

## The recent history and status of the Mississippi Kite

*"With few exceptions, records . . . suggest that kite numbers have been stable or increasing . . .*

*Locally, recent population expansions have often seemed explosive."*

*James W. Parker and John C. Ogden*

**D**ECREASE IN POPULATION size or contraction of range characterize the recent histories of many North American falconiform birds. However, the White-tailed Kite (*Elanus leucurus*) has recently shown a dramatic recovery and expansion (Eisenmann, 1971; many reports in *American Birds*), and populations of some other raptors have also stabilized or begun to recover in areas where public sentiment toward predators has warmed, and where habitat destruction has not been severe (Murphy *et al.*, 1975). The Mississippi Kite (*Uctinia mississippiensis*) has not escaped the adverse effects of coexistence with man. Here we summarize historical and recent characteristics of Mississippi Kite populations and discuss reasons for changes in its distribution and population size. A review of this kite's history and status is warranted especially because its responses to human presence have not been spatially or geographically constant, and unlike most other raptors, it has benefited considerably from human activity in parts of its range, and now seems to be reoccupying its former range.

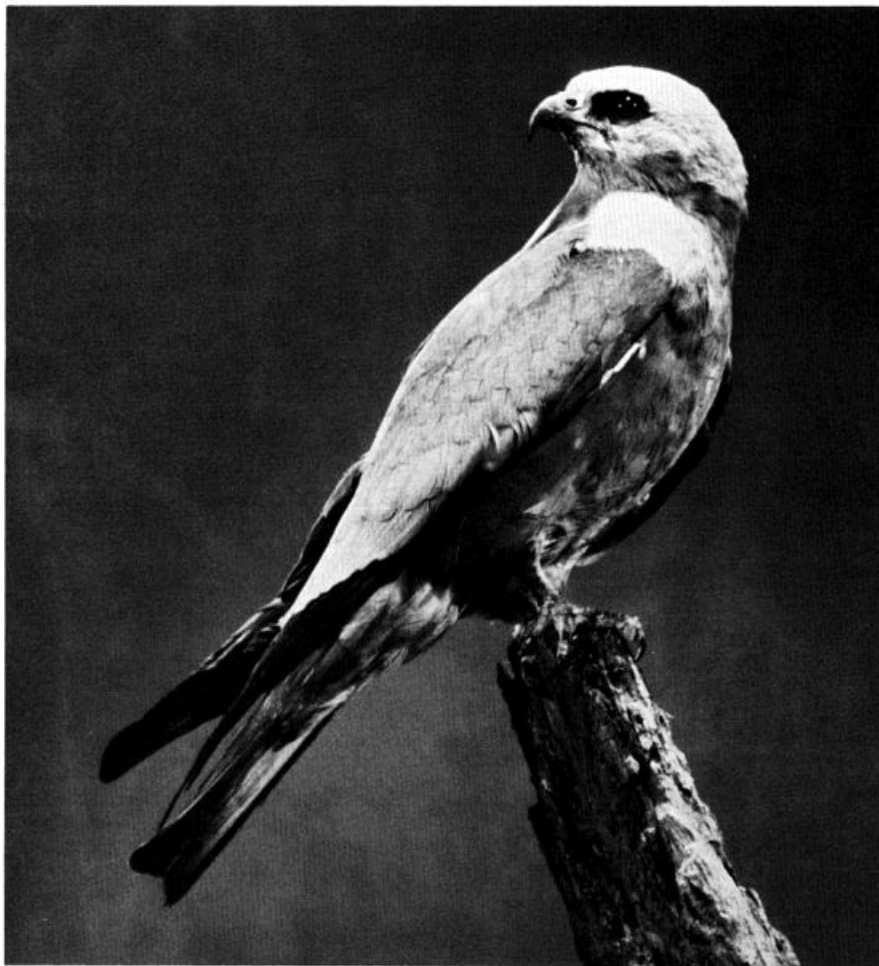
### METHODS

**W**E HAVE REVIEWED and critically assessed the scattered but considerable literature describing Mississippi Kite populations. *American Birds* has been an invaluable source of information reporting recent population dynamics. In fact, noteworthy records of distributional and numerical changes in populations have been published with such rapidity that temptation has often been strong to wait an extra month to

incorporate the latest observations. Correspondence with many experienced field workers has added greatly to our analyses, and our personal familiarity with the Mississippi Kite in the Great Plains (Parker) or the southeast (Ogden)

has contributed to our interpretations of published accounts of kite populations.

We often experienced difficulty reaching firm conclusions about the past conditions of kite populations because range and abundance in the 19th century were poorly documented; the few early accounts were usually written with few specifics. From the early 1900s on, the published data for the Great Plains improved considerably, that for the East and Southeast less so. In preparing breeding range maps, we decided to include areas (e.g., in Indiana, Kentucky, Texas) for one or the other map, where nesting was unconfirmed by the finding of a nest if other evidence of breeding seemed to us convincing. Particularly, repeated sightings of adult kites well into the breeding season (especially in more than one year) was sometimes considered adequate evidence for nesting because study of breeding populations showed that virtually all



*Mississippi Kite. Photo/R. Austing. N.A.S./P.R.*

adults attempt to nest during the reproductive season and that they often remain near their nest sites after reproductive failure (Parker, 1974). Thus, our maps are liberal estimations of the past and present breeding ranges.

**B**AILEY (1925) and SPRUNT and Chamberlain (1949) implied that persons not looking specifically for nesting Mississippi Kites would not be likely to find them. This is often true today. The Mississippi Kite is a large bird which often forms conspicuous flocks and which nests colonially. Often, however, kites feed at a distance from their nests and rapidly exit and reenter the nesting area (Skinner, 1962; J. W. Parker, G. Bartnicki, *pers. obs.*). They also perch inconspicuously for hours at a time in solitary or communal roosts (Sutton, 1939). Consequently, many observers may have failed to recognize that large concentrations, including nesting colonies, can be hard to detect. For example, at a large Great Plains breeding colony more than 100 kites were seen with binoculars above a two-mile-long expanse of trees where only about 20 were visible (some barely) without binoculars, and there were days when none of the resident nesters could be found (Parker, 1974). Kites can be harder to detect by casual observation in the forested Southeast. In sum, a little time spent assessing Mississippi Kite populations may leave a misleading impression, and we have given consideration to how workers may have misinterpreted their numbers.

