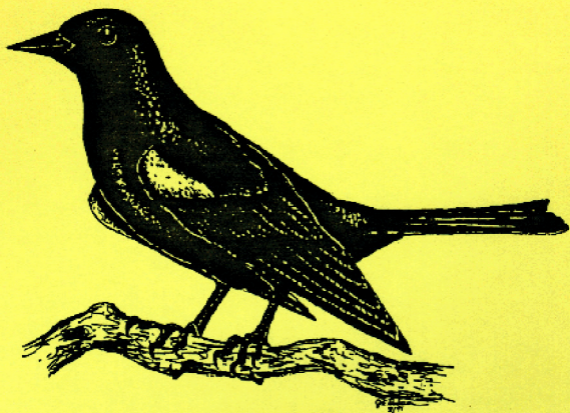


Recovery Plan
For The
Yellow-shouldered
Blackbird
(*Agelaius xanthomus*)



U.S. Fish and Wildlife Service
Southeast Region
Atlanta, Georgia

YELLOW-SOULDERED BLACKBIRD REVISED RECOVERY PLAN

(Agelaius xanthomus)

(Original Approved: May 25, 1983)

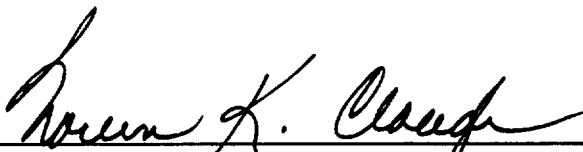
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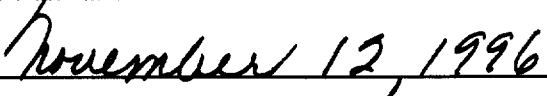
U.S. Department of the Interior
Fish and Wildlife Service
Southeast Region
Atlanta, Georgia

Approved by:



Noreen K. Clough, Regional Director, Southeast Region
U.S. Fish and Wildlife Service

Date:



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EXECUTIVE SUMMARY OF THE YELLOW-SHOULDERED BLACKBIRD REVISED RECOVERY PLAN

Current Status: The yellow-shouldered blackbird (*Agelaius xanthomus*) is listed as endangered. This species is endemic to Puerto Rico and Mona Island. At present, it is restricted to a few localities in southwestern, southern, and eastern Puerto Rico, and to Mona and Monito Islands.

Habitat Requirements and Limiting Factors: Present distribution of the species includes the Boquerón Commonwealth Forest in southwestern Puerto Rico, Roosevelt Roads Naval Station in eastern Puerto Rico, Salinas in southern Puerto Rico, and Mona and Monito Islands. In southwestern Puerto Rico, a mean of 258 and 352 yellow-shouldered blackbirds have been counted during pre- and post-reproduction seasons, respectively. Approximately 400 individuals are known from Mona Island, 20 individuals have been sighted in Salinas, and approximately 14 individual were observed at Roosevelt Roads Naval Station. Although nesting yellow-shouldered blackbirds have been reported from a variety of habitats (mudflats and salinas, mangrove forests and cays, coastal upland dry forest, palm trees, suburban areas, caves, and coastal cliffs), at present, almost all the nests monitored have been located in artificial structures (PVC pipes and elbows). The species is currently threatened by loss of habitat, nest invasion by Caribbean martins, and parasitism by shiny cowbirds.

Recovery Objective: Downlisting to threatened status.

Interim Recovery Criteria: In order to ensure a self-sustaining population in the Boquerón Commonwealth Forest (BCF), the reproductive success should be enhanced to ≥ 0.96 daily survival for eggs and chicks, and parasitism rates should be reduced to ≤ 20 percent. These criteria should be maintained for at least 5 years in the artificial structures. The criteria for delisting should be developed after modeling data obtained from natural nests in the BCF and at least two additional areas in Puerto Rico, including Mona Island.

Actions Needed:

1. Protect and manage yellow-shouldered blackbird habitat.
2. Protect and manage yellow-shouldered blackbird populations.
3. Monitor reproductive success in existing artificial nest structures.
4. Develop an education program.

Date of Recovery: Downlisting should be initiated in 2020, if interim recovery criteria are met.

Recovery Costs: Recovery costs for the yellow-shouldered blackbird have been estimated at \$302,000 for the first 3 years of this plan. Subsequent expenditures will depend on the results of these preliminary studies and activities, and, therefore, cannot be estimated at this time.

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I. INTRODUCTION

The yellow-shouldered blackbird (*Agelaius xanthomus*), commonly known as "la Mariquita de Puerto Rico" or "Capitán," is endemic to Puerto Rico and Mona Island. In the past, this species was considered abundant and widespread in Puerto Rico. In the mid-1970s, the southwestern and eastern populations declined drastically. The destruction of the species' nesting and foraging habitat and brood parasitism by the shiny cowbird (*Molothrus bonariensis*) were identified as the two most important factors responsible for the species' decline. At present, the yellow-shouldered blackbird is restricted to a few localities in southwestern, southern, and eastern Puerto Rico, and to Mona and Monito Islands.

The yellow-shouldered blackbird was determined to be an endangered species and critical habitat was designated in 1976, pursuant to the Endangered Species Act of 1973, as amended (U.S. Fish and Wildlife Service (Service) 1976). Critical habitat designation included all of Mona island; a portion of southwestern Puerto Rico in the municipalities of Cabo Rojo, Lajas, and Guánica (Figure 1); a circular area with a 1-mile radius in the town of San Germán; and Roosevelt Roads Naval Station (RRNS), southeast of Ceiba (50 CFR 17.95 (b)).

Description

This species is one of the nine species of the blackbird genus *Agelaius*. There are two recognized subspecies: *Agelaius x. xanthomus*, known only from Puerto Rico and formerly from Vieques Island, and *Agelaius x. monensis*, which occurs only on Mona and Monito Islands (Post 1981a).

The yellow-shouldered blackbird is a medium-sized (20 to 23 centimeters) bird which is glossy black with yellow epaulets (humeral patches). The plumage of males and females is similar. Immature birds are a duller black than adults and possess a brown abdomen (Raffaele 1989). The humeral patch is usually edged with a narrow white margin, and under the wing the humeral feathers are occasionally tinged with orange (Post 1981a).

Historical Range and Status (1864 - 1974)

The yellow-shouldered blackbird was widespread and abundant in Puerto Rico and Mona Island until the 1940s (Post and Wiley 1976). In the mid-19th century it was described as "excessively abundant" in the San Juan region (Taylor 1864). The species was collected even in the mountainous interior at Lares and was also considered common throughout lowland Puerto Rico (Wetmore 1927 and Danforth 1936). Kuns *et al.* (1962) estimated a density of 0.15 yellow-shouldered blackbirds per hectare in the upland forest and the cacti forest in Mona Island. Leopold (1963) reported the species as common along the

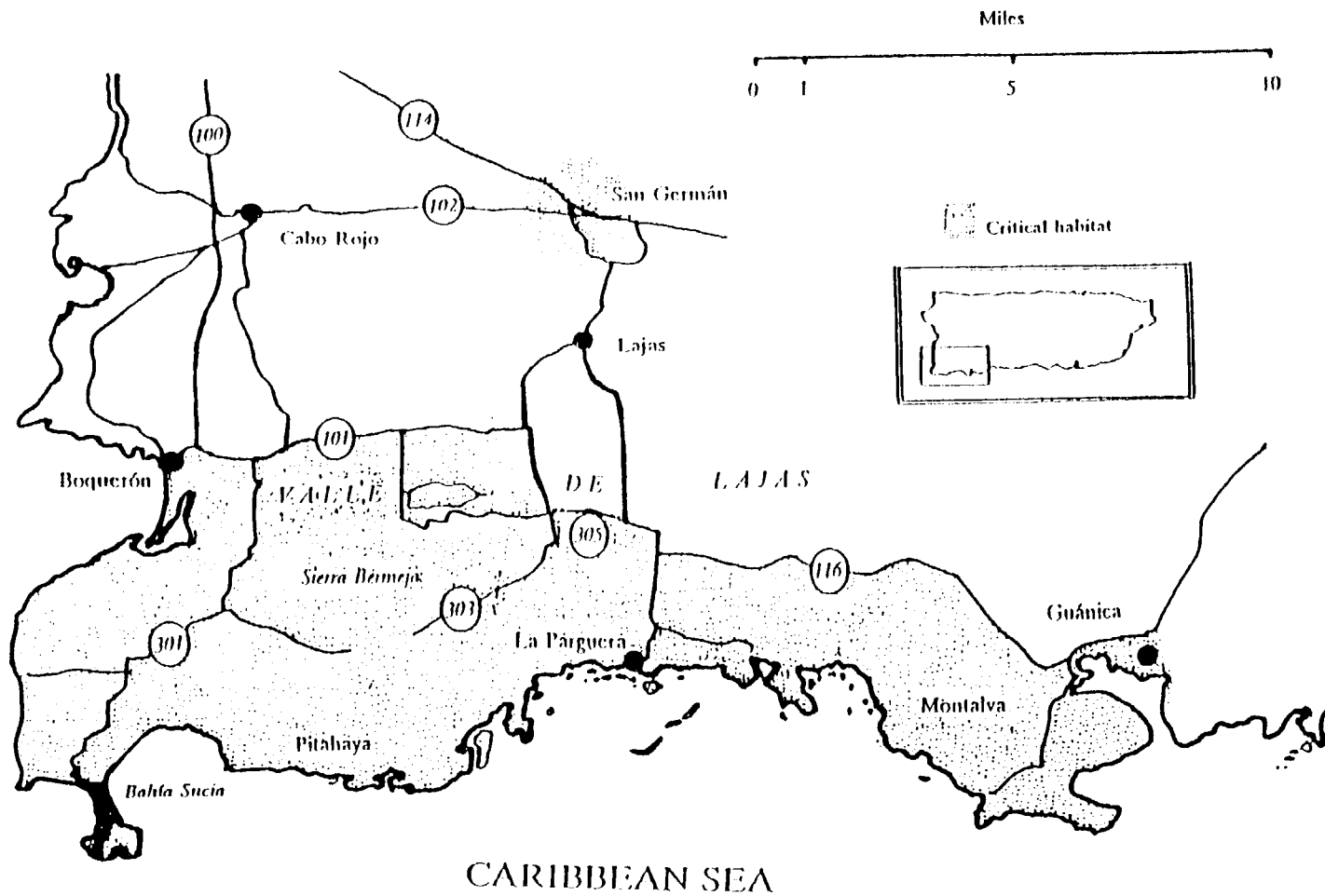


Figure 1. Designated critical habitat for the yellow-shouldered blackbird in southwestern Puerto Rico.

coastline of Puerto Rico. Kepler and Kepler (1970) estimated a density of 0.0098 yellow-shouldered blackbirds per hectare at Guánica. Post and Wiley (1976) estimated the total population of the yellow-shouldered blackbird to be about 2,400 and considered that the population was concentrated in three areas: coastal southwestern Puerto Rico with 2,000 individuals; coastal eastern Puerto Rico with 200; and Mona Island with approximately 200 birds. They also considered that coastal southwestern Puerto Rico, from Ensenada to Punta Guaniquilla, was the most important population center for the species.

The yellow-shouldered blackbird was reported from Vieques in April 1974 and in March 1978 (Service 1978).

Present Distribution and Abundance (1974 - 1995)

Southwestern Puerto Rico:

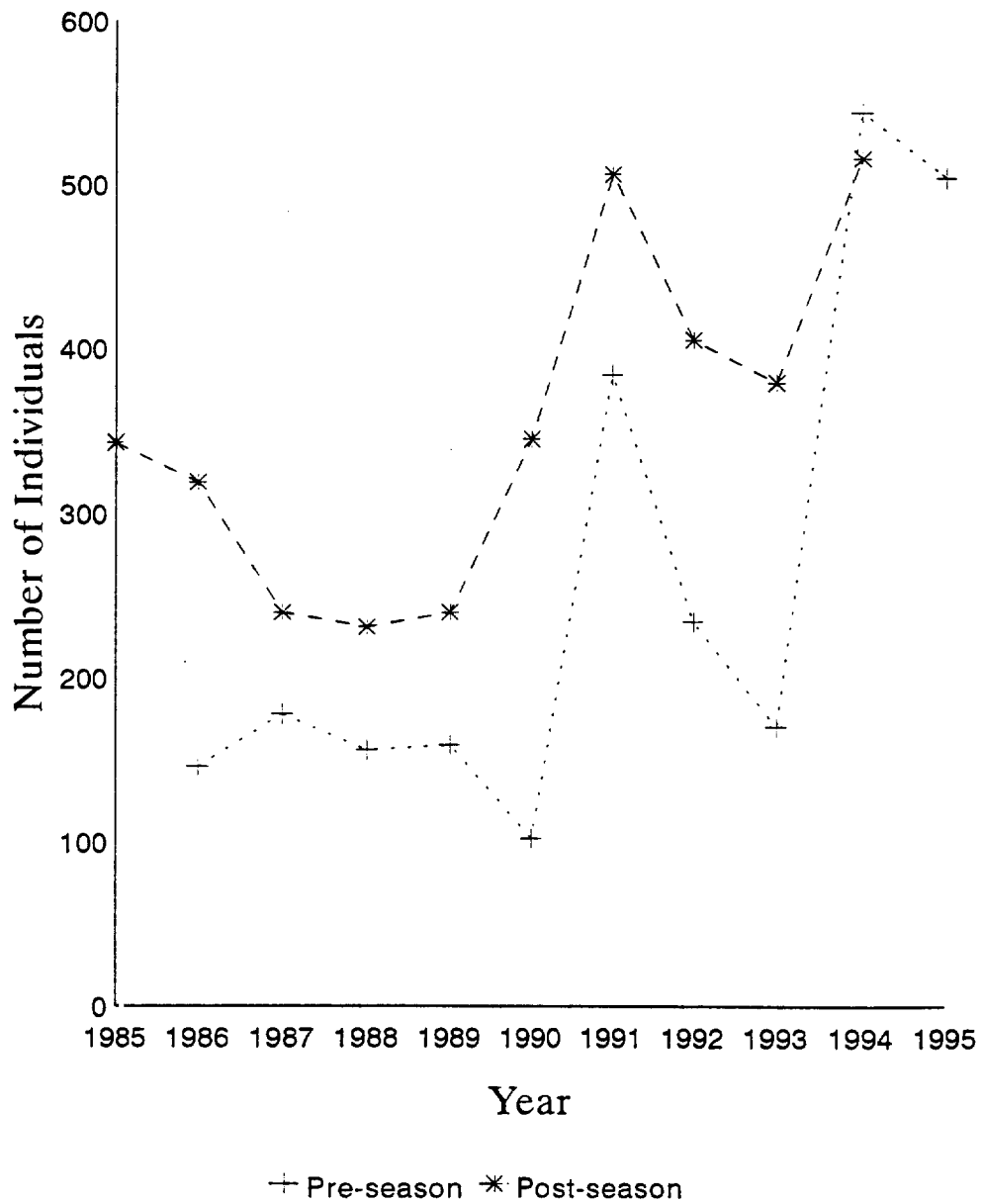
From 1975 to 1981, the yellow-shouldered blackbird population in coastal southwestern Puerto Rico declined by about 80 percent (Wiley *et al.* 1991). In contrast to 2,000 individuals estimated in 1976, the population was estimated at about 300 individuals in 1982.

Roost counts conducted between 1985 and 1995 in southwestern Puerto Rico by the Commonwealth Department of Natural and Environmental Resources (Department) showed mean counts of 258.9 ± 39.0 yellow-shouldered blackbirds during pre-reproductive season and a mean of 352.8 ± 25.8 yellow-shouldered blackbirds during post-reproductive season (Figure 2). These data show that this population, as measured by seasonal counts, is increasing. Based on pre-reproductive season counts, Collazo *et al.* (1995) estimated that the southwestern population is increasing at a rate of 0.13 ± 0.04 per year (finite rate or $\lambda = 1.14$). This means that the population increased at a rate of 14 percent annually or 39 birds per year, on average.

Collazo *et al.* (1995) found a positive relationship between the number of yellow-shouldered blackbirds during pre- and post-season counts. On the average, 71 ± 9.94 percent of the birds counted during the post-season counts were being counted during pre-season censuses. However, high post-season counts did not always result on higher pre-season counts. They found that the ability to predict pre-reproductive season numbers on the bases of post-season counts was not strong. They stated that this lack of ability was probably a function of the openness of the population and that the counts were comprised of members of other populations besides the southwestern population.

According to the Department (1992), the decrease observed in the surveys conducted before the nesting season may be the result of winter dispersion of the species. Variations in roost counts conducted after the nesting season may be due to human errors, the timing

Figure 2. Roost counts in southwestern Puerto Rico, 1985 - 1995.



of the breeding seasons, timing of counts, number of areas included on the counts, frequency and number of counts, and dispersion of the species.

Roosevelt Roads Naval Station:

At the RRNS in Ceiba (mentioned previously as coastal eastern Puerto Rico), the yellow-shouldered blackbird population declined to six pairs (97 percent decline) in 1982 (Wiley *et al.* 1991). These same authors mentioned that only two nesting pairs were found in 1985 and 1986 in this area. After Hurricane Hugo in September of 1989, this population was believed to have been extirpated (Service 1991). One individual was observed in May 1993 (J. Saliva, pers. comm.). Wunderle (pers. comm.) reported two yellow-shouldered blackbirds in December 1994. The Department (1995) reported that one yellow-shouldered blackbird was found dead at an electrical substation, and 15 yellow-shouldered blackbirds were reported near the principal gate of the base. Intensive surveys are needed to determine how many yellow-shouldered blackbirds remain in the area.

Mona and Monito Islands:

The only known localities for the subspecies *Agelaius x. monensis* are Mona and Monito islands. In 1971 and 1972, several hundred yellow-shouldered blackbirds were reported from Mona island (Raffaele 1973). Post and Wiley (1976) estimated the Mona population to be 200 individuals. Pérez-Rivera (1983) reported that in 1981 and 1982 the population was from 220 to 310 individuals, respectively. Lewis (1982) estimated the Mona population to be 250 pairs. In two roost counts conducted by the Department on Mona in 1986, approximately 338 yellow-shouldered blackbirds were recorded (Department 1986). Hernández-Prieto and Cruz (1987) reported a mean of 290 yellow-shouldered blackbirds from roost count estimates conducted in the summer of 1986 (counts ranged from 276 to 305 individuals). Hernández-Prieto and Cruz (1989) suggested that the total yellow-shouldered blackbird population on Mona exceeds 400 individuals (an average of 652, ranging between 467 and 908). Roost counts were carried out by the Department in five different locations on Mona island in 1992. A total of 310 yellow-shouldered blackbirds was counted (Department 1992). In 1994, the Department reported 267 yellow-shouldered blackbirds in three areas (Department 1994). In 1995, the Department reported a total of 153 yellow-shouldered blackbirds (Department 1995).

On Monito Island, Hernández-Prieto and Cruz (1987) reported "no less than 25" individuals, of which 13 had juvenile plumage. The Department reported 25 yellow-shouldered blackbirds in 1994 and 23 in 1995 (Department 1994 and Department 1995). Bonilla (pers. comm.) reported that blackbirds fly to Monito from the Cabo Barrio Nuevo area of Mona, suggesting that the source of the blackbirds on Monito may be western Mona. Hernández-Prieto and Cruz (1987) and Hernández-Prieto and González-Román (1990) reported breeding in Monito in 1986.

Yellow-shouldered blackbirds have been found on coastal cliffs and adjacent plateau areas of eastern and southern Mona (Hernández-Prieto and Cruz 1989). Danforth (1936) collected specimens from Playa Pájaros, in the southeastern part of Mona. They have also been reported from cliffs on the northern coast (Lewis 1982 and Pérez-Rivera 1983), and have been observed in the interior of the plateau (Camino del Diablo and Bajura de los Cerezos) and coastal areas (Sardinera and Pájaros) (Hernández-Prieto and Cruz 1989).

Barnés (1946) collected yellow-shouldered blackbirds from caves such as Cueva el Gato (northwest) and Cueva El Capitán (northwest), Las Caobas area (west) and plateau areas of northwestern and northeastern Mona island. Hernández-Prieto and Cruz (1987) indicated that the caves in eastern Mona (Cueva de Frío to Playa Pájaros) were commonly used by yellow-shouldered blackbirds for roosting. Other roosting areas were identified on the southern coast, from Uvero Beach to the vicinity of Caigo o No Caigo, and on the cliffside areas. Small numbers of blackbirds were found in the Cueva del Esqueleto, Punta Capitán, Cabo Barrio Nuevo, and Cabo Noroeste areas. No blackbird roosts were found in the plateau or beach areas, but birds were observed feeding at these locations (Hernández-Prieto and Cruz 1987 and Hernández-Prieto 1993).

San Germán:

Although the species was known from San Germán when it was listed in 1976, no counts or population estimates were conducted in that particular area. In 1992, thirteen blackbirds were counted in a roost in San Germán (Department 1992).

Salinas:

A new population of yellow-shouldered blackbirds was found between Guayama and Salinas (Department 1991). Censuses were carried out by the Department in Salinas, and 20 individuals were detected in 1991 and 41 in 1995 (Department 1991 and Department 1995).

Other Areas:

The yellow-shouldered blackbird has been reported from other areas. In December 1982, yellow-shouldered blackbirds were reported from the Caño Martín Peña, when the inventory of fauna and flora was conducted for the construction of the "Agua-guagua" project. Núñez-García (pers. comm.) reported yellow-blackbirds nesting near Yabucoa in 1986. He reported 11 individuals including fledglings. He also reported an unparasitized blackbird nest which fledged three chicks at the Union Caribe Grafito Company. In 1990, reports of yellow-shouldered blackbirds were received from Ponce, Mayagüez, Añasco, Yauco, Guánica, Guayanilla, and Guayama (Department 1990). In 1991, reports of blackbirds were received from Utuado, Ponce, Guánica, Guayama, and Salinas (Department 1991). In 1992, yellow-shouldered blackbirds were reported from the town

plaza of Cabo Rojo. Personnel from the Department confirmed the presence of a nest with a chick at this site (Department 1992). In 1994, six yellow-shouldered blackbirds were reported from Cataño (G. Bonilla, pers. comm.) and four were observed in Naguabo (personal observation). The species has been reported from Las Vegas Ward in Barranquitas (J. Colón, pers. comm.).

Breeding Biology

The breeding season for this species extends from April through August. Post and Wiley (1977b) and Post (1981a) suggested that the breeding season or initiation of pairing coincides with spring rains. The latter explained that the spring growth of vegetation provided food for foliage-feeding insects (on which the species feeds). Pérez-Rivera (1980) reported that breeding activity may begin as early as February on Mona Island and could last through November in San Juan and Cayey, depending upon the rainfall pattern during the year.

According to Post (1981a), the yellow-shouldered blackbird is a monogamous species. Pairing generally begins 6 or 10 weeks prior to breeding. Pairs establish themselves in the nesting areas of previous years. The males establish limited territories around nesting areas. Site defense by the females begins only after the nest is built, and decreases when females stop brooding the young. Intraspecific defense is primarily the male's role, with the area regularly defended within a 3-meter radius (Post 1981a).

Yellow-shouldered blackbirds in La Parguera nested in scattered mangroves, as well as in cavities in the dead trees and stumps (Post 1981a). The species used two types of cavities, holes in the sides of dead trees and holes in the tops of stumps. In large deciduous trees, the nests were placed on main branches or crotches at an average height of 5.6 meters. On offshore cays, yellow-shouldered blackbirds usually placed their nests on main branches or crotches. On the mainland, birds nested in the open nests or platforms made of leaves, grass, cotton, and occasionally paper, string, plastic bags, and twine. Nest cups were made of grass leaves, stems, and cotton, and were usually lined with fine grass leaves and stems. Nests on cays were bulkier than those found on the mainland because they contained large quantities of sargassum (Post 1981a).

In southwestern Puerto Rico, as well as on Mona Island, clutches contained an average of 3 eggs (Post 1981a and Pérez-Rivera 1982). There was no difference in the average clutch size of birds nesting on islands and on the mainland, nor between birds using cavity or open nests. Incubation began after the second egg was laid, and hatching was asynchronous. Only the female incubates and broods, while both sexes bring food and clean the nest. The incubation period lasts 12 to 13 days and the nestling period ranged from 13 to 16 days. Yellow-shouldered blackbirds usually nest in colonies and the distance between nests ranges from 5 to 35 meters (Post 1981a). This author believed that nesting aggregations resulted from active attraction among birds.

