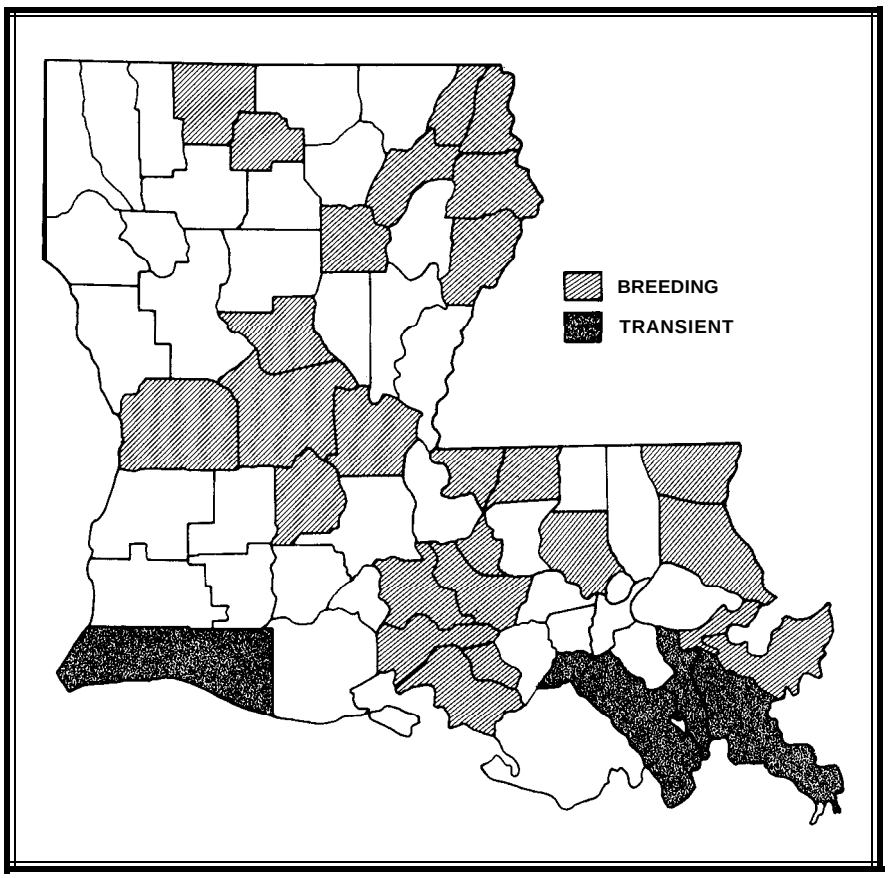


Figure *19 - Louisiana parishes in which the red-eyed vireo has been recorded as breeding or transient.*

Distribution

The distribution of the red-eyed vireo in the United States is given in figure 18. Lowery (1974) reported that this vireo can be found virtually everywhere in the hardwood sections of the State. Although breeding-bird surveys conducted by biologists of the Louisiana Natural Heritage Program have recorded this bird in many of the parishes within the State (fig. 19), the red-eyed vireo can probably be found in forests and woodlots throughout the entire State. Hamilton and Lester (1987), Hamilton and Yurkunas (1987), and Tucker (1980) found this vireo on the Catahoula, Vernon, and Kisatchie Districts of the KNF, respectively.

Biology

The red-eyed vireo, an abundant summer resident of Louisiana, arrives in the State during the last half of March (Lowery 1974). The majority of prey items in the diet of this bird are insects, primarily lepidopterans gleaned from hardwood leaves; however, some plant material (berries) may be taken (Bent 1950, James 1976, Robinson 1981, Southern 1958, Williamson 1971). Maurer and Whitmore (1981), working in the Fernow Experimental Forest, in West Virginia, found that these vireos used hovering and gleaning about equally while foraging mainly on the outer perimeter of a tree. Robinson and Holmes (1982), however, observed red-eyed vireos using hovering about twice as much as gleaning in the Hubbard Brook Experimental Forest in New Hampshire. They give the following percentages for the five prey-capturing maneuvers of this vireo: hover (56.6), glean (29.9), hang (7.1), flush-chase (1.9), and hawk (4.5).

The peak of breeding activity occurs from late May to mid-June, and the nesting season extends from early May to late July (Hamel and others 1982). The female bears sole responsibility for constructing the intricately woven pensile nest, which is typically suspended from a small fork in a lower branch of a small tree (Southern 1958). Nest heights generally average about 5.3 m; however, mean nest heights have been reported as ranging from 2.3 m (Southern 1958) in Michigan to 10.7 m (Robinson 1981) in New Hampshire. The red-eyed vireo lays a single clutch of two to four white eggs having a few tiny black spots, and the 13-day incubation period begins only after the last egg has been laid (Southern 1958). Both sexes share in the incubation of eggs and care of nestlings, which fledge at approximately 10 to 13 days of age.

Of 78 red-eyed vireo nests observed by Southern (1958), 19 were deserted due to cowbird parasitism, 11 were destroyed by natural causes, and 48 were successful in producing vireos and/or cowbirds. Based on the number of eggs laid in 32 nests that produced vireo young, Southern reported a nesting success for red-eyed vireos of 87.49 percent; however, 8 of these nests produced 1 to 3 (total of 10) cowbirds as well. For 21 unparasitized nests, this same author reported a nesting success of 79.33 percent. Lawrence (1953) noted that red-eyed vireos fledged young from 60 percent of 98 eggs in 30 nests having a hatching success of 76 percent. Fall departure of red-eyed vireos from Louisiana and the rest of the Southeast varies from early to late October (Hamel and others 1982, Lowery 1974).

Habitats

The red-eyed vireo is generally known to inhabit upland and river-bottom deciduous and mixed woods, wooded clearings, and suburban areas. Blake and Hoppes (1981) captured significantly more red-eyed vireos in tree-fall gaps than in the forest interior, which suggests an affinity for these openings. Conner and others (1983) found that the distribution of red-eyed vireos was positively correlated with the number of tree species, percentage of small hardwoods (5 to 16 cm in d.b.h.), percentage of canopy closure, and vegetation height, but was negatively correlated with the percentage of small pines. Southern (1958) described the habitat of his study area in Michigan as dominated by aspen and red maple. Robinson's (1981) study area in New Hampshire was dominated by sugar maple, American beech, and yellow birch, and the principal study area of Williamson (1971) was dominated by American beech and white oak. In contrast, Conner and others (1983) and Whiting and Fleet (1987) reported finding vireos in loblolly-shortleaf pine stands in east Texas.

On the Catahoula District of the KNF, Hamilton and Lester (1987) found the red-eyed vireo to be among the 10 most abundant breeding birds in the loblolly-shortleaf pine-upland hardwood forests of central Louisiana. Hardwoods present on their study areas included southern red oak, post oak, hickories, sweetgum, and red maple. Among the understory plants reported were yellow jessamine, blackberry, and waxmyrtle. Hamilton and Yurkunas (1987) found vireos on the Vernon District in the longleaf-slash pine habitat of west-central Louisiana. In addition to the dominant habitat descriptors, loblolly pine, sweetgum,

red oak, and red maple were among the trees present on the study area. Understory taxa were similar to those on the Catahoula District. Tucker's (1980) study area in the Bayou Boeuf Research Natural Area of the Kisatchie District was chiefly bottom land hardwoods.

Territory Size/Density

Densities of red-eyed vireos ranged from a low of 13 pairs per square kilometer (Dickson 1978b) to a high of 323 pairs per square kilometer (Rice 1978) (table 9). Robbins and others (1989) reported a greater than 90-percent probability of detecting red-eyed vireos from any randomly established observation point in wooded plots of at least 1 km^2 in size. Although the density estimates of red-eyed vireos in Louisiana are dramatically lower than those in other geographic locations, definitive measurements of densities have not been conducted. The average density of 118 pairs per square kilometer (from table 9) is the highest average density among the 13 species chosen for review in this report.

Table 9.-Density estimates for red-eyed vireos by location

State, region, or province	Density	Reference
	Pairs/km^2	
Louisiana	*13*	Dickson 1978a
Illinois	20	Graber and Graber 1963
Louisiana	25	Tucker 1980
Wisconsin	29	Ambuel and Temple 1983
Tennessee/ North Carolina	59	Wilcove 1988
Southeastern States	62	Shugart and others 1978
Arkansas	67	Shugart and James 1973
Georgia	106	Johnston and Odum 1956
Ontario, Canada	130	Kandeigh 1947
New Hampshire	131	Robinson 1981
Ontario, Canada	141	Lawrence 1953
Michigan	145	Southern 1958
Michigan	145	Profitt 1946*
Maryland	188	Williamson 1971
Michigan	312	Nesslinger 1949*
Ontario, Canada	323	Rice 1978

* In Southern (1958).

Distribution

The distribution of the red-eyed vireo in the United States is given in figure 18. Lowery (1974) reported that this vireo can be found virtually everywhere in the hardwood sections of the State. Although breeding-bird surveys conducted by biologists of the Louisiana Natural Heritage Program have recorded this bird in many of the parishes within the State (fig. 19), the red-eyed vireo can probably be found in forests and woodlots throughout the entire State. Hamilton and Lester (1987), Hamilton and Yurkunas (1987), and Tucker (1980) found this vireo on the Catahoula, Vernon, and Kisatchie Districts of the KNF, respectively.

Biology

The red-eyed vireo, an abundant summer resident of Louisiana, arrives in the State during the last half of March (Lowery 1974). The majority of prey items in the diet of this bird are insects, primarily lepidopterans gleaned from hardwood leaves; however, some plant material (berries) may be taken (Bent 1950, James 1976, Robinson 1981, Southern 1958, Williamson 1971). Maurer and Whitmore (1981), working in the Fernow Experimental Forest, in West Virginia, found that these vireos used hovering and gleaning about equally while foraging mainly on the outer perimeter of a tree. Robinson and Holmes (1982), however, observed red-eyed vireos using hovering about twice as much as gleaning in the Hubbard Brook Experimental Forest in New Hampshire. They give the following percentages for the five prey-capturing maneuvers of this vireo: hover (56.6), glean (29.9), hang (7.1), flush-chase (1.9), and hawk (4.5).

The peak of breeding activity occurs from late May to mid-June, and the nesting season extends from early May to late July (Hamel and others 1982). The female bears sole responsibility for constructing the intricately woven pensile nest, which is typically suspended from a small fork in a lower branch of a small tree (Southern 1958). Nest heights generally average about 5.3 m; however, mean nest heights have been reported as ranging from 2.3 m (Southern 1958) in Michigan to 10.7 m (Robinson 1981) in New Hampshire. The red-eyed vireo lays a single clutch of two to four white eggs having a few tiny black spots, and the 13-day incubation period begins only after the last egg has been laid (Southern 1958). Both sexes share in the incubation of eggs and care of nestlings, which fledge at approximately 10 to 13 days of age.

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Habitats

The red-eyed vireo is generally known to inhabit upland and river-bottom deciduous and mixed woods, wooded clearings, and suburban areas. Blake and Hoppes (1981) captured significantly more red-eyed vireos in tree-fall gaps than in the forest interior, which suggests an affinity for these openings. Conner and others (1983) found that the distribution of red-eyed vireos was positively correlated with the number of tree species, percentage of small hardwoods (5 to 16 cm in d.b.h.), percentage of canopy closure, and vegetation height, but was negatively correlated with the percentage of small pines. Southern (1958) described the habitat of his study area in Michigan as dominated by aspen and red maple. Robinson's (1981) study area in New Hampshire was dominated by sugar maple, American beech, and yellow birch, and the principal study area of Williamson (1971) was dominated by American beech and white oak. In contrast, Conner and others (1983) and Whiting and Fleet (1987) reported finding vireos in loblolly-shortleaf pine stands in east Texas.

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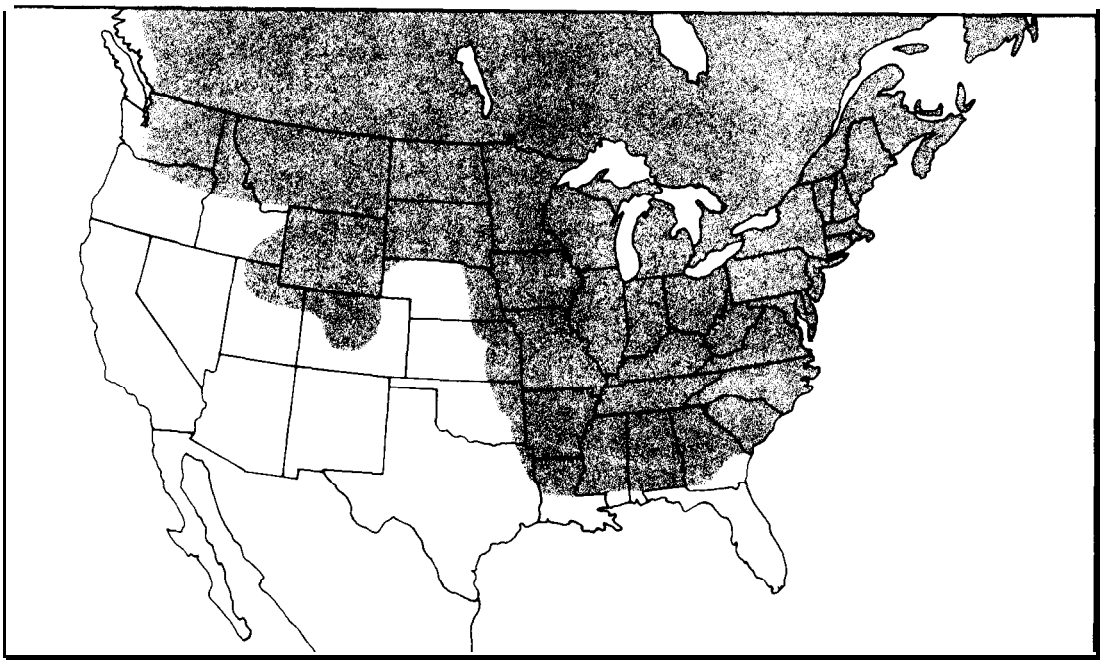


Figure 20.—*Distribution of the American redstart (shaded areas) in the United States and southern Canada.*