### THE EAST

**O**UR ESTIMATES OF THE CHANGES in breeding range of Mississippi Kites in the southeastern coastal plain and Mississippi Valley are shown in Figures 1 and 2. Our interpretation of kite range prior to major reductions is based on a liberal use of 19th century kite reports, to compensate for declines that were in progress throughout that century. Records from about 1900 to 1940 were used to show the eastern population when range and numbers were lowest, and records since 1950 to show the extent of recovery.

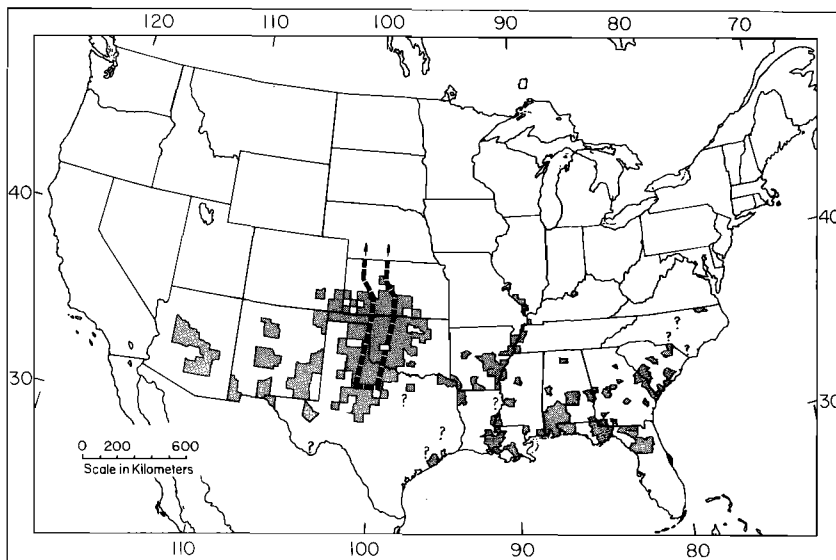
The 1800s. — Mississippi Kites once occurred generally throughout the coastal plain from South Carolina southward, with the exception of central and southern Florida, and in the Mississippi River Valley north and west at least to

Indiana and Iowa. Kites were most common in the vicinity of inland, riparian forests in the lowlands, less common immediately along the coast, and nearly non-existent in hill country above the fall line. Bendire (1892) gave no exact breeding locations for kites anywhere east of the Mississippi Valley, but he reported nests also in non-riparian, pineland locations.

It is likely that kites bred along the Black, Santee and Pee Dee Rivers in northeastern South Carolina (Sprunt and Chamberlain, 1949), but they were rare in North Carolina (Smithwick 1897, Pearson *et al.*, 1942). Wayne (1906, 1910)

have wandered to or migrated through (or wintered?) in southern Florida.

**F**OR THE LOWER MISSISSIPPI VALLEY of Mississippi and Louisiana, Brewer (1856), Ganier (1902) and McIlhenny (1943) substantiated large numbers of kites before 1900, and the latter two noted their abundance in adjacent open land, hill land and swamp country. In southeastern Arkansas, kites were common (pre-1900?) (Baerg, 1931). Although only a few early records exist for Tennessee or Kentucky, kites must have bred in these states near the Mississippi River (Pindar, 1925; Rhoades, 1895). Kites were numerous in south-



**Fig. 1.** Stippled areas indicate counties in which the Mississippi Kite has apparently nested at some time since 1940, and in which nesting probably occurs now, at least on an intermittent basis. Question marks indicate areas where nesting is uncertain, but probable, or where nesting is most likely to occur in the near future. The heavy dashed lines indicate the area in the central and southern Great Plains where shelterbelt planting was most extensive and successful (Zon, 1935)

said they existed in considerable numbers near Charleston, along the Savannah River to the west, and on the Suwannee River in Florida. Other early accounts indicate that kites were widely distributed in other regions of the southeastern coastal plain (Bailey, 1883; Howell, 1932; Golsan and Holt, 1914), although abundance within this region varied considerably. We must assume that Mississippi Kites historically were generally common in suitable habitat in southern Georgia, northern Florida, southern Alabama and southern Mississippi where reports are missing, probably because of the scarcity of 19th century ornithologists in this region. It is doubtful that kites often bred south of northern Florida although there is one questionable nesting record from the Caloosahatchee River in south Florida (Howell, 1932). However, based on old reports in Howell, some individuals may

eastern Missouri to St. Louis (Widmann, 1907) and southern Illinois (Cooke, 1888; Cory, 1909; Nelson, 1877; Ridgway, 1881). Widmann's (1907) mention of numerous kites in the Springfield, Missouri region in the 1880s is the only early record west of the Mississippi Valley in Missouri or Arkansas. In Louisiana, however, kites were reported through much of the state (McIlhenny, 1943; Oberholser, 1938).

To the northeast, Mississippi Kites once summered near the Wabash River in Knox County, Indiana (Butler, 1897; Chansler, 1912), and although Wheaton (1882) made no mention of them, their bones (probably several hundred years old) were found in Jackson County, Ohio, about 30 miles north of the Ohio River (Wetmore, 1932). Farther north in the Mississippi Valley, Bailey (1918) and Anderson (1907) reported a few for southeastern Iowa.

