February 1989

Seasonal Variation in Habitat Use by Great-Tailed Grackles in the Lower Rio Grande Valley

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Habitat use by great-tailed grackles was measured by performing weekly censuses of birds in 6 different habitat types: chaparral, citrus groves, feed lots, pastures, residential areas, and agricultural fields. **We found that** use of chaparral, citrus, and residential sites was low during the winter months, increased sharply with commencement of the nesting season in April, and declined again by October. Use of agricultural fields and pasture was irregular. Feed lot use was low during the summer, but high from October - April with October and March migration peaks. An overall sex ratio of 1.3 females/male was observed with skews from this ratio related to the different life history requirements of the sexes.

INTRODUCTION

The great-tailed grackle uiscalus mexicanus) is an abundant permanent resident of the lower Rio Grande Valley of Texas where it is a serious pest on many of the agricultural products of the region. Grackles are not new to the area; they are native, as is testified by accounts from early ornithological investigations in the region (Lawrence 1853:12, Dresser 1865:493). Sennett (1878:28) notes that the species was abundant in towns and in colonies along watercourses. He also mentions that they occurred in chaparral where they showed a marked preference for breeding in stands of ebony (Pithecellobium flexicaule).

The past few decades has seen a marked increase in grackle numbers and a widening of their distribution to the point where they are no longer confined to towns, rivers, and thorn forest: As 98% of the Valley's 1,116 sq km of land surface has been converted to agriculture and residential uses, the grackle has become ubiquitous. The birds are not, however, evenly distributed, and their habitat preferences change through the course of an annual cycle.

Development of a clear understanding of the habitat requirements for grackles is important for the formulation of control strategies. We began investigation of the bird in January 1987, as part of a project designed to provide methods for reducing grackle damage to citrus fruit. Grackles occur in all of the 6 major habitat types in the Valley. In this paper we report on how preferences for these habitats change during the year. We also examine sex ratios by season and habitat type.

METHODS

Habitat use surveys were conducted once/week from the first week of April, 1987 to the last week of April, 1988 for selected sites in Hidalgo and Cameron counties. Twelve census sites were chosen in each county, 2 for each of the 6 major habitat types. The habitat types are: 1) Chaparral, 2) Citrus Groves, 3) Residential Areas, 4) Agricultural Fields, 5) Pastures, 6) Feed Lots. The total number of males and females within a 200-m radius of the census point was recorded using 10x40 binoculars. Information on the movements and behavior of the birds was noted. Censuses were conducted between 0800-1000h and 1400-1600h. The time at which each point was visited was changed weekly.

RESULTS AND DISCUSSION

Chaparral

Only 4,700-ha of chaparral remain in the lower Rio Grande Valley. Dominant tree species in this habitat include: mesquite

tPaper presented at ninth Great Plains wildlife damage control workshop (Colorado State University, Fort Collins, April 17-20 1989].

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Mom glandulosa), ebony, brazil n li obovat), and spiny hackberry (Celtic lli). Canopy height is 3 **to 4-m away from** the river, up to 8 or 9-m along the flood plain. Undergrowth is tangled with extremely dense growths of forestiera F r i r spp.), snake eyes Phaulothamnus spinescens lime pricklyash (Zanthoxylum Fagare and other shrub species. Canopy cover is 95-100% in ungrazed chaparral, so there is little in the way of ground cover except at openings.

Grackles prefer chaparral as a breeding area above all other habitat types. Adult males begin moving to chaparral and establishing display territories in March (fig. 1). They are joined by adult females in April and nesting is well underway by May. Young are produced in June. Depending on the availability of water, birds may continue to use chaparral into August and September. The habitat is also used for roosting during the postbreeding period into October. However, by the end of October, there is very little grackle activity in chaparral, and numbers remain low until March (fig. 1).

Citrus Groves

There are approximately 11,760-ha of citrus in the Valley (Waggerman 1988), down from nearly 30,000-ha prior to the December freeze of 1983. Citrus includes a number of different fruit varieties for both grapefruit and oranges. The trees are spaced 2 to 3-m apart in rows that are 4 to 5-m apart. Mature trees are 4 to 5-m tall, forming an almost continuous canopy down a given row. Most groves are located near a water source, usually an irrigation ditch, and are irrigated as needed throughout the year. The cycle of citrus production begins with flowering in March. The tiny fruits set in April and reach full development by October. Most of the fruit is harvested in November, but some varieties, e.g. Valencia oranges, are harvested in January or February.