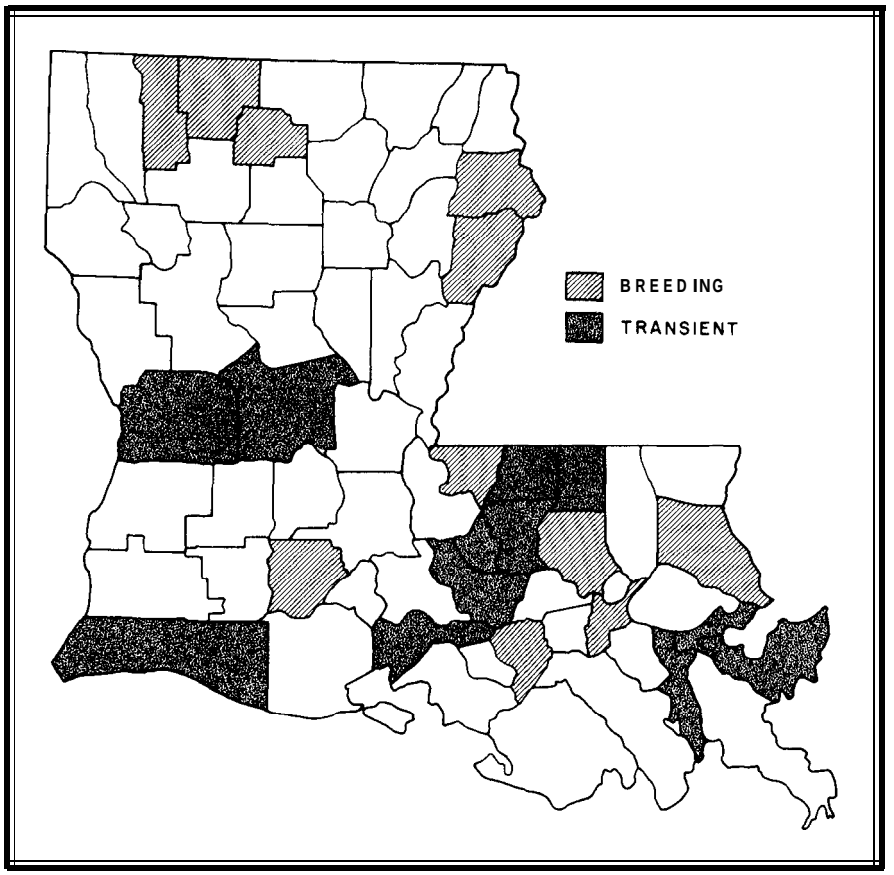
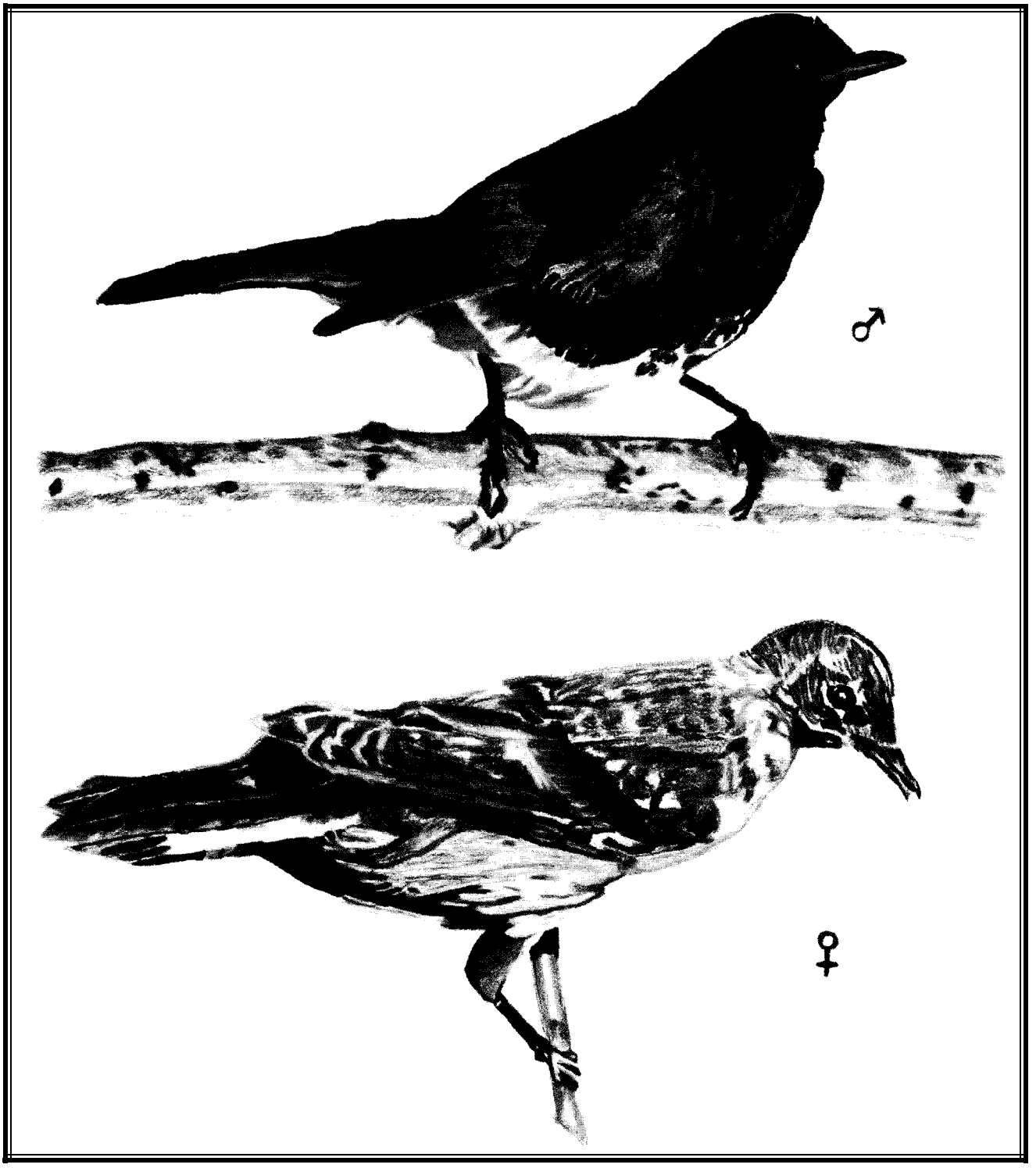


Figure 21-Louisiana *parishes in which the American redstart has been recorded as breeding or transient.*



American Redstart *(Setophaga ruticilla)*

Distribution

The distribution of the American redstart in the United States is given in figure 20. Lowery (1974) reported localized breeding populations of redstarts in Louisiana in the Pearl River Swamp opposite Bogalusa, in deep magnolia ravines near St. Francisville, and near Minden. The southernmost breeding record was from near Donaldsonville in Assumption Parish. Redstarts have also been recorded as occurring fairly regularly during winter in Orleans, Plaquemines, and Cameron Parishes. Biologists of the Louisiana Natural Heritage Program have reported redstarts as breeding birds in the parishes marked in figure 21.

Biology

The American redstart is a common to locally abundant migrant but is only a localized breeder in Louisiana (Lowery 1974). This atypical wood warbler arrives in the spring from early to late April (Hamel and others 1982). The redstart forages primarily on arthropods in the midstory of the forest canopy, usually at heights of 3 to 9 m; however, much unlike other warblers, the redstart forages by hovering and flycatching (hawking) as well as by gleaning (Ficken and Ficken 1967, Maurer and Whitmore 1981, Robinson and Holmes 1982). In New York, Ficken and Ficken observed that flycatching makes up over 80 percent of the foraging patterns before the leaves are out in May, then hovering and gleaning become more prevalent as the season progresses. In West Virginia, Maurer and Whitmore describe foraging behavior in young forests as made up of 54.9 percent hovering, 7.0 percent gleaning, and 38.0 percent hawking. For mature forests they found foraging behavior comprised of 34.0 percent hovering, 10.6 percent gleaning, and 55.3 percent hawking. In New Hampshire, Robinson and Holmes (using a slightly different scheme) report foraging behavior as composed of 53.1 percent hovering, 22.8 percent gleaning, 0.4 percent hanging, 17.4 percent flush-chase, and 6.3 percent hawking.

The redstart's breeding season is from early May to late June, with the peak period extending from late May to early June (Hamel and others 1982). The female bears sole responsibility for constructing the nest of bark, grasses, and feathers in a three- to four-pronged crotch of a sapling 1.0 to 10.7 m above the forest floor (Ficken 1964). The male, however, shares in incubating the clutch of three to five grayish-white or bluish-white eggs during the 12- to 13-day incubation period. Most juvenile male redstarts attempt to secure territories and breed; virtually all adult males breed. Though data on nesting success is sketchy, Baker (1944) reported that 14 (87.5 percent) of 16 nestling redstarts survived at least to fledging age (8 to 9 days). Following the nesting season, redstarts remain in Louisiana until the end of October.

Habitats

Sherry (1979) and Sherry and Holmes (1988) found that American redstarts in New Hampshire inhabited second-growth hardwood stands dominated by American beech, sugar maple, and yellow birch. The preferred habitat at Douglas Lake, in Michigan, was second-growth sugar maple (Baker 1944), and Howe (1974), also in Michigan, found redstarts in an alder and aspen swamp west of Baker's (1944) study area. Ficken (1962) identified her New York study area as moist deciduous woodland with plenty of second growth. Ficken and Ficken (1967) reported that all redstarts found on their New York study area were associated with mature and second-growth deciduous forests with few conifers.

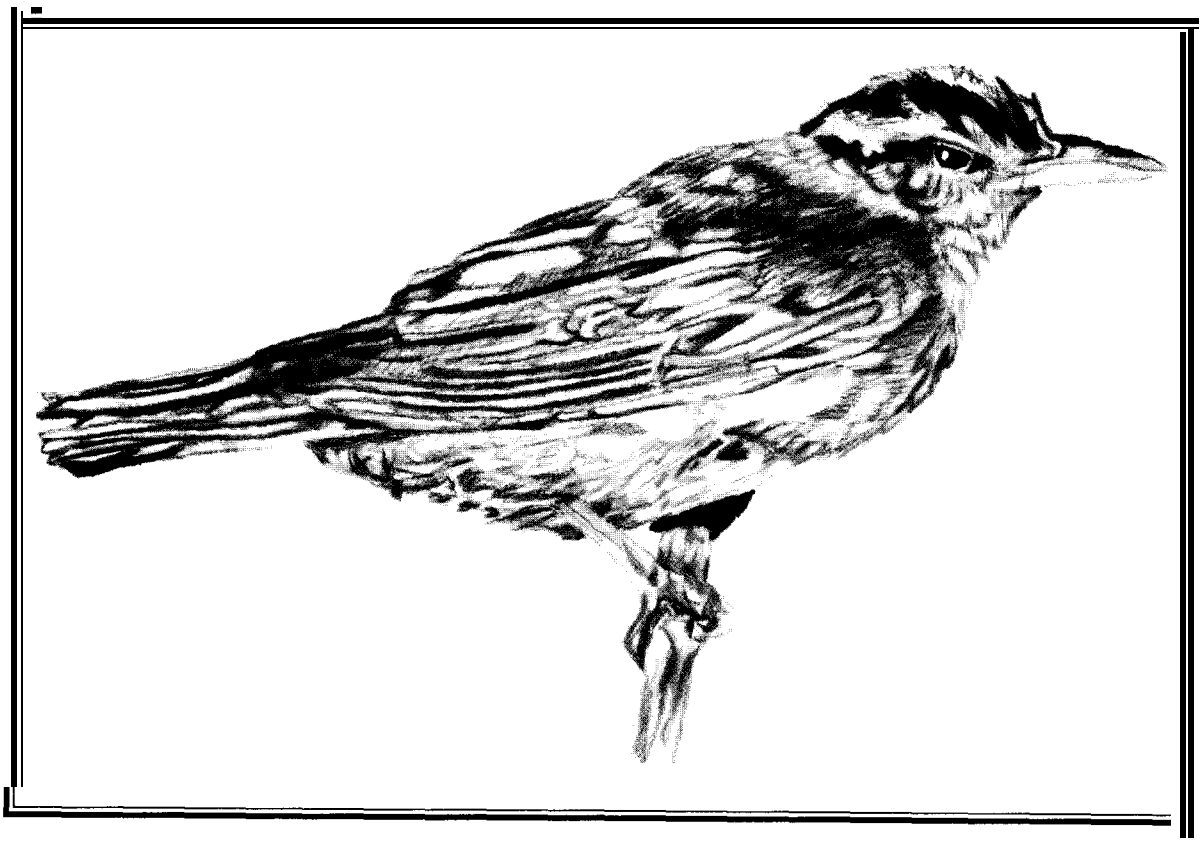
Dickson (1978a) found very few American redstarts in oak-gum forests of east Texas. Maurer and Whitmore (1981) studied the influence of vegetation structure on the foraging of five bird species, including the redstart, in a West Virginia forest dominated by red oak, chestnut oak, red and sugar maples, black cherry, American beech, and tuliptree. Noon and others (1979) reported the dominant tree species in northern deciduous communities as sugar maple, beech, basswood, yellow birch, and red maple. Temple and others (1979) found that redstarts ranged over deciduous, mixed, and coniferous forest types in the North Central and Northeastern United States. Dominant species on the study areas of Titterington and others (1979) in Maine were spruce, balsam fir, yellow birch, paper birch, red maple, and American beech.

Territory Size / Density

Where habitat features are optimum for redstarts, breeding densities can be quite high. Ficken and Ficken (1967) reported a territory size of 0.30 ha per pair on their study area in New York, and the estimates of Sturm (1945) averaged 0.08 ha per pair in Ohio. The lowest density reported in the literature was one pair per 25 ha (four pairs per square kilometer) (Dickson 1978a). Although the density of redstarts can be quite high depending on local conditions, densities in Louisiana are probably much lower and more local than those reported for more northerly populations (table 10). This difference is because Louisiana is on the periphery of the redstart's spatial distribution (fig. 20). The average density of the American redstart in the United States is 103 pairs per square kilometer (excluding Sturm 1945).