## THE DECLINE DURING THE EARLY 1900s

THE EARLY 20TH CENTURY produced numerous reports of declines by Mississippi Kites from most regions of the Mississippi Valley and the southeastern states, with the expected unevenness in both rates and timing of reported declines that comes where varied factors influenced the declines and field observers were thinly scattered. Generally summarized, however, it appears that kites were largely extirpated from regions where breeding densities were low, including most non-riparian sites, along the smaller drainage systems, and in peripheral parts of the range; numbers were reduced along the major river systems. Burleigh (1958) reported that kites were scarce in southern Georgia, and Murphey (1937) considered kites "greatly diminished" along the middle Savannah River Valley. However, observations by Tompkins (1949) suggested that healthy populations still existed along areas of the Savannah River. Kites were uncommon in northern Florida (Weston, 1925; Williams, 1904), and almost non-existent in the central and southern Florida peninsula (Howell, 1932; Sprunt, 1954).

healthy kite populations survived in a few locales, mainly the Mississippi River swamps in Mississippi and Louisiana (Lowery, 1955; Oberholser, 1938; Vaiden, 1939), and perhaps coastal South Carolina (Dingle, 1934; Sprunt and Chamberlain, 1949).

MISSISSIPPI KITES were almost non-existent in the central Mississippi Valley between 1910 and the early 1950s, or at least their presence was scarcely documented. During this 40-year period, kites were unreported in western Tennessee north of Memphis, and were of only casual occurrence in western Kentucky (Carpenter, 1937; Mengel, 1965). They had been common in southern Illinois as late as the 1870s, but had essentially disappeared in both Illinois and southern Indiana by 1910 (Chansler, 1912; Cahn and Hyde, 1929; Ridgway, 1889). Kites were occasionally seen in southern Missouri during this period (Bennett, 1932), but here too they were apparently quite rare.

## RECOVERY DURING THE SECOND HALF OF THE 20th CENTURY

RECOVERY OF EASTERN MISSISSIPPI KITES has been widely recognized

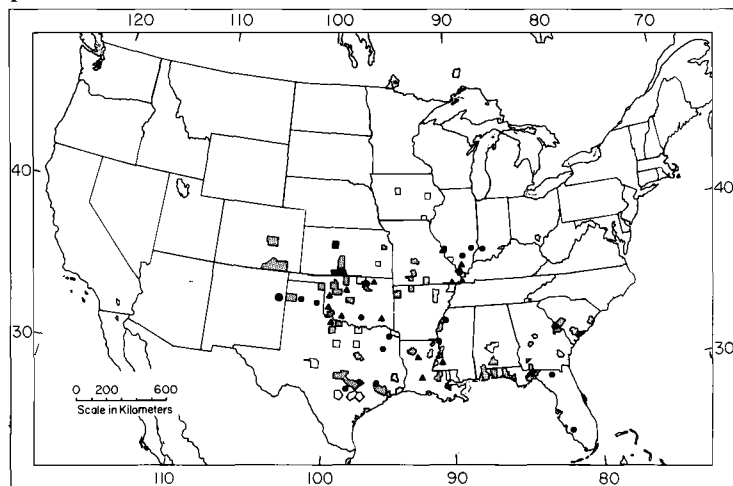


Fig. 2. Counties in which the Mississippi Kite nested or probably nested before 1900 (outlined areas), between 1900 and 1940 (stippled areas), or both (rectangular or irregular black areas). Black circles indicate areas where records only generally document the presence of kites in the nesting season before 1900, and black triangles indicate similar documentation for 1900-1940.

Kites were reported to be rare in the coastal plain of Alabama (Howell, 1924), and so reduced in southern Louisiana that they had become rare in regions away from the Mississippi River (Bailey and Wright, 1931; McIlhenny, 1943). Baerg (1931) indicated a decline in southeastern Arkansas before 1931, and later he (Baerg, 1951) considered kites rare in the state. Observations by a few field workers, however, suggested

and fairly well documented. Local numerical increases and reoccupation of range may have begun during the 1940s, but certainly was evident during the 1950s in South Carolina (Chamberlain, 1961; Parnell, 1965), Georgia (J. F. Denton, *in litt.*), Florida (Stevenson, 1954, 1959, 1964, 1966; Stewart, 1965; Weston, 1965; Ogden, 1971, 1976; Kale, 1976), Alabama (Newman, 1958a; Imhof, 1962; R. W. Skinner, *in litt.*),

Mississippi (Lowery and Newman, 1953; Newman, 1956; Stewart, 1964), and Louisiana (Lowery, 1955; R. Kennedy, 1974, *pers. comm.*; Stewart, 1976). These reports show kites increasing in numbers along larger rivers in all states between South Carolina and Louisiana, and more frequent occurrences of kites at non-riparian sites. An example of the latter is Tallahassee, Florida where kites commonly are seen over residential neighborhoods, shopping centers and golf courses (Ogden, *pers. ob.*). First nesting records from Columbus, Georgia in 1959 (Chamberlain, 1959) in Suwannee County, Florida (Stevenson, 1964), and Jackson, Mississippi in 1964 (Stewart, 1964), and at Gainesville, Florida in 1971 (Ogden, 1971) must represent reoccupation of long-abandoned, former range, rather than a range extension. High counts of Mississippi Kites have included 40 during May 1967 near Camden, South Carolina (Chamberlain, 1961), 36 in Gadsden County, Florida in 1961 (Robertson, 1961), 64 at Rosedale, Mississippi during August 1964 (Stewart, 1964), 73 in the Atchafalaya Basin, Louisiana during August 1956 (Newman, 1956), and counts of 100 in July 1962 and again in August 1967 along the Mississippi River in Louisiana (Stewart, 1962, 1967).

POSSIBLE RANGE EXTENSION has occurred along the Atlantic coast, where reports of kites north of South Carolina have become more frequent during the 1970s. Mississippi Kites have summered in eastern North Carolina (LeGrand and Lynch, 1973; Teulings, 1975; LeGrand, 1976), and likely are nesting. Single kites were also present for several weeks during 1976 in New Jersey (Buckley *et al.*, 1976), and at Cape Cod, Massachusetts (Finch, 1976).

