

The decline of the Aplomado Falcon in the United States

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ALTHOUGH THE APLOMADO FALCON (*Falco femoralis*) once nested regularly in parts of Arizona, New Mexico, and Texas, population declines in the early 20th century have essentially eliminated the species from the United States (Bailey 1928; Ligon 1961; Oberholser 1974; Murphy 1978; and Hector 1980). Aplomado Falcons are extremely rare, with a limited distribution in the United States on the gulf-coastal plain of Texas and in the desert grasslands to the west, where many birders search for them annually. Only recently, however, has the status of this species been called to the attention of management-oriented agencies (Bond 1972; Wildlife Habitat Management Staff Group 1975; Murphy 1978; Evans 1982; Millsap 1983; LeFranc and Millsap 1984). LeFranc and Millsap (1984) classified the Aplomado Falcon one of the most "sensitive" of North American raptors.

Reasons for the decline of the Aplomado Falcon are unknown. Ligon (1961:82) says that "considering the permanent source of their food and the abundance of suitable nesting places, the disappearance [of the Aplomado Falcon] from most of its former range remains somewhat of a mystery." He felt that shooting pressure may have been a factor because Aplomado Falcons were very tame. Oberholser (1974: 257), however, says that ". . . none of the usual causes of bird decimation seem to apply to the Aplomado Falcon"

In 1976 I began a study of the ecology and behavior of the Aplomado Falcon in eastern Mexico. A long-term objective of the project was to provide information which might help to improve the status of the Aplomado Falcon in the United States. Management of any species requires some understanding of its basic ecological relationships and how these relate to any population declines that have occurred. Results of the initial ecological investigations dealing with feeding ecology and habitat selection have been completed (Hector 1981 and 1985). This paper presents a scenario which describes and attempts to explain the decline of the Aplomado Falcon in the United States.

METHODS

I solicited specimen records from 57 museums and private ornithological collectors in the United States and Canada. A total of 43 responded and 29 contained specimens from the United States.

Specimens from the following collections (in order of appearance) are mentioned in this paper: San Diego Natural History Museum (SDNHM), United States National Museum (USNM), Cincinnati Museum of Natural History (CMNH), Museum of Vertebrate Zoology (MVZ), American Museum of Natural History (AMNH),

National Museum of Natural History (NMNH), Virginia Polytechnical State University (VPSU), Western Foundation of Vertebrate Zoology (WVZ), University of Michigan Museum of Zoology (UMMZ), Oklahoma State University Wildlife Collections (OSU). Nineteen collections contained only specimens collected by F.B. Armstrong (see Discussion) and are not referred to individually.

In addition, I attempted to locate all late 19th and early 20th century references to the Aplomado Falcon, and contact individuals who had seen the species in the United States or Latin America. Although my sample of specimen records and observations is surely incomplete, I have probably garnered collection dates and localities for over 90% of North American specimens of the Aplomado Falcon.

In the remainder of this paper numbers in parentheses (#1-#34) refer to locations on Figure 1.

RESULTS

Early History in New Mexico

In March 1852, Heermann (1854; Brewer 1856) collected the first U.S. Aplomado Falcon (#1) in southwestern New Mexico. Stephens added a third U.S. specimen (SDNHM) in August,

1875, when he shot an adult female (#2) near Silver City, New Mexico (Grant County). Anthony (1892) reported a pair of falcons (#3) near Hachita (Grant County) in June 1886. On the Jornada del Muerto (#4; Dona Ana County), Ligon discovered several nests with young in June 1908 and 1909 (Bailey 1928). In July of the same year, Goldman collected an adult (USNM) at Hachita, and observed a bird in August in the Playas Valley (#5; Hidalgo County; Bailey 1928).

In June 1917, Ligon collected an adult female (USNM) 45 miles north of Alamogordo (#6; Otero County). He observed a pair of adults 25 miles north of Engle (#7; Socorro County, #25) in August (Bailey 1928); and collected a pair of adults (USNM) in September near Nutt (#1; Luna County). In September of the next year, he observed

one bird 20 miles southeast of Silver City (#2; Luna County, Bailey 1928), and in November Ligon (1961) and A.K. Fisher observed a pair of falcons near Engle (#7; Sierra County). In December 1918, Ligon observed a pair of Aplomado Falcons 10 miles north of Engle (#7; Bailey 1928). In May 1919, Ligon shot an adult male (CMNH) 30 miles southeast of Silver City.