Table 10.— *Density estimates for American redstarts by location*

State or region	Density	Reference
	Pairs / km²	
East Texas	*4*	Dickson 1978b
Illinois	*15*	Graber and Graber 1963
Southeastern States	*24*	Shugart and others 1978
Arkansas	*35*	Shugart and James 1973
Maine	*36*	Titterington and others 1979
New York	92	Ficken 1962
New Hampshire	120	Sherry 1979
New York	137	Hickey 1940
New Hampshire	140	Holmes and Sherry 1988
Michigan	202	Howe 1974
New York	329	Ficken and Ficken 1967
Ohio	1,176	Sturm 1945



Worm-Eating Warbler (*Helmitheros vermivorus*)

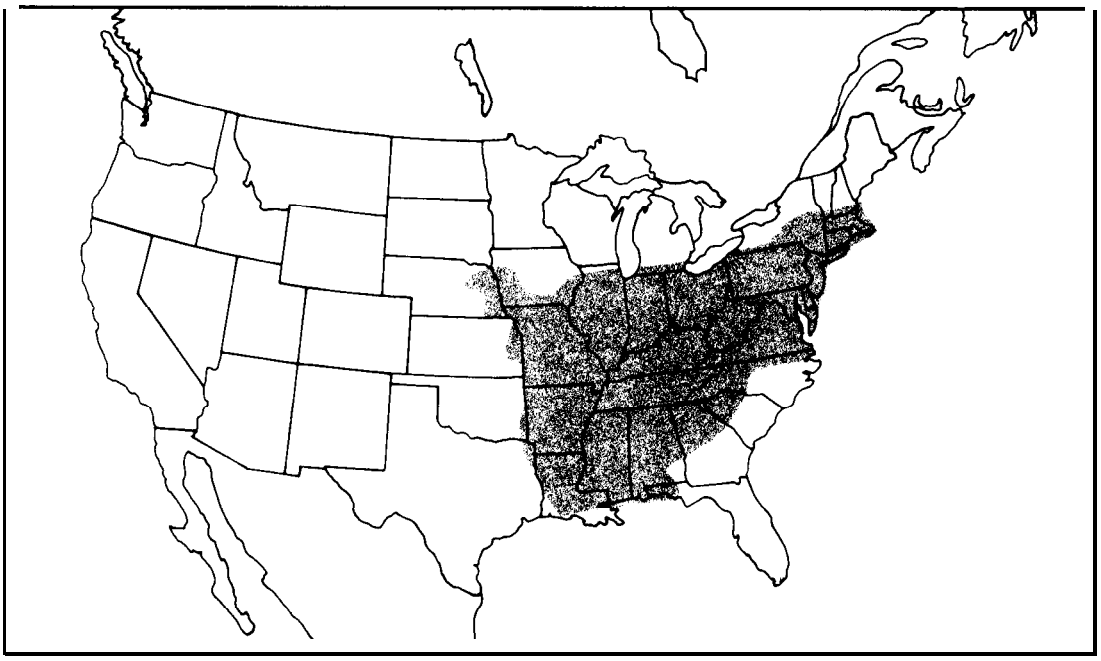


Figure 22.-Distribution of the worm-eating warbler (shaded areas) in the United States.

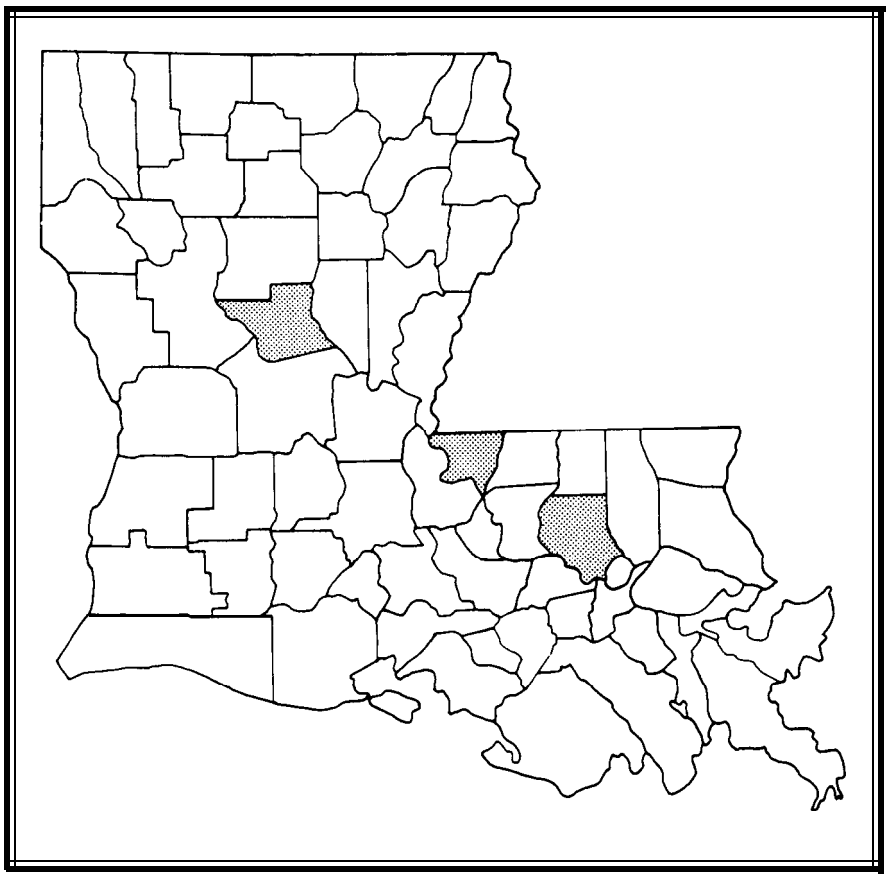


Figure 23.-Louisiana parishes (shaded areas) in which the worm-eating warbler has been recorded as breeding.

Distribution

The worm-eating warbler breeds throughout a large portion of the Eastern United States (fig. 22). Lowery (1974) reported that the only breeding records of this bird for Louisiana were from the St. Francisville area in West Feliciana Parish. Data from the Louisiana Natural Heritage Program on the occurrence of this warbler is lacking at this time (fig. 23). However, Hamilton and Lester (1987) did find this bird on the Catahoula District of the KNF, and Dr. R. B. Hamilton[2] found this warbler in Livingston Parish.

Biology

This rather uncommon and extremely local breeding bird arrives in the State as early as mid-March (Lowery 1974). This warbler is known to vary its foraging tactics between breeding and nonbreeding seasons from live- to dead-leaf searching, respectively (Greenberg 1987a, 1987b). On Greenberg's (1987b) study area in Maryland, worm-eating warblers gleaned arthropods (Lepidoptera, Coleoptera, and Homoptera) mostly from the leaves of oaks but shifted foraging locations to understory shrubs as the summer progressed.

The breeding season of this ground-nesting warbler extends from mid-May to late June, with the peak period extending from late May to early June (Hamel and others 1982). According to Burns (1905), the nest is constructed of well-rotted leaves and is lined with moss; it is placed on the ground at the foot of a small shrub in a drift of dead leaves. Incubation of the four or five eggs is performed by the female alone. Estimates of hatching success or survival of young are not available. Lowery (1974) submits that fall migrants pass through the State until the end of October.

Habitats

Burns (1905) described the haunts of this bird as wooded hillsides in second-growth timber. Similarly, Lowery (1974) described the area near St. Francisville, Louisiana, as deep, well-shaded beech-magnolia woods. Hamel and others (1982) described the primary breeding habitat of this warbler in the Coastal Plain as bottomland hardwoods with a rich understory of broadleaf evergreen shrubs and saplings. Conner and Adkisson (1975) found the worm-eating warbler in 7- and 12-year-old clear-cuts composed of mixed oaks, hickories, and red maple in southwestern Virginia, but not in mature stands. Dickson and others (1980), however, reported this warbler as present in young, intermediate, and mature stands throughout the Southeast. Hooper (1978) found this warbler to be associated with virgin hardwood and second-growth sawtimber in cove forests of the Appalachians, and Noon and others (1979) found a similar relationship in northern hardwood forests. Robbins and others (1989) found that the probability of detecting this bird at a random point in a forest was maximized at 36 percent for an area of 3,000-plus ha.

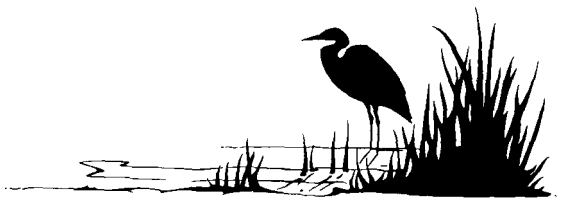
Territory Size/Density

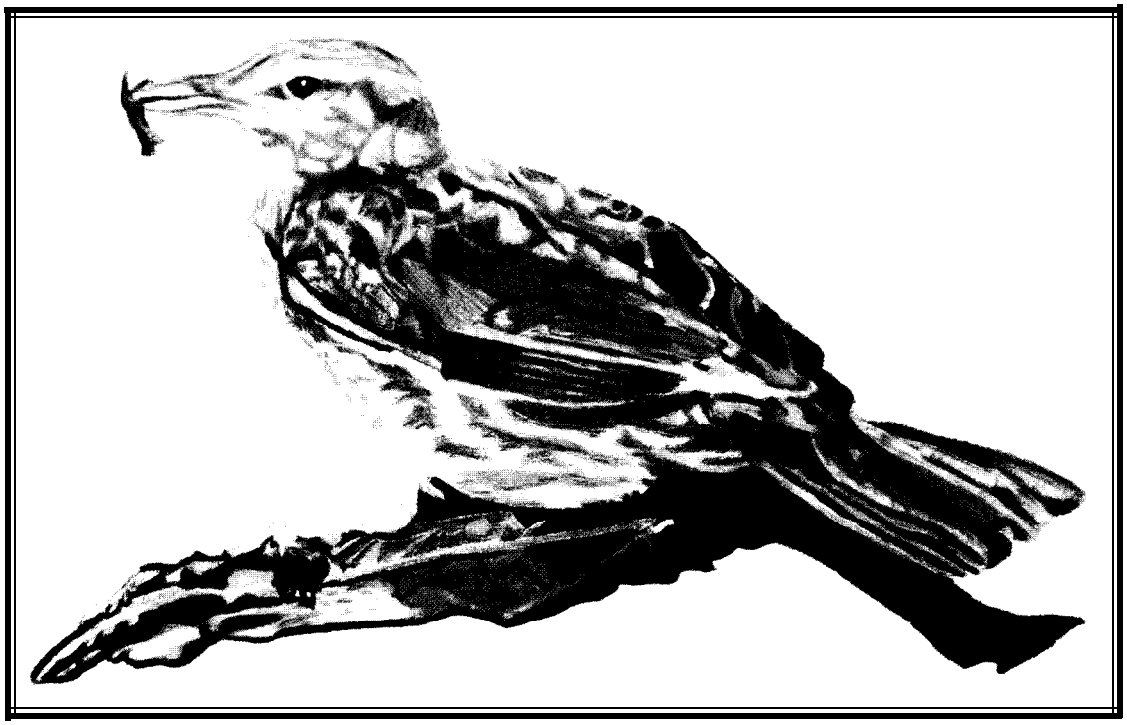
The lowest density reported in the literature (7 pairs per square kilometer) was that of Graber and Graber (1963) in Illinois, but Greenberg (1987b) reported a density as high as 100 pairs per square kilometer in Maryland (table 11). The great disparity between these estimates is probably related to the amount of suitable habitat in the respective locations. Because the worm-eating warbler is known to prefer forested areas with deep-gulled terrain, habitat is probably the most limiting factor to the distribution and abundance of this warbler on the KNF.

Table 11.— *Density estimates for worm-eating warblers by location*

State or region	Density	Reference
	Pairs/km²	
Illinois	7	Graber and Graber 1963
Southeastern States	15	Shugart and others 1978
Tennessee	17	Wilcove 1988
Arkansas	35	Shugart and James 1973
Maryland	100	Greenberg 1987b

[2] Personal communication with R. B. Hamilton, 26 August 1991, School of Forestry, Wildlife, and Fisheries, Louisiana State University, Baton Rouge, LA 70803.





Swainson's Warbler (*Limnothlypis swainsonii*)

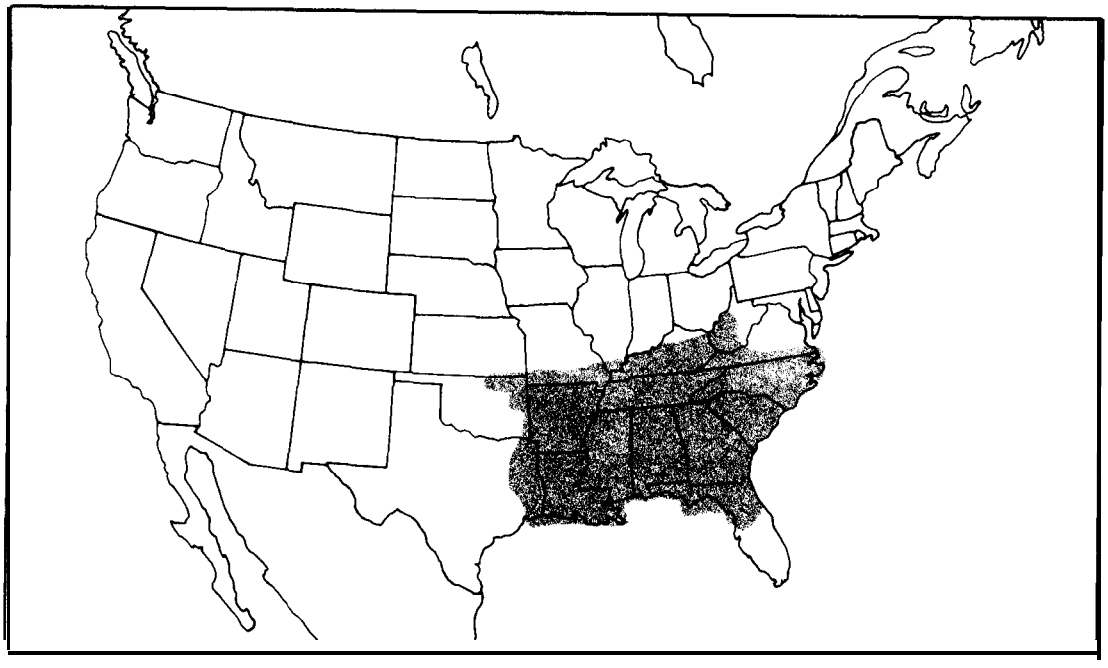


Figure 24.—Distribution of the Swainson's warbler (shaded areas) in the United States.