There is additional indication that kites may occasionally use peninsular Florida as a migration route, and may sometimes winter in the deep south. Single kites were near Tallahassee in December 1953 (Stevenson, 1954), at Lake Beulah, Mississippi in December 1959 (James, 1960), and in Polk County, Florida in January 1965 (Hendrickson *et al.*, 1965). Migration in the peninsula is suggested by Ogden's south Florida observations of three immatures in September 1965, and one adult in May 1966 in Everglades National Park, and other observations in late fall and early spring near or south of Gainesville (Kale, 1975, 1977).

In Arkansas, kites were well on the road to recovery by the early 1950s

(Meanley and Neff, 1953) and have become regular or locally common along the Arkansas and White Rivers up to Pulaski and Monroe counties, and in all counties along the Mississippi River (Stewart, 1967; D. James, F. James, *pers. comm.*). Kites expanded north of Memphis to Reelfoot Lake in northwestern Tennessee between 1952 and the early 1960s (Lowrey and Newman, 1952; Newman, 1957, 1958b; B. B. Coffey, *pers. comm.*), to eastern Missouri and extreme western Kentucky by the mid-1960s or later (E. and M. Cypert, *pers. comm.*; Graber, 1962; Petersen, 1964, 1965, 1968; Kleen, 1976a, 1977), and were appearing in southern Illinois and Indiana in the late 1950s and 1960s (Nolan, 1957; Mumford, 1961; Peterson, 1963). Two reports from Jefferson County, Kentucky (Carpenter, 1937, 1955) suggest that rare nestings may occur farther northeast along the Ohio River.

**L**ATE SPRING AND SUMMER SIGHTINGS of one or two kites near Chicago (Peterson, 1967; Kleen, 1973, 1974), a June observation of one or possibly two birds in Grundy County, Missouri (Kleen, 1975), and sightings in Wisconsin (Soulen, 1971; Janssen, 1977), Minnesota (Janssen, 1975), central Indiana (Kleen, 1975), western Illinois (Kleen, 1976b; 1977). New Jersey (Scott and Cutler, 1961), Pennsylvania (Scott and Cutler, 1974), and even Ontario (Goodwin, 1977) are among records suggesting that range expansion will continue, and that isolated pairs may now nest far to the north and east.

We reiterate that our summary of population fluctuations during the past 150 years is not entirely conclusive. Although many pre-1900 accounts describe seemingly large populations of Mississippi Kites, declines began before 1900 and reached their greatest extents between 1910 and 1940. However, documentation before 1900 is thin and often contradictory for many areas, so that major declines in abundance and range shrinkage cannot always be substantiated. Accounts between 1900 and 1940 showed kites present in most of the areas where they exist today and in a few places where they do not now nest (e.g., southern Missouri). Increased attention to Mississippi Kite populations has been encouraged recently by seasonal summaries in *American Birds*, possibly resulting in the late discovery of some small but old populations. Certainly, more attention is now paid to those previously known.

One can safely say that since about 1950 range expansions in some areas have been remarkable, and numbers have increased in many areas, witness northern Florida and southern and eastern Arkansas. Although no published records show kites nesting now along the Mississippi River north of Baton Rouge to the Arkansas border or throughout much of southern Mississippi and Georgia, it is likely that kites might now be found in these areas as well as along the large rivers in central and southern Missouri.

### THE WEST

**D**ESCRPTIONS OF GREAT PLAINS populations of the Mississippi Kite provide a relatively continuous and unambiguous record of population dynamics. According to Bendire (1892) kites were much more abundant in the west than elsewhere (see Fig. 2). Now, the southern Great Plains can be considered a stronghold of the species (Fig. 1) suggesting that it is better adapted to riparian habitats in plains and savanna regions than to the wooded east.

### THE LATE 1800s

**T**HE EARLIEST AUTHORITATIVE report on south-central and southwestern Kansas suggested that where sizable riparian woodland occurred, so did kites. Goss (1887, 1891) described them as common on the Medicine River and

its tributaries, although he (Goss, 1886) earlier wrote that kites were rare in the state. He (Goss, 1885) reported a nest in northeastern Kansas (Woodson County), and there is a 1906 nesting record for Douglas County (Long, 1934, 1940) documented by two adults, two eggs, and the nest, all displayed at Baker University, Baldwin City, Kansas. However, these and Wetmore's (1909) observations of fall migrants in Douglas County are the only records for northeastern Kansas, an area repeatedly mentioned by many sources (including the A.O.U. Checklist, 1957) as part of the normal breeding range.

Members of the Sitgreave expedition (probably including Woodhouse) found Mississippi Kites exceedingly abundant on the Arkansas River and its tributaries in northern Oklahoma (Brewer, 1856; see Tomer, 1974, for an account of this and other early western expeditions.) Thus, it seems likely that simultaneous nesting occurred in adjacent southwestern Kansas. Nice (1931) noted the early abundance of kites in northern Oklahoma and supplied one pre-1900 record for Murray County in the south. Shortly after 1900 kites nesting along branches of the Arkansas River provided many eggs for collectors (Short, 1904, 1905; Love, 1911), which suggests that these populations were large prior to 1900. There are no accounts to show how common the species was elsewhere in Oklahoma before 1900, but the forests along the Cimarron, Red, Canadian, and



Mississippi Kite in flight. All photos/J. Parker.

Washita Rivers were probably populated to some extent.