Grackles use the groves primarily as breeding colony habitat, as a substitute for chaparral. The dense crowns of mature citrus and the usral proximity of water to the nest sites in citrus groves serve as the main apparent attractants. The pattern of grove use by grackles is very similar to that seen in chaparral (fig. 2). The birds begin moving into groves in March and remain through the summer breeding and post-breeding periods until October when grove use drops sharply. Grackle use of groves after this time is spotty. Some groves, particularly those with late-maturing fruit, continue to be visited by large numbers of grackles through the winter period. For instance, a small (2-ha) grove on Trenton Road was visited daily in February, 1987 by a flock of over 200 grackles, mostly males. The birds were feeding on mature Valencia orange fruit. When the remaining fruit was finally harvested, the birds no longer visited the grove.

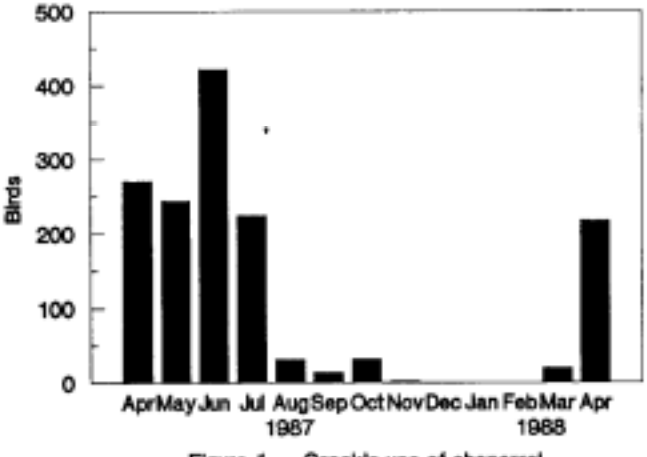

Figure 1.—Grackle use of chaparral.

Residential

The "Residential" category includes a variety of habitat types: lawns, gardens, bird feeders, dumps, and groves of hackberry

Celtis la&*-I), palm V(-Vashinetonia spp.), and many other native and exotic species. As a result, use patterns depend on the types of microhabitats chosen to sample. Our 4 sites were mainly parklike with gassy lawns and scattered trees. Therefore, the use pattern is similar to that of citrus and chaparral since the trees were used as breeding colony sites (fig. 3).

Pasture

We use the term "pasture" to refer to areas of actively grazed short grass that are kept clear of shrubs. In the Rio Grand Valley, most such sites are "improved" pasture, i.e. they are cultivated and planted with an exotic grass, e.g. coastal bermuda Cynodo da lon). Pasture is used by grackles exclusively as a foraging area for arthropods, and as figure 4 shows, it is used throughout the year with peaks in October and March. These peaks probably reflect movements of transient and winter resident grackles moving into or through the Valley from the north in fall and from the south in spring.

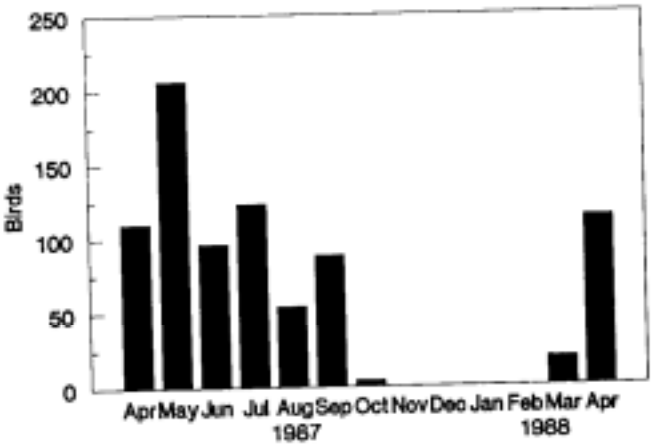

Figure 2.—Grackle use of citrus groves.