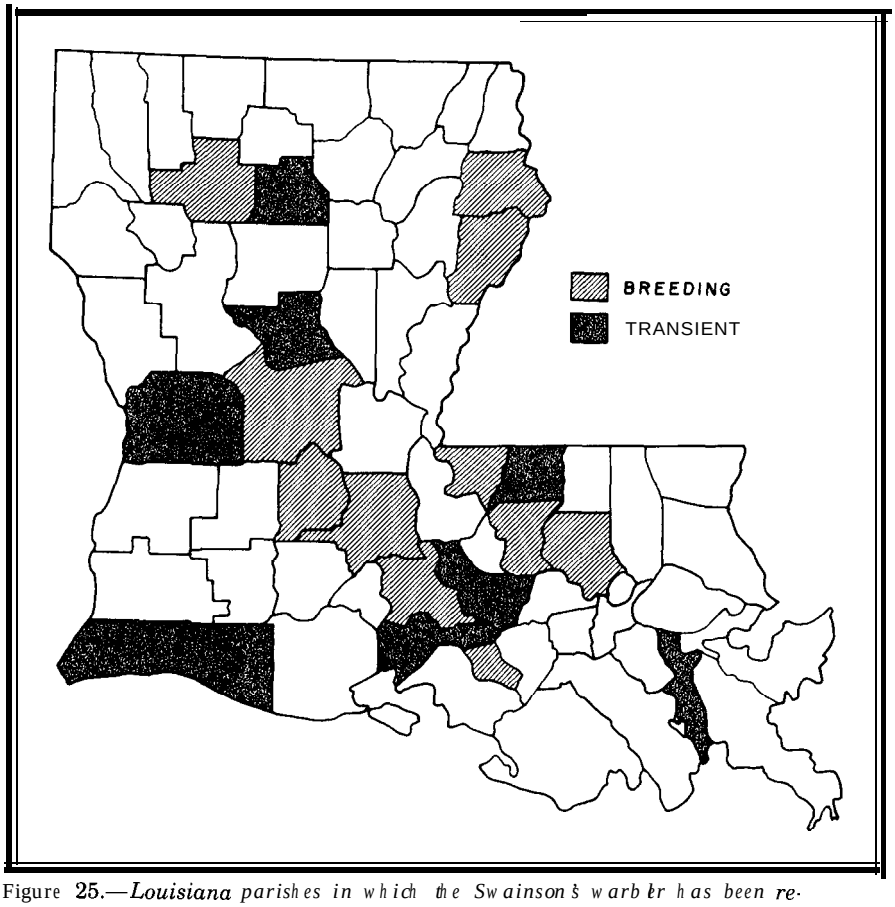


Figure 25.—*Louisiana parishes in which the Swainson's warbler has been recorded as breeding or transient.*

Distribution

The distribution of Swainson's warbler in the United States is given in figure 24. In Louisiana, this warbler was found nesting in Rapides Parish (Meanley 1966, 1971) and was observed in Cameron Parish during migration (Lowery 1974). Researchers in breeding-bird surveys have also noted the presence of Swainson's warblers in other parishes throughout the State (fig. 25). Swainson's warblers have been found on the Catahoula District of the KNF by Hamilton and Lester (1987) but not on the Vernon District (Hamilton and Yurkunas 1987) or the Kisatchie District (Tucker 1980).

Biology

The Swainson's warbler, an uncommon summer resident of wooded swamps and canebrakes in the Southeastern United States, arrives in Louisiana by the end of March (Lowery 1974). This bird forages on the ground beneath leaves and other debris to find most of the important invertebrate prey items, such as spiders, ground beetles, crickets, ants, and their larvae or pupae (Meanley 1945, 1966, 1971).

The breeding season of Swainson's warbler extends from early May to early July, with a peak period extending from mid-May to mid-June (Hamel and others 1982). The nests are large, bulky structures placed 0.6 to 3.0 m above the ground in dense tangles of canes, briars, thick bushes, or palmettos in or near a swampy area (Bent 1953, Lowery 1974, Meanley 1971). The usual complement of three or four eggs are variable in color: plain white with a bluish, greenish, or pinkish tinge. The incubation period reported by Meanley (1971) ranged from 13 to 15 days, and the young fledged after about 10 days. The fall departure of Swainson's warbler from Louisiana ranges from late September to early October (Lowery 1974).

Habitats

The habitat of the Swainson's warbler has been described by Meanley (1966, 1971) as river floodplain forests dominated by a hackberry-swamp chestnut oak-elm association on the Upper Coastal Plain, or a laurel oak-sweetgum-hackberry association on the Lower Coastal Plain. Midstory species included boxelder and ash and also saplings of the dominant species. Undergrowth was typically 100 percent giant canebrake in the Upper Coastal Plain or scrub palmetto in the Lower Coastal Plain. Other habitats mentioned by Meanley (1966, 1971) include pineland galls, cypress bays, and dry woods near swamp edges that contain a scattering of canes. Morse (1989) stated that Swainson's warblers tend to settle in clumped territories in the midst of large expanses of unoccupied but favorable habitat.

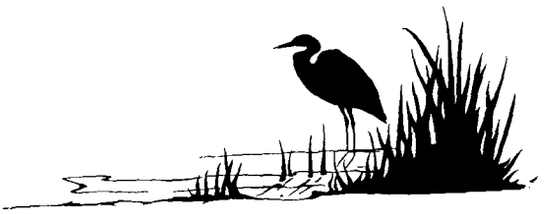
Wright and Harper (1913) described the predominantly pondcypress and/or blackgum habitat of the Swainson's warbler in the Okefenokee Swamp in Georgia. In addition to the forested wetland habitats described above, the Swainson's warbler is known to be a locally common breeding bird in at least two major plant communities on the Allegheny Plateau. The reader is encouraged to examine the summary of Meanley (1966, 1971) or consult Brooks and Legg (1942) and Sims and DeGarmo (1948) for a description of these habitats.

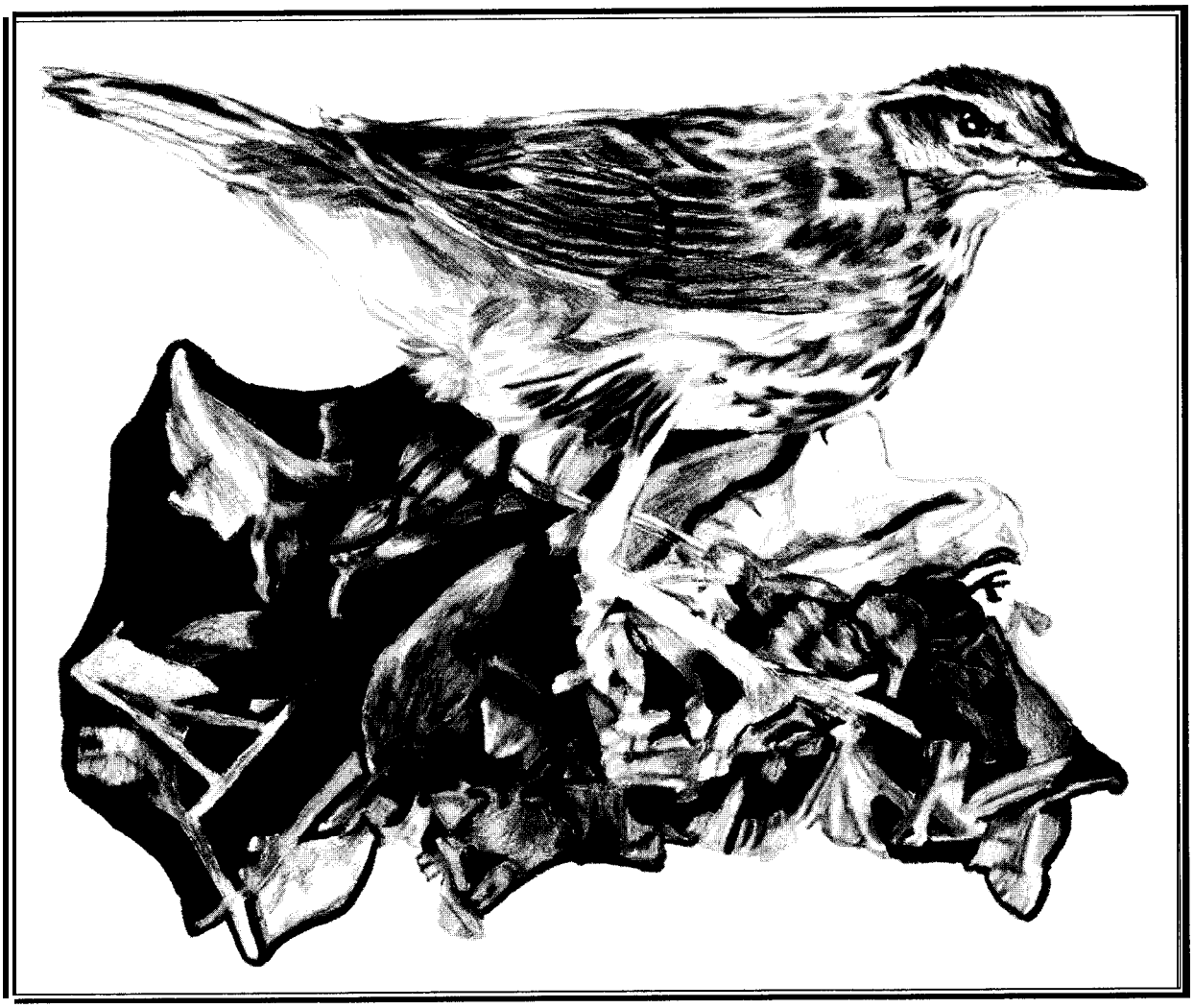
Territory Size/Density

Norris (1963) gives density estimates of 5 pairs and 10 pairs per square kilometer in broadleaf deciduous and floodplain forests, respectively, in South Carolina (table 12). Meanley (1966) reported a density of 25 pairs per square kilometer in a sweetgum-water oak forest in Rapides Parish, Louisiana, and 1 pair per 0.7 ha of canebrake (143 pairs per square kilometer) in Georgia. Meanley (1971) provided a comprehensive look at territory sizes reported in the literature along with the associated vegetative characteristics. An estimate of the possible maximum population of the Swainson's warbler for the KNF cannot be made without knowing the extent of area occupied by forests having the necessary understory vegetation; i.e., canebrakes and scrub palmettos.

Table 12.-Density *estimates for Swainson's warblers by location*

State or region	Density	Reference
	Pairs/km²	
South Carolina Deciduous forest	5	Norris 1963
South Carolina Floodplain forest	10	Norris 1963
Louisiana	10	Dickson 1978a
Louisiana	25	Meanley 1966
Southeastern States	65	Meanley 1971
Georgia	143	Meanley 1966





Louisiana Waterthrush *(Seiurus motacilla)*

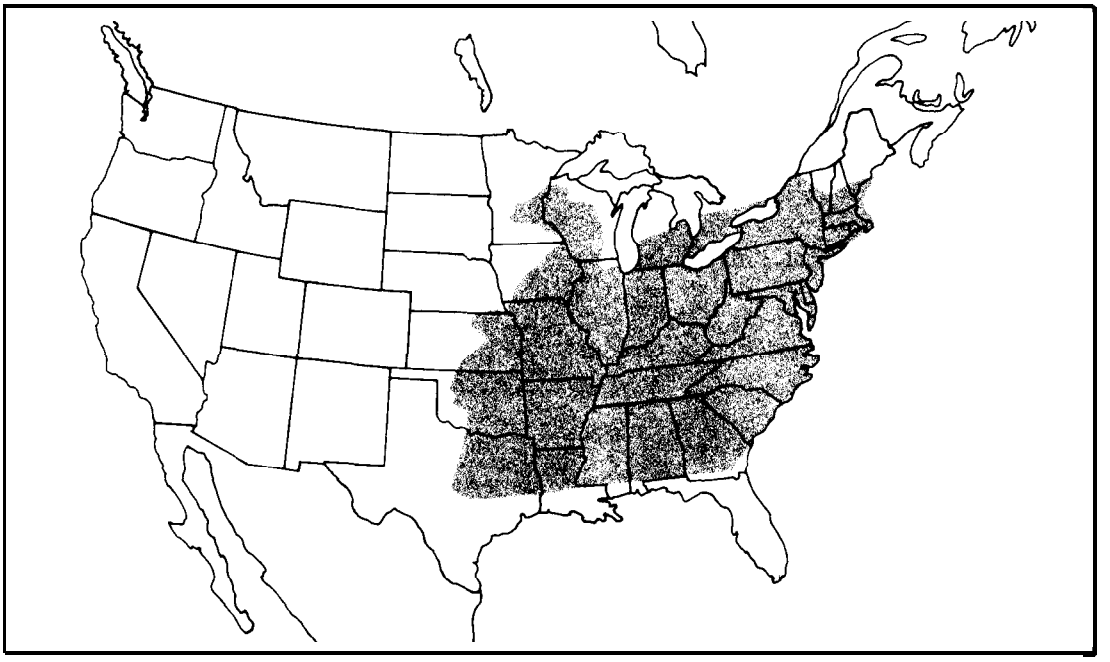


Figure 26.-Distribution of the Louisiana waterthrush (shaded areas) in the United States and southern Canada.