The yellow-shouldered blackbird is relatively long-lived. The annual survival rate for the adult population in southwestern Puerto Rico has been estimated at 82.4 percent (Post and Wiley 1977b). Post and Wiley (1977b) calculated the annual recruitment rate to be 18.1 percent, which in this case is about equal to the adult mortality rate. They estimated that about two blackbirds must be fledged per breeding pair each year for the population to be maintained.

Nesting Habitats

Nesting yellow-shouldered blackbirds have used a variety of habitats. The yellow-shouldered blackbird has been found nesting in the Boquerón Commonwealth Forest (BCF) and coastal upland dry forest in southwestern Puerto Rico, RRNS in eastern Puerto Rico, and on Mona Island. Other nesting localities such as Guánica, San Germán, Cabo Rojo, Salinas, and Carolina have also been reported (Department 1991, Department 1992, and Post and Wiley 1976). Wetmore (1927) found nests at Laguna Cartagena in Lajas.

In studies conducted by Post and Wiley (1976), yellow-shouldered blackbirds were described as using eight types of nesting habitats: mud flats and salinas, offshore red mangrove cays, black mangrove forest, lowland pastures (dry coastal forest), suburban areas, coconut plantations, and coastal cliffs. However, at the present time, most of these areas are not being used by the yellow-shouldered blackbird for nesting.

Southwestern Puerto Rico:

Post and Wiley (1976) described the abandoned salinas or salt flats and mud flats in the coastal mangrove zone as the most important nesting habitat for the species in southwestern Puerto Rico. The principal vegetation in these areas was black mangrove (*Avicennia germinans*), red mangrove (*Rhizophora mangle*), and white mangrove (*Laguncularia racemosa*). The trees were usually small and were either recolonizing an area that was once cleared of trees for extraction of salt and subsequently abandoned, or recolonizing a mud flat, where trees had died from extremely high concentrations of salt due to poor water circulation. In these areas, two types of nest sites were described: (1) open, cup-shaped nests, placed near the mud or water in small mangrove trees; and, (2) cup nests placed in a cavity or hollow of a dead mangrove.

Wood boxes and PVC pipes have been installed in these open mud flats in Pitahaya and Parguera (BCF) as artificial nesting structures for the yellow-shouldered blackbird. According to available data, since 1989 only a few natural nests (nests not located in artificial structures) have been found in this type of habitat.

The offshore red mangrove cays of La Parguera Reserve in the BCF were also identified by Post and Wiley (1976) as nesting sites for the species. The small islands are located approximately 250 to 550 meters from shore. Nests were usually built on the main

branches of the red mangrove, 0.2 to 4.0 meters above water (Post and Wiley 1976). Yellow-shouldered blackbirds nesting on offshore islands flew to the mainland to forage. At present, nesting has not been documented on these cays. The presence of houseboats and rats, and human disturbance on the cays, among other impacts, may have contributed to the loss of this nesting habitat.

The dry coastal upland forest in southwestern Puerto Rico (from La Parguera to Pitahaya) has been reported as nesting habitat for the yellow-shouldered blackbird (Post and Wiley 1976, Department 1986, Department 1989, and Department 1990). Nests have been observed in large deciduous trees, primarily úcar (*Bucida buceras*) and algarroba (*Hymenaea courbaril*) found in pastures at the edge of the mangrove forest (BCF). Nests are usually located from 6 to 9 meters from the ground. As in the black mangrove forest, pairs nested close together in the same tree.

Post and Wiley (1976) reported nesting activity at the Interamerican University Campus in suburban San Germán. The nests were found on the fronds of royal palms (*Roystonea borinquena*) which reach 16 to 18 meters in height. Nests were located 12 to 15 meters above the ground in these palms, which had been planted around the buildings. Nesting in San Germán has not been reported since 1976. At present, breeding in urban sites has been reported in Cabo Rojo and La Parguera (Department 1992).

Post and Wiley (1976) reported yellow-shouldered blackbird nests in the axils of coconut (*Cocos nucifera*) and royal palms, particularly at Boquerón, La Parguera, Boca Prieta, and on Mona Island.

Roosevelt Roads Naval Station:

At the RRNS, in the municipality of Ceiba (eastern Puerto Rico), Post and Wiley (1976) reported yellow-shouldered blackbirds nesting in dense stands of black mangrove. Nests were sometimes aggregated and usually located near the fringe of the mangrove forest along small pools or clearings. The area was heavily affected by Hurricane Hugo in 1989. Only one nest has been reported from RRNS since the hurricane (Department 1995).

Mona Island:

On Mona Island, Barnés (1946) reported blackbirds nesting in cacti in scrub habitat. The sheer cliffs and caves surrounding the island have been reported as nesting habitat for the yellow-shouldered blackbird. Post and Wiley (1976) reported that the blackbirds placed their nests on ledges or in crevices. Pérez-Rivera (1982) observed blackbird nesting on water-surrounded rocks on Mona Island.

Artificial Structures:

In the late 1970s in the BCF, wooden nest boxes were installed in open salt flats in known yellow-shouldered blackbird nesting habitat in order to increase fledgling success. The boxes were accepted and successfully utilized by the blackbirds. This allowed the creation of nesting habitat in areas, such as open salt flats, where management activities could be undertaken. Although the number of shiny cowbird eggs in nest boxes was larger than the number in open natural nests, reproductive success of blackbirds was higher in the box nests in 1983 (Cruz and Nakamura 1984). The authors indicated that the advantage of box nesting was that rat (*Rattus rattus*) predation was reduced. Thereafter, the boxes deteriorated and were heavily used by the Caribbean martins (*Progne dominicensis*).

In the mid-1980s, PVC elbows and pipes were utilized to build nest structures which were placed in breeding areas of the BCF (often replacing deteriorated wooden nest boxes). These structures were located in mud flats surrounded by mangrove forest. The PVC pipe nest structures were also accepted and utilized by the blackbirds for nesting. The number of PVC pipe structures was increased from 30 in 1986, to 190 in 1988, and to 286 in 1990. The number of structures remained the same between 1990 and 1994. During this period, the percent of nests located in PVC structures as opposed to those in vegetation also increased from 20 percent in 1986, to 98.7 percent in 1988, and 100 percent in 1990. From 1990 to 1994, one hundred percent of the nests monitored have been located in PVC structures. In 1995, two nests were located on mangroves.

Feeding Habits

Little is known about the feeding ecology of the yellow-shouldered blackbird. Wetmore (1916) reported yellow-shouldered blackbirds probing bucaré (*Erythrina sp.*) blossoms for nectar but, in examining 55 stomachs, he found that 90 percent of the food consisted of animal matter. Danforth (1926) observed blackbirds on Mona Island taking nectar from the guamá (*Inga fagifolia*) as well as feeding on the fruits of several species of cacti (e.g., *Cephalocereus royenii*). Pérez-Rivera (1980) reported birds feeding on the fruits of the cactus *Opuntia sp.* and the threatened higo chumbo (*Harrisia portoricensis*). Post (1981a) recorded observations of probing for nectar in the aloe (*Aloe vera*) and yuca (*Manihot esculenta*). Lewis (1982) reported seeing blackbirds on Mona Island probing blossoms of the shrub *Croton discolor*. Ventosa (pers. comm.) reported 8 yellow-shouldered blackbirds probing for nectar in maguey flowers (*Furcraea tuberosa*).

Post and Wiley (1977a) indicated that yellow-shouldered blackbirds and shiny cowbirds fed in mixed-species flocks around cattle feeding lots, monkey feeders, and in pastures. Post (1981a) identified the bulk of the food from young birds as arthropods with a trace of vegetable matter. The arthropods were gathered from the canopy and branches of the trees, whereas the vegetable matter was obtained at domestic animal feeding sites.

McKenzie and Noble (1990) indicated that yellow-shouldered blackbirds foraged in mixed-species flocks with shiny cowbirds and grackles (*Quiscalus niger*), particularly when caterpillars were the major food item. Head-down display associated with allopreening (interspecific preening invitation display) between cowbirds and blackbirds was described (McKenzie and Noble 1990). They mentioned that these species foraged primarily on the larvae of *Mocis latipes*, *Melipotis ochrodes*, *Spodoptera spp.*, *Molipotis sp.*, *Heliothis sp.*, and *Anticarsia gemmatalis*.

On Mona Island, the blackbird's diet consists of both animal and plant matter. According to Hernández-Prieto and Cruz (1987), the animal food consisted mainly of arthropods; and plant material consisted mainly of fruits, pulps, seeds, and nectar of 16 identified families and 23 genera. These authors reported that, on both Mona and Monito islands, the federally-listed *Harrisia portoricensis* was the most important plant in the yellow-shouldered blackbird's diet. Other plants important in the diet were *Cissus trifoliata*, *Ficus citrifolia*, and *Lantana involucrata*.

Reasons for Listing

Post and Wiley (1976) determined that the decline of the yellow-shouldered blackbird populations was caused by a number of factors, including extensive brood parasitism by the shiny cowbird, nesting and feeding habitat destruction, predation by exotic mammals, and diseases.

Shiny Cowbird Parasitism:

The shiny cowbird, an avian brood parasite, was originally confined to South America, Trinidad, and Tobago, but during the last 100 years, the species has spread throughout the West Indies and to the eastern United States (Cruz *et al.* 1989, Post and Cruz 1993). In Puerto Rico, the shiny cowbird was first reported in 1955 (Grayce 1957). However, Post and Wiley (1977a) believed that it may have arrived before then. This species is distributed throughout Puerto Rico, but it is most common in disturbed lowland habitats, often in association with agriculture and livestock (Cruz *et al.* 1985).

From 1972 to 1975, Post and Wiley (1976) found that 73.7 percent of the yellow-shouldered blackbird nests in Puerto Rico were parasitized. Post and Wiley (1977b) reported the yellow-shouldered blackbird to be the main host of the shiny cowbird. All of the 53 mainland yellow-shouldered blackbird nests examined in 1975 (35 at the BCF and 18 at the RRNS) were parasitized by shiny cowbirds. In contrast, they found that only three of 19 nests on offshore La Parguera (BCF) were parasitized from 1972 to 1975.

From 1975 to 1981, ninety-three percent (152 of 164) of the yellow-shouldered blackbird nests examined in mangrove habitats of the BCF and the RRNS were parasitized by the shiny cowbird (Wiley 1987). In 1982, all of the 44 blackbird nests examined by Cruz *et al.* (1985) in both areas were parasitized. In 1983, a total of 94.8 percent of the blackbird nests studied in BCF were parasitized by cowbirds (Cruz and Nakamura 1984).

As reported by Post and Wiley (1976), the extensive nest parasitism of the yellow-shouldered blackbird by shiny cowbirds was the most crucial factor in the decline of the blackbird in Puerto Rico. Brood parasitism by the shiny cowbird reduced the reproductive output of the yellow-shouldered blackbird (Post and Wiley 1977b). The reduced productivity at parasitized nests resulted mainly from puncturing and breaking of host eggs by female cowbirds.

According to Post and Wiley (1977b), the effects of brood parasitism in RRNS were more severe than in BCF. In BCF, they found that 35 nests produced 27 blackbirds and 24 cowbirds; however, in RRNS, 18 nests produced only three yellow-shouldered blackbirds, but 17 cowbirds. The low level of yellow-shouldered blackbird production at RRNS was directly related to brood parasitism by cowbirds. Post and Wiley (1977b) concluded that the production of blackbirds at BCF and RRNS was below that needed (two blackbird fledglings per breeding pair each year) for population maintenance.

A summary of breeding success of yellow-shouldered blackbirds and degree of parasitism by the shiny cowbird at BCF and the RRNS between 1975 and 1981 is presented in Table 1 (Wiley 1987). The percent of successful nests (a successful nest was described as a nest from which at least one chick fledged) in both areas was very similar, but under 50 percent. In RRNS, a lower percent of hatched eggs and a lower rate of fledging success (number of fledglings per number of eggs) were found during this period. These lower values may be related to the higher number of parasitized nests found in that area.

In contrast to the data from Post and Wiley (1977), which showed that non-parasitized blackbird nests had higher nest success than parasitized nests, Wiley (1987) found no better nest success in non-parasitized nests than at parasitized nests in both study areas (Table 2). Wiley (1987) compared the clutch size (mean number of eggs per nest), hatching success (mean number of eggs hatched per nest), and fledging success (mean number of chicks fledged per nest) at parasitized and non-parasitized nests at both study areas, and he found that in BCF, the clutch size of blackbirds was larger in parasitized nests. In both areas, parasitized nests hatched more chicks. The yellow-shouldered blackbird in BCF had higher fledging success in parasitized nests than in non-parasitized nests.

A summary of breeding success of yellow-shouldered blackbirds and degree of parasitism by the shiny cowbird at BCF in 1983 is presented in Table 3. Unlike the previous study, where the study areas were mangrove forests only, Cruz and Nakamura (1984) included data on nests in wood boxes (52 nests in mangroves, six in trees or cacti, one in a natural cavity, and 11 in wood boxes). Negative effects of parasitism on the fledging success of the yellow-shouldered blackbird were found in the breeding season of 1983. Cruz and Nakamura (1984) found a lower percent of fledging success than was found by Wiley (1987) in the parasitized nests in the same region. This low fledging success was

Table 1. Breeding success of yellow-shouldered Blackbirds in RRNS and BCF from 1975 to 1981 (Wiley 1987).

Yellow-shouldered blackbirds	RR NS	BCF
Total # active nests (TAN)	98	66
Total # successful nests (TSN)	37	26
% successful nests (SN)	38	39
Total # eggs (TE)	248	163
Total # eggs hatched	48	60
% hatching success (HS)	19	37
Total # fledglings (TF)	12	30
% fledging success (FS)	5	18
Fledglings/succ. nest	0.3	1.2
Nests parasitized	93	59
% parasitized nests	95	89
Fledglings/successful nest	1.5	1.6

TAN = at least one egg was laid
 TSN = at least one chick fledged
 $SN = (TSN/TAN) \times 100$
 $FS = (TF/TE) \times 100$

Table 2. Comparison of clutch size, nest success, hatching success and fledging success in parasitized and non-parasitized nests in RRNS and BCF (Wiley 1987).

	Parasitized Nests		Non-parasitized Nests	
	RRNS	BCF	RRNS	BCF
Clutch size	2.63	2.62	3.0	2.5
Nest success	0.5	0.4	0.2	0.1
Hatching success	.49	.98	.40	.29
Fledging Success	.11	.47	.40	.29

Table 3. Breeding success of yellow-shouldered blackbirds in the BCF in 1983 (Cruz and Nakamura 1984).

Yellow-shouldered blackbird	BCF
Active nests	58
Nest success (NS)	0.41 (24/58)
Fledglings/active nest	0.74 (43/58)
Fledglings/successful nest	1.79 (43/24)
Fledglings/eggs	0.29 (43/150)
Eggs hatched/eggs laid	0.32 (48/150)
Eggs/active nest (EAN)	2.69 (148/55)
Cowbird eggs/active nest (CEAN)	2.78 (153/55)
% Parasitized nests	95 (55/58)

NS = fledged at least one blackbird young

EAN = 55 active nests containing at least one blackbird egg

CEAN = 55 active nests containing at least one cowbird egg

primarily related to the high prevalence of shiny cowbird parasitism. Cruz and Nakamura (1984) stated that host egg puncturing and breakage of host eggs by shiny cowbirds were the main factors in the decline in numbers of blackbird eggs hatched.

Although 61 percent of the resident passerine species in mangrove areas in Puerto Rico have been found to be parasitized by the cowbirds, the yellow-shouldered blackbird is considered to be its primary host (Cruz *et al.* 1985). Some factors have been identified to explain the cowbird's preference for the yellow-shouldered blackbird. The shiny cowbird apparently is not recognized by the yellow-shouldered blackbird as a potential threat, and therefore, the blackbird does not attack it with the same intensity that it attacks other species that it may recognize as competitors or nest predators (Cruz *et al.* 1985). Post and Wiley (1977b) mentioned that the concentration of cowbirds on the southwestern coast in the summer coincides with the breeding season of the yellow-shouldered blackbird. A combination of factors has been identified by Post and Wiley (1977b) to explain the parasitism of blackbirds by cowbirds. These include the behavior of the cowbird as an expanding population, the close taxonomic relationship of host and parasite, similarity of size and color of eggs, lack of cryptic nests, colonial nesting patterns of the yellow-shouldered blackbird, low nest attendance, and other ecological similarities.

Although cowbirds have been reported from Mona Island, cowbird parasitism of blackbirds on Mona Island has not been observed (Hernández-Prieto and Cruz 1987 and Hernández-Prieto and Cruz 1989).

Habitat destruction:

The feeding and nesting habitat of the yellow-shouldered blackbird has been extensively reduced since 1900. The utilization of extensive acreage of coastal forest for the monoculture of sugar cane, and its subsequent development for housing due the decline of the sugar cane industry, reduced the feeding habitat available to the species. In addition, the extensive utilization of the lowlands for industrial, residential, and tourist development has reduced significantly the yellow-shouldered blackbird's nesting and feeding habitat. Cruz *et al.* (1989) mentioned that forest fragmentation creates small patches of forest surrounded by open habitat, thus increasing the forest edge habitat available for cowbirds. Cowbirds tend to utilize edge habitat for feeding and nest searching. Habitat fragmentation, by increasing the ratio of patch perimeter to area, greatly exacerbates the problem of cowbird parasitism (Wiley 1982 and Cruz *et al.* 1989).

Nest Predation:

The introduced rat (*Rattus rattus*) and the mongoose (*Herpestes auro punctatus*) are widespread in lowland Puerto Rico. Rats are an important predator of yellow-shouldered blackbirds. Post and Wiley (1977a) documented loss of yellow-shouldered blackbird nests due to rat predation. Cruz and Nakamura (1984) reported that nest predation accounted for 48 percent of the nests that failed in 1983. They found that rat predation of yellow-shouldered blackbird nests increased sharply during July and August, the months when the

water level receded and exposed peripheral mangroves to dry land. The Department (1985) documented the presence of rats, mongooses, and feral cats in the BCF and found some of these animals in cowbird traps and nest boxes. They stated that rats were the most important predator responsible for the loss of eggs and hatchlings. Since 1989, no natural nests have been found in the mangroves at the BCF, where predation by rats was the major cause of the loss of eggs and chicks. In PVC structures, the predation of rats is controlled by rat excluding devices (metal guards on supporting poles).

Parasitism and Diseases:

Post (1981a, 1981b) documented mite infestation in open, cavity, and artificial (boxed) yellow-shouldered blackbird nests. Blood sucking mites of two species (*Ornithonyssus bursa* and *Androlaelaps casalis*) were found. He mentioned that infestation by mites may lead to premature desertion of the nest by young birds. The author also found four cases of adult blackbirds deserting young that were in cavities infested with mites. At present, the mite infestation is controlled by applying the insecticide Sevin to the PVC pipes.

Studies of the factors leading to the decrease of island species have implicated fowl pox as a potential problem (Amadon 1950). Post (1981b) reported that 19 percent of the blackbirds examined from 1974 to 1975 were infected with avian pox and that infected birds had a significantly lower survival rate than uninfected birds. A record for the nematode *Acuaria* sp. was reported by Whittaker *et al.* (1970). At Mona island, avian pox was observed on two yellow-shouldered blackbirds in March 1994 (F. López, pers. comm.).

Present Management of Yellow-shouldered Blackbird Reproduction

The Department, through a Cooperative Agreement with the Service, has been conducting a program for the control of shiny cowbirds and the monitoring of yellow-shouldered blackbird reproduction in southwestern Puerto Rico, specifically in the BCF, for the last 13 years (from 1982 to 1995). The yellow-shouldered blackbird program has been conducted under the Section 6 Endangered Species Program since its establishment in 1984. In 1984, the Department established an office in the Cabo Rojo National Wildlife Refuge to monitor yellow-shouldered blackbird reproduction and conduct a cowbird control program.

Objectives of the Program:

The principal objectives of the program are the following: (1) to monitor reproductive success of the yellow-shouldered blackbird and associated shiny cowbird populations in artificial structures; (2) to trap and remove shiny cowbirds; (3) to install and monitor artificial nest structures for the yellow-shouldered blackbird to increase its population; (4) to control rats and mites that affect the reproductive success of the yellow-shouldered blackbird; and, (5) to monitor yellow-shouldered blackbird populations.

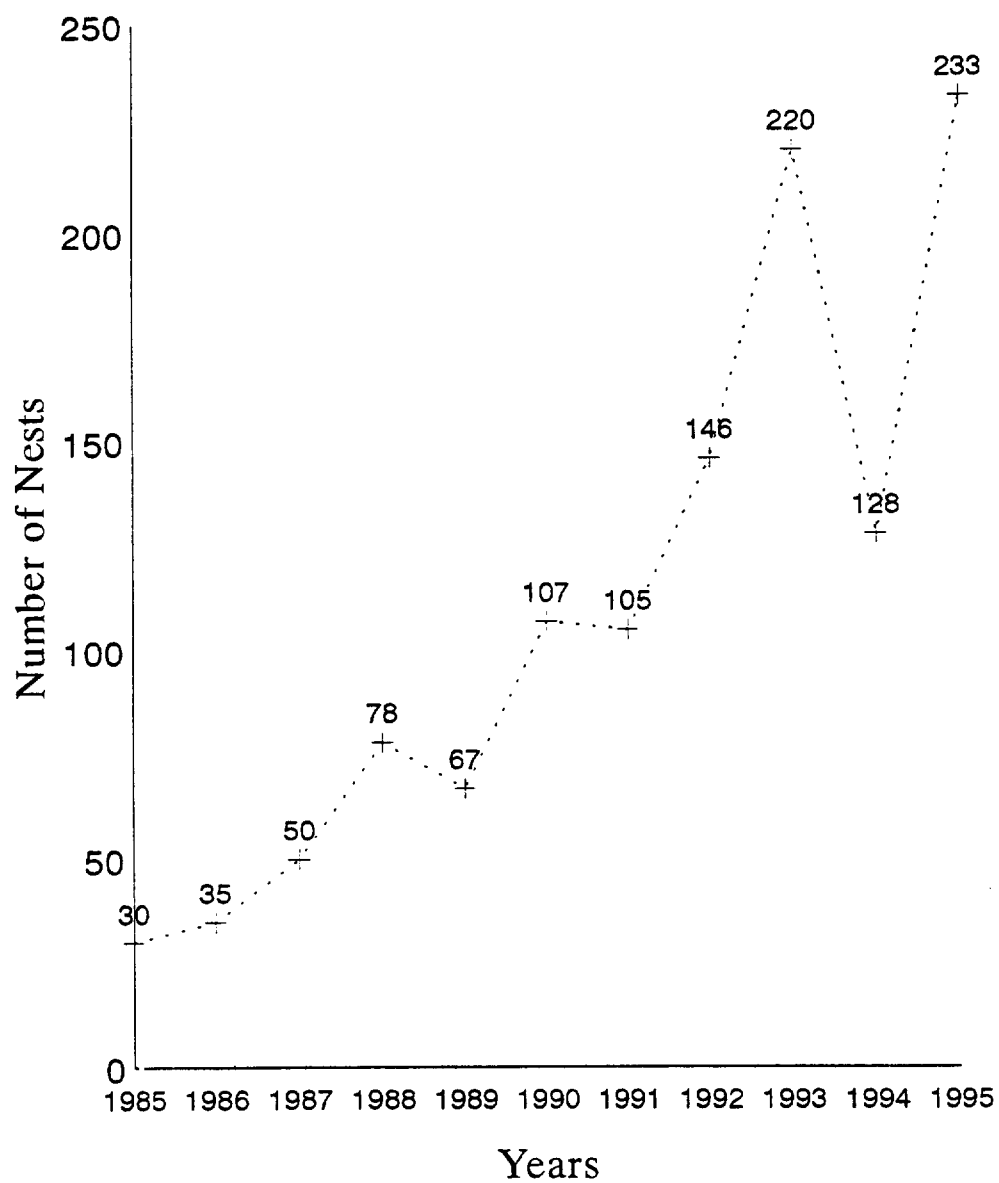
Areas of reproduction are located primarily in mud flats surrounded by black mangrove forests at the BCF (from La Parguera to Pitahaya). In 1990, a design of 286 artificial nest structures (PVC straight and elbow pipes) in nine reproduction areas in southwestern Puerto Rico was implemented. The distribution of artificial structures was altered in 1995. The Department removed all the PVC pipes used two or more times by the Caribbean martins in the previous 5 years and replaced them with PVC elbows. The elbows had not been heavily used by martins throughout the history of the project. In addition, some groups of artificial nesting structures, located in open areas, that were taken over by Caribbean martins, were relocated inside mangrove forest. The purpose of the new design was to minimize the interference of Caribbean martins with yellow-shouldered blackbirds. No Caribbean martins had been reported in mangrove forests by Department personnel (Department 1995). A total of 58 PVC elbows was installed and nine groups of structures were relocated. Another 14 structures (seven PVC elbows and seven PVC straight pipes) were placed randomly inside a new mangrove area (fastened to mangrove trees) without rat exclusion devices. The main objective of this new design was to promote nesting in natural habitat, as well as to measure the incidence of predation of yellow-shouldered blackbird nests in mangroves.