Gault wrote Bendire (1892) that Mississippi Kites were abundant in the Red River region of Texas, especially in Bowie County near the Oklahoma and Arkansas borders, and Brewer (1856) said that, according to members of Captain Sitgreave's Zuni River expedition, they were exceedingly abundant in eastern Texas. In 1912 kites were common nesters in the Texas panhandle (Strecker, 1912), which suggests their presence there before 1900. However, Gault's "Red River region" may not have included the entire river course from extreme eastern Texas to the panhandle, and McCauley (1877) did not see kites in the area near the source of the Red River in the south-central portion of the panhandle. A few nestings were known from near San Antonio, Austin, Houston, and possibly even San Angelo (Beckham, 1887; Cooke, 1888; Singley, 1892; Strecker, 1912).

#### THE 1900s

WITH FEW EXCEPTIONS, records after 1900 suggest that kite numbers have been stable or increasing, and that nesting has been widespread in the Great Plains since the turn of the century. Locally, recent population expansions have often seemed explosive. Long (1940) continued to list Mississippi Kites rare in Kansas except in Barber and Comanche counties. However, this was

not likely the case because, since 1950, kites have bred in most Kansas counties south and several north of the Arkansas River (Ely, 1971; Graber and Graber, 1951; Johnston, 1964; Rising and Kilgore, 1964; Rolfs, 1973; Seibel, 1971; Tordoff, 1953; J. W. Parker, *pers. obs.*). Nesting has not reoccurred in north-eastern Kansas, but a kite was recently documented at St. Joseph, Missouri (Kleen, 1976b).

Western Oklahoma has apparently had a healthy kite population since initial settlement of the Great Plains by white men. Sutton (1939) found many kites in the northwest, and since then kites have nested throughout western Oklahoma and in many central, north-central and eastern counties (Sutton, 1969; field notes filed at the Stovall Museum, Univ. of Oklahoma; J. W. Parker, *pers. obs.*). The only suggestion of a major decline in numbers (Nice, 1931) was for the region near the Arkansas River where kites had earlier been abundant.

Since 1900, kites have nested widely in north-central Texas, including the eastern half of the panhandle. Strecker (1912) mentioned them for the panhandle and elsewhere in the state, and More and Strecker (1929) included kites among the most characteristic birds of the prairie in the region of Wilbarger County. From 1940 to the present, nesting kites have been numerous in the eastern half of the panhandle, and have appeared eastward into Denton County

and southward at least to Tom Green and Callahan counties (Allen and Sime 1943; Brandt, 1940; Jackson, 1945 Oberholser, 1974; Stevenson, 1942, Thompson, 1952; Williams, 1974 1975a; Wolfe, 1967; J. W. Parker, *pers. obs.*).

THE STORY IS DIFFERENT only for extreme northeast Texas. Strecker (1935) did not find kites in Bowie County, and there is only one recent record (breeding seems likely) for that region (Williams, 1973). This is the only Texas area where a population decline after 1900 seems to have been substantial. Strecker (1912) and Simmons (1925) listed kites breeding near Houston and Austin. However, we can find only one nesting report after 1900 for southeastern Texas east of Dallas and San Antonio, the Lake Jackson area in Brazoria County (Webster, 1975), but kites have also recently summered in Polk and Fort Bend counties (Williams, 1974) where breeding is likely.

There are no verified nesting records for Nebraska. However, kites were seen repeatedly in late May, 1944 in Adams County (Haeker, 1944) and near Omaha in late May, 1965 (Cortelyou, 1965), May and June, 1975 (Williams, 1975b; *pers. comm.* from A. Saunders, Chief Naturalist, Fontenelle Forest Nature Center) and 1977 (Williams, 1977).

To the west and southwest Mississippi Kites are colonizing areas not within the recognized original range of the species. Bailey and Niedrach (1965) listed only two occurrences from Colorado, both before 1900, and neither verified nesting. Elsewhere in the southwest, kites were unknown until recently, except for one doubtful record for New Mexico (Bailey 1928; Hubbard, 1970).

A colony of six kite nests was observed in 1971 along the Arkansas River in La Junta, Otero County, Colorado (Cranston, 1972). This was the first record of breeding for the state, and the colony was also active in 1972, 1973, and 1974 (W. Anderson, *pers. comm.*; Kingery, 1974). Judging from sightings of kites near La Junta prior to 1971 (Cranston, 1972), kites have been breeding there, and perhaps elsewhere near La Junta, since at least 1968. Nesting populations have more recently been reported on the Cimarron River in Baca County, and kites have been observed in Prowers, Larimer, and Morgan counties (Cranston, *pers. comm.*; Kingery, 1974, 1975). It is possible that recent breeding in



southeastern Colorado demonstrates recolonization of an area where kites have been repeated, but irregular, nesters for a long time.

Observations of Mississippi Kites in New Mexico began in 1950, and there is evidence of nesting in at least nine counties throughout the state, as well as in nearby El Paso County, Texas (Ligon, 1961; Hubbard, 1970, *pers. comm.*; Williams, 1977). In nearby trans-Pecos Texas kites now nest near Balmorhea in Reeves County (Ohlendorf and Board, 1972). This is about 90 miles southwest of Odessa in Midland County, the nearest Texas region where kites have nested previously. The most westerly published nesting records are from Arizona where Levy (1971) observed as many as eight kites in Pinal County along the San Pedro River in 1971, and Yavapai County where a breeding bird was first taken in 1970 along the Verde River (Carothers and Johnson, 1976; see also Witzeman *et al.*, 1976). In summer 1977, R. Ohmart and R. Glinski (*pers. comm.*) observed what seem to be increasing populations along the Verde and San Pedro Rivers. There is a possibility that low density populations have always, or intermittently, existed in the riparian areas of the Southwest.

As yet there are no nesting records for southern California; only scattered sightings of one or two individuals in the widely-separated Inyo, Santa Barbara, Contra Costa, and Humboldt counties (Small, 1974; McCaskie, 1976; Stallcup and Winter, 1975; Winter and Erickson, 1976). Breeding records would not be unlikely in the near future for southern California.