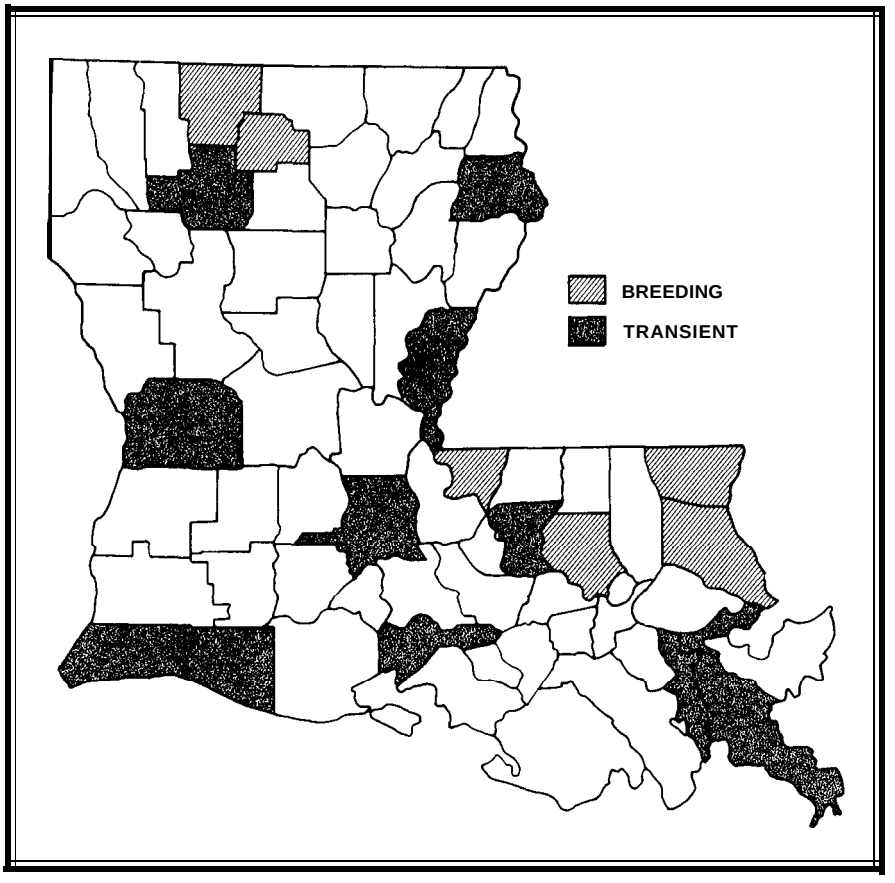


Figure 27.-Louisiana parishes in which the Louisiana waterthrush has been recorded as breeding or transient.

Distribution

The distribution of the Louisiana waterthrush in the United States is given in figure 26. In Louisiana, this bird has been reported as a breeding bird in the parishes marked in figure 27. Hamilton and Lester (1987), Hamilton and Yurkunas (1987), and Tucker (1980) did not report the presence of the Louisiana waterthrush on the Catahoula, Vernon, or Kisatchie Districts of the KNF, respectively.

Biology

The Louisiana waterthrush is a locally common summer resident in the northern part of the State that arrives in mid-March (Lowery 1974). This warbler forages primarily on insects associated with aquatic environments, and Craig (1984) found the following taxa to be important to the diet of the Louisiana waterthrush: caddisflies (Trichoptera), mayflies (Ephemeroptera), flies (Diptera), and termites (Isoptera). In addition, Eaton (1958) noted that stoneflies (Plecoptera) and caddisflies were important components of the Louisiana waterthrush's diet.

The breeding season of the Louisiana waterthrush extends from mid-April to early June, with the peak period extending from late April to mid-May (Hamel and others 1982). Both sexes participate in the construction of the bulky nest composed of dead leaves, sticks, fine grasses, and rootlets plastered together with mud (Eaton 1958, Lowery 1974). Nests are usually placed near the banks of woodland streams under an overhanging bank, and Eaton (1958) reported that most nests in his New York study area were built 0.5 to 4.0 m above the glen floor on an east-facing slope. Lowery (1974) stated that the Louisiana waterthrush lays a clutch of four to six finely speckled white eggs; however, Eaton (1958) reported a mean clutch size of 5.8 eggs for 16 Louisiana waterthrush nests in New York. Eaton also found that, following the 14-day incubation period and 9- to 10-day nestling stage, Louisiana waterthrush pairs fledged young from 70 percent of all eggs laid. The young may be attended by adults for up to 25 days after fledging (Eaton 1958), and southward migration begins as early as July 1 (Lowery 1974).

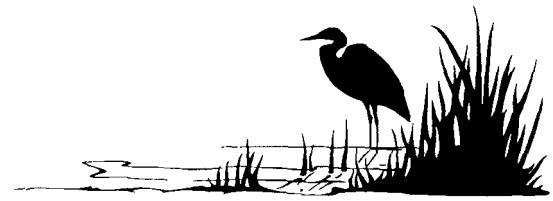
Habitats

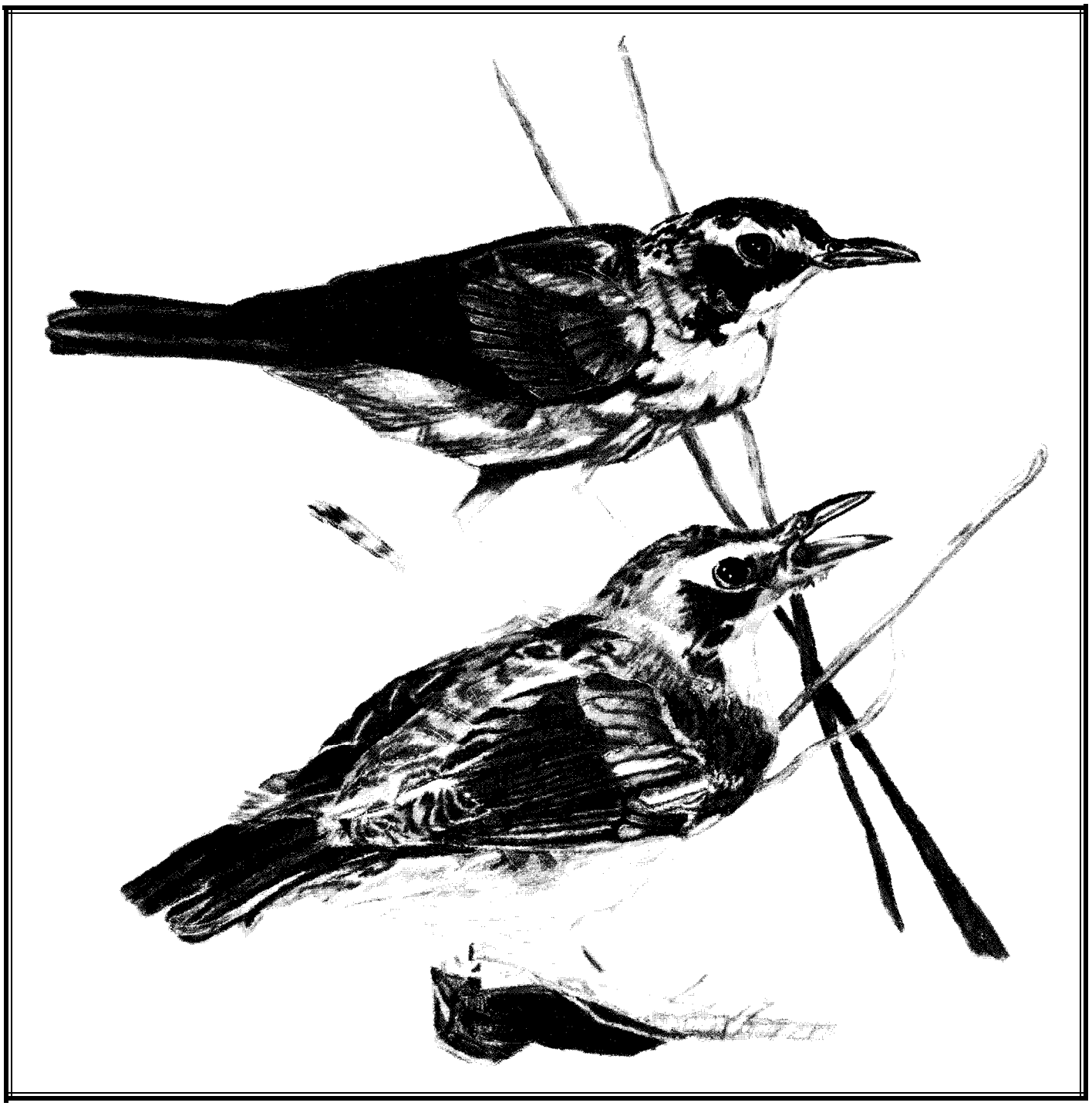
The Louisiana waterthrush favors bottomland forests usually in close proximity to rapidly moving streams. Eaton (1958) studied the life history of the Louisiana waterthrush in 10 glens along the east shore of Cayuga Lake, near Ithaca, New York, and described the vegetation as composed of oaks with an understory of ericaceous plants. Although a better description of the vegetation is lacking in this study, Eaton did note the presence of swift-moving streams in the glens. In Boston Hollow, Connecticut, Craig (1984, 1985, 1987) described the habitat of the Louisiana waterthrush as mesic, mature deciduous forests dominated by yellow birch, sugar maple, and red maple in areas with fast-moving streams. Eliason and Fall (1989) found Louisiana waterthrushes in steep-sided valleys with permanent, swiftly flowing streams in Washington County, Minnesota, where vegetation was dominated by mesic deciduous forests of sugar maple and basswood.

Conner and others (1979) found Louisiana waterthrushes only in mature forest stands in southwestern Virginia. Similarly, Dickson and others (1980) found this warbler to be relatively more abundant in mature than in young or intermediate forests throughout the Southeast. Hooper (1978) found this waterthrush only in second-growth sawtimber in Appalachian cove forests. Robbins and others (1989) found a maximum probability of occurrence of 25 percent in forest tracts of 3,000-plus ha.

Territory Size/Density

Eaton (1958) described the territory as long and narrow and occupying approximately 400 m along the course of a fast-flowing stream. Craig (1984) reported that the territory size of the Louisiana waterthrush averaged 0.67 ha (149 pairs per square kilometer). It is difficult to speculate on the actual density of Louisiana waterthrushes on the KNF because of their affinity for nesting near streams. Most streams in Louisiana are generally slow moving, however, which is contradictory to the nature of nesting habitats reported by Eaton (1958) and Craig (1984). But there are approximately 400 km of perennial streams on the KNF; therefore, the potential exists for it to support a substantial breeding population.





Kentucky Warbler *(Oporornis formosus)*

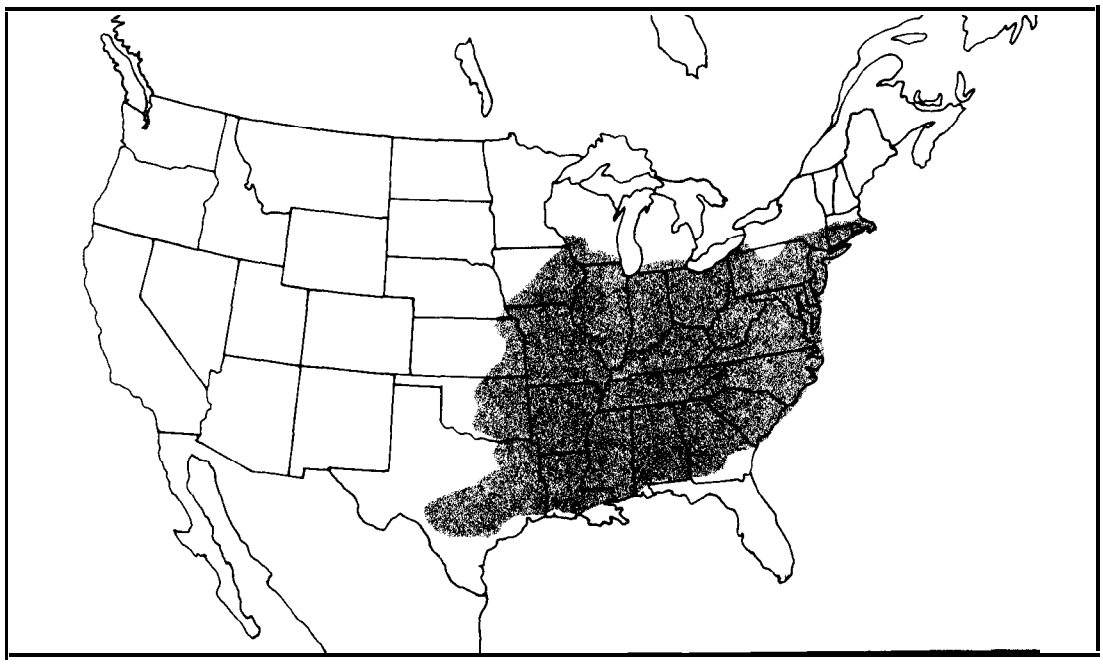


Figure 28.—*Distribution of the Kentucky warbler (shaded areas) in the United States.*

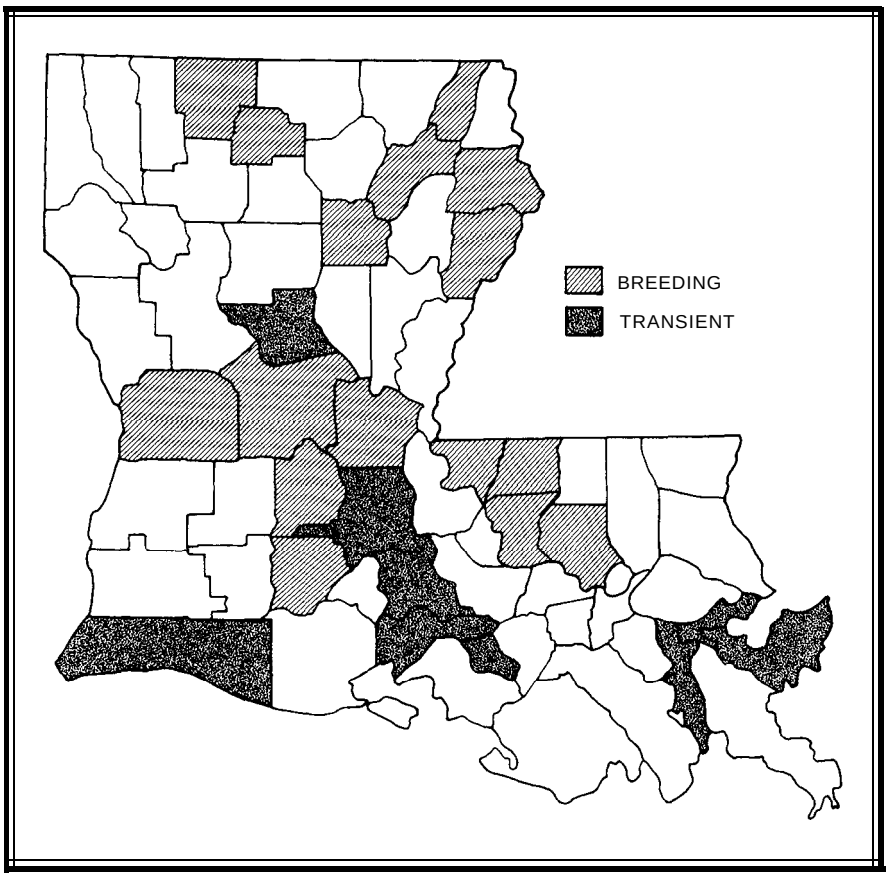


Figure 29.—*Louisiana parishes in which the Kentucky warbler has been recorded as breeding or transient.*

Distribution

The distribution of the Kentucky warbler in the United States is given in figure 28. A common breeding bird of dense eastern hardwood forests, this ground-dwelling warbler has been recorded as a breeding bird by biologists of the Louisiana Natural Heritage Program in the parishes shown in figure 29. Based on the number of observations of breeding birds, Hamilton and Lester (1987) found this warbler to be one of the 20 most common birds on the Catahoula District. Tucker (1980) found the Kentucky warbler on the Bayou Boeuf Research Natural Area of the Kisatchie District, but Hamilton and Yurkunas (1987) did not record the presence of this bird on the Vernon District.