Since 1988, reproduction has been heavily manipulated, including removal of shiny cowbird eggs and chicks from artificial structures, placement of rat guards, and dusting of mite infested nests with insecticide. To evaluate the breeding success of the yellow-shouldered blackbird in the artificial nest structures, these are visited at least once a week. The Department has gathered data on the number of nests parasitized by the shiny cowbird, number of shiny cowbird eggs per nest, number of yellow-shouldered blackbird eggs per nest, number of shiny cowbird fledglings, and number of yellow-shouldered fledglings. Predation and harassment by rats, Caribbean martins, and other species, and infestation with mites were monitored and evaluated.

Number of Nests (1985 - 1995):

The number of yellow-shouldered blackbird nests located in the BCF increased between 1985 to 1995 (Figure 3). Figure 3 includes both natural and artificial nest structures. Since 1990, the number of nests located increased dramatically when compared with previous years. One possible reason for this increase is the large number of PVC

Figure 3. Number of nests, Boqueron Commonwealth Forest, 1985 - 1995.



structures placed since 1988 in the nesting areas (Table 4). The number of artificial structures doubled from 1986 to 1990, resulting in an increase in number of structures used for nesting. The percent of use increased from 7.4 percent in 1986, to 24.1 in 1990. Although the number of artificial structures has remained almost the same from 1990 to 1995, the percent of use increased to 68.4 percent in 1995, the highest percent use in the 11 years of the project.

The types of structures used by yellow-shouldered blackbirds for nest construction have changed during this time (Figure 4). Artificial structures were not heavily used by the yellow-shouldered blackbird through the early 1980s. More than 75 percent of the nests studied in 1985 were found in vegetation, with natural stumps being the most important nesting sites for the species. Nest boxes were not heavily used by the yellow-shouldered blackbird due to the deterioration of the boxes and the disturbance by the Caribbean martin in these structures. In 1986, the mangrove forest of the BCF was the most important nesting habitat for the blackbirds. This trend changed in 1987, when almost 50 percent of the nests were located in PVC structures and wood boxes were not used by the species. Although some nests were found in vegetation in 1989 and 1990, more than 75 percent of the nests located were in PVC structures. This change in use of sites for nest construction may have been a response to the increased number of PVC structures placed in 1988 and the establishment of a new design for the location and distribution of artificial PVC nest structures in the nesting areas. In 1988, one nest was located in a post, and the remaining 77 nests were located in PVC. After 1991, almost all the nests were located in PVC structures. In 1995, two nests were found in the mangroves.

The number of active nests found in the project area increased from eight active nests in 1985, to 229 active nests in 1995 (Table 5). An active nest is defined by the Department as a nest where at least one blackbird egg was laid. The percentage of active nests has been maintained at over 60 percent for the 11 years of the study. In 1995, ninety-eight percent of the nests located were used by yellow-shouldered blackbirds for nesting. Lower percentages of active nests were reported in 1985 and 1991. The lower percentage of active nests meant that yellow-shouldered blackbirds invested energy in the construction of a nest that was abandoned before laying eggs. Disturbance of reproduction areas by people or by other bird species, or predation of eggs before the nest was monitored, may have been the principal factors affecting these percentages. Heavy and aggressive use of nest boxes by Caribbean martins was reported during 1985. Therefore, only two nest boxes were used by yellow-shouldered blackbirds. This interference with Caribbean martins in the boxes may have caused the yellow-shouldered blackbirds to use the natural vegetation for nesting. Five of the eight active nests produced at least one fledging, resulting in a relatively high percentage (62 percent) of successful nests.

In 1991, thirty-seven of 105 nests were reported as "nests in construction abandoned." The Department (1991) related this event to interference by Caribbean martins. They also reported that 44 percent (30 out of 68) of the active nests were taken over by Caribbean

Table 4. Comparison between the number of artificial structures available for the yellow-shouldered blackbird and the number of structures used for nest construction, 1985 - 1995.

Year	Structures Available	Structures Used	Percent of Use
1985	-	2	-
1986	136	10	7.4
1987	130	27	20.8
1988	240	77	32.1
1989	245	56	22.9
1990	286	69	24.1
1991	286	105	36.7
1992	286	146	51.0
1993	286	171	59.8
1994	286	128	44.8
1995	272	186	68.4

- = data was not available

Figure 4. Nesting structures used, Boqueron Commonwealth Forest, 1985 - 1995.

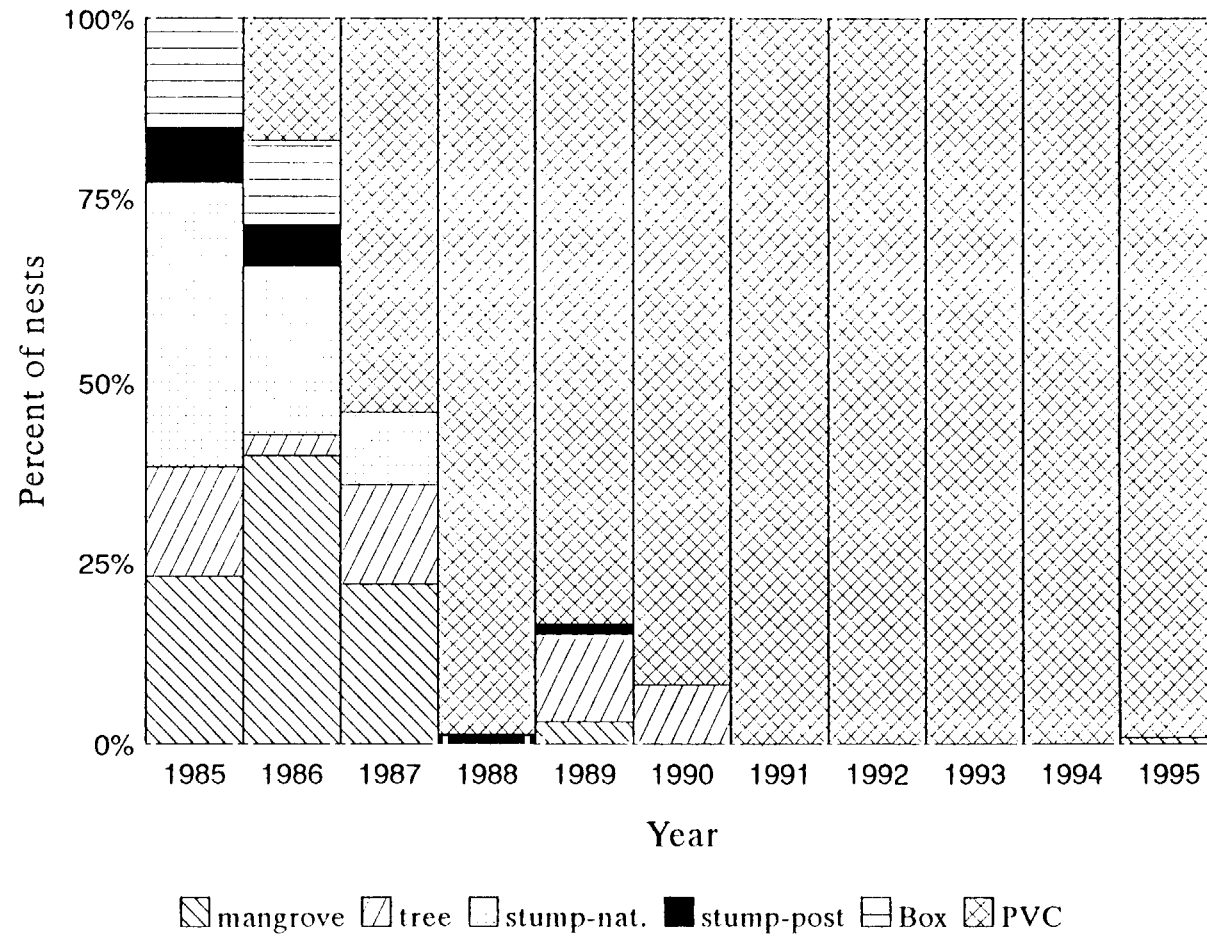


Table 5. Number of active and successful nests of yellow-shouldered blackbirds, 1985 to 1995.

Year	Nests Located	Active Nests	% Active Nests	Successful Nests	% Successful Nests
1985	13	8	61	5	62
1986	35	32	91	20	62
1987	50	41	82	26	63
1988	78	61	78	21	34
1989	57	42	74	20	47
1990	101	79	78	69	87
1991	105	68	65	51	76
1992	146	125	86	105	84
1993	220	187	85	130	70
1994	128	97	76	68	70
1995	233	229	98	158	69

martins. However, in the same year, 76 percent of the active nests produced at least one fledging. This percentage is higher than previous years, except for 1990 (Table 5). This higher percentage of successful nests may be related to the timing of the interference because most of the active nests were taken by Caribbean martins after yellow-shouldered blackbirds fledged their chicks.

The lowest percentages of successful nests were reported in 1988 and 1989, with 34 and 47 percent, respectively. Figure 5 shows that in these 2 years, the highest percentages of eggs and chicks lost were reported. More than 60 percent of the total number of eggs and close to 20 percent of the chicks were lost. This figure indicates that the loss of eggs may be the principal factor affecting the reproductive output (production of fledglings).

Figure 5 also shows that after 1987, in general, higher percentages of eggs and chicks lost were reported. What happened in the project after 1987, that resulted in these higher percentages? After 1987, the amount of artificial structures installed almost doubled and continued increasing in the following 2 years (Table 4). The percentage of use of these artificial structures also increased dramatically in 1987 and thereafter. In addition, the type of structures used by the species changed dramatically after 1987. Before 1987, inclusive, the yellow-shouldered blackbird used vegetation for nesting. After 1987, the species nested mostly in PVC structures. Although the reproduction in artificial structures is intensively managed for the removal of shiny cowbird eggs and chicks, rat exclusion, and prevention of mite infestation, PVC structures seems to be very attractive to Caribbean martins.

Clutch Size and Fledging Success:

During the 11 years of study, the clutch size (number eggs per nest) of the yellow-shouldered blackbird was near three eggs, the same as the clutch size reported for the species by Post (1981a) (Table 6). The small clutch size reported in 1987 may be related to predation by rats, mongoose, and shiny cowbirds. According to Department (1987), six nests were lost due to rats and mongoose and three were lost due to egg puncturing, possibly by shiny cowbirds. During the study years, at least two yellow-shouldered blackbird chicks fledged from successful nests each year, except for 1994.

A fledging success greater than 50 percent was estimated for the majority of the years. Fledging success rate is the number of chicks that fledged from the total number of eggs laid. Fledging success under 50 percent was reported during breeding seasons of 1986, 1988, 1989, and 1994. As we discussed before, the high percentage of eggs and chicks lost during these years contributed to the low fledging success.

Figure 5. Eggs and chicks lost, Boqueron Commonwealth Forest, 1985 - 1995.

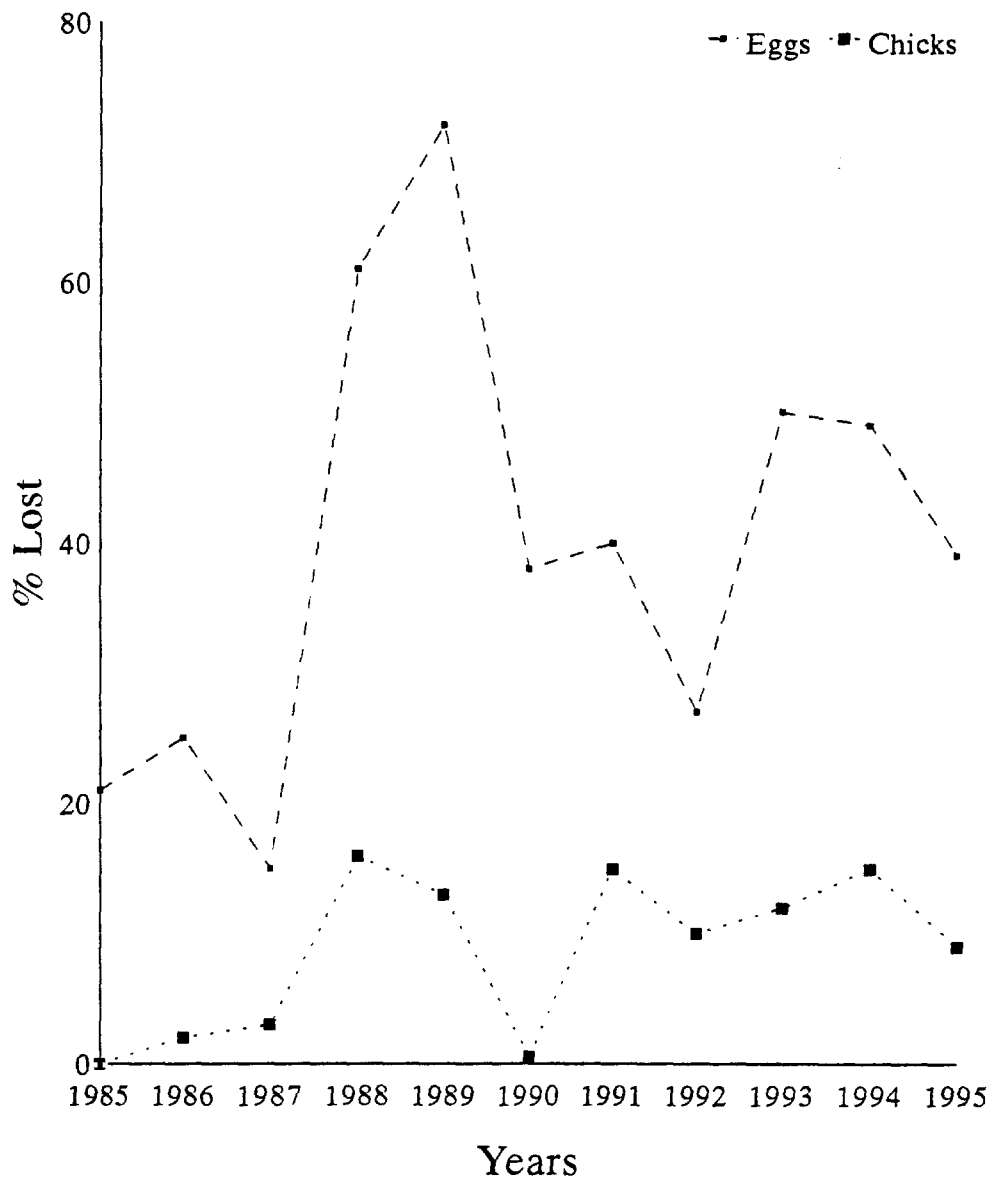


Table 6. Clutch size and fledging success of the yellow-shouldered blackbird in the BCF from 1985 to 1995.

Year	Total # eggs (TE)	Eggs/ nest	Total # successful nests (TSN)	Total # fledglings (TF)	Fledglings/ successful nest	% fledging success (FS)
1985	24	3.0	5	15	3.0	62
1986	96	3.0	20	43	2.1	45
1987	98	2.4	26	78	3.0	64
1988	169	2.8	21	51	2.4	30
1989	120	2.9	20	46	2.3	38
1990	257	3.2	69	180	2.6	70
1991	205	3.0	51	116	2.2	57
1992	382	3.1	105	252	2.4	66
1993	584	3.1	130	335	2.6	57
1994	281	2.9	68	117	1.7	42
1995	663	2.9	158	355	2.5	53

TSN = at least one chick fledged

FS = (TF/TE) x 100

Collazo *et al.* (1995) analyzed data from 1989, 1992, 1993, and 1994, and estimated reproductive success using the Mayfield method. They excluded 145 of 464 nests from the data sets because nests records were incomplete, and in many instances, data was not collected in a systematic fashion. Using this method and a reduced sample size, they estimated that the mean probability of a nest surviving the entire nesting period and producing at least one young was 0.76 ± 0.03 (Appendix 1). They also found that nestlings had a significantly greater daily survival probability than did eggs (0.917 ± 0.018 and 0.834 ± 0.022 , respectively, $Z=3.57$, $P=0.0002$).

Model outputs under several scenarios were generated by Collazo *et al.* (1995) (Appendix 2). They used productivity per successful nest of 2.3 (without cowbird parasitism) (Department 1995) and 1.8 (with cowbird parasitism) (Post and Wiley 1977b). Under the first scenario, they examined productivity rates under the highest of reported values for selected parameters (survival estimates of 0.82 for adults and 0.18 for fledgings [Post 1981], parasitism rates of 5 percent [Department 1995], and a renesting attempt rate of 60 percent). Under this scenario, the population of the BCF increased in size. The model showed that the population could tolerate parasitism rates of up to 45 percent and still be able to reach the sink-source cutoff point even if pairs attempted to raise only one brood per season. When they dropped egg daily survival rates to 0.96 percent, a population that attempted to breed only once a season would not produce enough to maintain itself at parasitism rates of 30 percent. They stated that to overcome that deficit, a portion of the population had to raise a second brood.

Under the subsequent scenarios they incorporated different levels of parasitism and proportion of nesting population to model when the cutoff point was not reached by a population capable of raising a second brood. These scenarios are included in Appendix 2.

Present Threats to the Species

Although parasitism of yellow-shouldered blackbird nests continues, loss of habitat and the invasion of nesting areas by Caribbean martins are the two most important threats to the species.

Loss of Habitat:

At the present time, the center of the yellow-shouldered blackbird mainland population is in the southwest, roosting and reproducing principally in the BCF. Within the BCF, the two principal areas that this population utilizes are Pitahaya and La Parguera. At this moment, Pitahaya is the center of the reproduction of the species, and La Parguera is the most important roosting area for this population. Historically, at least 11 cays of La Parguera Natural Reserve were utilized (until the 1970s) for nesting and roosting, with as many as 1,663 individuals roosting together in La Parguera (Post 1981a).

From 1989 to 1995, more than 50 percent of the yellow-shouldered blackbirds counted during pre-season and post-season censuses have been recorded in La Parguera (Ventosa pers. comm.). Until January 1995, when a new roosting area was found in Bahía Sucia, more than 70 percent of the individuals were observed in the roosting areas of La Parguera and Pitahaya. There is only one roosting area in Parguera that is consistently used by the species; however, it shifts among at least four mangrove cays and the number of birds roosting varies throughout the year.

Mainland mangroves in La Parguera, as well as those of off-shore cays, have been eliminated and adversely affected by legal and illegal construction of stilt homes, docks, and the mooring of floating houses. The potential impacts to the yellow-shouldered blackbird in La Parguera have been an issue since prior to 1978, as a result of the disorderly construction of piers and stilt houses in the coastal mangrove area. In 1979, the Department and the Corps of Engineers signed a Memorandum of Understanding (MOU) specifying guidelines that were to ensure the preservation and best use of the environment of La Parguera area. The MOU provided the opportunity to improve habitat conditions in the following manner: (1) no permits were to be granted for cay houses or docks; (2) abandoned structures on the mainland were to be removed; (3) houses or docks abandoned or damaged were to be removed; and, (4) phase out of private ownership of shoreline structures was to occur.

After-the-fact permits on private structures along the shoreline were granted but the off-shore cays were excluded; at that time no permits were granted for existing cay structures. Structures on the cays were to be removed by the Department by June 13, 1980. All abandoned or unsafe structures along the shoreline would become property of the Department within 12 years, and thereafter, restructured according to a Master Plan to be developed. The MOU was later amended and after-the-fact permits were granted for private structures on the off-shore cays for the remainder of the 12-year period. At that time, there were 14 structures on the cays. No new structures or additions were to be permitted, and cay structures were to be removed after the 12-year period.

In 1989, the Corps of Engineers issued a Public Notice for after-the-fact permits involving 69 unauthorized structures and floating houses, 36 of which were located on off-shore cays. Thirty-three unauthorized structures were located along the shoreline, in addition to the 144 structures that were issued temporary permits in 1979. The Service issued a Biological Opinion that stated that the issuance of the after-the-fact permits would adversely modify designated critical habitat of the yellow-shouldered blackbird and would be likely to jeopardize the continued existence of the species.

The MOU was never successfully implemented. Inventories of structures that were conducted showed that structures continued to expand. Although cease and desist orders were issued, restoration has not been completed for most of the violations; only a few structures have been removed, and additional violations continue to occur. In 1994, the Service issued a Biological Opinion stating that the reconstruction of an unusable,

abandoned stilt house on Cayo La Gloria was likely to jeopardize the continued existence of the yellow-shouldered blackbird and would adversely modify designated critical habitat of the species. The utility lines for water and electrical power still run underwater from the shoreline and the remaining stilt homes on Cayo La Gloria are using these utilities.

The mooring of floating houses, construction of docks and stilt houses, development of utility lines, and accumulation of waste on cays may have direct and indirect impacts on yellow-shouldered blackbird nesting success. These impacts include: (1) clearing of mangroves that results in a decrease of essential nesting habitat and in an increase of habitat edge, attractive to shiny cowbirds; (2) an increase in rats; (3) an increase in feral cats and other predators, such as the mongoose, being transported to cays; and, (4) the accumulation of above-ground waste that supports rat populations and allows foraging cowbirds greater access to nesting blackbirds. The construction of roads, boat ramps, catwalks, and stilt houses on the shoreline also results in many indirect impacts on yellow-shouldered blackbirds, foremost being the proliferation of future unauthorized human use and construction activity on the cays.

The disturbances caused by the extensive and intensive use of the 144 authorized structures, 30 to 40 unauthorized floating houses, additional unauthorized structures in the cays and the shoreline, boats, sailboats, and personal water craft and their impacts (direct, indirect, and cumulative) on the roosting areas in La Parguera have not been evaluated. Observations conducted by Department personnel (Ventosa, pers. comm.) suggest that yellow-shouldered blackbirds do not use cays with any kind of structures for roosting. Furthermore, they have observed that yellow-shouldered blackbirds periodically shifted mangrove cays for roosting, perhaps moving away from cays invaded by people.

If the population in Pitahaya continues growing, additional roosting and nesting areas will be needed in La Parguera. Restoration and preservation of these areas are vital for the recovery of the species. The Service believes that the present use of La Parguera waters, cays, and shoreline is incompatible with the needs of the species for roosting and nesting in the area.

The destruction of the blackbird's foraging and nesting habitat on the mainland for residential and tourist development, as well as for agricultural activities, continues in southwestern Puerto Rico. On September 17, 1992, an interagency meeting was conducted with the Department to discuss management problems and current threats to the species. The destruction of the species feeding, roosting, and breeding habitats was identified as the major threat to the species. More than 18 development projects were identified in three municipalities within the designated critical habitat for the species. Most of the projects were proposed as residential and tourist developments. All of them were proposed on privately-owned lands and could adversely affect the survival and recovery of the species. For some of the projects, earth movement has been initiated. Although these projects are located within the designated critical habitat area for the species, Federal funds, permits, or subsidies are not involved. Therefore, consultation under Section 7 of the Endangered Species Act is not required.

Nest Invasion by Caribbean Martins:

Although the shiny cowbird invaded a large number of yellow-shouldered blackbird nests between 1985 and 1988, that is not the case at the present time (Figure 6). After 1988, more yellow-shouldered blackbird nests have been invaded by Caribbean martins than by shiny cowbirds. In the early 1980s, Caribbean martins utilized the wood boxes that remained in the reproduction areas, although these boxes were very deteriorated. Upon installation of PVC structures in 1986, the yellow-shouldered blackbird moved completely to this type of structure. Since 1989, invasion of PVC structures by Caribbean martins has increased considerably. In 1993, all the yellow-shouldered blackbird nest invasions were by Caribbean martins. Although the wood boxes used by Caribbean martins for reproduction were relocated in 1990 at a distance from the PVC structures, the martins continue to use the blackbirds' nests. Caribbean martins were observed entering blackbird nests, displacing blackbirds, and stepping on the eggs until they were broken or buried in the nests (Department 1989).