In May 1924, Ligon took an adult male (YPM) 15 miles southeast of Cutter (#7; Sierra County). In June, Kellogg collected two adult males (CMNH) and an adult female (MVZ) on the Tadpole Ranch, 4 miles north of Separ (#8; Grant County). In September 1928, Ligon collected another falcon (CMNH) southeast of Silver City.

Toomey collected the last skin from New Mexico in October 1939. This was an immature male (CMNH) taken near

Animas (#9, Hidalgo County) Arnold Bayne located the last documented United States nest site in May 1952 near Deming, New Mexico (#1; Luna County; Ligon 1961).

Early History in Arizona

Henshaw (1875) saw Aplomado Falcons several times near Ft. Bowie, Arizona (#10) in 1873-1874. Fourteen years later in April and May, Benson located five nesting pairs (#11) at Ft. Huachuca, Arizona (Cochise County, Bendire 1887). In 1910, Lusk (Visher 1910), observed a bird near Tucson (#12; Pima County), and Willard (1910) saw one in February along the San Pedro River near Fairbanks (#11, Cochise County). Monson spotted a falcon in the Sulphur Springs Valley

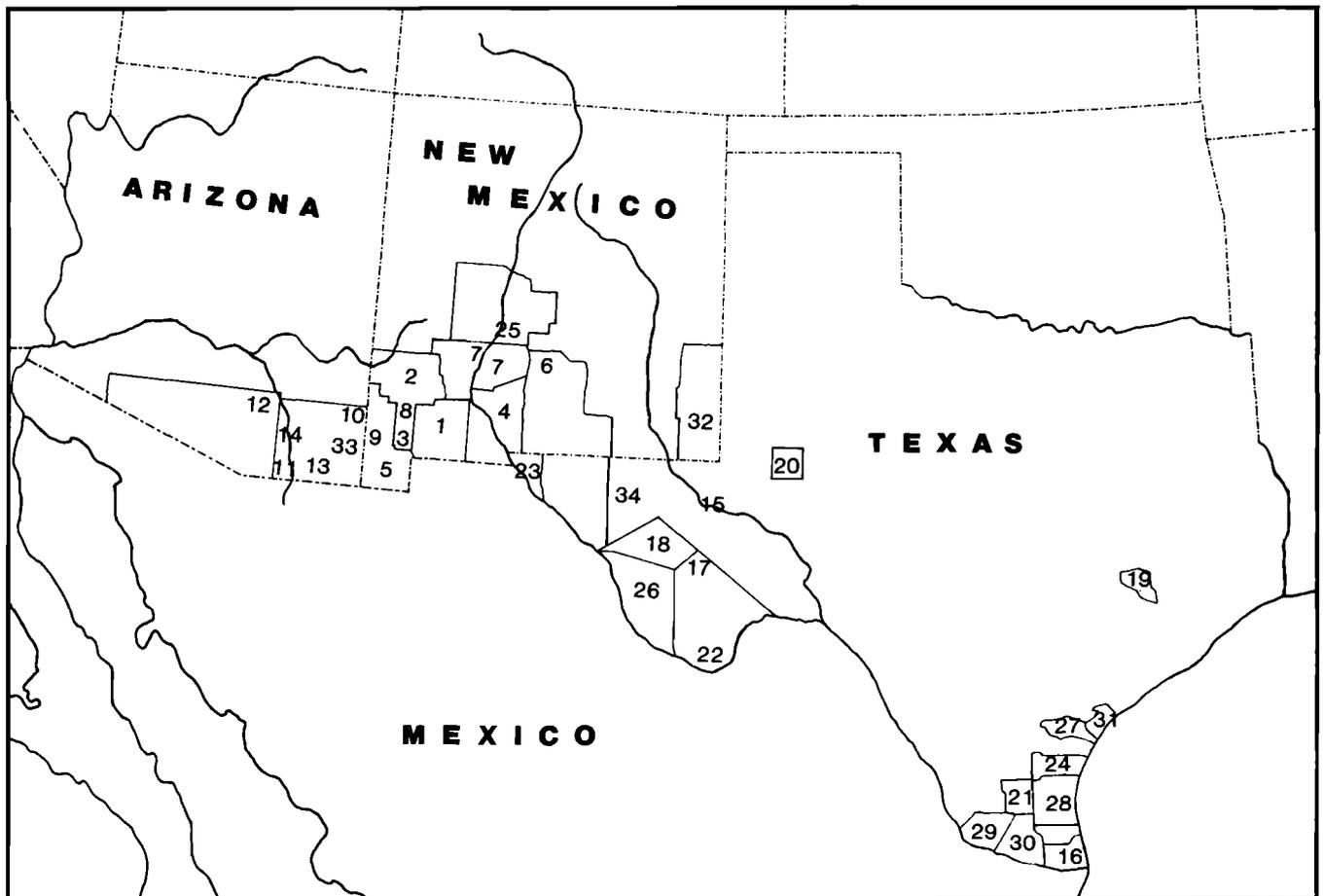