Biology

The Kentucky warbler arrives in the State during mid-March (Lowery 1974). To the author's knowledge, there have been no published studies of the life history of this bird. However, some information can be found in other publications concerned with bird communities. Like many other warblers, the Kentucky warbler forages by gleaning arthropods from low-level vegetation, generally below 7 m (Dickson and Noble 1978, Evans 1978).

The breeding season extends from early May to mid-July, with a peak period that extends from late May to early June (Hamel and others 1982). Nests are placed on or near the ground, are composed of leaves and rootlets lined with grasses, and are located near a stream, marsh, or damp lowland (De Garis 1936). The female is chiefly responsible for incubation of the four to six grayish-white or ashy-colored eggs flecked with various shades of brown (De Garis 1936). Of the six nests observed by De Garis, the incubation period was 12 to 13 days, and the nestling stage was 8.5 to 10.0 days. In 4 of the nests, 17 of 19 eggs (89 percent) hatched, and in 4 nests young birds fledged. The Kentucky warbler leaves Louisiana in October for its wintering areas in Central and South America (Lowery 1974).

Habitats

The Kentucky warbler is generally found in mature hardwood forests with open overstories and small understory plants (Anderson and Shugart 1974). Dominant trees on their Tennessee study area were pines, tuliptree, oaks, and hickories. In southwestern Virginia, Conner and Adkisson (1975) found this warbler in clearcuts more than 7 years old in an oak–hickory-maple forest. Also in Virginia, Tsipoura and Morton (1988) studied song-type distribution in a population of Kentucky warblers in a forest dominated by tuliptree, oaks, and black locust. Johnston and Odum (1956) reported that the Kentucky warbler occurred only in mature oak-hickory climax forests in Georgia.

Dickson and others (1980) reported that the Kentucky warbler occurred in young, intermediate, and mature pine, hardwood, and mixed stands throughout the Southeast. Noon and others (1979) found that this bird was recorded equally on censuses in mature and successional habitats. Meyers and Johnson (1978) reported the presence of this warbler in pine, hardwood, and mixed stands; however, these habitats were mature stands. Robbins and others (1989) found that significant predictors of relative abundance for this warbler were canopy height, forest area, moisture gradient, and low-level foliage density. In addition, these researchers found that the maximum probability of detection was 29 percent in forest tracts of at least 3,000 ha.

Territory Size/Density

The Kentucky warbler, although known to be a fairly common bird, occurs at relatively low densities throughout its range (table 13). Densities reported in the table may not be representative of actual densities because none of the estimates are from territory mapping studies; rather, they are from breeding-bird surveys or line transects. The mean of the densities presented in table 13 is 16.4 pairs per square kilometer.

Table 13.-Density *estimates for Kentucky warblers by location*

State or region	Density	Reference
	Pairs/km²	
Louisiana		Dickson 1978a
Louisiana	12	Dickson 1978b
Georgia	13	Johnston and Odum 1956
Southeastern States	13	Meyers and Johnson 1978
Southeastern States	13	Shugart and others 1978
Tennessee/ North Carolina	18	Wilcove 1988
Illinois	20	Graber and Graber 1963
Arkansas	35	Shugart and James 1973

POPULATION TRENDS

Most long-term population studies have been conducted in more northerly latitudes, notably the Northeastern and Middle Atlantic States. Whether data for these areas reflect the state of population changes for birds across their breeding ranges remains to be investigated; however, annual breeding-bird surveys seem to indicate that population declines are widespread. Hill and Hagan (1991) analyzed 53 years of spring-migration data for migrants in eastern Massachusetts and concluded that overall population trends are negative. During 1982–83, Wilcove (1988) repeated breeding-bird censuses that had been conducted in 1947–48 and found that neotropical migrant populations of the Great Smoky Mountains did not show any significant changes.

There are two broad physiographic areas within which Louisiana falls: the Upper Coastal Plain (UCP) and Mississippi Alluvial Plain (MAP). Although the KNF lies within the UCP, both areas are considered for the sake of increased applicability. According to survey data on the 13 breeding birds that are abstracted herein, Louisiana populations of 9 species either remained stable or increased from 1966 through 1989, while 4 species showed nonsignificant decreases (table 14). Three species (American redstart, worm-eating warbler, and Swainson's warbler) have shown significant population increases in the MAP, but in the UCP, population trends for the first two species were negative. Though it is unknown what factors are responsible for the increases in the latter two species, the American redstart is known to inhabit second-growth forests and successional habitats and probably benefits from timber harvesting that occurred a decade ago (Ficken and Ficken 1967, Titterington and others 1979, Webb and others 1977).

A subset of the data for 1980–89 (table 15) shows some similarities to and differences from the entire data set. The three species mentioned above show a significant increase in population in Louisiana for 1966–89 and for 1980–89. The worm-eating warbler declined during both periods, while Swainson's warbler increased during both periods in the UCP. American redstart populations have decreased in the UCP over the 24-year period of record but have increased slightly during the last decade. In addition, the Acadian flycatcher showed an increase during the last decade in both physiographic areas. The wood thrush decreased significantly in the UCP and MAP during both time periods.

The population trend for the Mississippi kite showed a nonsignificant decrease in Louisiana and the UCP and a significant decrease in the MAP over the 1966–89 period; however, the trend from 1980 to 1989 showed a nonsignificant increase in Louisiana and the UCP and a nonsignificant decrease in the MAP. Parker and

Table 14.—*Population trends during 1966–89 for 13 neotropical migratory birds that breed on the Kisatchie National Forest, Louisiana**

Species	Louisiana	UCP†	MAP†
		Trend‡	
Mississippi kite	–	–	↓
Broad-winged hawk	+	+	+
Yellow-billed cuckoo		–	↓
Chuck-will's-widow	+	↓	+
Acadian flycatcher	+	o	–
Wood thrush		↓	↓
Yellow-throated vireo	+	↓	↑
Red-eyed vireo	–	+	–
American redstart	↑	–	↑
Worm-eating warbler	↑	–	↑
Swainson's warbler	↑	+	↑
Louisiana waterthrush	+	+	↑
Kentucky warbler	+	–	+

* Data from Louisiana breeding-bird survey routes; compiled by U.S. Fish and Wildlife Service, Office of Migratory Bird Management, Laurel, MD (Courtesy of Sam Droege).

† UCP, Upper Coastal Plain; MAP, Mississippi Alluvial Plain.

‡ ↑, significant increase; ↓, significant decrease; +, nonsignicant increase; –, nonsignificant decrease; o, no net change.

Table 15.—*Population trends during 1980–89 for 13 neotropical migratory birds that breed on the Kisatchie National Forest, Louisiana**

Species	Louisiana	UCP†	MAP†
		Trend‡	
Mississippi kite	+	+	
Broad-winged hawk	–		–
Yellow-billed cuckoo	o	↓	↓
Chuck-will's-widow	–		NA
Acadian flycatcher	↑	+	+
Wood thrush	↓	↓	
Yellow-throated vireo	+	↓	NA
Red-eyed vireo	+	–	
American redstart	↑	+	NA
Worm-eating warbler			↑
Swainson's warbler	↑	+	NA
Louisiana waterthrush	+		NA
Kentucky warbler	+	↓	+

* Data from Louisiana breeding-bird survey routes; compiled by U.S. Fish and Wildlife Service, Office of Migratory Bird Management, Laurel, MD (Courtesy of Sam Droege).

† UCP, Upper Coastal Plain; MAP, Mississippi Alluvial Plain.

‡ ↑, significant increase; ↓, significant decrease; +, nonsignicant increase; –, nonsignificant decrease; o, no net change; NA, not available.

Ogden (1979) reported that this raptor is not only increasing in abundance throughout its range but has also expanded its range in recent times, which may account for the observed increase. Broad-winged hawk populations, on the other hand, have shown increasing trends for the overall 24-year period 1966-89 but decreasing trends for the subset period 1980–89. This is just the opposite of what has been occurring with Mississippi kite populations. Because there has not been a definitive survey and inventory of kite or broadwinged hawk populations across the State, and due to the nature of breeding-bird survey methods, conclusions about these two populations should be made with reservation.

Although the main focus of this report is on the previously mentioned group of 13 species, several species listed in appendix C are worthy of mention here because their rangewide population trends over the period 1966-89 were significantly negative. The eastern kingbird (*Tyrannustyrannus*), cerulean warbler (*Dendroica cerulea*), prothonotary warbler (*Protonotaria citrea),* and orchard oriole (*Icterusspurius*) are generally known to be common summer residents in Louisiana and throughout their range. Not only have population trends for these passerines declined over their entire range during this period, but declines have been apparent for Louisiana as well However, during the period 1980-89, the declines were not statistically significant.[3]

The reasons for the decline of these and other species may be difficult to ascertain because there is usually no common thread to follow. For instance, the eastern kingbird and orchard oriole prefer fairly open habitats with scattered hardwoods and nest within the canopy, but the cerulean warbler prefers mature hardwood stands with an open understory, and the prothonotary warbler nests in cavities over water in wooded swamps. Although inclusion of abstracts on these species would most certainly be helpful to researchers interested in studies to determine the causes for these declines, compilation of the data for the 13 species abstracted here has been a major undertaking given the time and resources available. Hopefully, other researchers will compile abstracts and further investigate the remaining species of neotropical migratory birds.

EFFECTS OF FOREST MANAGEMENT PRACTICES ON AVIFAUNA

The multiple-use concept of forest management provides for sound conservation programs for soil, water, timber, wilderness, wildlife, grazing, and outdoor recreation. The Chief of the Forest Service announced in a letter[4] and in testimony before Congress[5] that the Forest Service will use an ecological approach, known as ecosystem management, to achieve multiple-use management of the 77.3 million ha of National Forest System lands. The Chief emphasized that ecosystem management will be based on solid scientific information, supported by professional judgment and experience. Some scientific information is examined here that may be useful in developing an ecosystems management strategy with reference to avifauna.

Because any species of wildlife is undeniably a product of its habitat and the juxtaposition of these habitats with the edaphic features in which they occur, alteration of the mosaic of habitat types on a forest will produce changes in the associated fauna. The following discussion summarizes some of the published studies on the effects of silvicultural practices on the avifauna of forest ecosystems. This has direct bearing on management considerations for the KNF.

On the KNF, revised projected timber sales total about 471 million board feet (Scribner C) from 1991 through 1995 (table 2). Two broad categories of timber stand management determine the way in which forest vegetation changes-even-aged and uneven-aged management. Under even-aged management, the main techniques are shelterwood, seed tree, and clearcutting. Even-aged management favors early seral stages and is most suitable for producing monotypic stands of timber. In a seed tree or shelterwood cut, all standing timber is not removed as in clearcutting, but these techniques produce essentially the same conditions. Uneven-aged management is basically accomplished through selective removal of single trees or groups of trees with as little disturbance to the surrounding timber as possible. Under this type of management, all seral stages are maintained at all times, but this technique is used almost exclusively on relatively small private holdings.

Succession of bird communities generally follows forest succession from early seral stages, produced through even-aged management, toward climax communities (Crawford and others 1981, Dickson and others 1984, Hodorff and others 1988, Johnston and Odum 1956, Meyers and Johnson 1978, Noon and others 1979). Clearcutting followed by site-preparation

[3] Data from Louisiana breeding-bird survey routes; compiled by U.S. Fish and Wildlife Service, Office of Migratory Bird Management, Laurel, MD (Courtesy of Sam Droege).

[4] Robertson, F. Dale. 1992. Letter dated June 4 to Regional Foresters and Station Directors about Ecosystem Management of the National Forests and Grasslands. On file with: U.S. Department of Agriculture, Forest Service, Auditors Building, 201 14th Street S.W. at Independence Ave. S.W., Washington, DC 20250.

[5] Robertson, F. Dale. 1992. Statement on June 16 by Chief of the Forest Service before the Subcommittee on Forests, Family Farms, and Energy Committee on Agriculture, U.S. House of Representatives, concerning H.R. 1969, clearcutting, and ecosystem management. On file with: U.S. Department of Agriculture, Forest Service, Auditors Building, 20114th Street SW. at Independence Ave. S.W., Washington, DC 20250.

burning can eliminate habitats for most birds for only a short period of time (Wood and Niles 1978). Forest-interior birds, such as those discussed here, may be excluded for many years while the stand regenerates; however, most of these species do not make extensive use of pine-dominated stands. Conner and Adkisson (1975) found that after 1 year, a regeneration stand in a mixed oak woodland in southwestern Virginia had the lowest diversity of breeding birds among six stands in later successional stages. These authors also found that species diversity was highest in the regeneration stand 7 years after cutting, and that forest-interior birds (wood thrushes) were first recorded in a regeneration stand 12 years after cutting. Similarly, Conner and others (1979) found that species diversity increased along the continuum of regeneration stands 3 to 30 years after cutting but decreased in mature stands. Four of the species examined in these abstracts (yellow-billed cuckoo, Acadian flycatcher, red-eyed vireo, and Louisiana waterthrush) occurred only in stands 30 years or more after cutting, but the wood thrush was found in regeneration stands as soon as 10 years after cutting.