Parasitism by Shiny Cowbirds:

In the 1970s and 80s, parasitism by shiny cowbirds was considered to be the principal factor contributing to the reduction of reproductive success of the yellow-shouldered blackbird and the most important threat to the survival of the species. At the present time, the prevalence (percentage of parasitized nests) of parasitism by shiny cowbirds has been reduced dramatically in the artificial structures (Figure 7). The Department completely controls parasitism in the PVC structures, removing all shiny cowbird eggs at the end of the incubation period and prior to hatching. The use of artificial nest structures, specifically PVC, has apparently caused a reduction in parasitism by shiny cowbirds. In 1995, only 5 percent of the nests were parasitized by shiny cowbirds.

Mortality Factors

If the data from the 11 years of study are combined, the disappearance of eggs and chicks, abandonment of nests with eggs and chicks, and nests taken by Caribbean martins are the three principal factors responsible for mortality in the artificial structures (Figure 8). If these mortality factors are separated by year, the following changes can be observed.

Figure 6. Parasitism by shiny cowbirds, Boqueron Commonwealth Forest, 1972 - 1995.

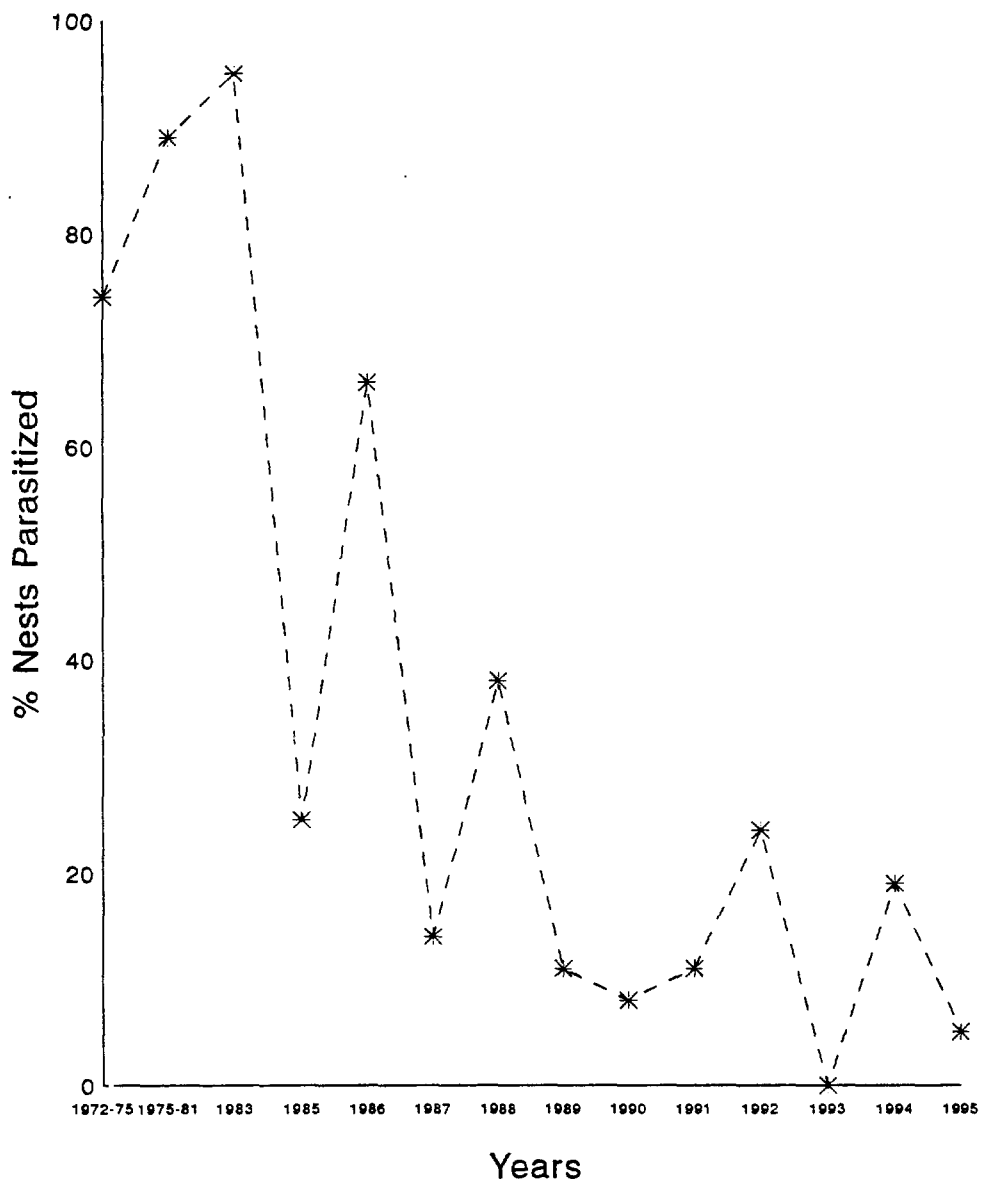


Figure 7. Nests invaded by shiny cowbirds and Caribbean Martins, Boqueron Commonwealth Forest, 1985-1995.

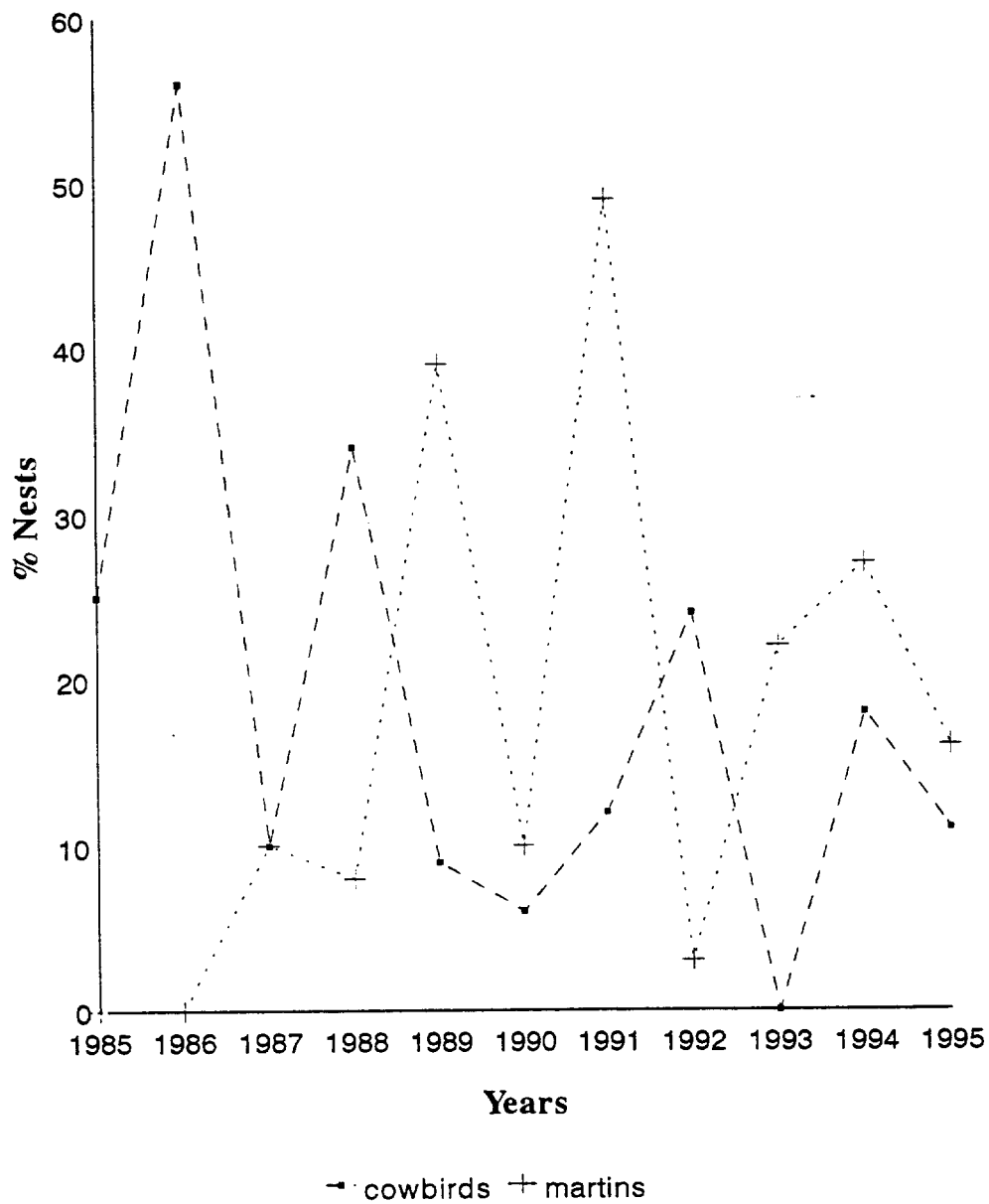
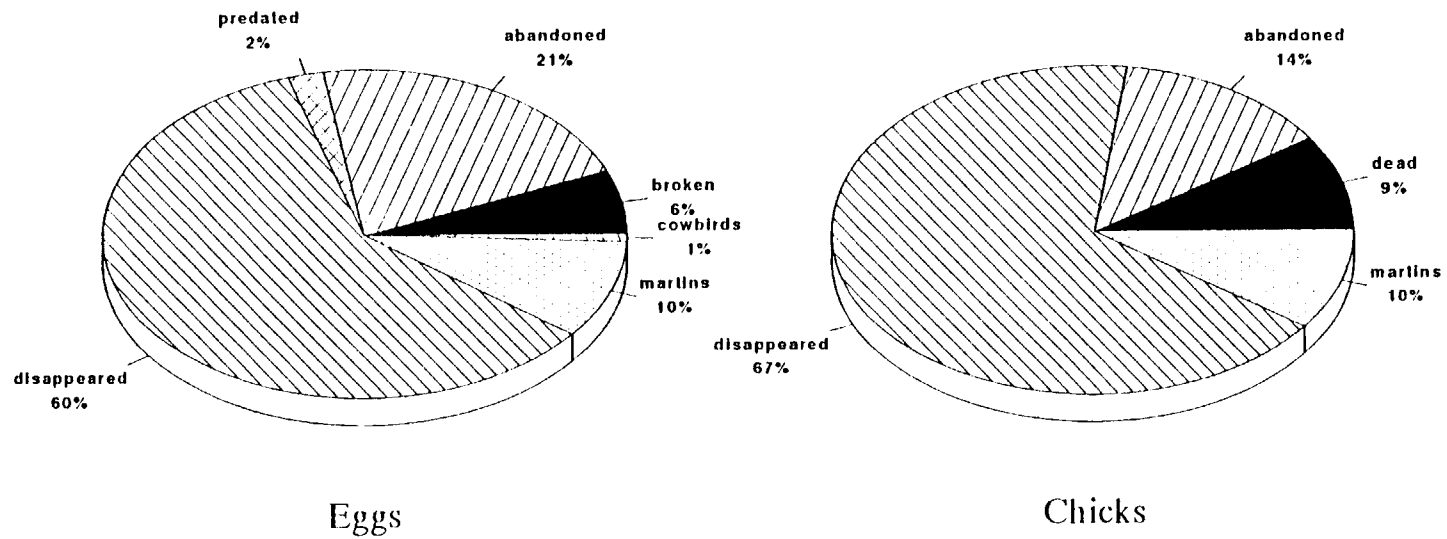


Figure 8. Mortality factors, Boqueron Commonwealth Forest, Combined Data.



Eggs:

During the first years of the project, when nesting occurred mostly in natural areas (mangroves and stumps), predation by rats was the principal cause of egg loss (Figure 9). When PVC structures became the principal type of nest structure utilized by the species, interference by Caribbean martins began and the number of punctured (broken) eggs increased, along with the disappearance and abandonment of eggs. Based on the project's final reports, broken eggs were mostly related to parasitism by shiny cowbirds; however, abandonment of eggs was mostly related to interference and disturbance by Caribbean martins. In 1993, forty-three eggs were abandoned in yellow-shouldered blackbird nests that were subsequently occupied by Caribbean martins. Disappearance of eggs was the principal factor that contributed to the loss of eggs since 1988. The disappearance of eggs may be related to invasion of the nest by Caribbean martins, unhatched eggs removed by the blackbirds from the nests, and broken eggs hidden in the bottom of the nest.

Chicks:

Factors contributing to chick mortality varied with time (Figure 10). Death of chicks in the nests was primarily attributed to mite infestation. Treatment of nests with Sevin has eliminated this cause of death. Interference by Caribbean martins and abandonment of the nests and chicks by the parents have also contributed to the loss of chicks. Between 1991 and 1995, the majority of the losses were attributed to the disappearance of chicks. Because artificial structures are visited only one or two times per week, the possibility that some of these chicks may have fledged from the nest should not be discounted. Some of these chicks may have died in the nests and been removed by their parents. Because of the presence of excluding devices on the PVC structures, predation by rats is not a factor; however, predation by other birds may explain some of these disappearances. Intensive monitoring of these structures should be considered by project personnel to determine the reasons for these disappearances.

Conservation Efforts

Southwestern Puerto Rico:

Between 1973 and 1979, ninety-six nest boxes were placed in the BCF by the Service. In 1980, the Youth Conservation Corp of the Cabo Rojo National Wildlife Refuge built 80 new nest boxes and 12 cowbird traps to be placed and operated in the BCF. A cowbird trapping experiment was initiated in the BCF in 1980 (Wiley 1980). The

Figure 9. Percent of eggs lost, Boqueron Commonwealth Forest, 1985 - 1995.

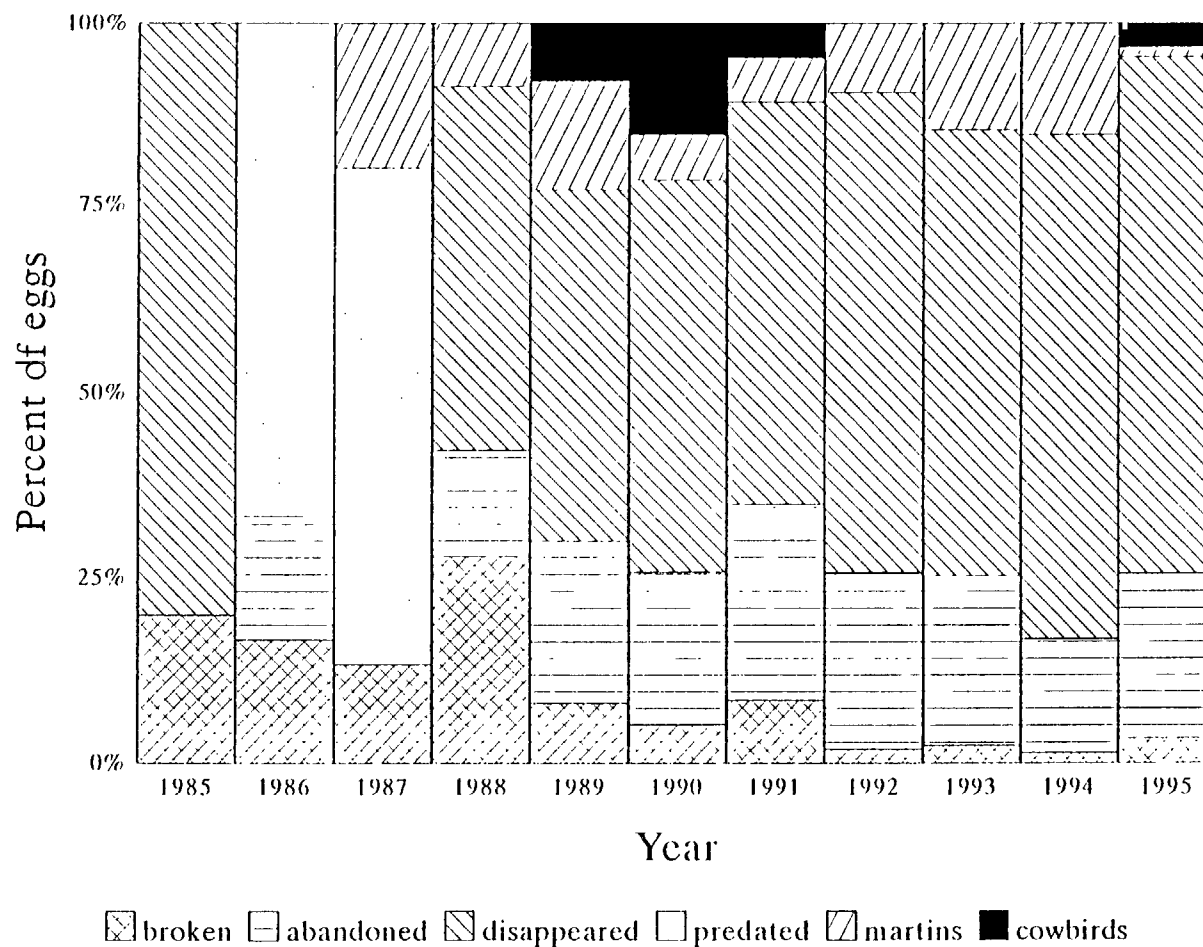
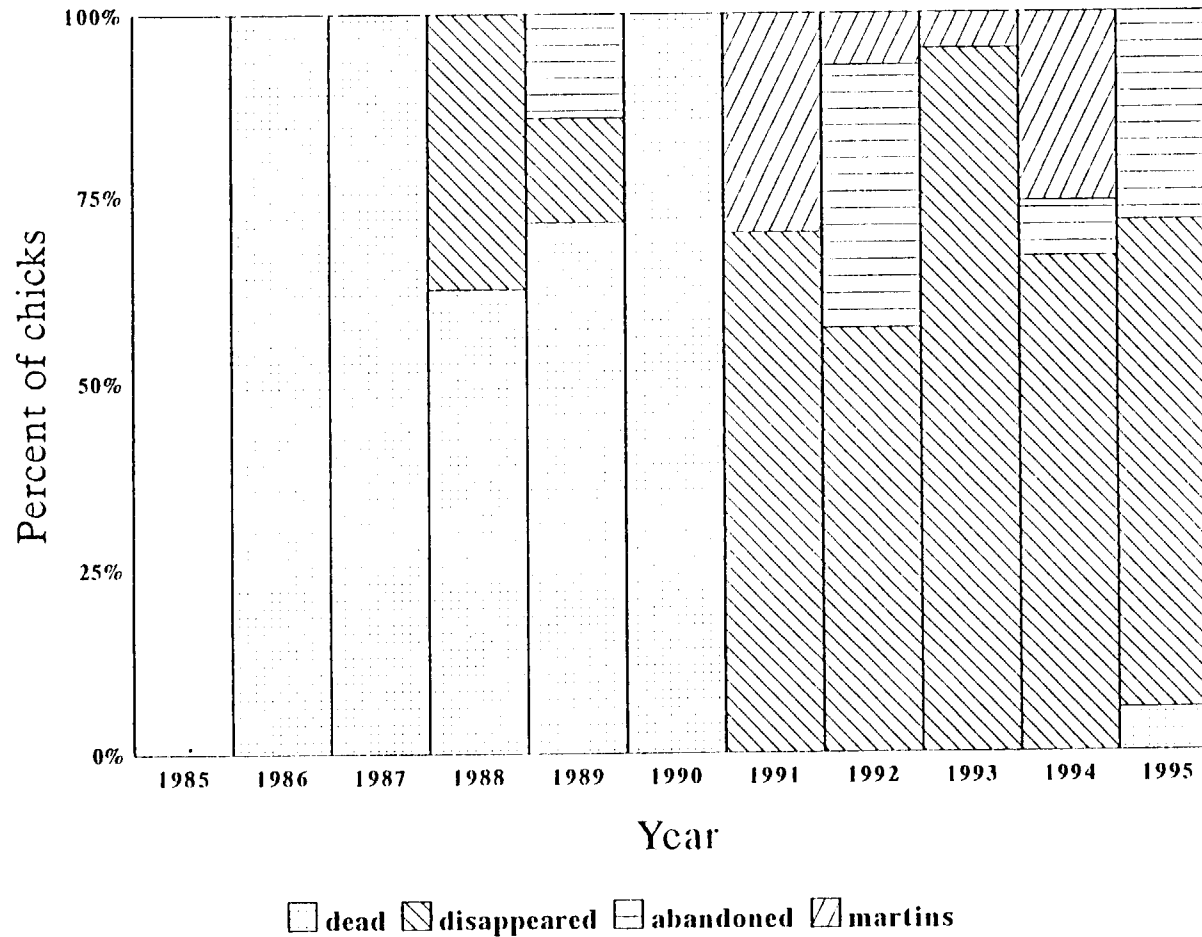


Figure 10. Percent of chicks lost, Boqueron Commonwealth Forest, 1985 - 1995.



The experiment resulted in higher blackbird nest success and productivity. The removal of all female cowbirds and the removal of all the cowbirds in the trap were most effective in improving blackbird reproductive success.

In 1982, the Service built 70 more nest boxes and supported a cowbird trapping program adjacent to known nesting areas in the BCF. In 1983, the yellow-shouldered blackbird program was transferred to the Department, and it has been conducted under their Section 6 Endangered Species program. To reduce parasitism, the Department has been capturing shiny cowbirds in 10 to 11 wire traps located in feeding and nesting areas since 1983. In the 11 years of the program, over 19,000 shiny cowbirds have been captured.

Although parasitism in the artificial structures has been reduced, the number of shiny cowbirds captured in the traps has remained relatively high, except for 1995, in which the number of cowbird trapped was reduced to 1,070 individuals (Figure 11).

RRNS:

In Ceiba, the U.S. Navy, in cooperation with the Service, established, an agreement in 1980 to minimize the impact of their activities on the yellow-shouldered blackbird. An experimental cowbird trapping project was first conducted at RRNS in 1978. Cowbird control projects were conducted on several occasions in RRNS between 1983 and 1987 (Wiley *et al.* 1983, Heisterberg *et al.* 1985, and Service 1987).

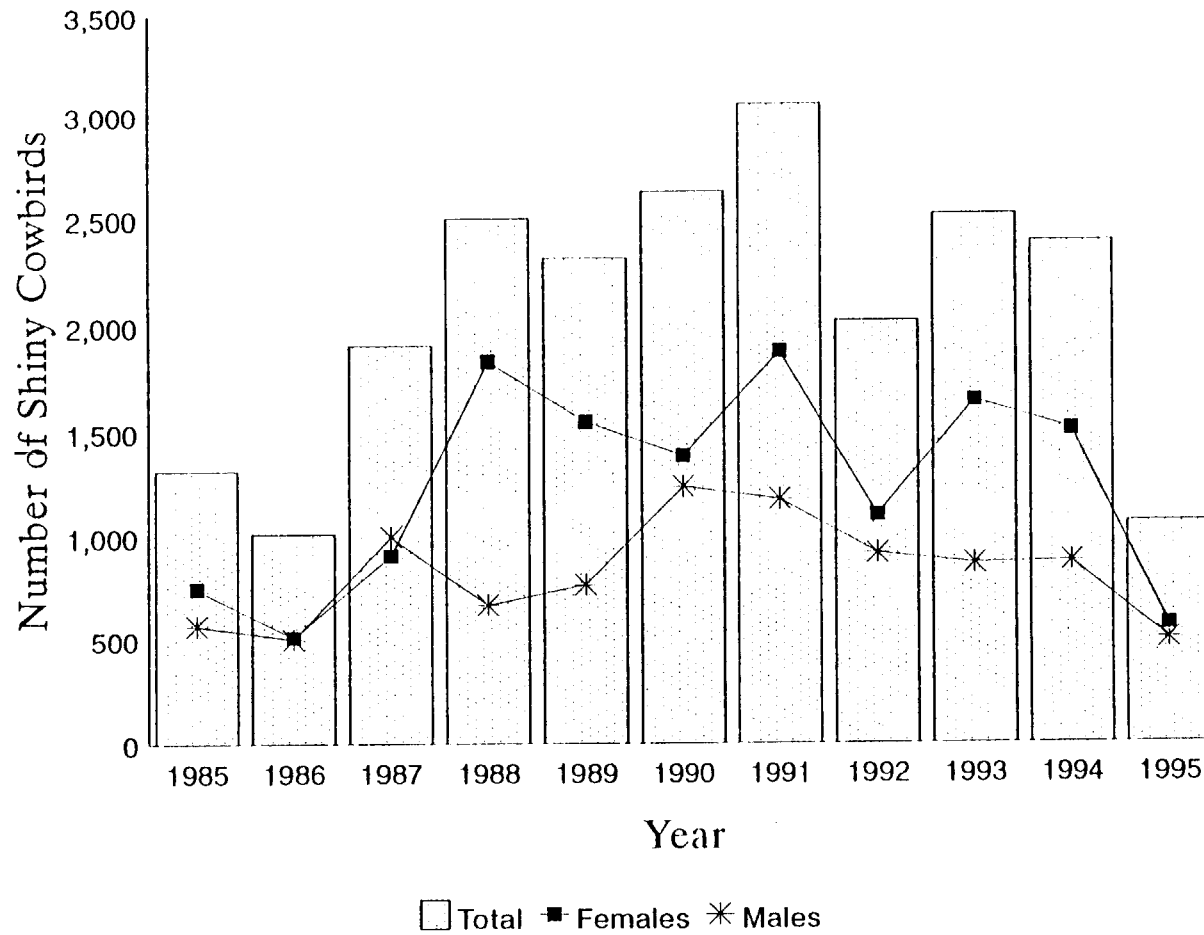
Summary of Comments Received

Copies of the Technical/Agency Draft Revision of the Yellow-shouldered Blackbird Recovery Plan were sent to 51 reviewers, including four peer reviewers, for review and comments. A notice of availability of the Technical/Agency Draft was published in the *Federal Register*. Twelve comment letters were received. Comments providing supplemental data have been incorporated into the appropriate sections of this plan.