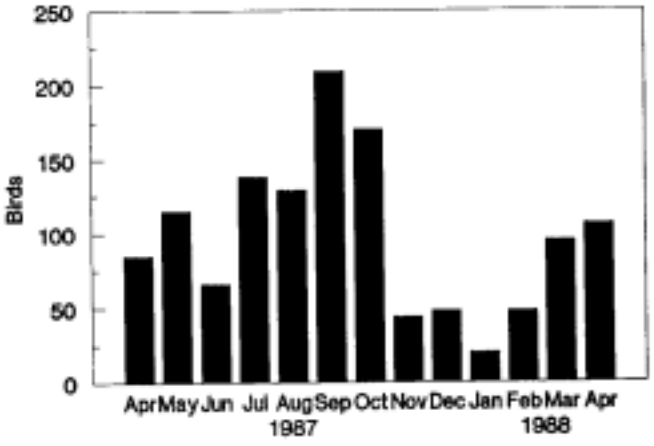

Figure 3.—Grackle use of residential areas.

Agriculture

"Agriculture" includes a wide variety of crops grown in the Valley: sorghum, cotton, sugar cane, melon, tomatoes, beans, aloe, and okra to mention a few. They have in common that they are plowed dirt for a portion of the year, and leafy vegetation the rest of the time. During the periods of plowing and cultivation, grackles are attracted only during and immediately after the cultivation process. Birds flock to machinery working the fields, following behind the vehicles and feeding on the soil organisms exposed. Later, when the crops produce leaves and seeds or fruits, the birds move into the fields to eat either the crop itself (as in the case of young melons) or insects feeding on the crop. They will also eat seeds sown during planting. Peaks in grackle numbers in this habitat reflect responses tuned to **the seasonal cropping rhythms of the specific fields** included in the sample (fig. 5).

Feed Lots

There are several feed lots, dairies, and graineries in the Valley; places where large amounts of grain are available throughout the year to grackles and other species [primarily pigeons of mb livia), house sparrows (.Passer domesticus), cowbirds loth s spp.), and blackbirds A li phoeniceus iceus. Euphagus cvanocenhalus). The main type of grain available at these sites is sorghum (Sorghum 1 n), though corn in) silage and other mixed grain feeds are important at feed lots and dairies. These sites are used throughout the year with greatest use during the winter months, and lows during the summer when most birds are in chaparral, citrus and riparian breeding colonies (fig. 6). As in the pasture habitats, we see peaks during October and March presumably as a result of the migration of transients through the region.

Sex Ratios

During the entire counting period, we observed a total of 12,797 birds at 1,320 counting sites: 5,562 males and 7,235 females for a ratio of 1.30 females/1 male (table 1). Counts at a point were often heavily skewed in favor of 1 sex or the other. As an example, a flock composed of 28 males and 18 females was observed at 0813-h at Carpenter Dairy on 9 December 1988, while at the same locality at 0826-h on 22 December 1988, there was a flock of 38 females and no males. Single-sex flocks are a fairly common occurrence during the winter months.

Table 1. -Cirost-tatted Ora" ratios of males (M) to females (Fl by habitat and season.

	Apr-jun		Oct-Doc		jul-sep		jan-mar	
	TOW							
	M	F	M	F	M	F	M	F
chaparral							505	431
	88	183	30					4
	20	0	841					818
cane							219	190
	123	142						
	40	18	3					382
	398							
Residential	87	179	188	308				88
	174	93						70
	438	791						
Pasture							88	110
	99	53	143					158
	78	104	408					429
Agriculture	41						85	112
	135							
	101	21						2
	0	258	241					
Fwd Lots	482	777	301	821	1.132	2.088	1.548	1.368
	3.	481	4.864					

Some of the habitat-related sex ratios have rather obvious explanations. For instance, the preponderance of males in citrus and chaparral from July - December is related to the perch defense behavior exhibited by many adult males during the nonbreeding season when these habitats are otherwise relatively deserted by grackles. Males are the first to move into the groves in spring (Mar) to defend their perch sites. Females begin to arrive in April, build their nests, and begin laying and incubating eggs. By June, most females are feeding young while the territorial males continue to defend perch sites attempting to attract females whose earlier nesting attempts may have failed. By July, the groves are occupied mainly by females and young, adult males have