Figure 1. Aplomado Falcon collection and observation localities in the U.S. **NEW MEXICO** localities: #1-Hidalgo Co.; #2-Silver City and Ft Bayard, Grant Co.; #3-Hachita, Grant Co.; #4-Jornada del Muerto, Dona Ana Co.; #5-Playa Valley, Hidalgo Co.; #6-Alamogordo, Otero Co.; #7-Engle, Sierra Co.; #8-Tadpole Ranch, Grant Co.; #9-Animas, Hidalgo Co.; #25-Socorro Co.; #32-Lea Co. **ARIZONA** localities: #10-Ft Bowie, Cochise Co.; #11-Ft. Huachuca, Cochise Co.; #12-Tucson, Pima Co.; #13-Sulphur Springs Valley, Cochise Co.; #14-St. David, Cochise Co.; #33-Chiracahua Mtns. **TEXAS** localities: #15-Pecos, Reeves Co.; #16-Brownsville and Pt. Isabel, Cameron Co.; #17-Alpine, Brewster Co.; #18-Jeff Davis Co.; #19-Bellville, Austin Co.; #20-Midland Co.; #21-Brooks Co.; #22-Big Bend National Park, Brewster Co.; #23-El Paso Co.; #24-Riviera, Kleberg Co.; #26-Presidio Co.; #27-Welder WR, San Patricio Co.; #28-North Padre Island, Kenedy Co.; #29-Roma, Starr Co.; #30-Mission, Hidalgo Co.; #31-Aransas NWR, Aransas Co.; #34-Culberson Co.

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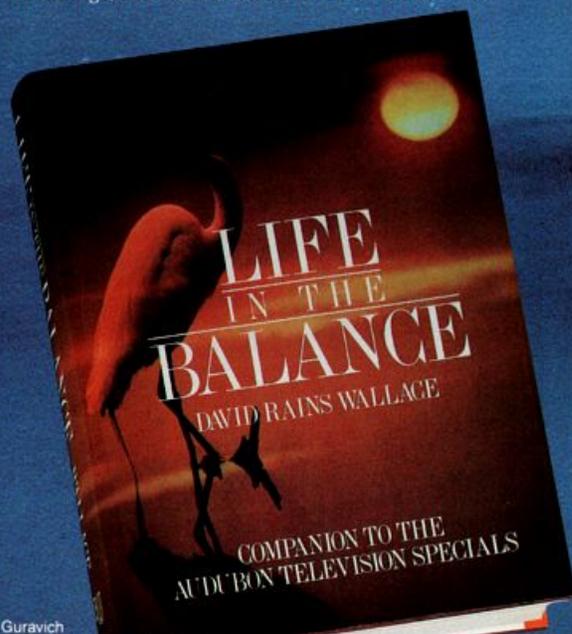