The Atlantic Division of Naval Facilities Engineering Command in Virginia provided comments on the plan, and stated that prior to committing to a course of action, they would like additional information regarding the number of yellow-shouldered blackbirds needed to maintain a viable population at RRNS. They mentioned that the Navy was conducting a habitat study for the species, and according to preliminary findings, habitat in the base has increased over the last 15 years.

Dr. Joseph Wunderle, International Institute of Tropical Forestry, recommended that, given the risk of hurricanes and their limited range of damage, an effort should be made to spread yellow-shouldered blackbirds throughout the island. He proposed the use of models to evaluate this. He suggested the use of nesting boxes and translocation of birds into RRNS.

Figure 11. Shiny cowbirds trapped, Boqueron Commonwealth Forest, 1985 - 1995.



Dr. James Wiley recommended translocation of wild-caught blackbirds birds from BCF to other parts of the island, including RRNS. He also recommended management of translocated birds, including monitoring, nest site provisioning, and cowbird control.

The National Wildlife Health Center of the National Biological Service suggested a monitoring project for the yellow-shouldered blackbirds observed with pox lesions, including virus isolation or histopathology, because they mentioned that not all “lumps and bumps” are pox. In order to obtain an overall picture of the yellow-shouldered blackbird health, they recommended a systemic collection and evaluation of egg fertility, contaminant residue analysis, pox monitoring and necropsy of suitable carcasses. The Office of Prevention, Pesticides, and Toxic Substances of the Environmental Protection Agency recommended the evaluation of possible impacts of the application of pesticides on foraging blackbirds in agricultural fields.

II. RECOVERY

A. Recovery Objective

Objective: To downlist the species to threatened status.

Delisting recovery criteria cannot be set at this time because critical demographic information for a reliable population viability model is lacking. However, interim criteria, using a preliminary model were developed by Collazo *et al.* (1995), utilizing the following assumptions: (1) a recruitment rate of 0.18; (2) an adult survival rate of 0.82; (3) all adults attempt to breed at least once per year; (4) 2.3 fledglings per successful nests produced in non-parasitized nests; and (5) 1.8 fledglings per successful nests produced in parasitized nests.

In order to ensure a self-sustaining population in the BCF, the reproductive success should be enhanced to ≥ 0.96 daily survival for eggs and chicks, and parasitism rates should be reduced to ≤ 20 percent. These criteria should be maintained for at least 5 years in the artificial structures. There should also be additional documentation of population trends and adequate support habitat.

The criteria for delisting will be developed after modeling data are obtained from natural nests in the BCF and at least two additional areas in Puerto Rico, including Mona Island.

B. Narrative Outline

1. Protect and manage yellow-shouldered blackbird habitat. Preventing further habitat loss and degradation is essential to the recovery of the yellow-shouldered blackbird in Puerto Rico. Present habitat degradation has resulted in reduced availability of predator free nesting areas that are needed for successful nesting and of additional roosting areas that can support an increasing population.

Based on our current knowledge, the priority for habitat protection should be given to nesting and roosting areas. Existing populations and their habitat should be appropriately protected and managed by public agencies, and the habitat enhanced for maximum breeding success. The protection of the species by private landowners is encouraged. Additional habitat protection must also be provided to areas required for species expansion and recovery. The protection of currently known breeding, roosting and feeding areas, as well as historic sites, must be given the highest priority. Protecting feeding and other support habitat for juveniles and non-nesting adults is also important.

11. Develop and implement management plans for government-owned habitat. Management plans for the protection of existing breeding and roosting habitat at the BCF, Mona and Monito Islands, and RRNS should be developed and implemented. Although La Parguera is included in the BCF, it is designated and managed by the Department as a Natural Reserve. The plan should include the protection and management of the existing and historic roosting sites on the offshore cays of La Parguera, as well as the historic nesting sites. Regular patrolling of these areas, limiting recreational use, the removal of tourist houses on the cays, and predator control on the cays are examples of programs necessary to achieve protection of these areas. These cays were used by the species as breeding sites in the past and efforts need to be directed toward restoration of this use.
12. Avoid vandalism and disturbance. The access road to the BCF, adjacent to the reproduction areas, should be closed and patrolled during the breeding season.
13. Identify existing habitat on privately-owned lands and obtain protective status for it. An inventory of privately-owned lands currently used by the species should be conducted. Privately-owned sites should be protected through land acquisition, the establishment

of conservation easements, the development of habitat conservation plans, and the implementation of private land programs and landowner agreements.

2. Protect and manage yellow-shouldered blackbird populations. Yellow-shouldered blackbird populations must be monitored on a long-term basis in order to produce demographic data needed to determine the delisting recovery criteria for the species.

21. Enforce existing Federal and Commonwealth endangered species regulations. The Endangered Species Act of 1973, as amended, and the Commonwealth Department of Natural Resources Regulation to Govern the Management of Threatened and Endangered Species of 1985 provide for criminal penalties for illegal take of the species. Permits may be issued to carry out otherwise prohibited activities involving endangered wildlife species under certain circumstances.

Development projects which occur on privately or publicly-owned land may be funded through local or Federal agencies or require Federal or local permits. Section 10 of the regulation provides for consultation on endangered species which may be affected by a particular project, similar to Section 7 of the Federal Endangered Species Act. A Section 7 consultation would be necessary for any Federal action that might affect the species.

Permitting and funding agencies (both Commonwealth and Federal) should be made aware of the endangered status of the yellow-shouldered blackbird, the laws pertinent to the protection of the species, and their responsibilities pursuant to these laws.

22. Continue to gather information on distribution and abundance. Additional information concerning the distribution and abundance of the species can affect future management decisions and the development and implementation of recovery tasks. Censuses should be conducted on a regular basis in roosting and breeding areas to determine relative abundance of the species. Emphasis should be given to Pitahaya, La Parguera, RRNS, Salinas, and Mona and Monito islands. Counts should be conducted before, during, and after the nesting season.
23. Search for new populations. Islandwide searches for new populations should be conducted.
24. Search for natural nests. Natural nests should be located and monitored. Reproductive success and parasitism level on natural

nests should be determined and compared with artificial structures. Emphasis should be given to known breeding areas such as BCF (from Bahía Sucia, Cabo Rojo, to Bahía Montalva, Lajas, including offshore cays); coastal upland forests adjacent to the BCF and the Parguera Natural Reserve; RRNS; and Salinas.

25. Gather ecological information. Basic field observations on population biology, reproductive biology, feeding biology, movement patterns, food availability, and other aspects of life history should be conducted in currently known populations. Emphasis should be given to coastal forest areas in southwestern (Cabo Rojo and Lajas) and southern (Salinas) Puerto Rico.
26. Determine number of individuals and populations necessary to ensure species' stability, security, and self-perpetuation. As additional information is gathered, the number of individuals and population necessary to ensure species' stability, security and self-perpetuation should be determined. This will allow to establish more precise and realistic recovery criteria.
27. Characterize existing habitat. Characterization of the habitat preferred by the species for breeding, feeding, and roosting should be conducted.
28. Identify potential breeding, roosting, and feeding sites. Potential habitat for yellow-shouldered blackbirds should be identified. The results from characterization studies of known breeding, roosting, and feeding habitat, aerial-photo interpretation studies, as well as historical and anecdotal records should be utilized.
29. Conduct surveys in identified potential sites and ensure protection. Surveys should be conducted in identified sites. If yellow-shouldered blackbirds are discovered in a new site, surveys should be conducted to determine number of individuals and describe habitat use. Information on reproductive biology, feeding behavior, and other aspects of life history should be collected. Habitat assessments should be conducted on new sites.

If new sites are not already on protected land, steps must be taken to alter the status of such land in order to provide protection for new populations. Management plans for these new sites should be developed or modified, if existing, to include considerations for this species.

3. Monitor reproductive success in existing artificial nest structures. Continue the existing project on enhancement of reproductive success of the yellow-shouldered blackbird through the use of artificial structures in the BCF.
 31. Develop and implement alternative management measures to increase nesting in natural habitat. Short-term and long-term measures should be developed, evaluated, and implemented in order to increase nesting in natural habitats and reduce the use of artificial structures.
 32. Monitor reproductive success on artificial structures. Monitoring of reproductive success of yellow-shouldered blackbirds in existing artificial nest structures at Pitahaya, Cabo Rojo, should continue. Artificial structures with nests should be visited at least three times a week. Effects of parasitism by shiny cowbirds and martins should be evaluated.
 33. Trap and destroy shiny cowbirds. Trapping and destroying of shiny cowbirds in blackbird nesting areas should be conducted during nesting season. Cowbird traps in shiny cowbird feeding areas should be operated only outside the nesting season.
 34. Evaluate effects of trapping and destroying shiny cowbirds on reproductive success. Efforts should be directed to evaluating the effects of trapping and destroying cowbirds on the yellow-shouldered blackbird's reproductive success in both natural and artificial nests. Scientific data to support trapping and destroying efforts should be collected. Studies should be designed and conducted to determine whether trapping is indeed beneficial.
 35. Evaluate effects of Caribbean martins on the reproductive success of the yellow-shouldered blackbird. Efforts should be directed to evaluating the effects of invasion by Caribbean martins on yellow-shouldered blackbird reproductive success in the artificial structures. Studies should be designed and conducted in order to address this mortality factor.
 36. Control mites and rats. Dusting of active nests with Sevin should continue to provide control of mites in yellow-shouldered blackbird nests in artificial structures. To avoid predation by rats, excluder devices should be installed, repaired, or replaced, when needed, on artificial structures.

4. Incorporate the yellow-shouldered blackbird into existing education program. Both Federal (Service) and Commonwealth (Department) agencies are involved in informing the public on general conservation values, as well as on the importance of protecting endangered species and of adhering to Federal and local regulations. The yellow-shouldered blackbird should be included in brochures and slide presentations presented to local schools and organizations.

Prudent use of the media (newspapers, magazines, radio, and television) is an effective means of educating the public. Brochures and posters stressing the importance of protecting the yellow-shouldered blackbird and its habitat should be prepared and distributed throughout schools, local communities, and at conservation activities.

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IV. IMPLEMENTATION

The following Implementation Schedule outlines actions and estimated costs for the recovery of the yellow-shouldered blackbird over the next 3 years, beginning in 1997.

Key to Implementation Schedule column 1:

- Priority 1: Those actions that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
- Priority 2: Those actions that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.
- Priority 3: All other actions necessary to provide for full recovery of the species

Key to Agency Designations in columns 5 and 6:

FWS - U.S. Fish and Wildlife Service
R4 - FWS Region 4
ES - FWS Division of Ecological Services
LE - FWS Division of Law Enforcement
DNER - Puerto Rico Department of Natural and Environmental Resources
RRNS - Roosevelt Roads Naval Station
UNIV - Universities
Org. - Conservation Organizations

**IMPLEMENTATION SCHEDULE FOR THE
YELLOW-SHOULDERED BLACKBIRD REVISED RECOVERY PLAN**

Task Priority	Task Number	Task Description	Task Duration	Responsible Organization		Cost Estimates			Comments
				FWS	Other	FY 1	FY 2	FY 3	
1	11.	Develop and implement management plans for government-owned habitat.	Annual	R4, ES	DNER, RRNS				No costs anticipated.
1	12.	Avoid vandalism and disturbance.	Annual	R4, ES	DNER				No costs anticipated.
1	13.	Identify existing habitat on privately-owned lands and obtain protective status for it.	Annual	R4, ES	DNER, UNIV, Org.				Costs cannot be determined at this time.
1	21.	Enforce existing Federal and Commonwealth endangered species regulations.	Ongoing	R4, ES, LE	DNER, RRNS				No costs anticipated.
1	22.	Continue to gather information on distribution and abundance.	Ongoing	R4, ES	DNER, RRNS, UNIV, Org.	10	15	20	Costs include Task 23.
1	23.	Search for new populations.	Annual	R4, ES	DNER, RRNS, UNIV, Org.				
1	24.	Search for natural nests.	Annual	R4, ES	DNER, RRNS, UNIV, Org.	10	10	10	
1	25.	Gather ecological information.	Annual	R4, ES	DNER, RRNS, UNIV, Org.	25	25	25	
1	26.	Determine the number of individuals and populations necessary to ensure species' stability, security, and self-perpetuation.	Annual	R4, ES	DNER, UNIV	20			

Task Priority	Task Number	Task Description	Task Duration	Responsible Organization		Cost Estimates			Comments
				FWS	Other	FY 1	FY 2	FY 3	
1	27.	Characterize existing habitat.	Annual	R4, ES	DNER, RRNS, UNIV, Org.	10	10		
1	31.	Develop and implement alternative management measures to increase nesting in natural habitat.	Ongoing	R4, ES	DNER, UNIV	10	10	10	
1	32.	Monitor reproductive success on artificial structures.	Ongoing	R4, ES	DNER	15	15	15	
1	33.	Trap and destroy shiny cowbirds.	Ongoing	R4, ES	DNER	14	14	14	
1	34.	Evaluate effects of trapping and destroying shiny cowbirds on reproductive success.	Ongoing	R4, ES	DNER	10	10	10	Costs include Task 35.
1	35.	Evaluate effects of Caribbean martins on reproductive success of the yellow-shouldered blackbird.	Ongoing	R4, ES	DNER, UNIV				
1	36.	Control mites and rats.	Ongoing	R4, ES	DNER				
2	28.	Identify potential breeding, roosting, and feeding sites.	Annual	R4, ES	DNER, UNIV	10	10		
2	29.	Conduct surveys in identified potential sites and ensure protection.	Annual	R4, ES	DNER	10	10	10	
2	4.	Incorporate the yellow-shouldered blackbird into existing education program.	Ongoing	R4, ES	DNER, RRNS				

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APPENDIX I

Table 5. Mayfield estimates of reproductive success of Yellow-shouldered Blackblrds in southwestern Puerto Rico, 1989,1992,1993,1994.

Incubation Period	Number of nests lost	Number of nest exposure days	Number of successful nests	Number of nests	Daily survival rate	S.E. of daily survival rate	Survival rate	S.E. of survival rate
1989	4	154	13	17	0.974	0.013	0.712	0.104
1992	0	1104	93	101	0.993	0.003	0.910	0.029
1993	17	1264.5	119	136	0.987	0.003	0.840	0.034
1994	16	696	57	73	0.977	0.006	0.741	0.052
total	45	3218.5	282	327	0.986	0.002	0.834	0.022

Nestling Period	Number of nests lost	Number of nest exposure days	Number of successful nests	Number of nests	Daily survival rate	S.E. of daily survival rate	Survival rate	S.E. of survival rate
1989	0	164	12	12	1.000	0.000	1.000	0.000
1992	8	1009	53	61	0.992	0.003	0.890	0.035
1993	8	1262	66	74	0.994	0.002	0.911	0.029
1994	2	629	39	41	0.997	0.002	0.954	0.031
total	18	3064	170	188	0.994	0.001	0.917	0.018

Entire Nest Period	Number of nests lost	Number of successful nests	Number of nests	Survival rate	S.E. of survival rate
1989	4	12	19	0.712	0.147
1992	16	53	101	0.810	0.062
1993	25	66	136	0.765	0.060
1994	18	39	74	0.707	0.081
total	63	170	330	0.765	0.038

¹Length of incubation period, 12.9 days; length of nestling period, 14.7 days (Wiley, pers. comm.).

APPENDIX II

Chart 5. Point estimates of a deterministic demographic model for the southwestern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.98	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. blrds		2.3
w/cowblrds		1.8
% of nests parasitized		0.05
Prop. of adults not nesting.		0
Adult surv.		0.82
Juvenile survival		0.18
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.96	2.19	102
Double Brood	0.41	3.12	86
Probability to fledge 1 nest for a nester			0.96
2 nests			0.41
Break even productivity		2	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

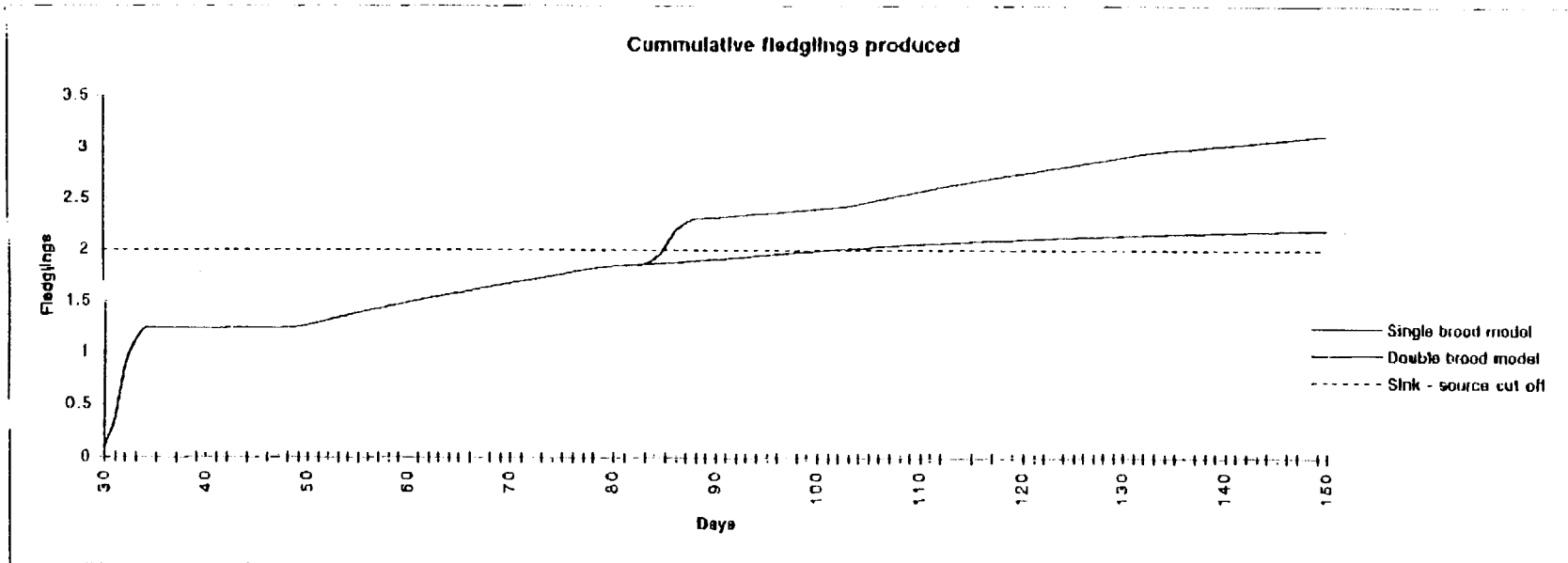


Chart 6. Point estimates of a deterministic demographic model for the southern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.98	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. birds		2.3
w/cowbirds		1.8
% of nests parasitized		0.45
Prop. of adults not nesting.		0
Adult surv.		0.82
Juvenile survival		0.18
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.96	2.00	150
Double Brood	0.41	2.84	87
Probability to fledge 1 nest for a nester			0.96
2 nests			0.41
Break even productivity		2	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

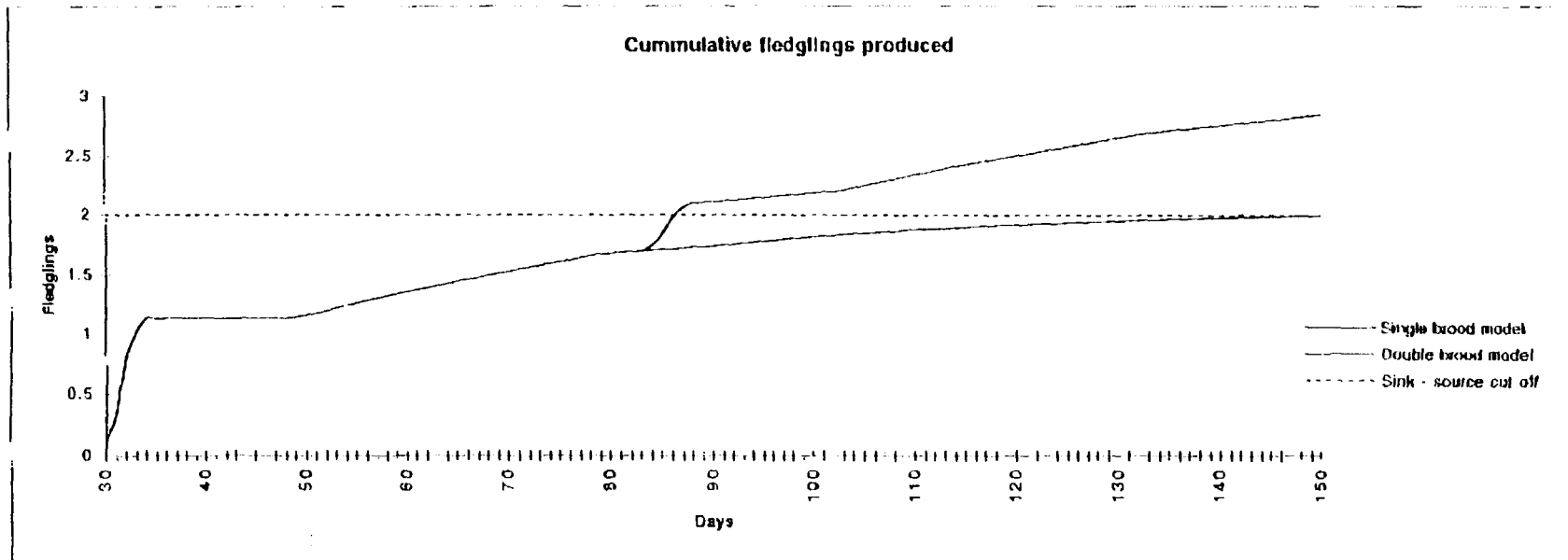


Chart 7. Point estimates of a deterministic demographic model for the southwestern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.96	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. birds		2.3
w/cowbirds		1.8
% of nests parasitized		0.3
Prop. of adults not nesting.		0
Adult surv.		0.82
Juvenile survival		0.18
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.91	1.95	Never
Double Brood	0.30	2.59	108
Probability to fledge 1 nest for a nester			0.91
	2 nests		0.30
Break even productivity		2	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