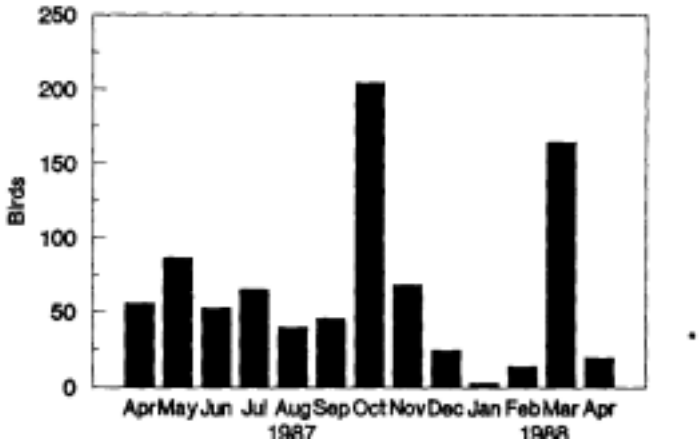

Figure 4 . --Grackle use of pasture.

250
200
150
100
50

0
AprMayjun Jul AugSepOctNovDecJanFebMarApr
1987 1988

Fore 5.--Grackle use of agricultural fields.

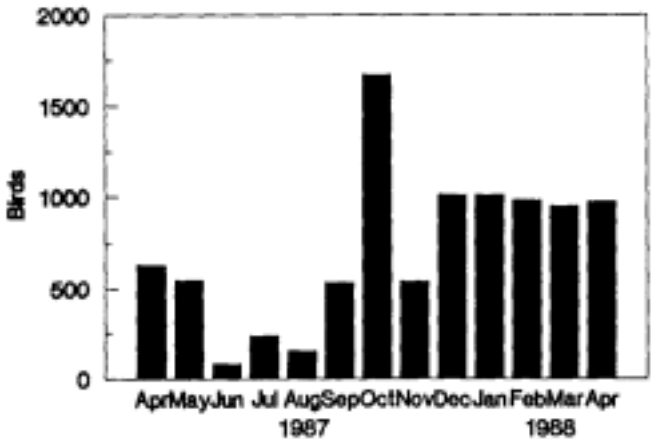

Figure 6. —Grackle use of feed lots.

moved to prime feeding areas, e.g. sorghum fields, pastures, and fallow fields. The higher numbers of females observed in citrus, chaparral, and residential sites from July - September is presumably related to the high movement and activity levels associated with their care of young - at a time when males have begun to desert breeding colonies. However, explanations for sharp sex ratio skews in certain habitats and times of the year will require further investigation. As an example, it is not clear why males predominate in agricultural habitats from October December.

CONCLUSIONS

Analysis of great-tailed grackle use of habitat in the lower Rio Grande Valley of Texas indicates that birds are dispersed throughout a variety of habitats, particularly during the nonbreeding season (Aug-Mar). Concentrations do occur at this time in feed lots on the order of several thousand birds, but numbers even at these locations represent a small portion of the half a million birds estimated to inhabit the Valley. Use of citrus groves during this portion of the annual cycle is irregular and unpredictable with flocks of 200-300 birds occasionally entering groves and damaging mature fruits. However, it is dear that citrus is not a preferred habitat in winter. Grackles concentrate in chaparral, citrus, and residential areas from April - July forming colony sites where trees provide suitable nest placement locations. They often remain in the groves, causing considerable damage, during the immediate post-breeding period (Aug-Sep) if a secure supply of water is available.

Changes in sex ratios during different seasons reflect the different life history requirements of the 2 sexes. Most of the damage to citrus occurs during the late summer months (Aug-Sep), and is done primarily by the females and young that remain in and around the groves attracted to the permanent water supplies in the form of irrigation ditches that are usually available in the vicinity.

ACKNOWLEDGEMENTS

This research was funded through multi-year cooperative agreements with USDA-APHIS and Animal Damage Control. Don Hawthorne, ADC Supervisor for Texas and Martin Mendoza, ADC South Texas Regional Supervisor, were particularly helpful with the project. Animal Damage Technicians John Hobbs, Joe Palacios, Fred Leon, and Judson Dosher assisted with the collection of field data as did Alan Storey, Paul Schulz, John Rappole, Jr., John Norwine, Jody Palacios, David Peterson, David Johnson, and Ralph Bingham of Caesar Kleberg Wildlife Research Institute (CKWRI). Sam Beasom, Director of CKWRI served as overall project leader. Fred Guthery, Research Scientist for CKWRI, assisted with the project and the first year data collection and analysis. Nancy Koerth performed statistical analysis. Yolanda de los Santos and Annette Heffelfinger helped with manuscript preparation. David Bergman generated the graphs and tables. And special thanks to Becky Ware Davis, Operations and **Public Relations Officer** for CKWRI, who kept track of all of us.