Even-aged management is not without benefit to at least some species. For instance, American redstarts respond favorably to disturbed habitats (Titterington and others 1979, Webb and others 1977), and species that prefer open, mature pine stands would benefit. Seed tree and shelterwood cuts may not be favorable for most forest-interior bird species; however, these changes will be beneficial for a different set of community dominants and provide better foraging opportunities for species such as raptors (Noon and others 1979). Thompson and others (1992), however, found some of the forest-interior species to be more abundant in sapling or pole- to saw timber-sized stands that had previously been clearcut than in stands with no recent harvest. Those authors hypothesized that species such as the Kentucky and worm-eating warblers were keying on the high density of the woody stems present, even though the overstory was not mature.

The abundance, number, and diversity of species were found to be highest in interior-edge habitats on the border of clearcuts (Strelke and Dickson 1980), which indicates that some amount of clearcutting benefits at least some birds. Though this may be true on a landscape level, the same may not hold true at the stand level. If there is a large tract of relatively contiguous forest behind a particular edge, these benefits may be realized; however, in a highly fragmented landscape, many edges increase the potential for nest predation and parasitism.

Under uneven-aged management, high densities of forest-interior birds are favored due to improved vertical diversity of the forest canopy, which provides a greater variety of foraging situations; however, species diversity is reduced due to reduced horizontal diversity (Temple and others 1979). Horizontal diversity of forest vegetation can be improved, with a resultant increase in species diversity, through crown and selection thinning, which stimulates understory growth (Wood and Niles 1978). Most uneven-aged management is practiced on small private holdings, which make up approximately 59 percent of the forest land base in Louisiana (Vissage and others 1992). The effects of forest management on this major portion of the land base should be beneficial to the bird populations discussed in this publication. In the future, more private and commercial forest landowners should be encouraged to manage their timber in this manner.

Prescribed fire is a common tool of management that is used for a variety of purposes, including site preparation, fuel reduction, and hardwood control primarily in pine types. In some forest types (e.g., longleaf pine), fire is essential to the phenology of forest development. The influence of a fuel-reduction fire on the structure of vegetation is generally short lived and can dramatically improve the vigor and quality of fire-adapted species, especially those in the understory. This should benefit NTMB with an affinity for early successional habitats, such as the prairie warbler *(Dendroica discolor)* and indigo bunting *(Passerina cyanea)*. Johnson and Landers (1982) found that densities of breeding birds were higher in burned than unburned slash pine flatwoods in Georgia, and Bock and Bock (1983) found that populations of breeding birds either increased or remained the same following prescribed burning in ponderosa pine stands in Colorado.

Fire is the primary factor that maintains a forest in an early seral stage of succession. Fire suppression results in a change from a herbaceous or fire-adapted community to a community of primarily woody vegetation, which then progresses naturally toward the particular climax vegetation of the site (Johnson and Landers 1982, Wood and Niles 1978). Although this change will preclude avian species that prefer more open habitats, forest species that prefer the climax vegetational community will be favored.

Streamside management zones (SMZ) provide travel corridors and possibly limited habitat for some species associated with mature forests (Dickson and Huntley 1985). In addition, nesting and foraging sites are provided, and habitat diversity and edge are created when these forest buffers are left during timber harvesting. Gates and Giffen (1991) found that NTMB tend to concentrate at forest-stream ecotones, similar to the way that many species concentrate at forest-field edges. Therefore, these linear habitat patches are important to NTMB in areas under intensive timber management. Though the effect of edge areas may be beneficial to some degree, species nesting near these edges may also be subjected to unusual amounts of

predation and/or nest parasitism. Thus, by leaving SMZ that are too small, the chance of nests being destroyed or parasitized increases, and if SMZ are the only habitat patches remaining in an extensive clearcut, an ecological sink or trap is created with potentially disastrous results for breeding NTMB.

SUGGESTED FOREST MANAGEMENT PRACTICES

It is encouraging that populations of the 13 selected NTMB are stable or increasing in some parts of Louisiana. However, in general, populations of NTMB have been declining in much of North America, so some changes to current management practices are suggested that may be beneficial to NTMB.

Although many NTMB inhabit stands dominated by pines, only 20 percent of the KNF is composed of hardwood and mixed pine-hardwood forests, which are the most suitable habitats for the majority of NTMB of concern. Of the 13 selected species, 12 inhabit hardwood forests and 5 utilize mixed forests as well. It is obvious that management of this portion of the forests will have the most effect on NTMB. Acquisition of hardwood forests or an increase in the percentage of hardwood and/or mixed forests would benefit these NTMB. It is encouraging to know that in the land management plan for the KNF (USDA FS 1985) there is a stated desire to increase hardwood acreage by 74 percent (see pages II-15 and B-17). The authors support this goal and encourage expansion of it.

Traditionally, forest management in the United States has favored species that prefer the forest edges rather than species that prefer the forest interior. The warblers, thrushes, and vireos (46 of the NTMB of the KNF) are usually forest-interior species. Reversing the current trend by managing to decrease the amount of forest edges would increase the amount of suitable habitats for these NTMB and would reduce the risk of creating a situation in which these birds might fall into the ecological sink. Perhaps moving away from the use of habitat generalists as management indicators and concentrating management more on a landscape level than on a stand level, as previously stated, would benefit NTMB and other nongame species.

RESEARCH AND INFORMATION NEEDS

Although the distribution of NTMB throughout Louisiana is generally shown in the preceding maps, there are large gaps in the data. For instance, data on the occurrence of NTMB species for this report were available for only three of the six forest districts (Hamilton and Lester 1987, Hamilton and Yurkunas 1987, Tucker 1980). The data supplied by Hamilton and Yurkunas and by Tucker are limited to a specific habitat type or to a relatively small area. To obtain a better knowledge of the distribution of NTMB on the forest, it may be wise to establish survey routes for both breeding and wintering birds on each district and to stratify the districts by habitat type.

Most of the studies concerning the life histories of NTMB have been conducted in the northern part of the country and the Middle Atlantic States. Basic data on the life history of each of the 13 species abstracted here is lacking for Louisiana and the South in general and for some species altogether. To date, the authors have found little information on habitat selection, territory size, or productivity of the Kentucky and worm-eating warblers. It also appears that no information has been published on the life history of the fairly common Kentucky warbler. The worm-eating warbler has been studied in depth in relation to foraging tactics (Greenberg 1987a, 1987b), but, as stated above, the same information lacking for the Kentucky warbler is lacking for this species as well. Similarly, these data are conspicuously absent for common neotropical migrants such as the yellow-billed cuckoo and yellow-throated vireo. In contrast, species such as the broad-winged hawk, Acadian flycatcher, red-eyed vireo, and American redstart have been quite thoroughly studied over much of their range.

Most of the literature on the Mississippi kite comes from the Great Plains region, even though this raptor often breeds in close proximity to or within urban areas of Louisiana, such as Baton Rouge and New Orleans. Broad-winged hawks, which pass in large numbers through the southwestern part of the State during fall migration, have not been studied in Louisiana during the breeding season. Projects concerning the distribution, ecology, home range, and productivity of Mississippi kites and/or broad-winged hawks on the KNF or throughout the State could be accomplished in the time period allotted for most graduate programs, with possible State and Federal sources of funding.

Because the breeding distribution of the Louisiana waterthrush has been described as restricted to areas with fast-moving streams (Craig 1984, 1985, 1987; Eaton 1958), a researcher could identify and survey many such locations with relative ease, especially if the scope were restricted to the KNF. Another bird whose distribution is chiefly restricted by habitat features is the Swainson's warbler. Locating and surveying habitats with scrub palmetto or giant canebrake understories could also be a reasonably simple task. New technologies in remote sensing and geographic information systems (GIS) should be of benefit in such undertakings. During an investigation of these two birds, data could be gathered on other species that

inhabit moist deciduous woodlands, such as the Acadian flycatcher and wood thrush.

Little to nothing is known about the habitat selection and productivity of the chuck-will's_widow throughout its range. Most data that have been published on habitat selection were collected on the basis of call counts, which reveal little about actual habitat selection. For instance, if habitat selection of northern mockingbirds (*Mimus polyglottos*) were determined on the basis of call counts, one might be led to believe that preferred habitats were rooftops and television antennas. Many questions, such as territory size and productivity, could be answered about the chuck-will's_widow by using radio telemetry.

Currently, a coordinated effort by Federal, State, and private agencies and organizations is underway that uses satellite imagery to help identify critical stopover areas and migration routes of nongame birds. Basic monitoring studies should be initiated on all National Forest System lands to give researchers a better understanding of the seasonal movements of NTMB. For instance, Moore and others (1990) found that some neotropical migrants utilized barrier islands in the Gulf of Mexico as stopover areas during spring. Other areas along the gulf coast, such as the DeSoto National Forest and the Atchafalaya River Basin, may be important as stopover areas, where NTMB can replenish their endogenous reserves before continuing their northward journey, as well as serving as travel corridors. Given the fragmented nature of the forests in southern Louisiana, the KNF may be functionally similar to an island and, correspondingly, extremely important as a spring and fall staging area for a significant proportion of the continent's NTMB population.

With the increasing concern about population declines of NTMB, it is curious that basic data, as described previously, is severely lacking for some of the more common species. This current effort was restricted to an indepth literature review of only 13 species; however, reproductive data is lacking or absent for 9 of these species. Although some sources of data, published and unpublished, were certainly overlooked, it is apparent that most of the abstracted birds have not been the species of focus in the Gulf States. The foregoing discussion leads to some questions about the state of ornithological investigation by professional and aspiring researchers.

Given the advanced state of scientific endeavor in avian research in such disciplines as behavioral and community ecology, why have many of the basic biological attributes of individual species, such as nesting success and territory size, been overlooked? Even with the omnipresent constraints on budgets and personnel, and with the research mandates of agencies and institutions, there must be some room for the opportunity to conduct these kinds of basic studies. Are there too few interested academicians or students in the Nation's colleges and land grant universities? If the answer to this question is no, then the problem may be that it is not generally known that this severe lack of basic biological information exists. In actuality, however, most major learning institutions are moving further and further away from encouraging students to understand and collect data on basic life history. Most of the university museums and departments of biology, ecology, etc., are stressing theoretical and molecular programs at the expense of programs with empirical and organismal emphases.

Maybe the basic biological information exists and the authors have failed to locate it. Perhaps; but if these critical pieces of data on life history do not exist, then investigators and others obviously cannot build predictive models of population structure or develop sound management practices to ensure the continued existence of viable populations. If this critical information exists but is inaccessible to most researchers, ways must be found to rectify the situation.

If the preceding discussion in this section sounds like strong criticism of certain types of research efforts or offends the reader, this was not the intention. It is merely to point out, in a frank manner, the fact that researchers have tended to make quantum leaps in conducting research and have overlooked some important basic studies. Hopefully, this discussion will prompt researchers to reevaluate existing programs and strive to identify and fill these very important gaps.

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Appendix A

List of common and scientific names of plants and trees mentioned in the text*

Alder	*Alnus rugosa*
Ash	*Fraxinus* spp.
Ash, black	*Fraxinus nigra*
Ash, green	*Fraxinus pennsylvanica*
Ash, white	*Fraxinus americana*
Aspen, bigtooth	*Populus grandidentata*
Aspen, trembling	*Populus tremuloides*
Basswood	*Tilia* spp.
Basswood, American	*Tilia americana*
Beech, American	*Fagus grandifolia*
Birch, black (cherry)	*Betula lenta*
Birch, white (paper)	*Betula papyrifera*
Birch, yellow	*Betula alleghaniensis*
Blackberry	*Rubus* spp.
Blackgum	*Nyssa sylvatica*
Boxelder	*Acer negundo*
Canebrake, giant	*Arundinaria gigantea*
Cherry, black	*Prunus serotina*
Chestnut, American	*Castanea dentata*
Cottonwood, black	*Populus heterophylla*
Cottonwood, eastern	*Populus deltoides*
Cottonwood, western	*Populus fremontii*
Crabapple	*Malus ioensis*
Cypress	*Taxodium* spp.
Dogwood, flowering	*Cornus florida*
Dogwood, roughleaf	*Cornus drummondii*
Elderberry	*Sambucus glauca*
Elm, American	*Ulmus americana*
Fir, balsam	*Abies balsamea*
Hackberry	*Celtis laevigata*
Hawthorn	*Crataegus* spp.
Hemlock, eastern	*Tsuga canadensis*
Hickories	*Carya* spp.
Honeylocust	*Gleditsia triacanthos*
Locust, black	*Robinia pseudoacacia*
Magnolia	*Magnolia* spp.
Maple	*Acer* spp.
Maple, red	*Acer rubrum*
Maple, sugar	*Acer saccharum*
Mulberry	*Morus microphylla*
Oak	*Quercus* spp.
Oak, black	*Quercus velutina*
Oak, cherrybark	*Quercus falcata var. pagodaefolia*
Oak, chestnut	*Quercus prinus*
Oak, laurel	*Quercus laurifolia*
Oak, post	*Quercus stellata*
Oak, red	*Quercus rubra*
Oak, southern red	*Quercus falcata*
Oak, swamp chestnut	*Quercus michauxii*
Oak, water	*Quercus nigra*
Oak, white	*Quercus alba*
Osage-orange	*Maclura pomifera*
Pine	*Pinus* spp.
Pine, loblolly	*Pinus taeda*
Pine, longleaf	*Pinus palustris*
Pine, pitch	*Pinus rigida*
Pine, shortleaf	*Pinus echinata*
Pine, slash	*Pinus elliottii*
Pine, Table Mountain	*Pinus pungens*
Pine, Virginia	*Pinus virginiana*
Pine, white	*Pinus strobus*
Plum	*Prunus americana*
Poplar, balsam	*Populus balsamifera*
Pondcypress	*Taxodium distichum* var. *nutans*
Redcedar	*Juniperus virginiana*
Sassafras	*Sassafras albidum*
Scrub palmetto	*Sabal minor*
Spruce, red	*Picea rubens*
Sumac	*Rhus glabra*
Sweetgum	*Liquidambar styraciflua*
Tuliptree	*Liriodendron tulipifera*
Walnut	*Juglans major*
Waxmyrtle	*Myrica cerifera*
Wild cherry	*Prunus serotina*
Willow	*Salix* spp.
Yellow jessamine	*Gelsemium sempervirens*

*Scientific nomenclature is mainly from Radford and others (1968).