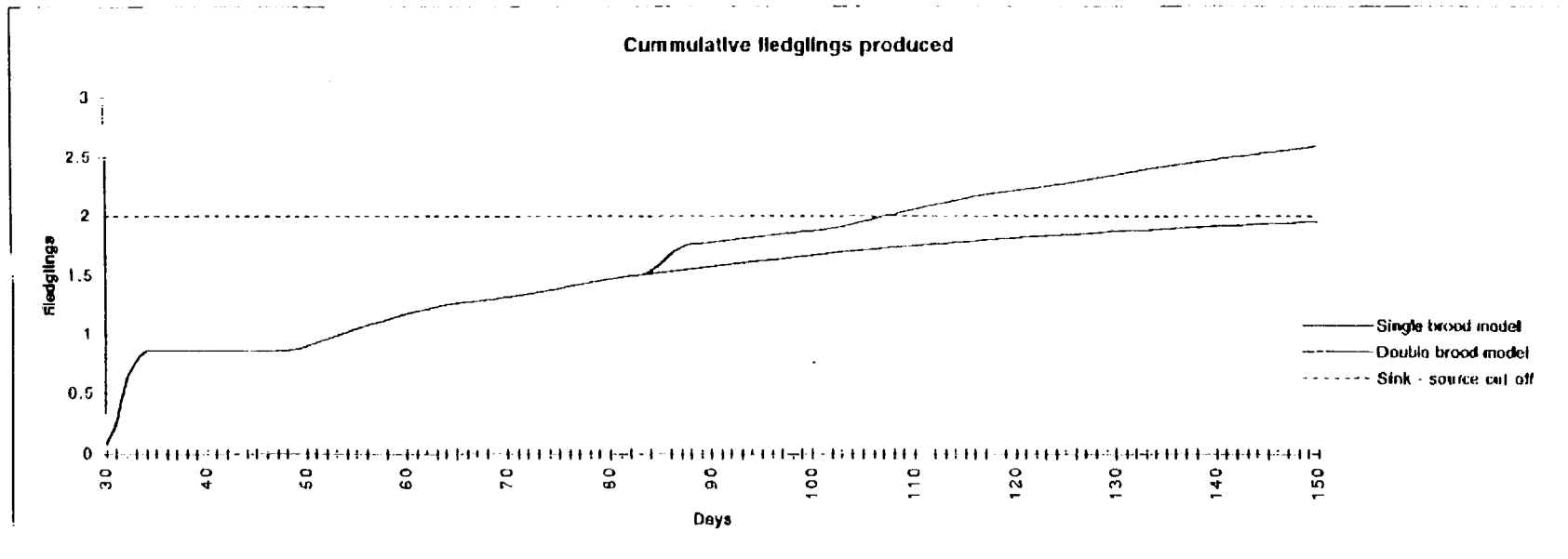


Chart 8. Point estimates of a deterministic demographic model for the southern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.98	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. birds		2.3
w/cowbirds		1.8
% of nests parasitized		0.05
Prop. of adults not nesting.		0.05
Adult surv.		0.82
Juvenile survival		0.18
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.92	2.08	121
Double Brood	0.39	2.96	86
Probability to fledge 1 nest for a nester			0.96
2 nests			0.41
Break even productivity		2	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

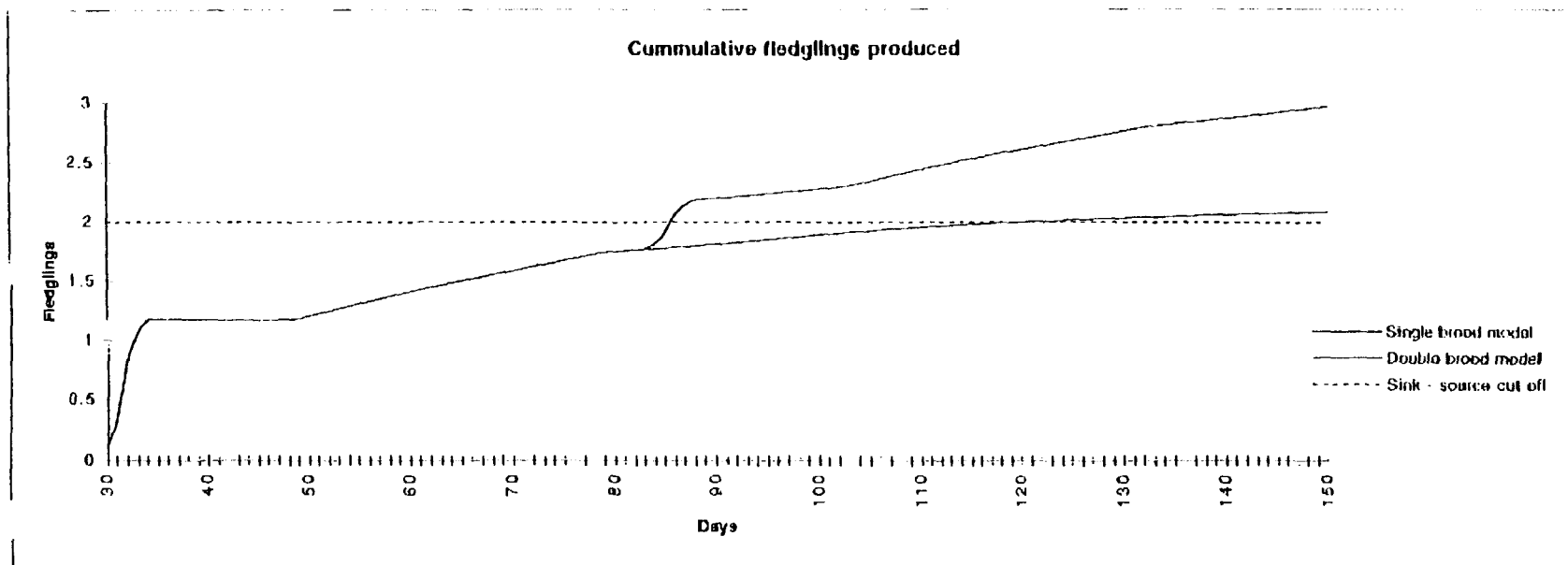


Chart 9. Point estimates of a deterministic demographic model for the southwestern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.98	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. birds		2.3
w/cowbirds		1.8
% of nests parasitized		0.05
Prop. of adults not nesting.		0.1
Adult surv.		0.82
Juvenile survival		0.18
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.87	1.97	Never
Double Brood	0.37	2.81	87
Probability to fledge 1 nest for a nester			0.96
2 nests			0.41
Break even productivity		2	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

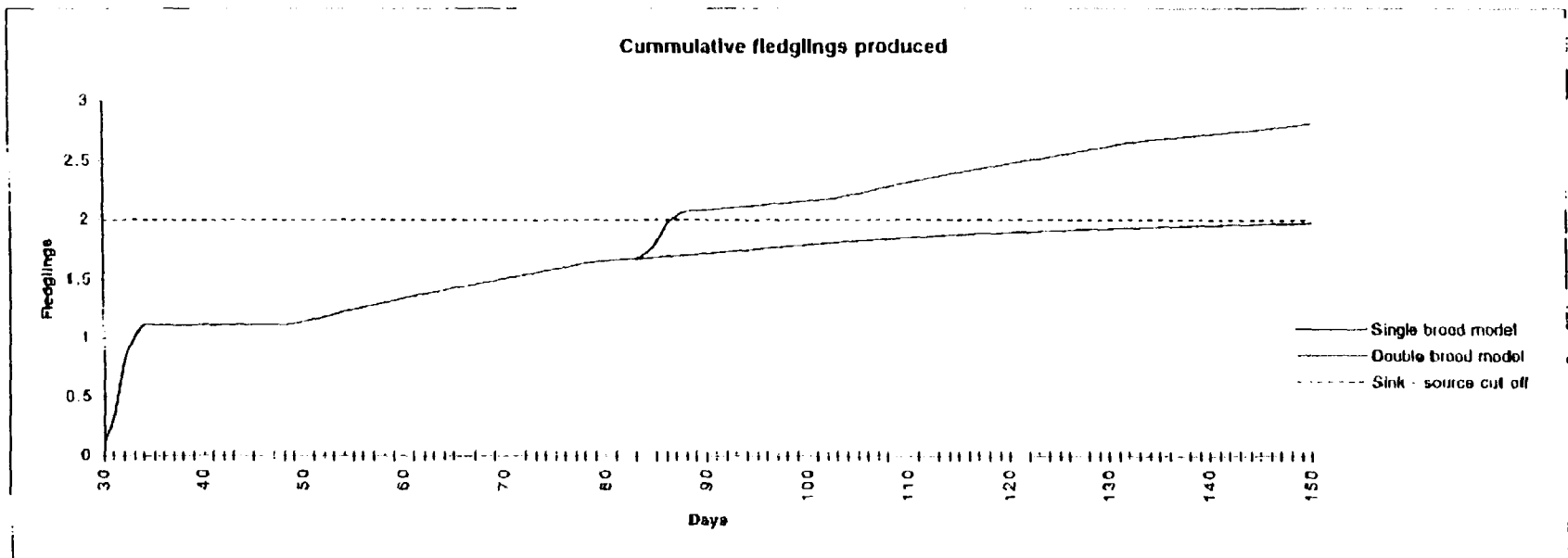


Chart 10. Point estimates of a deterministic demographic model for the eastern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.96	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. birds		2.3
w/cowbirds		1.8
% of nests parasitized		0.1
Prop. of adults not nesting.		0.1
Adult surv.		0.82
Juvenile survival		0.18
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.82	1.84	Never
Double Brood	0.27	2.44	114
Probability to fledge 1 nest for a nester			0.91
2 nests			0.30
Break even productivity		2	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

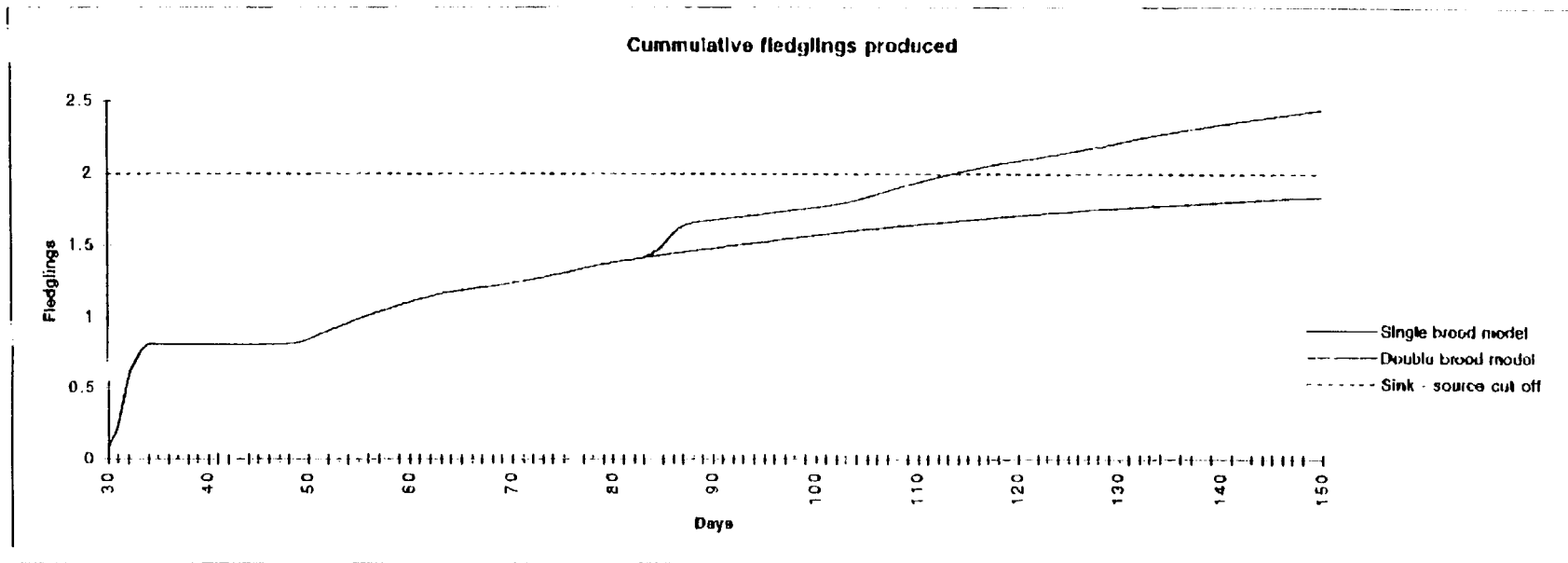


Chart 11. Point estimates of a deterministic demographic model for the southwestern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.96	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. brds		2.3
w/cowbirds		1.8
% of nests parasitized		0.1
Prop. of adults not nesting.		0.27
Adult surv.		0.82
Juvenile survival		0.18
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.66	1.49	Never
Double Brood	0.22	1.98	Never
Probability to fledge 1 nest for a nester			0.91
2 nests			0.30
Break even productivity		2	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	10
delay after successful nest	25

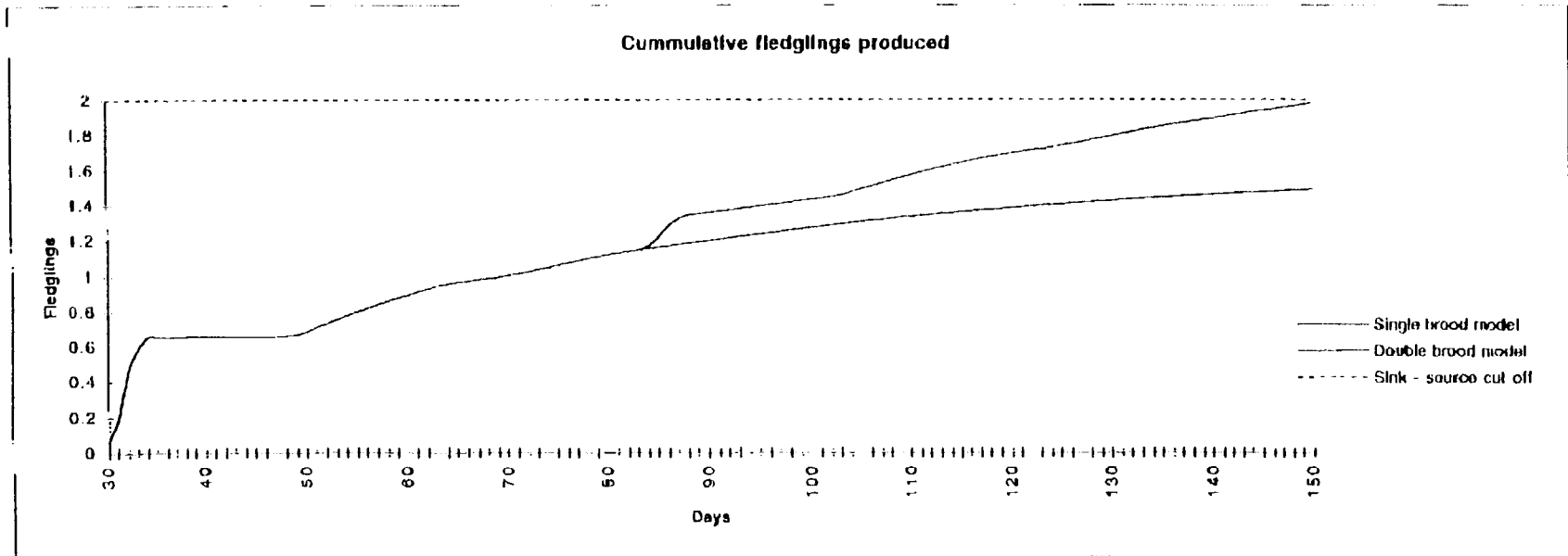


Chart 12. Point estimates of a deterministic demographic model for the western population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.96	0.98
dens. factor	0	
Fledglings per succ. nest		
w/o c. brds		2.3
w/cowbrds		1.8
% of nests parasitized		0.45
Prop. of adults not nesting.		0.2
Adult surv.		0.82
Juvenile survival		0.18
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.73	1.51	Never
Double Brood	0.24	2.00	150
Probability to fledge 1 nest for a nester			0.91
2 nests			0.30
Break even productivity		2	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

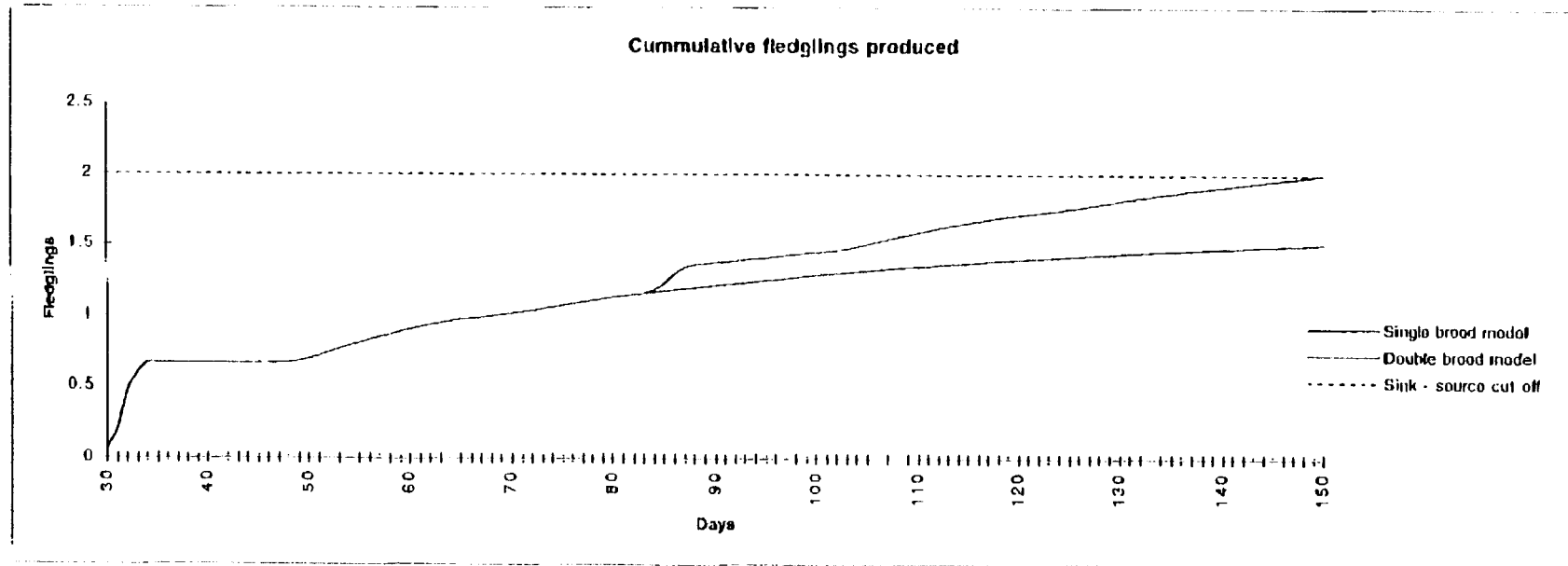


Chart 13. Point estimates of a deterministic demographic model for the southwestern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.98	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. birds		2.3
w/cowbirds		1.8
% of nests parasitized		0.05
Prop. of adults not nesting.		0.1
Adult surv.		0.81
Juvenile survival		0.17
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.87	1.97	Never
Double Brood	0.37	2.81	106
Probability to fledge 1 nest for a nester			0.96
2 nests			0.41
Break even productivity		2.235294118	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

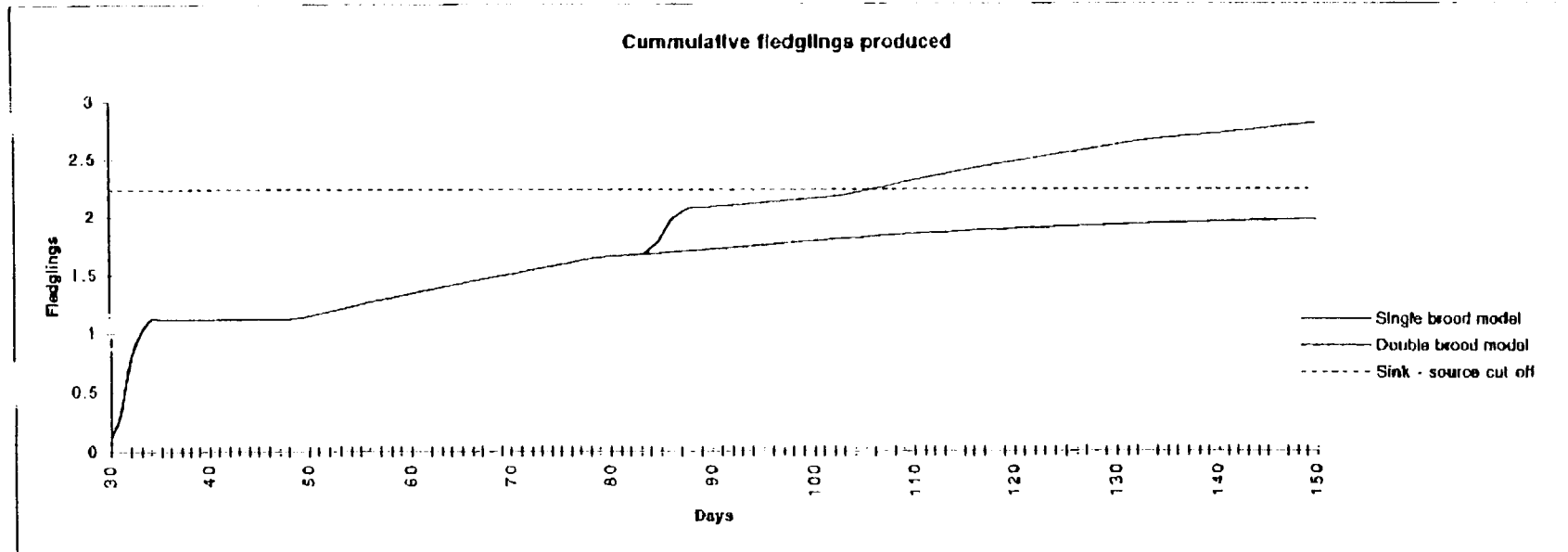


Chart 14. Point estimates of a deterministic demographic model for the western population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.98	0.98
dens. factor	0	.
fledglings per succ. nest		
w/o c. brds		2.3
w/cowbirds		1.8
% of nests parasitized		0.25
Prop. of adults not nesting.		0.25
Adult surv.		0.81
Juvenile survival		0.17
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.72	1.57	Never
Double Brood	0.31	2.24	150
Probability to fledge 1 nest for a nester			0.96
2 nests			0.41
Break even productivity		2.235294118	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

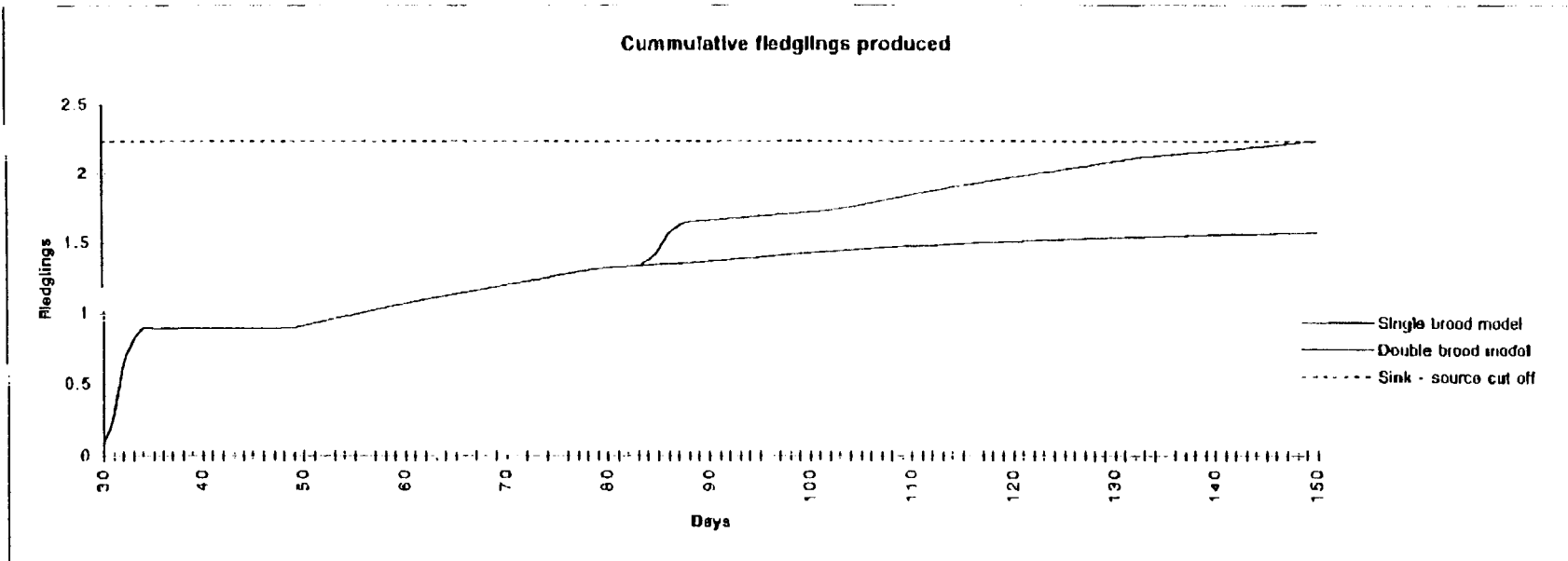


Chart 15. Point estimates of a deterministic demographic model for the southwestern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