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Fall Food Habits of Double-Crested Cormorants in Arkansas'

Albert E. Bivings, Michael D. Hoy, and Jeffery W. Jones

Abstract.--One hundred forty-eight double-crested cormorants (Phalacrocorax auritus) were collected in OctoberDecember 1988. Some were collected while actively feeding, but most were collected at loafing or roosting areas. Of the 135 with fish in them, 79% contained gizzard shad (Dorosoma cepedianum) and 16% contained centrarchids (mostly Lepomus sp.). The rest contained a variety of aquaculture (commercially raised) fish. Fish prey weights were estimated from total length of prey items and use of published length-weight tables. Total weights of prey ranged from 39 to 4558 with a mean of 185g. This was felt to be a conservative estimate of 1/2 daily consumption. Thus, these birds appear to be eating approximately 370g (0.81 lbs.) of fish per day. Potential impact at aquaculture facilities will depend on the value of the crop.

INTRODUCTION

Double-crested cormorants, formerly year**round residents in Arkansas, are a common** migrant **throughout** the state. The last known nest in the **state was observed** in 1951 at Grassy Lake (Hemp**stead** county). Recently, birds have been seen during the summer on Lake Millwood, but no nests were observed. Band returns indicate the principal sources of Arkansas cormorants are from Saskatchewan, Manitoba, Wisconsin, and North and South Dakota (James & Neal 1986).

Commercial fisheries in the Great Lakes regions suffered increasing depredation problems from cormorants during the period 1920-1945 **(Craven** and Lev 1985). Some control measures were initiated in the period between 1946-1950. However, problems subsided as cormorant populations declined approximately 80% in the Great Lakes region from 1950-1978 (Postupalsky 1978). Principal reasons listed for this decline were DDT, DDE, DDD, PCB, other contaminants, and persecution by fishermen (Craven and Lev 1985). These trends have been reversed with a subsequent rise in the populations (Vermeer and Rankin 1984).

The apparent increase in the wintering population of cormorants in the South prompted a study of food habits on Texas reservoirs (Campo, et al. 1988) and this study in Arkansas. The purpose of this study was to attempt to identify and quantify prey items of double-crested cormorants in the fall, when population of both cormorants and aquaculture fish are high.

The authors would like to thank Messrs. Neal Anderson, I.F. Anderson, Bob Goetz, Mike Freeze, Danny Nixon, Howard Hammans, Charles Summerhill, David Yocum, Jerry Williamson, and the many others who assisted this project. Thanks are also due to T. Booth and R. Owens for their support and editorial assistance.

STUDY AREA AND METHODS

• The study was conducted from 18 October through 05 December 1988 in central and southeast Arkansas at various aquaculture facilities.

Prior to collection, each facility was sur veyed to determine the number of birds present and their location. Most cormorants were collected with shotguns, although a few were taken with rifles. Birds were taken either at the feeding site or transiting to or from roosting or loafing sites. Collection of downed birds was simplified by use of trained retrieving dogs.

Cormorant esophagus and stomach contents were removed and prey items taxonomically identified. Fish prey consumed were classified to either genus or species. Prey were counted by species and total length of each was measured to the nearest 6 mil limeters (1/4 inch). Numbers and length of each prey species for each bird were recorded and tab ulated. Mean total length was computed for each prey species consumed. Total weight of prey con sumed was estimated when possible for each sample bird based on published length-weight tables (Carlander 1969).

'Paper presented at the Ninth Great Plains Wildlife Damage Control Workshop. (Colorado State University, Fort Collins, April 18-19, 1989).

2United States Department of Agriculture, **Animal**

RESULTS AND DISCUSSION

During this study, 148 cormorants were collected and examined for esophageal/ stomach contents. Of the 135 with food items (91%), 106 (71.6%) contained gizzard shad (Table 1). Mean number of shad per bird was 4.87 and mean total length of shad was 149 mm (5.85 in.) (Table 2).