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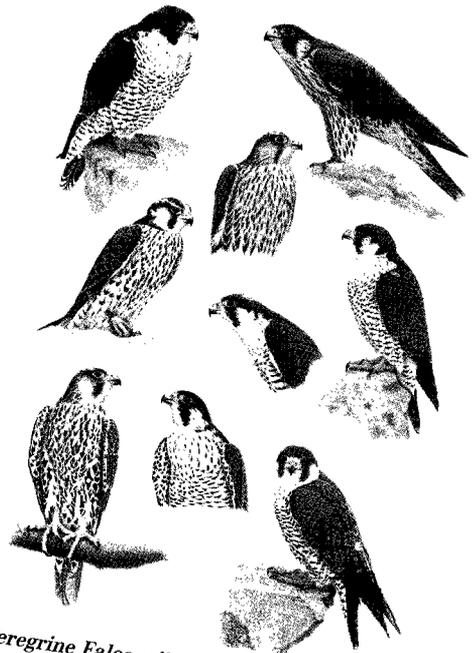
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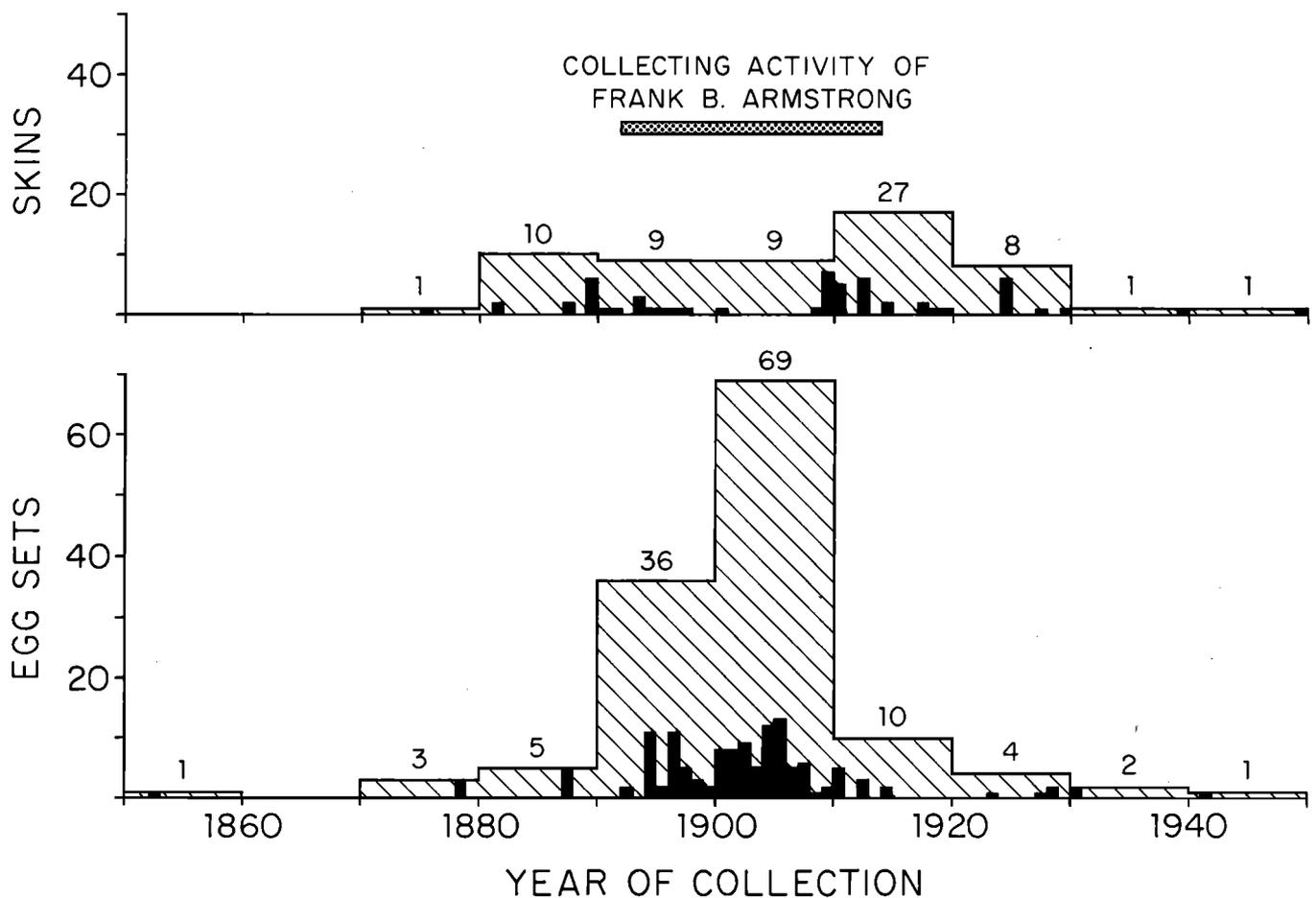