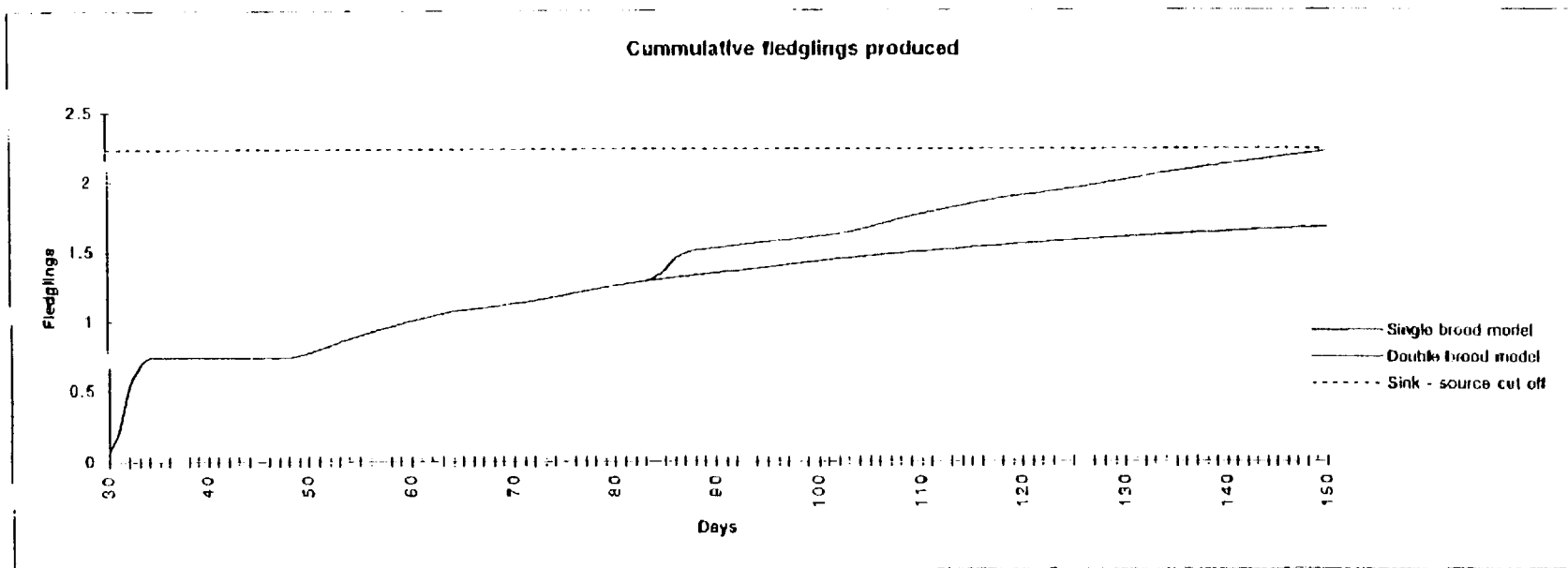
	eggs	chicks
Daily Surv	0.96	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. birds		2.3
w/cowbirds		1.8
% of nests parasitized		0.12
Prop. of adults not nesting.		0.18
Adult surv.		0.81
Juvenile survival		0.17
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.75	1.67	Never
Double Brood	0.24	2.22	Never
Probability to fledge 1 nest for a nester			0.91
2 nests			0.30
Break even productivity		2.235294118	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25



Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.98	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. birds		2.3
w/cowbirds		1.8
% of nests parasitized		0.05
Prop. of adults not nesting		0.1
Adult surv.		0.8
Juvenile survival		0.16
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.87	1.97	Never
Double Brood	0.37	2.81	122
Probability to fledge 1 nest for a nester			0.96
2 nests			0.41
Break even productivity		2.5	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

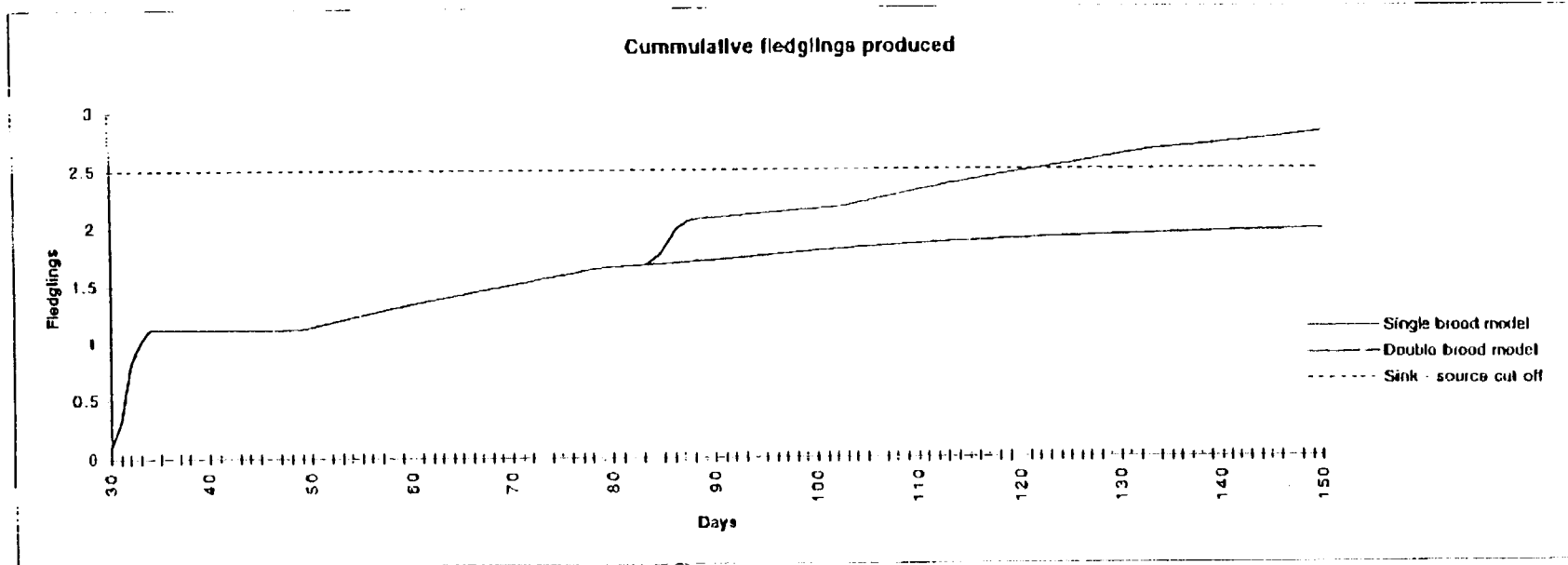


Chart 17. Point estimates of a deterministic demographic model for the southwestern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

	eggs	chicks
Daily Surv	0.98	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. birds		2.3
w/cowbirds		1.8
% of nests parasitized		0.15
Prop. of adults not nestling.		0.18
Adult surv.		0.8
Juvenile survival		0.16
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.79	1.76	Never
Double Brood	0.33	2.50	150
Probability to fledge 1 nest for a nester			0.96
2 nests			0.41
Break even productivity		2.5	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	18
delay after successful nest	25

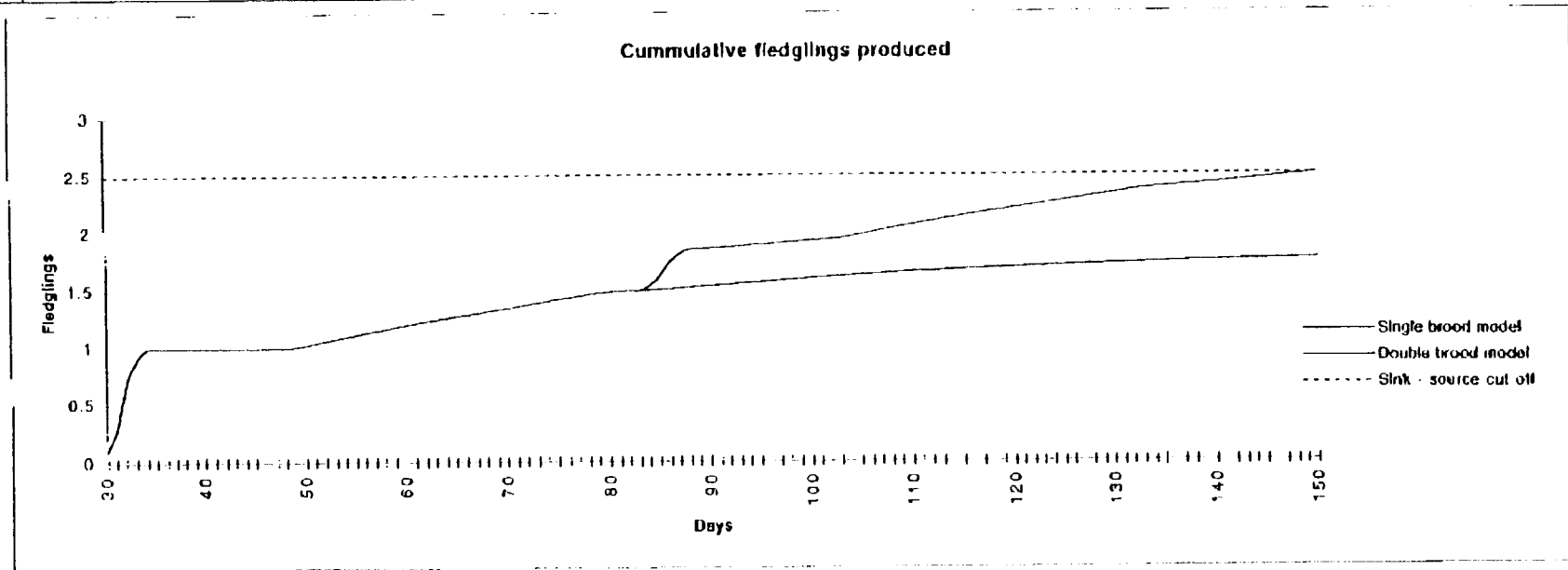


Chart 18. Point estimates of a deterministic demographic model for the eastern population of the Yellow-shouldered Blackbirds, Puerto Rico.

Yellow-shouldered Blackbird

Input parameters:

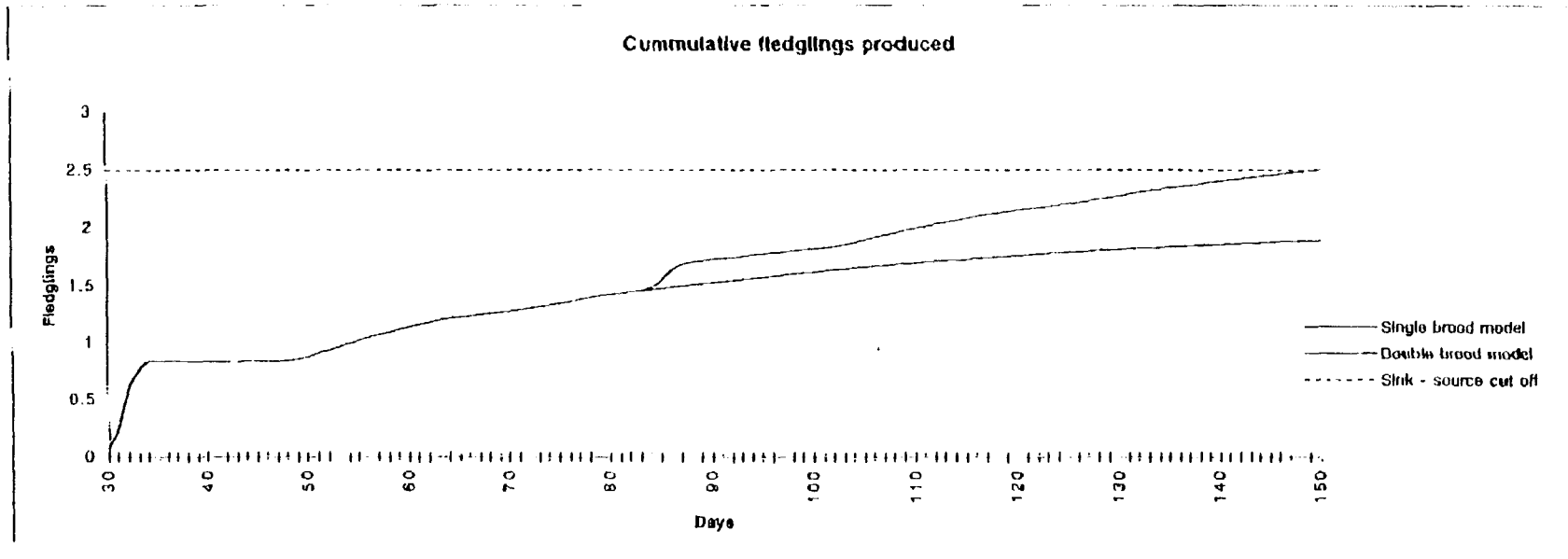
	eggs	chicks
Daily Surv	0.96	0.98
dens. factor	0	
fledglings per succ. nest		
w/o c. birds		2.3
w/cowbirds		1.8
% of nests parasitized		0.08
Prop. of adults not nesting.		0.08
Adult surv.		0.8
Juvenile survival		0.16
Prop. of succ. nesters to attempt a re-nest		0.6

Output:

Model	Prop of all adults to fledge	Total Productivity	Day to break even
Single Brood	0.84	1.89	Never
Double Brood	0.27	2.51	150
Probability to fledge 1 nest for a nester			0.91
2 nests			0.30
Break even productivity		2.5	

Unchangeable parameters:

	Days
laying period	2
incubation	13
nestling stage	15
length of breeding season	150
delay after failed nest	10
delay after successful nest	25



YELLOW-SHOULDERED BLACKBIRD

RECOVERY PLAN

RECOVERY PLAN
FOR THE
YELLOW-SHOULDERED BLACKBIRD, AGELAIUS XANTHOMUS

Prepared by
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for

U.S. Fish and Wildlife Service
Region 4, Atlanta
March 1983

Approved:

Acting

J. Eugene Nester
Director, U.S. Fish and Wildlife Service

Date

May 25, 1983

THIS IS THE COMPLETED YELLOW-SHOULDERED BLACKBIRD RECOVERY PLAN. IT HAS BEEN APPROVED BY THE U.S. FISH AND WILDLIFE SERVICE. IT DOES NOT NECESSARILY REPRESENT OFFICIAL POSITIONS OR APPROVALS OF COOPERATING AGENCIES. THIS PLAN IS SUBJECT TO MODIFICATION AS DICTATED BY NEW FINDINGS AND CHANGES IN SPECIES STATUS AND COMPLETION OF TASKS DESCRIBED IN THE PLAN. GOALS AND OBJECTIVES WILL BE ATTAINED AND FUNDS EXPENDED CONTINGENT UPON APPROPRIATIONS, PRIORITIES, AND OTHER BUDGETARY CONSTRAINTS.

LITERATURE CITATIONS SHOULD READ AS FOLLOWS:

U.S. Fish and Wildlife Service. 1983. Yellow-shouldered Blackbird Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 23 pp.

Additional copies may be obtained from:

Fish and Wildlife Reference Service
Unit i
3840 York Street
Denver, Colorado 80205

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PART I. INTRODUCTION

Description

The yellow-shouldered blackbird (Agelaius xanthomus) is similar in size and shape to the better known red-winged blackbird (A. phoeniceus) of North America. The feathers of adults are predominately blackish neutral gray, with a spectrum yellow humeral patch. The humeral patch is usually edged with a narrow white margin, and under the wing the humeral feathers are occasionally tinged with orange (Post 1981b).

Taxonomic Position

The yellow-shouldered blackbird (YSBB) is one of the nine species of the blackbird genus Agelaius. There are two recognized races of the YSBB -- A. x. xanthomus, known only from Puerto Rico and Vieques Islands, and A. x. monensis, which occurs only on Mona and Monito Islands.

Former Range and Status

In the mid-1800's the YSBB was described as "excessively abundant" in the San Juan area (Taylor 1864). Wetmore (1927) found the species common throughout lowland Puerto Rico, and collected specimens in the mountainous interior. As late as 1936, the YSBB was still common in the lowlands (Danforth 1936). Published reports and information on museum specimen labels show the species was still widespread in Puerto Rico until the 1940's. There is no information on the range or abundance from the 1940's until 1972. Post and Wiley (1976) estimated that about 2,400 individuals were left in three principal population centers: 1) coastal southwestern Puerto Rico - 2,000; 2) coastal eastern Puerto Rico - 200; and 3) Mona Island - 200.

Both Post and Wiley (1976) and Perez-Rivera (1978, 1980) reported on finding isolated pairs and small groups at various locations throughout the island of Puerto Rico, with an estimated 200 birds being found outside of the three main population centers mentioned previously.

Present Range and Status

In 1976, the YSBB was listed as endangered and critical habitat was established (USFWS 1976). Coastal southwestern Puerto Rico, the zone from Ensenada to Punta Guaniquilla is the important yellow-shouldered blackbird population center in Puerto Rico (Post and Wiley 1976). The population for this area was estimated, as of April 1982, to be about 423 individuals (Post pers. comm.). The second largest population of

A. x. xanthomus is located at Roosevelt Roads Naval Station, near Ceiba in eastern Puerto Rico, and was estimated to be about 75 individuals as of March 1982 (Wiley pers. comm.). Other nesting localities throughout Puerto Rico are considered to be secondary sites (Post and Wiley 1976; Perez-Rivera 1980) and probably have a total population of less than 100 individuals.

Yellow-shouldered blackbird populations in southwestern and eastern Puerto Rico are severely declining. The population estimate for A. x. xanthomus for 1972-1975 was 2,400 individuals. As of April 1982, it is estimated to be 720. Recruitment to these populations is below that needed for population maintenance (Post and Wiley 1976). Wiley (pers. comm.) reported that there has been very low recruitment to the Roosevelt Roads population between 1978 and 1982.

The only known localities for A. x. monensis are Mona and Monito Islands. Post and Wiley (1976) estimated the Mona population to be 200 individuals. Perez-Rivera (1982) reported counting 151 blackbirds at Mona in 1981, found 82 active nests in June 1982, and felt that the 1982 population could be at least 220 birds. Lewis (1982) believed the Mona population to be 250 pairs. No cowbirds were observed at Mona in 1981-1982 by Perez-Rivera (1982) during his brief stays nor did he find any evidence of cowbird nest parasitism.

The status of A. x. monensis is not well documented, but this population apparently does not have the same nest parasitism problems as A. x. xanthomus. The shiny cowbird was first noted on Mona Island in the early 1970's -- at least 20 years after its arrival on Puerto Rico. Little is known about the impact of the cowbird on Mona's avifauna.

Causes of Decline

Contributing factors in the decline of the yellow-shouldered blackbird are: 1) reduction in feeding habitat; 2) reduction in nesting habitat; 3) introduced pest species; 4) nest predation by the pearly-eyed thrasher (Margarops fuscatus); 5) disease; and 6) shiny cowbird nest parasitism (Post and Wiley 1976).

Since 1900 increasing amounts of acreage have been committed to sugar cane. The devotion of extensive acreage to monoculture may have reduced the feeding habitat available to the yellow-shouldered blackbird. The decline of the sugar cane economy has resulted in less acreage in sugar cane, but housing development is occurring on the lands removed from cane production. The possibility of developing a rice farming program in the Lajas Valley in southwestern Puerto Rico might improve the available food resources but could lead to a conflict between farmers and birds because of potential crop damage and pesticide problems. It should be noted that little is known about the current feeding ecology of the blackbirds and nothing is known about its original feeding ecology prior to the destruction of large tracts of lowland habitat.

Early observations (Danforth 1926, Wetmore 1927) indicated that the YSBB was found nesting most often in palms and deciduous trees. Although no previous observations of nesting had been reported from the mangroves, it was presumed by Post and Wiley (1976) that they were used as they are now. The extensive human utilization of Puerto Rico's lowlands had a substantial impact on the reduction of nesting habitat. This can best be exemplified by noting that the most important nesting habitat remaining today is the mangroves (Post and Wiley 1976) which in 1968 were considered to have been only 25 percent of the original acreage (Wadsworth 1968). Mangrove destruction still continues although at a much reduced rate. The main breeding ground of the remaining YSBB is in the extensive mangrove tracts found in coastal southwestern Puerto Rico.

The introduced rat (Rattus rattus) and the mongoose (Herpestes auropunctatus) are now widespread in lowland Puerto Rico. YSBB usually nest in predator-free sites such as small islands, cactus (Barnes 1946), palm fronds, steep cliffs, and water surrounded rocks. Post and Wiley (1976) believe that these site choices suggest that ground predators have influenced the behavior of nesting blackbirds.

Post and Wiley (1976) noted that blackbirds nested in cavities only in southwestern Puerto Rico where the aggressive cavity-nesting pearly-eyed thrasher was not found. Wiley (pers. comm.) reports that pearly-eyed thrashers destroyed yellow-shouldered blackbird nests at Roosevelt Roads and Perez-Rivera (1982) reported that a thrasher destroyed a blackbird nest on Mona Island.

Studies of the factors leading to the decrease of island species have implicated fowl pox as a potential problem (Amadon 1950). Post (1981a) reported that 19 percent of the blackbirds examined in 1974-75 were infected with avian pox and that infected birds had a significantly lower survival rate than uninfected birds. A record for the nematode Acuaria sp. was reported by Whittaker, Schmidt and Garcia-Diaz (1970).

As reported by Post and Wiley (1976), the extensive nest parasitism of YSBB by shiny cowbirds is the most crucial factor in the decline of the blackbird in Puerto Rico. It should be noted that cowbird parasitism on blackbirds has never been reported for Mona Island. During 1972-75, Post and Wiley (1976) found 73.7 percent of the YSBB nests in Puerto Rico to be parasitized. Wiley (pers. comm.) found the mean rate for nest parasitism for the years 1977-80 to be 93 percent at Roosevelt Roads and 89 percent for southwestern Puerto Rico. The shiny cowbird has been spreading westward through the West Indies. It has become one of lowland Puerto Rico's most numerous birds. Because of the close taxonomic relationship between the two species, egg similarity, lack of crypticity of the blackbird nests and ecological similarities, the year-round association of the parasite and host results in a high incidence of nest parasitism (Post and Wiley 1977b).

History of Research

Prior to 1972 limited research had been conducted on the yellow-shouldered blackbird. The pre-1972 studies include Wetmore's (1916) notes on food habits and Barnes (1945) description of the Mona subspecies. Since 1972 a number of reports on the blackbird have been prepared. These reports include a review of the status of the species, a review of the shiny cowbird distribution (Post and Wiley 1977a), an examination of the reproductive interactions (Post and Wiley 1977b), a cowbird control program analysis (Wiley 1980), a report on ectoparasites and fowl pox (Post 1981a), a monograph on yellow-shouldered blackbird biology (Post 1981b), a draft management document (Wiley 1981) and a doctoral thesis on cowbird biology (Wiley 1982). A report by Perez-Rivera (1980) summarized notes of additional sightings in Puerto Rico, food habits, and breeding period on blackbird observations on Mona Island.