Total biomass consumed was calculated for 112 of the 135 with prey items based on our ability to determine prey live weights from existing tables. Total biomass ranged from 39g to 4558 with a mean of 185g per feeding.

The results of this study were similar to those found in Texas (Campo et al. 1988) and Wisconsin (Craven and Lev 1985) in that rough fish were consumed most of the time **and the average** size prey was about 150 mm (5.9 in.). Our study did show a greater reliance on commercially important species in our small December sample (N=15) where 33% of the cormorants contained channel catfish. This indicates a potential seasonal shift to catfish that has been suggested by **catfish pro**ducers. Campo, et al. (1988) noticed a similar decline in shad consumption over time indicated. This may be due to changing shad abundance, vulnerability, or to differential thermal response between shad and aquaculture-species.

Since cormorants were full of fish throughout the day, biomass estimates are felt to approximate 1/2 daily consumption. Similar thoughts were compiled by Campo et al. (1988) and Bennett (1970). Our daily consumption of 370g (0.81 lb.) is greater than the hypothetical estimates developed by Schramm, et al. (1987) in Florida, and similar to observed data from other studies (Campo et al. 1988, Bennett 1971). The maximum value of 9108 (2 lbs.) per day also agrees with Bennett (1971).

While the occurrence of aquaculture fish is low, it is also important to note that several very high value species were identified. The wholesale value of the single grass carp was about $4; while koi are worth $5-10 each. Thus, a small percentage of the population could produce high dollar damage to an individual producer. Also, if there is a shift to commercially important fish later in the winter, mean consumption of 370g (.81 lb.) of fish by the expanding population of wintering cormorants may result in substantial economic impact to southern fish farmers. Furthermore, cormorant predation on spring brood stock could be disastrous. Additional data needs to be collected on spring food habits when cormorant populations are high and shad populations are reduced.

Table 1.--Occurrence of prey species in esophagus/stomach of double-crested cormorants in October - December 1988 in Arkansas.

Prey Species	Number of Birds	Percent of Total
Shad 106	71.6	
Channel Catfish	10	6.8
Bluegill 9	6.1	
Green Sunfish	9	6.1
Golden Shiner	7	4.7
Crappie 3	2.0	
Goldfish 2	1.4	
Koi 1	0.7	
Unidentified Sunfish	1	0.7
Grass Carp 1	0.7	
Unidentified 13	9.0	
		109.8

1Total exceeds 100% because birds had more than 1 prey species.

Table 2.--Mean total length of prey species found in double-crested cormorants October December 1988 in Arkansas.

Species	XTL (mm)
Shad 149	
Channel Catfish	227
Golden Shiner 88	
Goldfish/Koi 140	
Bluegill 195	
Green Sunfish 86	
Grass Carp	178
Crappie 167	

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Evaluation of Predator Guards for Black-Bellied Whistling Duck Nest-Boxes'

Raymond L. Urubek2

Abstract. I evaluated the effectiveness, suitability, and expense of 2 styles of predator guards for black-bellied whistling duck (Dendrocygna autumnalis) nest-boxes. Guards evaluated were galvanized bottomattached shrouds and razor-ribbon wire. Both guards were effective against ground dwelling predators. The group not fitted with guards suffered a 55% overall depredation rate.

INTRODUCTION

Large-scale erection of artificial nesting structures for waterfowl has been a management tool for at least 4 decades (McLaughlin and Grice 1952, Belrose 1976). Most of these artificial nest structures were constructed to benefit wood ducks (McLaughlin and Grice 1952, Strange and Cunningham 1971, Bellrose 1976). Predation by ground dwelling species, primarily raccoons (Procyon lotor), and to a lesser extent avian species has often negated the beneficial effects of nestboxes (Bellrose et al. 1964, Bolen 1967b).

The black-bellied whistling duck is a Neotropical species whose northern breeding distribution extends into southern Texas and regularly occurs as far north as Refugio County (Belrose 1976). Whistling ducks adapt readily to artificial nest structures (McCamant and Bolen 1979). Efforts to provide artificial nest-boxes for whistling ducks began in the early 1960's (Bolen 1967b) and have become mere common in recent years (O'Kelley 1987). O'Kelley (1987) found that proper predator deterrents, reduced competition for nest-boxes, and proper density and location of boxes could increase the efficiency of a boxmanagement program. Bolen (1967 b) classified nest box failures into 2 groups, abandonment and predation.