**I**N GENERAL, REPORTS for the Southern Great Plains in *American Birds* began documenting more frequent and widespread observation of Mississippi Kites in 1953 when increases were noted for Halstead, Kansas and Amarillo and Midland, Texas (Baumgartner, 1953). In 1956 nesting was first discovered in Stillwater, Oklahoma (Baumgartner, 1956), and a pair was seen in El Paso, Texas (Monson, 1956). In 1964 it was reported that a marked increase in numbers had occurred near Vernon, Texas since 1952 (Williams, 1964). After 1965, reports accumulated rapidly from points throughout the Great Plains and farther west.

Wolfe (1967) correctly suggested cautious interpretation of reports in *American Birds* in making comparisons with earlier estimates of abundance. He noted that increase in the reported number of kites was at least partly owing to the greatly increased number of observers, and this may be the case, for example, in Wilbarger County, Texas. Cautious consideration of these accounts is also indirectly indicated by the seasonal summary for the nesting season in the Southern Great Plains Region in 1972 (Williams, 1972). It was reported that urban kite populations in the Texas panhandle supposedly remained stable while rural populations declined. In that summer, observations by Parker (1974) of nesting colonies just southeast of the panhandle and in southwestern Oklahoma showed reduced nesting success. Consequently, adults were less active than usual near the nest sites. This often conveyed the false impression that they were fewer in number than in past years, but this was not the case.

**S**UMMARIZING FOR WESTERN POPULATIONS, there is evidence of no past region-wide decline of the sort that apparently occurred in the East. Populations on the Arkansas River in northern Oklahoma were apparently reduced early in the 20th century, and, although kites now nest there, they have not fully recovered if early reports of their abundance are accurate. Kites have apparently become scarcer in central and east Texas, but reductions near Austin, Houston, and San Antonio have probably come about by the disappearance of a relatively small number of kites on the periphery of the normal range. We are inclined to believe that the only regional changes have been gradual and continual increase in numbers beginning about 1950, or shortly before, and continuing expansion of the range boundary.

#### FACTORS AFFECTING POPULATIONS OF MISSISSIPPI KITES

**T**HE FACTORS THAT CONTROL the distributions of Mississippi Kites differ from the Great Plains to the wooded East. In the latter region kites typically nest in riparian situations; nesting in the uplands has less often been reported. Thus, distribution is mainly along the major river systems. In much of the Great Plains nesting in riparian sites must also have been the original situation for most kites because of the general scarcity of trees. Today nesting in the plains is more common in "unnatural" situations. These include mesquite thickets and especially in tree plantings such as shelterbelts (windbreaks), farm woodlots, and lawn trees in towns. The result



Adult kite incubating.



Young just freshly out of egg.



*Adult at nest with young.*



*Nest with two downy young.*

is a more uniform regional distribution of nesting kites in the Great Plains.

The breeding range of the Mississippi Kite now appears disjunct. A hiatus extends through eastern Kansas, eastern Oklahoma, eastern Texas, much of Missouri, and northwestern Arkansas. These areas might not always have been devoid of kites, but there are few old records to suggest otherwise. However, there is no evidence that the two populations form separate gene pools. In fact, pair formation apparently takes place during the late wintering or migration period (Sutton, 1939) when kites from all areas presumably mingle to some extent. It is an interesting, but highly unlikely, possibility that a portion of the eastern population migrates north via the Florida peninsula. If this were so, some degree of genetic isolation of the two populations would be more likely.

#### **POSSIBLE EXPLANATION OF POPULATION DECLINES IN EARLY 1900s**

**D**ECLINES IN POPULATION SIZE or disappearance from portions of the original range cannot be attributed entirely to any one factor. Various authors have speculated that shooting (Mengel, 1965; Wolfe, 1967), egg collecting (Sutton, 1939), or alteration of foraging habitat (Mengel, 1965), have played major roles. No doubt all of these have been important locally, but the regional importance of all but shooting is doubtful. It is easier to identify factors responsible for population increases and widening distribution. For both increases

and decreases in numbers, the western populations are easier to understand.

Direct persecution of Mississippi Kites by shooting was undoubtedly widespread in the past, but the western populations certainly suffered much less than the eastern because the former were exposed later to human populations which were also of comparative low density. In particular, much of Oklahoma remained "Indian Territory" until about 1890, and was the last of the central plains states to undergo settlement (Hatton, 1935). Wolfe (1967) described a case of mass shooting of adult kites in Texas, but Parker's experience in the Great Plains suggests that, while shooting has not entirely ceased, it is now a minor problem. Rather, public sentiment is often neutral or positive. For example, efforts by Parker to census the entire nesting kite population of Meade, Kansas in 1977 met with enthusiastic support by the citizenry. In the East extensive shooting was undoubtedly effective in reducing kite numbers in many local areas. Robert Mengel (*pers. comm.*) suggested the possibility that shooting pressure in the eastern populations may have increased greatly in the years following the Civil War, when emancipated slaves began to acquire firearms and, in company with disadvantaged whites, to use them against "varmints" or to procure food. This period synchronizes with the hypothesized early period of population declines in the East.

**E**GG-COLLECTING RANKS far below shooting in importance as a cause of reduced numbers, but at least in specific Great Plains areas may have been dam-

aging. All 178 of the Mississippi Kite eggs from 13 museums examined by or for Parker (1976) were collected at a very few localities. At least 76 clutches of eggs were taken in Woods County, Oklahoma (the vicinity of the Salt Fork of the Arkansas River) between 1903 and 1912, most between 1908 and 1910. Another 11 clutches were taken in Llano County Texas in 1917-1918. In both cases collecting was heavy where kite numbers apparently declined thereafter.