Appendix B

Cross-reference index for 13 selected species of neotropical migratory birds (numbers correspond to literature cited section)

Mississippi kite

1 **6 48 53 54 73 78** 79 9 7 9 **8** 9 9 *100 101* 108 117 123

Broad-winged hawk

6 18 44 53 54 55 64 69 **75 76** 79 **80 87** *9196* 108 113 114 117 121 128 131 137 *139*

Yellow-billed cuckoo

3 5 12 14 20 27 29 **30 3138 45 46** 49 **52 53 54 55 56 60 70 7172** 79 **87 88** 9 4 9 **5** 9 **6 103 104 108** *109* 112 116 121126 128 133 *139*

Chuck-will's_widow

2 2 5 3 5 4 5 5 5 7 6 6 7 2 79 **8 5 8 6 1 0 8 1 2 0 1 2 1 1 3 8 1 3** 9

Acadian flycatcher

2 3 7 12 14 15 *19 20 29 30 3138 47 49 53 54 55 58* **64 71 72** 79 **8187** 9 **2** 9 **3 108** *109* 120 121 128 *129* 136 137 *139* 140 141

Wood thrush

2 3 1 0 1 1 1 2 1 4 1 9 **2 0 2 6 2** 9 **3 0 3 1 3 5 3 8 4 7 4** 9 **5 3 5 4 5 5 6 2 6 3 6 7 7 1 7 2 7** 9 **8 7 8 8 8** 9 **1 0 2 1 0 6 1 0 8 1 0** 9 **1 2 1 1 2 8 1 2** 9 **133 137** *139* 140 142

Yellow-throated vireo

2814293031384953545564687279879610812112512813313914 1

Red-eyed vireo

238 *1112141920212629303147495354556063687 1 72777981878896107108109110111115120 121124128129130133137139140141*

American redstart

249 *1114263031394041424953596063657179819610610811111511811912012 1 127128130133 137139141*

Worm-eating warbler

9171931384950515364799610610810912012112913914 0

Swainson's warbler

9162930313841535464798283849010812112213313914 4

Louisiana waterthrush

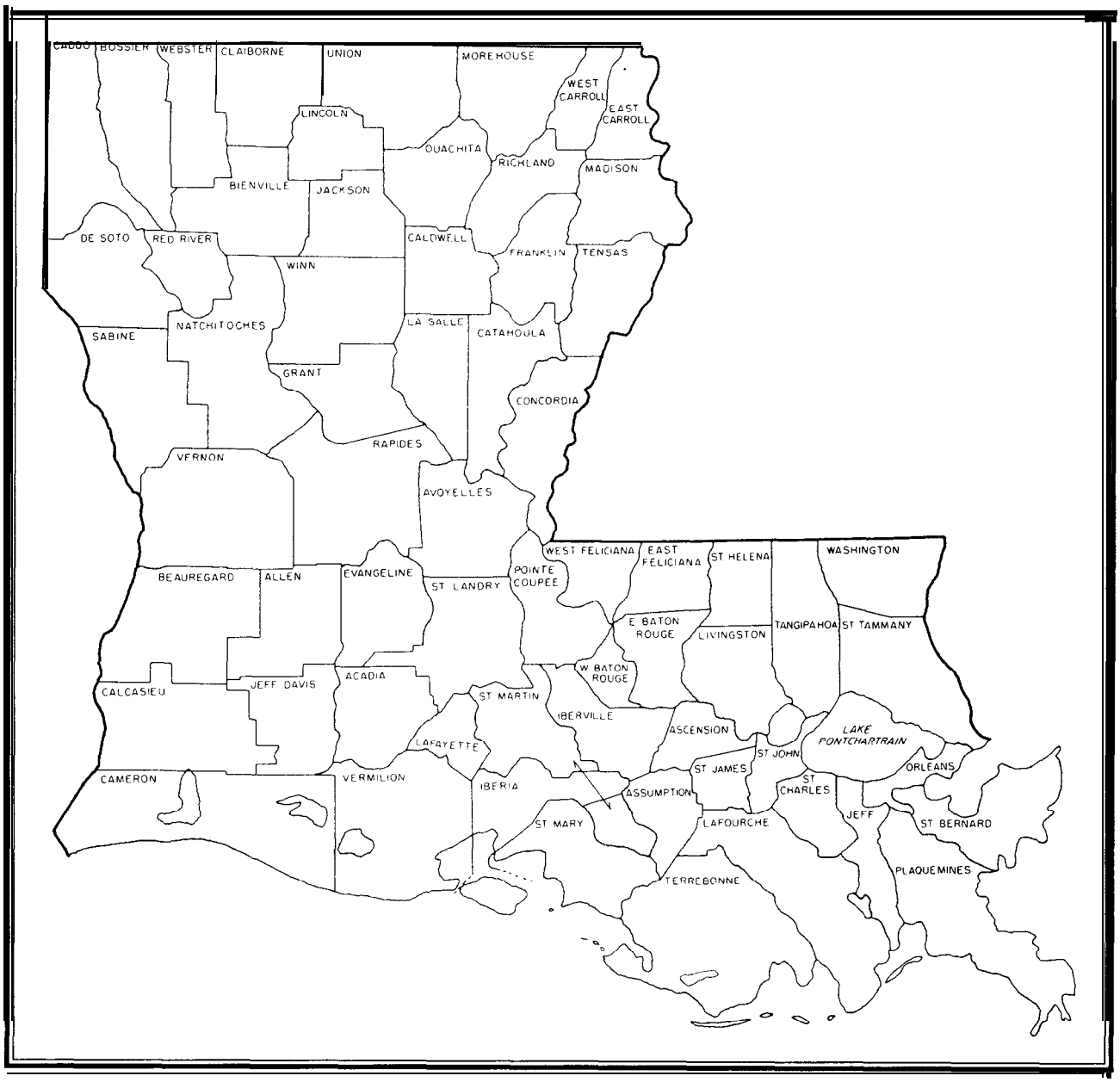
9202324253136373841495364799610610810912112813 9

Kentucky warbler

391219282930313438414953547279879096106108109120129132133139140

Appendix C

Map of Louisiana Parishes



Appendix D

Population trends, species abundance, seasonal status, and habitats of 118 neotropical migratory birds of the Kisatchie National Forest, Louisiana

Order Common name	Population trend 1966-89*	Species abundance†	Seasonal status‡	Habitats§
Ciconiiformes				
Wood stork	•	•	P	W
Falconiformes				
Turkey vulture	–	C	P	FO
Osprey	↑	UC	T	LW
American swallow-tailed kite	+	•	SR	LOW
Mississippi kite	–	R	SR	FOS
Sharp-shinned hawk	+	UC	WR	HO
Cooper's hawk	+	UC	P	HOS
Broad-winged hawk	+	UC	SR	HMP
American kestrel	+	C	P	FO
Peregrine falcon	0	R	T	·
Charadriiformes				
Lesser golden plover	·	R	T	F
Solitary sandpiper	·	UC	T	LSW
Semipalmated sandpiper	·	·	T	FLW
White-rumped sandpiper	·	·	WR	FLW
Baird's sandpiper	·	·	T	FLW
Pectoral sandpiper	·	·	WR	FLW
Buff-breasted sandpiper	·	·	T	FLW
Wilson's phalarope	·	•	T	FLW
Black tern	·	C	T	FLW
Cuculiformes				
Black-billed cuckoo	+	UC	T	HMOP
Yellow-billed cuckoo	–	C	SR	HMOPS
Strigiformes				
Burrowing owl	0	·	T	F
Caprimulgiformes				
Common nighthawk	0	C	SR	F
Chuck-will's_widow	+	C	SR	HMOP
Whip-poor-will	–	UC	T	HMOP
Apodiformes				
Chimney swift	+	C	SR	FOU
Ruby-throated hummingbird	0	C	SR	HMOPU
Black-chinned hummingbird	·	·	T	OS
Rufous hummingbird	·	·	T	FHMP
Piciformes				
Yellow-bellied sapsucker	↓	A	WR	HMP

Passeriformes

Olive-sided flycatcher	–	•	T	HMOP
Eastern wood pewee	–	C	SR	HMOPU
Yellow-bellied flycatcher	↑	UC	T	HMOPW
Acadian flycatcher	+	C	SR	H
Alder flycatcher	o	•	T	HLOW
Willow flycatcher	•	R	T	ow
Least flycatcher	•	UC	T	ou
Hammond's flycatcher	•	•	T	MP
Eastern phoebe	+	C	WR	FO
Great crested flycatcher	–	C	SR	HOU
Eastern kingbird	↓	C	SR	FOU
Scissor-tailed flycatcher	–	UC	SR	F
Purple martin	+	A	SR	FOSU
Tree swallow	↑	C	T	LSW
N. rough-winged swallow	+	C	SR	FOS
Bank swallow	+	R	T	FOS
Cliff swallow	+	C	SR	FLSUW
Barn swallow	↑	C	SR	FLSUW
House wren	+	UC	WR	HMOPU
Ruby-crowned kinglet	↓	A	WR	HMOP
Blue-gray gnatcatcher	–	C	P	HO
Veery	–	C	T	HSW
Gray-cheeked thrush	•	C	T	HMOP
Swainson's thrush	+	C	T	HMP
Hermit thrush	+	C	WR	HMOPS
Wood thrush	–	C	SR	H
American robin		C	P	FHMOP
Gray catbird	–	UC	SR	ou
American (water) pipit	o	UC	WR	F
Cedar waxwing	↑	C	WR	HMOU
White-eyed vireo	–	C	SR	FH
Bells vireo	–	C	A	OS
Solitary vireo	o	UC	WR	HMP
Yellow-throated vireo	+	C	SR	HMOPS
Warbling vireo	+	UC	SR	HMOPSU
Philadelphia vireo	•	UC	T	HMOPSU
Red-eyed vireo	–	C	SR	HOU
Bachman's warbler	o	R	A	HMOPW
Blue-winged warbler		UC	T	ow
Golden-winged warbler	↓	UC	T	HMOPW
Tennessee warbler	•	UC	T	HMOP
Nashville warbler	o	R	T	HMOPW
Northern parula		C	SR	HMOPW
Yellow warbler		C	T	FOU
Chestnut-sided warbler	–	C	T	HO
Magnolia warbler	↑	C	T	HMOP
Black-throated blue warbler	o	·	T	HMOP
Hermit warbler	o	•	T	HMP
Black-throated green warbler	–	C	T	HMOP
Blackburnian warbler	+	UC	T	HMOP
Yellow-throated warbler	↑	C	SR	HMPSW
Pine warbler	+	A	P	HMP
Prairie warbler		UC	SR	HMP
Palm warbler	+	•	WR	HMOPW
Bay-breasted warbler	•	UC	T	HMP
Cerulean warbler	↓	·	SR	HMP

Black and white warbler	–	C	SR	HMP
American redstart	↑	C	SR	HMOP
Prothonotary warbler	↓	C	SR	HW
Worm-eating warbler	↑	UC	SR	H
Swainson's warbler	↑	R	SR	HW
Ovenbird	+	UC	T	HMP
Northern waterthrush	+	UC	T	HMPSW
Louisiana waterthrush	+	UC	SR	HSW
Kentucky warbler	+	C	SR	HOW
Mourning warbler	+	•	T	HOW
Common yelbwthroat	–	C	P	FW
Hooded warbler	+	C	SR	HS
Canada warbler	–	UC	T	HSW
Yelbw-breasted chat	+	C	SR	FO
Summer tanager	+	C	SR	HMOPSU
Scarlet tanager	+	UC	T	HMOP
Rose-breasted grosbeak	+	C	T	HO
Blue grosbeak	↑	C	T	FOS
Indigo bunting	–	•	SR	FHO
Painted bunting	–	C	SR	FOS
Dickcissel	–	C	SR	F
Chipping sparrow	–	C	P	MOU
Vesper sparrow	↓	UC	WR	FO
Lark bunting	•	•	T	F
Savannah sparrow	↓	C	WR	FW
Grasshopper sparrow	↓	•	WR	F
Lincoln's sparrow	+	R	WR	FOSW
Bobolink	–	R	T	FOW
Red-winged blackbird	–	C	P	FLSW
Brown-headed cowbird	–	C	P	FO
Orchard oriole	↓	C	SR	0
Northern oriole	–	C	T	HOSU

*↑, significant increase; ↓, significant decrease; +, nonsignicant increase; -, nonsignificant decrease; o, no net change. Missing values (•) reflect insufficient or lack of available data.

† A, abundant; C, common; R. rare; UC, uncommon. Missing values (•) reflect insufficient or lack of available data.

‡ P, permanent; SR, summer resident; T, transient; WR, winter resident.

§ F, field, pasture, meadow; H, hardwood deciduous forest; L, lakes, reservoirs; M, mixed pine-hardwood forest; 0, open woodland, forest edge; P, pine/coniferous forest; S, streams, rivers, riparian; U, urban, residential, park; W, freshwater wetland, marsh. Missing values (•) reflect insufficient or lack of available data.

Barry, Robert X.; Parresol, Bernard R.; Devall, Margaret S. 1995. Neotropical migratory birds of the Kisatchie National Forest, Louisiana: abstracts for selected species and management considerations. Gen. Tech. Rep. SO-115. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 72 p.

Available literature on 13 species of neotropical migrants that breed on the Kisatchie National Forest is reviewed. Population trends, forest management practices, and research needs are discussed.

Keywords: Biology, density, distribution, forest management practices, habitats, population trends, research needs.

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