1Paper presented at the Ninth Great Plains Wildlife Damage Control Workshop. (Marriott Hotel, Fort Collins, CO, April 17-20, 1989]. Contribution 337, Rob and Bessie Welder Wildlife Foundation.

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My focus in this paper is an investigation of predation. Unlike the wood duck, whose major nest predator is the raccoon, snakes, particularly the Texas rat snake (Elaphe obsoleta) destroy more nests than any other single predator (Bolen 1967a). Although Bolen (1967a) ranked the raccoon second among nest predators, he felt that they were the most important predator because of the cunning and methodical manner in which they destroyed bird nests.

Information presented here was collected during the Welder Wildlife Foundation's yearly nest box maintenance and refurbishment program. I stress that this information should be approached from a demonstration viewpoint rather than that of a scientific study. There were unequal sample sizes, and many interconnected variables that make statistical analysis of the results questionable.

DEMONSTRATION AREAS

Two oxbow lakes and 5 stock ponds were used in this demonstration. All sites were located within the boundaries of the Welder Wildlife Refuge. The 3,158 ha refuge is located 40 km north of Corpus Christi in San Patricio County, Texas. The Aransas River, a permanent waterway, forms the north and east boundaries. The refuge lies in a transition zone between Gulf Prairies and Marshes and South Texas Plains (Gould 1975). Over 1400 species of flowering plants and ferns occur in this area, mostly of tropical and subtropical origin. Drawe et al. (1978) and **Drawe (1988)** further describe the soils and vegetation found on the refuge. The 30 **year average** annual rainfall is 91 cm.

Monthly rainfall means indicate a bi-modal pattern with peaks in spring and early fall (Low 1970, Kie 1985).

METHODS

Data presented here were collected from nest boxes erected before 1982, in 1982, in 1987, and in 1988. Table 1 presents the number and type of boxes available during the 1987 and 1988 breeding seasons.

Table 1.--Nest-boxes and predator guards available during the 1987 and 1988 nesting seasons.

Box and Guard Type	1987	1988
Wooden-Single Box		
Metal Shroud	11	11

Boxes erected prior to and including 1982 were of the type described by Bolen (1967a) and included single box units and units that employed 2 nest boxes per pole (fig. 1). Nest structures erected in 1987 included a modified version of Bolen's nest box (1967a, fig. 2) and a modified plastic bucket (Griffith and Fendley 1981) (fig. 3). Boxes obtained from the Texas Parks and Wildlife Department's Wood and Tree Duck Production Project (fig. 4) were erected in April 1988.

Predator guards were of two types; galvanized metal shroud (Bolen 1967b, fig. 1), and razor ribbon wire (fig. 5). Plastic 5-gallon buckets and modified Bolen boxes were not fitted with guards.

Each box was checked in early spring. Old nesting material was removed and a fresh bed of pine bark mulch was installed. Boxes were subsequently examined for usage at 2-3 month intervals through the nesting season. Each box was checked an average of 3 times per year. Nest predators were identified following the criteria of Reardon (1951).

RESULTS AND DISCUSSION

Overall nest box use by black-bellied whistling ducks was 85% and 45% for the years 1987 and 1988, respectively.

Figure 1.--Wooden-double box unit adapted from Bolen (1967a), with metal shroud.

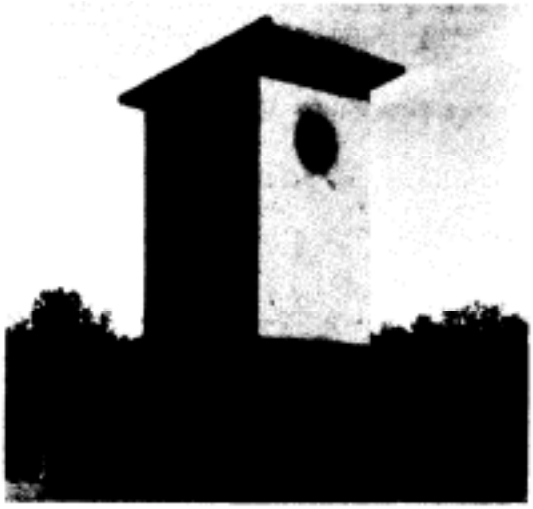

Figure 2.--Wooden-single box modified from Bolen (1967a), shown without predator guard.