Figure 2. Temporal distribution of U.S. specimens of the Aplomado Falcons. Outlined histogram bars show numbers of eggs or skins collected per decade. Dark bars show numbers of specimens collected per year.

habits oak and pine savannas (Hector 1981, 1985; Howell 1982), open grasslands, coastal deserts (Johnson 1963), riparian woodlands in the midst of desert grassland (Henshaw 1875), and marshes (Hector, *pers. obs.*).

Since the early 1900s much of the lower Rio Grande valley, gulf-coastal plain of Texas, and river floodplains of New Mexico and Arizona have been converted from grassland to farmland—principally cotton, sorghum, citrus, beans and corn. Farming activities have also altered much of the Rio Grande Valley, Texas coastal plain, and portions of New Mexico and Arizona. In addition, brush encroachment has congested much of the semi-open grassland once inhabited by the species (Bogusch 1952; Glendening 1952; Humphrey 1958; Hastings and Turner 1964; Harris 1966; York and Dick-Peddie 1969).

Unregulated grazing by livestock surely accelerated the spread of mesquite by opening up ground cover vegetation and by ingesting, scarifying and dispersing whole seeds (Hastings and

Turner 1964; Harris 1966; York and Dick-Peddie 1969). As in other grasslands, control of range fires, especially on the coastal plain of Texas, probably further accelerated the spread of mesquite (Humphrey 1958).

According to Camp (in Brooks 1933), the area congested by mesquite near Brownsville had increased in coverage and encroached about 5 miles on the coastal prairie in 20 years. Buffington and Herbel (1965) described the brush encroachment on the Jornada del Muerto between 1858–1963; evidently this area contained the highest known nesting densities of Aplomado Falcons outside of south Texas. The Jornada Experimental Range may coincide with the area in which J.S. Ligon found birds nesting in 1908–1909 (Bailey 1928). In 1858, an estimated 83,625 acres of the 144,475 acre study site was free of woody vegetation (mesquite, creosote, or tarbush). By 1915, the grassland acreage had decreased to 35,459 acres, then to 32,833 acres by 1928. In 1963, the study site was completely en-

croached by woody vegetation, mostly mesquite; over one-half of the area was covered by high densities of brush (50–100% coverage).

In Mexico, trees at falcon nest sites averaged 46 meters apart and 9.5 meters in height (Hector 1981). Tree densities averaged 19/40 hectares (19/100 acres; Hector 1981). Ground cover tended to be less than 25 centimeters deep (Hector 1981). Pastures not maintained by burning or clearing rapidly became congested with thorny legumes (mostly *Acacia farnesiana*). Aplomado Falcons tended to abandon nesting territories where grassy ground cover had given way to brush (Hector 1981). When I carried out a statistical comparison of habitat structure measurements for a sample of eastern Mexican nesting territories, I found that although occupied sites tended to have greater overall ground cover density, ground cover at these sites was concentrated below 0.5 meter above the ground (Hector 1981). Abandoned sites tended to be more congested with vegetation between 0.5

and one meter above the ground (Hector 1987). A number of studies have detected a relationship between raptor habitat selection and structure of ground cover vegetation (Howell *et al.* 1978; Bechard 1982; Hector 1987; and reviewed by Janes 1985). Janes (1984), using simple geometric models, has shown how habitat structure should affect prey detection ability and optimal perch heights of raptors. Presumably, capture efficiency should also be affected by vegetation structure.

Although birds are the staple food of the Aplomado Falcon (Hector 1985), the species feeds on a variety of prey including bats, rodents, lizards, and insects (Brooks 1933; Ligon 1961; Mader 1981; Hector 1985). Many prey animals are captured on the ground following high-speed chases begun from vantage posts in trees (Hector 1981, 1985, and 1986). Hunting falcons often force fleeing birds to hide in limited patches of thicker ground cover or in the crowns of isolated trees. Aplomado Falcons, however, are agile enough to corner and capture such grounded prey. With prey in continuous forest, dense brush, or dense, deep grass, however, falcons tended to quickly abandon pursuit.