Agricultural practices, defined broadly, seem to be primarily responsible for the major changes in Great Plains populations of the Mississippi Kite. A brief historical review of the original vegetation of the Great Plains from Aikman (1935), Bruner (1931) Cook (1908), Hatton (1935), Price and Gunter (1943), Rice and Penfound (1959), Rising (1970), Short (1965), and Widman and Penfound (1960) is useful and follows here. In the mixed and short grass prairie of southwestern and south central Kansas and parts of Oklahoma and Texas trees were generally absent except for narrow riparian forests along large rivers and small groups of trees near intermittent streambeds or the like. Gallery forests were often discontinuous, as is often the case today along rivers like the Cimarron. Much of central Oklahoma and north-central Texas was originally oak savanna, and shinnery oak (*Quercus* spp.) prairie (intermixed grasses and shrub oaks) was encountered by early explorers in western Oklahoma and was probably also present in the adjacent Texas panhandle. There were tall and mixed grass prairies in parts of the Texas panhandle, the northern

Texas counties immediately to the east, and parts of southwestern Oklahoma. More xeric growth, such as mesquite (*Prosopis juliflora*) and shinnery oak, was present only on poorer and dryer sites, but mesquite was not found north of central Texas. All of these types of woody vegetation are used by kites.

The original western riparian forests were usually removed (Hatton, 1935; see references in Short, 1965), and we may suppose that kite populations were sometimes disturbed or displaced as a result; but how widely the forests disappeared, and the kites with them, is unclear. Riparian forests were still present along the Medicine Lodge River in south-central Kansas during the 1800s, (Goss, 1891) and were probably equally common along other major and subsidiary river courses. The introduction and spread of salt cedar (*Tamarix gallica*), which displaced elm-oak forests in the flood plain of the Canadian River in Cleveland County, Oklahoma (Hefley, 1937), also altered vegetation structure along rivers farther west. The decrease in kites in northeastern and north-central Oklahoma after 1900 (Nice, 1931) can reasonably be attributed at least partially to tree removal.

#### POSSIBLE EXPLANATIONS OF RECENT POPULATION INCREASES

HOWEVER, THE PRIMARY EFFECT OF white settlement in the Great Plains has been a vast increase in woody vegetation. In the tall and mixed grass plains of north Texas and southwestern Oklahoma human activities associated with farming and cattle raising have caused the expansion of mesquite and its advance north and east (Cook, 1908; Brandt, 1940; Price and Gunter, 1943; Bogush, 1950). Tree planting near farm buildings was encouraged by governmental action beginning in the mid-1800s, and the Prairie States Forestry Project (begun in 1934) resulted in most of the shelterbelts which exist today (Stoekler and Williams, 1949). Abundant shelterbelts were planted within a 100-mile-wide area extending from North Dakota to north-central Texas, which fortuitously included the heart of the past and present nesting range of the Mississippi Kite (Fig. 1). Today in Kansas, Oklahoma, parts of Texas, and farther west, shelterbelts and other tree plantings stand as thousands of islands of nesting habitat which were non-existent prior to settlement. The impor-

ance of these tree plantings to Mississippi Kites has been noted (Williams, 1967), but their positive impact on kite populations has not been adequately stressed. Often, kites seem to prefer tree plantings to nearby, more natural riparian growth, and it is clear that Mississippi Kites are present now at hundreds, if not thousands, of nesting sites in the Great Plains where they could not have nested before the establishment of tree plantings and the spread of mesquite. The nests themselves are decidedly grouped in colonies, but the distribution of these colonial populations seems to be random where nesting habitat is abundant.

In the forested East lumbering could have disrupted nesting, but more likely has had a net positive effect by providing additional cultivated areas where foraging opportunities are improved for kites. Wayne (1906) observed hundreds of Mississippi and Swallow-tailed kites (*Elanoides forficatus*) attracted by massive numbers of grasshoppers near the edge of a plantation on the Suwannee River, and Murphey (1937) similarly noted kites attracted to enormous numbers of grasshoppers in the fields in the Savannah River Valley. In northwestern Florida, Monroe (Weston, 1965) noted a close association between distribution of Mississippi Kites and locations of numerous military airfields.

IT IS CONJECTURAL, but likely, that Great Plains kite populations also now benefit from an increase in insects, mainly orthopterans, which may sometimes comprise their entire diet or at least represent an important component (Fitch, 1963). Branson (1942) and Rivnay (1964) documented a positive correlation between increased insect numbers and agricultural practices, primarily overgrazing and irrigation, in plains regions, and Shotwell (1938) summarized the frequent grasshopper outbreaks that have occurred since 1900.

The food resources of the Mississippi Kite in the Great Plains (and possibly the East) may have recently changed in other ways. Kites in many plains breeding colonies are more versatile predators than was indicated by Fitch (1963), Brown and Amadon (1968), and others because they capture a variety of vertebrates, and sometimes scavenge as well (Parker, unpubl. data). It is interesting to speculate that their scavenging may be a recent development prompted by the availability of road-killed vertebrates,

and that the frequency with which kites now take small birds, including Cliff Swallows (*Petrochelidon pyrrhonota*), may have increased with widespread tree planting and the building of highway bridges and other structures which provide nesting sites for small birds. Consequently, kite populations may now be less susceptible to short-term fluctuations in insect abundance than previously.

Mississippi Kite populations in the heart of their Great Plains range do not now seem to be food limited during the nesting period (Parker, 1974, unpubl. data). One might expect an increasing population to escape food limitation, especially if food resources have increased at wintering grounds. But in this respect, the Mississippi Kite is difficult to interpret. A brief consideration of the kite's life history pattern is important if we are to understand the response of its populations to (probably) increased food and an increase in nesting habitat.

EISENMANN (1971) NOTED that White-tailed and Mississippi kites are in some ways similarly endowed for rapid population recovery; both are colonial, both travel widely, their reproductive capabilities seem little affected by pesticides (see Parker, 1976 for the Mississippi Kite), and they are both capable of breeding when one-year old. However, the two species differ in three important ways:

1) The habitat changes benefiting the two species are different. The White-tailed Kite apparently has profited from an increased food resource. The Mississippi Kite has probably benefited from this, but also from increased nesting habitat.