Figure 3.--Modified Griffith and Fendley (1981) plastic 5-gallon bucket nest-box.

McCamant and Bolen (1979) reported an 81% overall whistling duck nest-box use during the 12-year period 1964-75. The low use of boxes in 1988 was caused by drought conditions that left the oxbow lakes dry and water levels of the smaller **ponds very low.**

Predation was limited to unprotected wooden boxes (55%). Bolen (1967a) **found predation** rates in unprotected **boxes and natural** cavities of 23$ and 41%, respectively. I suggest that the predation rate observed is higher because of an abnormally large raccoon population and because boxes were placed immediately adjacent to the ponds. McLaughlin and Grice (1952) reported an overall raccoon predation rate of 41% on wood duck nest boxes; however, considering only boxes placed in swamp areas the predation rate rose to 78%. Rat snakes were found in 1 unprotected box and on the ground at the base of a box fitted with a metal shroud. A western cottonmouth (Agkistrodon piscivorus) was found on the ground at the base of a box protected by razor-ribbon wire. There was no evidence of raccoon or snake predation on nests in plastic boxes where the distance from mounting pole to entrance hole was greater than 330 mm.

Galvanized metal shrouds are expensive ($28); however, they are the most durable and can be manufactured to fit the mounting structure. Razor ribbon wire is an inexpensive ($4) alternative if the mounting structure will accept it. Although no accidents have been reported from the use of razor ribbon wire, I suggest its use be restricted to remote areas. If a predation problem arises while using plastic buckets, an inverted 5-gallon bucket (fig. 6) is an inexpensive I($1/unit) solution and can be modified to' fit many existing mounting structures. In the south Texas climate I expect the longevity of plastic buckets, razor ribbon wire, and galvanized metal shrouds to be 3, 5, and 8 years, respectively.

Figure 4.--Nest-box provided by the Texas Parks and Wildlife Dept., shown with razor-ribbon wire guard.

Figure 5.--Razor-ribbon wire guard, shown as mounted on Texas Parks & Wildlife box.

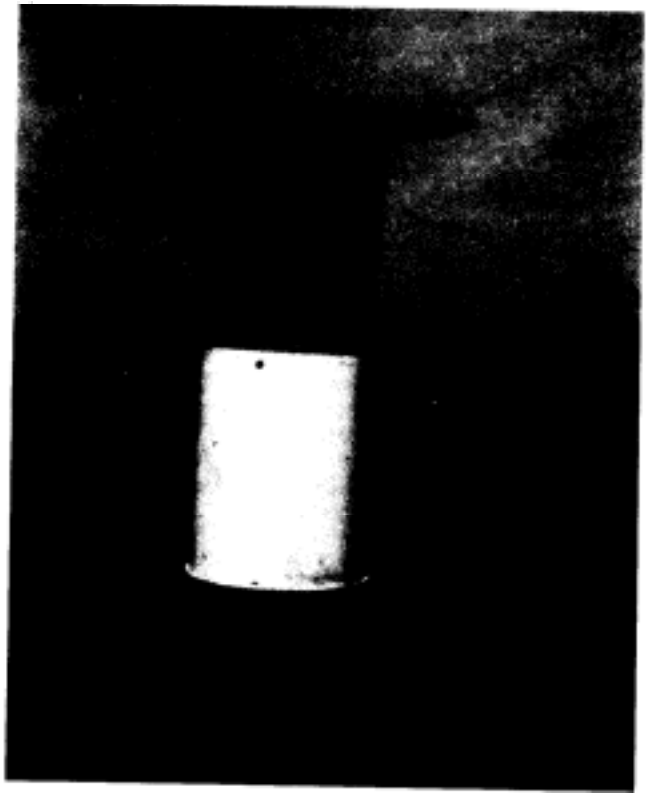

Figure 6.--Modified plastic 5-gallon nestbucket (Griffith and Fendley 1981), showing additional bucket mounted at base of nest-bucket.

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