Although grazing pressure could conceivably have improved hunting success for Aplomado Falcons by making prey more vulnerable to detection and capture, lack of cover probably reduced populations of many prey species by destroying food plants and protected nesting situations (Brown 1900 and 1904). This may account for the declines suffered by the Masked Bobwhite (*Colinus virginianus ridgwayi*) (Brown 1900 and 1904; Ellis *et al.* 1977; Tomlinson 1972), Scaled Quail (*Callipepla squamata*) (Phillips *et al.* 1964), Mearn's Quail (*Cyrtonyx montezumae*) (Brown 1900 and 1904; Phillips *et al.* 1964; Oberholser 1974), and a number of open country fringillids such as McCown's Longspur (*Calcarius mccownii*), and Botteri's Sparrow (*Aimophila botterii*), Rufous-winged Sparrow (*Aimophila carpalis*), and Baird's Sparrow (*Ammodramus bairdii*) (Phillips *et al.* 1964) in 1890–1910.

Populations of the White-tailed Hawk, Black-shouldered Kite (*Elanus leucurus*) (Eisenmann 1971; Pruett-Jones *et al.* 1980; Larson 1980), and Ferruginous Hawk (*Buteo regalis*) (Houston and Bechard 1984) have all declined in portions of their ranges where vegetational change has elimi-

nated open to semi-open grassland. Effects of brush encroachment on hunting success and prey availability probably account in part for these declines. This is significant not only because the Aplomado Falcon shares similar habitat preferences with these species, but also because Aplomado Falcons depend largely on other raptors (as well as corvids) for nesting platforms. In eastern Mexico, most nest platforms were the abandoned nests of the Brown Jay (*Psittorhinus morio*), Black-shouldered Kite, or Roadside Hawk (*Buteo magnirostris*) (Hector 1981). I also found falcons in old nests of the Crested Caracara (*Polyborus plancus*). In the United States, falcons used nests of the Chihuahuan Raven (*Corvus cryptoleucus*) (Bendire 1887), Swainson's Hawk (*Buteo swainsoni*) (Strecker 1930), and probably also those of the Black-shouldered Kite, White-tailed Hawk and Caracara.

Populations of the Black-shouldered Kite and White-tailed Hawk have recovered in coastal Texas. This seems related to intensive brush clearing and the use of prescribed burns to revert rangeland to some semblance of its former openness. Unlike these two rodent-oriented species, however, the Aplomado Falcon has failed to recover despite increased availability of open range.

The Effect of Pesticide Contamination

Aplomado Falcons occupy a feeding niche similar to that occupied by the Peregrine Falcon, a species whose pesticide-related declines have been well-publicized (Ratcliffe 1970). Kiff *et al.* (1981) discovered that post-DDT (post-1947) eggs of Aplomado Falcons from eastern Mexico averaged 25% thinner than pre-DDT eggs of this species. This is a greater degree of thinning than that found in declining populations of the Peregrine (Kiff *et al.* 1981).

Because of their dietary preferences (Hector 1985), and evidence that the species is heavily contaminated in Mexico, it is reasonable to assume that Aplomado Falcons surviving in the United States past the 1940s may have been further decimated by pesticide contamination. According to Lehmann, 5–9 falcons inhabited one 12,000 acre pasture on the northern part of the King Ranch until the early 1950s. These birds disappeared before brush encroachment had an appreciable effect on this pas-

ture Lehmann believed that pesticide contamination may have caused their disappearance. Furthermore, cotton agriculture dominated most areas—the Texas coast, and desert rivers of Arizona and New Mexico—near areas where Aplomado Falcons once occurred

An obvious effect of pesticide-induced reproductive problems would be a reduction in the ability of a species to colonize unoccupied patches of habitat. Consequently, although brush clearing activities are rapidly opening up south Texas ranches, Aplomado Falcons may not reoccupy their former range until pesticide use abates in Latin America, or some effort is made to artificially re-establish the species.

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