2) Major causes of mortality, male replacement, etc., of the migratory Mississippi Kite could be quite different from those of the non-migratory White-tailed Kite. Little is known of the Mississippi Kite on its wintering grounds although winter and migratory mortality is obviously important in determining the size of the nesting population (Parker, 1974).

3) In one clutch White-tailed Kites usually lay twice (or more) the number of eggs laid by Mississippi Kites which lay a relatively small and unusually constant clutch of two (Parker, 1974). Two broods are often reared in one season by the former species (Brown and Amadon, 1968), but the Mississippi Kite is almost always single-brooded, although it is not



definitely known if a rare, renesting female could lay more than two eggs in one reproductive season.

The last point is important. The low reproductive potential of the Mississippi Kite suggests it has evolved a so-called K-strategy, meaning that, according to prevailing interpretation, it should have evolutionarily developed its low productivity in the face of food limitation (see Pianka, 1970 for a tabulation of the classical correlates of K-selection). Such species are generally ill-suited to population recoveries (Botkin and Miller, 1974).

One would not expect a species with a low reproductive rate to be independent of food limitation, yet this seems to be the case with the kite. At least two explanations are possible: 1) past food limitation has been relaxed by cultural changes that have increased prey resources; this has increased productivity and the increasing population has capitalized on the greater availability of nesting habitat; and 2) the kite has not been food-limited, but has evolved a low reproductive rate in response to other reasons for its low nesting success (Parker, 1974), and its population is expanding owing primarily to the effects of increasing nesting habitat. Presently, neither of these hypotheses can be excluded; either or both may prove to explain the present condition of kite populations.

**F**OR WHATEVER REASON, there apparently are more Mississippi Kites surviving to reproduce now than there used to be. Although it may now be impossible to explain fully the proximate mechanism for range expansion, any hypotheses offered must be consistent with the following points. First, nowhere does nesting habitat appear now to be limiting; exclusion by nesting kites of

other potential nesters (there is no evidence that this happens by aggressive behavior) could usually result in the excluded birds using abundant nearby, and identical, habitat. Second, the social behavior of kites during the non-breeding seasons, especially their ways of forming spring migratory flocks and breeding pairs, could lead to many yearlings and possibly two-year-old birds being recruited into breeding populations far from those where they were produced. Thus, it is unlikely that range expansion near a particular colony or local area can be linked directly or simplistically to population pressure in that colony or particular area. It is possible that kites have sometimes expanded their range by travel along river systems, but it is equally likely that spring weather patterns and fortuitous wandering have as often introduced flocks to suitable, extra-limital nesting areas. The apparent present surplus of kites means that a larger number of birds without previous nesting experience (one- and possibly some two-year-olds) is available to remain in their areas and to readily establish new colonies.

#### NON-BREEDING SEASONS

**E**COLOGICAL CIRCUMSTANCES during migration and on the wintering grounds could affect significantly the dynamics of Mississippi Kite breeding populations, as conditions in the non-breeding seasons have apparently encouraged the expansion of White-tailed Kite populations (Eisenmann, 1971). However, the little information (Parker, 1977) on Mississippi Kites other than during the breeding season warrants only speculation on how the migratory and winter ecology of the species might affect its summer dynamics. Banding recoveries of

kites from Guatemala (Parker, 1977) and Honduras (Parker, unpubl. data) reflect shooting and possibly trapping. However, various forms of human "predation" predictably have had only a minor impact on kites, judging from the fact that recent kite expansions have been synchronous with human population explosions in Central and South America, or at least coincident with already-enlarged human populations. It is conceivable, and perhaps likely, that forest removal and agricultural expansion have increased foraging habitat and prey populations, as we assert has occurred in North America, but further speculation is presently unjustified.

#### THE FUTURE

**T**HERE IS NO APPARENT REASON why population increases should not continue in both the East and West. Certainly, nesting habitat is not saturated in the East, and in the western areas suitable, unused shelterbelts and other wooded areas are abundant in the interior of the range and on much of the range periphery. It would seem that food availability is more critical than nesting habitat and that different kite populations might be expected to depend on different diets, for example insects alone versus insects plus vertebrates. In areas where kites might be forced to rely on small or fluctuating prey populations, especially where they might depend primarily on insects, we should expect their populations to fluctuate considerably as a natural course of events.

One possible major source of disturbance for western nesting colonies is the loss of shelterbelt nest sites. Poor land management can cause the loss of shelterbelts and similar woodlots (Olson and Stoeckler, 1935), and one can easily find

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many presently-used woodlots experiencing a rapid tree die-off. The loss of aging shelterbelt trees has contributed to a reproduction in the Merlin (*Falco columbarius*) population in Saskatchewan (Fox, 1971), and the same cause could eventually affect kite populations. Also occurring now in many Great Plains areas, in a dubious effort to increase crop production, is the intentional removal of shelterbelts. This practice was examined in a report by Smith (1977) who plainly demonstrated that there are a few good reasons to remove shelterbelts, that there are several probable or certain agricultural benefits from their presence, and that benefits to game and non-game wildlife are recognizable. Although the removal of large numbers of shelterbelts would undoubtedly disturb kite nesting colonies, numerous riparian, urban and other residential woodlots should remain in many areas to provide alternate nest sites. Kite nesting colonies easily tolerate extensive human activity; kites will even remain at a site after some tree cutting has taken place there, and may relocate *en masse* to nearby habitat (Parker, 1974). Thus, in regions with abundant nesting habitat, occasional disturbance of a colony should have only minor effects on kite numbers or productivity. However, in areas like central Arizona, where nesting habitat is very localized and where concern has already been expressed for the Bureau of Reclamation's Central Arizona Project (Witzeman *et al.*, 1976), habitat disturbance may have a drastic and long-term impact on the Mississippi Kite population in an entire region. In general, however, the future of the species looks bright throughout most of its expanding range.



Plumage of immature Mississippi Kite, out of nest.

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