Nesting Habitat

Yellow-shouldered blackbirds are known to nest in eight habitat types (Post and Wiley 1976):

- (1) Mangrove pannes and salinas. The most important habitats in Puerto Rico are the revegetating salinas and pannes in the coastal mangrove zone. The trees (primarily black mangrove Avicennia germinans, red mangrove Rhizophora mangle, and white mangrove Laguncularia racemosa) are usually small and are either recolonizing an area that was once cleared of trees to form a salina, or recolonizing a panne whose trees have died from overconcentration of salt due to poor water circulation. In the salinas and pannes the blackbirds use two types of nest sites: (a) open, cup-shaped nests placed near the mud or water in small mangrove trees, and (b) cup nests placed in a cavity or hollow of a dead mangrove.
- (2) Offshore red mangrove cays. YSBB nest on small (100-1,000 m²) islands that are 250-550 m offshore. Aggregates of 2-6 pairs may nest on these cays. The birds fly to the mainland to forage.
- (3) Black mangrove forest. In eastern Puerto Rico, YSBB nest in dense stands of black mangrove. Nests are sometimes aggregated and are usually located near the fringe of the forest along small pools or clearings.
- (4) Lowland pastures. In southwestern Puerto Rico around La Parguera, blackbirds nest in large deciduous trees (mostly 11-14 m high oxhorn bucida Bucida buceras) in pastures at the edge of the mangroves. Nests are usually located 6-9 m high. As in the black mangrove forest, pairs may nest close together.

(5) Suburban. In San German, yellow-shouldered blackbirds nest on the campus of Interamerican University among the fronds of 16-18 m high royal palms (Roystonea borinquena) planted around the buildings. Nests are located 12-15 m above the ground. Blackbirds have also been seen breeding in urban sites in Carolina, Hato Rey, and La Parguera, and reported from Aguadilla, Isabela, Catano and Humacao.

(6) Coconut (Cocos nucifera) and royal palm plantations. YSBB build nests in the axils of coconut and royal palms, particularly at Boqueron, La Parguera, Boca Prieta and Mona Island.

(7) Cactus-scrub. The dry thorny cactus scrub (dominated by Philosocereus royenii) on the central plateau of Mona Island is used as nesting habitat by the blackbirds. YSBB place their nests in the axils of cactus.

(8) Coastal cliffs. In the cliffs surrounding Mona Island, blackbirds place their nests on ledges or in crevices. Most of Mona's blackbirds probably use such cliff sites for nesting and may also nest in the mouths of caves. In 1975, two cliff nests were located: one was about 30 m below the edge of a 60 m cliff top, and the other was near the base of the cliff about 50 m down.

Additionally, Perez-Rivera (1982) noted blackbird nesting on water-surrounded rocks at Mona Island.

Breeding Biology

Yellow-shouldered blackbirds are monogamous. First year males are known to breed (Wiley pers. comm.) and first year females have been observed with eggs and young (Post 1981b). Pairing generally begins six to ten weeks prior to breeding. The males will establish limited territories around nesting sites. Site defense by females begins only after building the nest and decreases when the females stop brooding the young (Post 1981b). Intraspecific defense is primarily the males' role, with the area regularly defended being about a 3 m radius (Post 1981b).

Breeding begins in April in eastern Puerto Rico and in May in southwestern Puerto Rico (Wiley pers. comm.) and appears to be triggered by the onset of spring rains (Post 1981b). Perez-Rivera (1980) reported that breeding activity may begin as early as February on Mona Island and could last through November in San Juan and Cayey, depending upon the rainfall pattern during the year. Birds nesting over water placed their nests lower than pairs nesting in terrestrial habitats (Post 1981b). The clutches averaged 1.61 YSBB eggs in eastern Puerto Rico and 2.60 eggs in southwestern Puerto Rico with the number of fledglings per nest being 0.17 and 0.77 respectively (Post and Wiley 1976). Perez-Rivera (1982) found that the clutches averaged 2.75 eggs on Mona Island.

In southwestern Puerto Rico the number of blackbird eggs was 2.59 per nest in the open and 2.71 per cavity nest, with 0.50 fledglings per open nest (0.19 fledglings/egg) and 1.71 fledglings per cavity nest (0.63 fledglings/egg) (Post and Wiley 1976).

Only the female incubates and broods, while both sexes bring food and clean the nest. The incubation period lasts 12-13 days and the nestling period ranged from 13-16 days (Post 1981b). The YSBB usually nest in colonies with 5-35 meters between nests. Post (1981b) felt that nesting aggregations resulted from active attraction among birds.

The annual survival rate for the adult (after hatching year) population in southwestern Puerto Rico was estimated at 82.4 percent. Post and Wiley (1976) calculated the annual recruitment rate to be 18.1 percent, which in this case is equal to the adult mortality rate, in other words two nestlings must fledge per breeding pair each year in order to sustain the population. Neither the eastern nor the southwestern populations have production levels to maintain the existing population levels (Post and Wiley 1977b).

Food Habits

In 25 food samples taken from young birds the bulk of the foods were identified as arthropods with a trace of vegetable matter (Post 1981b). The arthropods were gathered in the canopy and subcanopy layers of trees, while the vegetable matter was obtained at domestic animal feeding sites. Wetmore (1916) saw YSBB probe bucare (Erythrina sp.) blossoms for nectar and in examining 55 stomachs found that 90.1 percent of food consisted of animal matter; Danforth (1926) reported blackbirds on Mona Island taking nectar from the guama (Inga laurina) as well as the fruits of several species of cactus (Selenicereus sp., Cephalocereus royenii); Perez-Rivera (1980) reported feeding on the cactus fruits of Harrisia portoricensis and Opuntia sp.; Post (1981b) recorded observation of probing for nectar in the aloe (Aloe vularis) and yucca (Agavaceae); and Lewis (1982) reported seeing blackbirds on Mona Island probing blossoms of the shrub Croton discolor.

Protective Action Taken to Date

In 1976 the YSBB was listed as an endangered species and Critical Habitat (Figure 1) was established (USFWS 1976). In 1980 the U.S. Navy, in cooperation with the Fish and Wildlife Service, established a zoning plan for the Roosevelt Roads Naval Station to minimize the impact of their activities upon the yellow-shouldered blackbirds.

During 1977-1979, 96 nest boxes were placed in the Boqueron State Forest by the Fish and Wildlife Service. In 1980 the Cabo Rojo National Wildlife Refuge Youth Conservation Corps built 80 new nest boxes and 12 cowbird traps to operate in the Boqueron State Forest and the Fish and Wildlife Service conducted an experimental cowbird trapping program in the Boqueron State Forest. In 1982 the Fish and Wildlife Service built 70 more nest boxes and is supporting a cowbird trapping program adjacent to known nesting areas in southwestern Puerto Rico. The Fish and Wildlife Service and University of Colorado at Boulder are cooperating in monitoring the cowbird and YSBB populations in southwestern Puerto Rico.

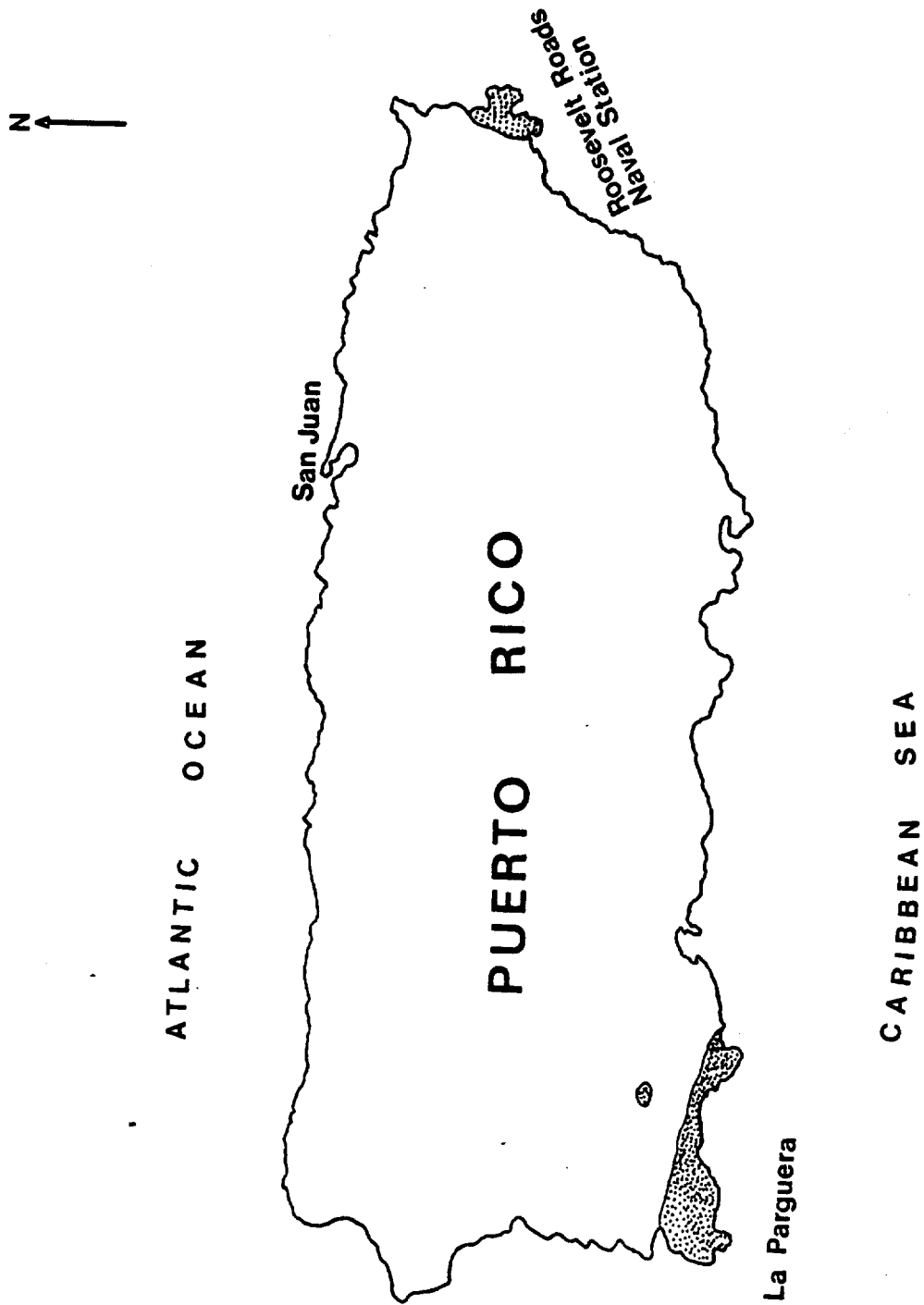


Figure 1. Stippled areas indicate designated Critical Habitat.

Mona Island 

The blackbird and its habitat receive protection under various Federal and Commonwealth laws which prohibit the disturbance, molesting and/or capture of the species, and the disturbance or destruction of mangroves. The Mona Island race receives complete protection at the Department of Natural Resources' Mona Island Refuge.

Preliminary Results of Management Actions Taken

During June and July 1980, twelve traps were placed in the blackbird nesting habitat of the Boqueron State Forest in southwestern Puerto Rico with the authorization of the Puerto Rico Department of Natural Resources. Four management strategies were tested: (A) control group - trap, band and release; (B) destroy all cowbirds; (C) destroy males, band and release females; and (D) destroy all females, band and release males (Wiley 1980). Results indicated that nest parasitism was: 91.7 percent in the control area (A); 45.5 percent in the destroy-all-cowbirds area (B); 66.7 percent in the all-males-destroyed area (C); and 30.0 percent in the all-females-destroyed area (D).

In the area where cowbirds were not controlled Wiley (1980) found that the blackbirds completed 6 of 19 nests started in boxes and 6 of 15 nests started in the "open". An average of 0.83 blackbirds and 1.00 cowbirds fledged from nest boxes, and an average 0.33 blackbirds and 2.67 cowbirds fledged from open nests.

Research Needs

Preliminary findings have indicated the value of cowbird traps and nest boxes in southwestern Puerto Rico. Additional studies to assess the value of both nest box design and placement and cowbird trap design and placement are needed to insure that the maximum benefits are obtained from the management efforts.

The impact of removing all cowbird eggs from nests is not known. The results of cowbird egg removal could be of limited value because of disturbance to the breeding blackbirds. Further information is needed to determine the value of this action as a management practice.

The habitat being used by the blackbird in southwestern Puerto Rico is believed to belong principally to the Department of Natural Resources but boundary lines are poorly defined. The ownership of the blackbird habitat needs to be determined in order to insure that all important habitat is protected.

Human disturbance is a poorly known factor in the YSBB habitats. Areas such as Roosevelt Roads and Mona Island are probably minimally impacted by the average visitor because of access and restricted entry problems. The nesting and roosting habitats of the southwestern population are confined to a long, narrow strip along the coast where boaters, vehicle operators and hikers have ready access to the birds, nest boxes and cowbird traps. An analysis of the human impact is necessary to insure adequate protection to the birds.

Post and Wiley (1976) described the habitats being used in general terms but no quantifiable data has been collected. A detailed evaluation of the breeding habitat, roosting habitat and feeding habitat is needed in order to better classify the essential habitats used by the blackbird.

The current knowledge of the ecology of the blackbird during the non-breeding season is limited. The possibility of additional limiting factors being present during the non-breeding season should be assessed. Patuxent Wildlife Research Center has approved a Puerto Rico Field Station project on this topic to begin in FY 83.

The estimates of survival and recruitment rates for the blackbird are based upon limited data and further research is needed to improve the estimation of survival and recruitment rates required to sustain the populations.

Standardized census methods and survey periods need to be established in order to insure that the estimations for the populations are reliable and comparable.

The work of Post (1981a) reporting a 19 percent infection rate for fowl-pox in YSBB indicates that this factor could be having a significant impact on the species. Further investigations about the role of disease as a limiting factor is needed to ascertain its importance throughout the year and over a period of years.

The impact of the pearly-eyed thrasher on the blackbird is not fully known; additional information on interactions between the two species is needed.

The impact of feral monkeys on the southwestern YSBB population is unknown. An assessment of monkey impact is needed.

PART II. RECOVERY

A. Recovery Objective

To consider the species for reclassification to Threatened status, maintain a minimum of two distinct populations of Agelaius xanthomus xanthomus, consisting of at least 250 pairs at Roosevelt Roads Naval Station and 1,000 pairs in southwestern Puerto Rico; and maintain a minimum population of Agelaius xanthomus monensis consisting of at least 250 pairs at Mona Island.

B. Step-down Outline

1. Increase net recruitment of blackbird populations until populations reach target levels
 11. Maximize reproduction of the populations
 111. Trap and destroy cowbirds found in nesting areas
 1111. Evaluate effectiveness of cowbird removal program
 11111. Monitor trap catch rates
 11112. Monitor cowbird parasitism of blackbirds
 112. Install nest boxes in suitable sites
 1121. Evaluate nest boxes in suitable sites
 11211. Monitor acceptance rates
 11212. Compare productivity of natural and artificial nests
 113. Remove and destroy all cowbird eggs in blackbird nests
 1131. Evaluate impact of cowbird egg removal on blackbird production
 114. Evaluate impact of public access to all blackbird breeding areas
 1141. Identify publicly owned lands in YSBB habitat
 1142. Establish appropriate use regulations to control publicly owned lands

11421. Establish appropriate hunting regulations

11422. Establish needed public use regulations

12. Evaluate, protect and improve habitat

121. Evaluate current publicly owned lands to see if all essential habitats are included

1211. Classify the physiographic features of all essential feeding, roosting, and breeding habitat

1212. Identify primary and secondary sites

122. Protect existing essential habitat on nonpublic lands

1221. Identify all nonpublic essential habitat

123. Assess habitat and improve through management as necessary, in accordance with appropriate Commonwealth and Federal regulations

1231. Conduct annual evaluations of all primary and secondary essential habitat

12311. Note any changes in plant community structure

12312. Review availability of food and water resources

12313. Identify any changes in public use of the areas

1232. Insure optimal mix of habitats in protected areas

13. Monitor blackbird and associated cowbird populations

131. Determine survival and recruitment rates

132. Conduct quarterly population inventories of blackbirds and cowbirds at Roosevelt Roads, southwestern Puerto Rico and Mona Island

133. Conduct population inventories of blackbird found outside the three principal breeding locations twice a year
134. Evaluate the impact of disease on blackbirds
 1341. Conduct non-lethal sampling (blood smears, tissue swabs) of live blackbirds for disease
 1342. Necropsy dead blackbirds
 13421. Conduct microbiological evaluations
 13422. Conduct parasitological evaluations
 1343. Conduct disease investigations of associated cowbird and grackle populations
 1344. Initiate immunization program if needed
135. Assess impact of pearly-eyed thrashers on blackbirds
136. Evaluate impact of feral monkeys on blackbirds

C. Narrative

1. Increase net recruitment of blackbird populations until populations reach target levels

11. Maximize reproduction of the populations

The immediate requirement for blackbird survival is to put a stop to the extreme decline in the population of YSBB on the island of Puerto Rico. Management and research efforts are needed to bring the populations up to target levels on Puerto Rico and Mona Island. A two person (one Fish and Wildlife Service employee and one Puerto Rico Department of Natural Resources employee) coordinating team should be established to review, approve, coordinate and oversee all management and research activities.

111. Trap and destroy cowbirds found in nesting areas

1111. Evaluate effectiveness of cowbird removal program

11111. Monitor trap catch rates

11112. Monitor cowbird parasitism of blackbirds

The most pressing need is to stop the population decline on the island of Puerto Rico. Initial research has shown that trapping and destroying cowbirds found in the YSBB breeding areas will produce the desired result. A cowbird control program should be implemented immediately, using existing traps and techniques. Research should be conducted to determine optimal trap design, trap placement and trapping periods in order to maximize the benefits from this management program.

112. Install nest boxes in suitable sites

1121. Evaluate effectiveness of nest boxes

11211. Monitor acceptance rates

11212. Compare productivity of natural and artificial nests

Initial studies have also indicated that nest boxes increase fledging success, therefore the installation of additional nest boxes in suitable sites should lead to increased production and population increases. Research is needed to determine the best design, spacing arrangement and specific site locations for installation. The value of nest boxes in comparison to natural nests should be thoroughly documented to justify the use of nest boxes as a management technique.

113. Remove and destroy all cowbird eggs in blackbird nests
1131. Evaluate impact of cowbird egg removal on blackbird production
- The removal and destruction of all cowbird eggs found in blackbird nests could provide a valuable tool in increasing blackbird production by insuring that parental feeding efforts were directed toward blackbird chicks. The use of egg removal as a technique needs to be evaluated carefully in order to insure that the increased disturbance does not result in lowered productivity.
114. Evaluate impact of public access to all blackbird breeding areas
1141. Identify publicly owned lands in YSBB habitat
1142. Establish appropriate use regulations to control publicly owned lands
11421. Establish appropriate hunting regulations
11422. Establish needed public use regulations
- All publicly owned lands containing essential blackbird habitat should be surveyed and clearly identified. An assessment of public entry and use of blackbird breeding areas should be undertaken in order to determine the human impact on blackbird reproduction efforts.
12. Evaluate, protect and improve habitat
121. Evaluate current publicly owned lands to see if all essential habitats are included
1211. Classify the physiographic features of all essential feeding, roosting and breeding habitat
1212. Identify primary and secondary sites
122. Protect existing essential habitat on nonpublic lands
1221. Identify all nonpublic essential habitat
- The breeding, roosting, and feeding habitats used by the blackbird throughout the year should be identified and classified. This information could reveal unprotected essential habitat.

123. Assess habitat and improve through management as necessary, in accordance with appropriate Commonwealth and Federal regulations
1231. Conduct annual evaluations of all primary and secondary essential habitat
12311. Note any changes in plant community structure
12312. Review availability of food and water resources
12313. Identify any changes in public use of the areas
1232. Insure optimal mix of habitats in protected areas

Annual evaluations of plant communities, food and water resources, and public use patterns are needed to insure adequate protection of essential habitat. Radio tracking studies could be used to delineate the areas being used by blackbird populations on Puerto Rico and Mona Island.
13. Monitor blackbird and associated cowbird populations
131. Determine survival and recruitment rates

Active banding and marking programs are needed to obtain adequate survival and recruitment rate estimates. This information will assist in determining management goals and help evaluate the effectiveness of management actions.
132. Conduct quarterly population inventories of blackbirds and cowbirds at Roosevelt Roads, southwestern Puerto Rico and Mona Island
133. Conduct population inventories of blackbirds found outside the three principal breeding locations twice a year

Quarterly inventories of blackbirds and associated cowbirds should be conducted at all primary sites and semiannual inventories should be conducted at significant secondary sites in order to evaluate the effectiveness of management activities in maintaining and increasing the populations.
134. Evaluate the impact of disease on blackbirds
1341. Conduct non-lethal sampling (blood smears, tissue swabs) of live blackbirds for disease
1342. Necropsy dead blackbirds

- 13421 Conduct microbiological evaluations
- 13422. Conduct parasitologica evaluations
- 1343. Conduct disease investigations of associated cowbird and grackle populations
- 1344. Initiate immunization program if needed

Studies of blackbirds for disease and parasitism for comparison with cowbirds and grackles will provide detailed information about the impacts of disease and parasites on the blackbird populations. This study would evaluate a possible serious limiting factor.

- 135. Assess impact of pearly-eyed thrashers on blackbirds

The evaluation of pearly-eyed thrasher interactions with YSBB will point out the significance of pearly-eyed thrashers as a limiting factor and the need for possible management actions.

- 136. Evaluate impact of feral monkeys on blackbirds

The question of the impact of feral monkeys on blackbirds is unresolved. A study of monkey-blackbird interactions would provide information on a possible adverse impact to YSBB.

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III. IMPLEMENTATION SCHEDULE

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			Estimated Fiscal Year Costs			Comments/Notes
					FWS		Other	FY 1	FY 2	FY 3	
					Region	Program					
M-4	Cowbird trapping	111	1	Ongoing	4		DNR/Navy	50,000	60,000	60,000	Immediate- DNR/FWS/Navy
R-4	Trapping evaluation	1111	1	2-3 yrs	4		Contract	5,000	5,000	5,000	Immediate- FWS
M-3	Nest box installation	112	2	Ongoing	4		DNR	5,000	5,000	5,000	Immediate- DNR/FWS done in connection w/task 111
R-4	Evaluation of nest box effectiveness	1121	2	1-2 yrs	4		Contract		5,000	5,000	
M-4	Cowbird egg destruction	113	2	Ongoing	4		DNR	5,000	5,000	5,000	DNR/FWS done in conjunction with task 111
R-4	Evaluation of egg destruction	1131	2	3 years	4		Contract	5,000	5,000	5,000	
M-7	Assessment of public use	114	2	1 year	4		DNR	-	5,000	-	
O-3	Establishment of pub. use regulations	1141	2	1 year	4		DNR	-	-	-	DNR agency actions
R-3	Evaluate currently owned lands	121	1	1-2 yrs	4		Contract and/or DNR	25,000	10,000	-	FWS/DNR
R-3, A-1,2,6	Identify and protect existing habitat	122	1	2-4 yrs	4		Contract	25,000	10,000	10,000	Habitat assessments needed to estimate aquisition expenses
I-2	Habitat assessment and management	123	2	Ongoing	4		DNR	5,000	10,000	10,000	DNR action
R-1	Determine survival and recruitment rates	131	1	3-4 yrs	4		Contract	5,000	10,000	10,000	
I-1	Conduct quarterly population inventory of principal populations	132	2	Ongoing	4		DNR	5,000	5,000	5,000	FWS/DNR actions
I-1	Conduct semi-annual population inventories of other populations	133	2	Ongoing	4		DNR	5,000	5,000	5,000	FWS/DNR actions

III. IMPLEMENTATION SCHEDULE

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			Estimated Fiscal Year Costs			Comments/Notes
					FWS		Other	FY <u>1</u>	FY <u>2</u>	FY <u>3</u>	
					Region	Program					
R-11	Evaluate impact of disease on YSBB	134	2	1-2 yrs	4		Contract	-	5,000	5,000	
R-9	Evaluate impact of thrashers on YSBB	135	3	1-2 yrs	4		Contract	-	5,000	5,000	
R-9	Evaluate impact of monkeys on YSBB	136	3	1 year	4		Contract	-	-	5,000	

Priorities in column 4 have been assigned according to the following general rules:

Priority 1 - Those actions absolutely necessary to prevent extinction of the species.

Priority 2 - Those actions necessary to maintain the species' current population status.

Priority 3 - All other actions necessary to provide for full recovery of the species.

DNR - Puerto Rico Department of Natural Resources

Contract - Could be private, DNR, or FWS researcher

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES *

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

* (Column 1) - Primarily for use by the U.S. Fish and Wildlife Service.

IV. Appendix

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