FINAL REPORT

As Required by

THE ENDANGERED SPECIES ACT, SECTION 6

TEXAS
Grant No: E-1-7

ENDANGERED AND THREATENED SPECIES CONSERVATION

Project No. 9.4

Reddish Egret/Brown Pelican Colony Monitoring

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December 15, 1995

ABSTRACT

Monitoring of Brown Pelican (*Pelecanus occidentalis*) nesting activities was initiated in September of 1989. This effort included monitoring of nesting colonies as well as monitoring of winter populations in the vicinity of the Port Isabel Causeway where some mortality has been reported. This monitoring effort took place during the fall of 1989 through the 1990 breeding season.

Efforts in 1990-91 focused on the Reddish Egret (*Egretta rufescens*) to determine movements of this species in relation to selected breeding colonies in the Upper Laguna Madre. Records were reviewed to identify appropriate study sites and these sites were observed to determine movement patterns of the species from nesting colonies to foraging areas.

From 1991 through the 1995 breeding season, efforts refocused on the Brown Pelican. An attempt was made to identify factors affecting nesting colony formation, identify potential colony sites and enhance the probability of colony formation by using decoys to lure adult Brown Pelicans to appropriate sites.

Historical sites, recent trends, and reproductive success of the Brown Pelicans (during periods when fledgling success is available) are also provided.

FINAL REPORT

STATE: Texas **GRANT NO.:** E-1-7

GRANT TITLE: Endangered and Threatened Species Conservation.

PERIOD COVERED: September, 1989 - August, 1995

PROJECT NUMBER: 9.4

PROJECT TITLE: Reddish Egret/Brown Pelican Colony Monitoring

PROJECT OBJECTIVE: To identify and monitor breeding sites used by Brown Pelicans and Reddish Egrets.

ACCOMPLISHMENTS

See Attachment 1.

SIGNIFICANT DEVIATIONS

Decoy placement failed to elicit nesting behavior to the point of establishment of new colonies. Further analyses of factors affecting nest site selection by the Brown Pelican were not completed. Acquisition of data pertaining to the distribution of prey resources relative to nest site location was not completed.

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Date

ATTACHMENT 1

1989 - 1990 ACTIVITIES

Brown pelican colonies established during the 1989 breeding season were monitored beginning in February. Three sites were chosen during the 1990 breeding season. Colony monitoring took place on Pelican Island (Corpus Christi Bay), Sundown Island (Matagorda Bay) and Dressing Point Island (East Matagorda Bay). Three established colonies were monitored by Texas Parks and Wildlife employees, National Audubon Society wardens, and U. S. Fish and Wildlife Service personnel in order to follow nesting activity and discourage disturbance due to human activity. Colony status during this period is provided in Table 1.

Severe cold fronts during December and February prior to the nesting season were noted as having potential detrimental effects on colony formation in additional areas (Cedar Lakes near Argent, Second Chain of Islands near Rockport, and South Pass Island south of Port O'Connor). Sixteen pelicans were found dead on or near Second Chain of Islands in San Antonio Bay and numerous other pelicans were found throughout the study area, either dead or with frost bitten feet.

Brown pelican activity in the vicinity of the Port Isabel causeway was also monitored to evaluate the mortality associated with this structure. Brown pelicans were censused in the vicinity of the causeway during cold fronts. An aerial census on November 1, 1989 located 138 brown pelicans in the Lower Laguna Madre. Census in the vicinity of the Port Isabel causeway on November 8, 1989, during a cold front, located 120 pelicans. Only about 60-70 of them flew over the causeway and were therefore subject to turbulence associated with the causeway.

Table 1. Brown pelican nesting colonies in Texas during 1990.

Location	Est. breeding pairs	Est. fledgling
Pelican Island	600	600-700
Sundown Island	50-60	75
Dressing Point Island	25	18

1990-1991 ACTIVITIES

Recent TPWD reports were reviewed to identify major nesting colonies for reddish egrets on the Texas coast (Table 2). Major nesting areas in 1990 included Dressing Point Island, Sundown Island, Second Chain of Islands, Long Reef/Deadman Island, Shamrock Island, Naval Air Station, Pita Island/Humble Channel Spoil Islands, South of South Bird Island, South Bird Island, South Baffin Bay Islands, South Land Cut, Green Island, and Three-island Spoil. Five of the above colonies were visited by boat during May, 1991. Naval Air Station, Humble Channel Spoil Islands, South Bird Island, South of South Bird Island, and South Baffin Bay Islands were visited. Highest counts were obtained during the mid-May visit in comparison to visits later in the month.

Observations of morning and evening flight lines were made at three colonies. Reddish egrets at the Humble Channel Spoil islands primarily arrived from the west side of the Laguna Madre. From South of South Bird Island, they traveled across the Laguna Madre to the west, but most flight activity was directed toward the eastern side of the Laguna Madre. Flight activity from South Baffin Bay Islands was primarily directed toward the northeast when leaving the colony. No large concentrations of foraging reddish egrets were noted in the upper Laguna Madre as has been reported for the lower Laguna Madre (Farmer, 1990).

Table 2. Pairs of reddish egrets breeding at colonies along the Texas coast between 1989 and 1992. Blanks in columns represent lack of census data. Data compiled from Lange (1992), Wagner and Lange (1994), and Martin (1991). Mean represents mean number of pairs over years censused between 1989 and 1992.

Colony Name	1989	1990	1991	1992	Mean
GREEN ISLAND	20	220	540	600	345
THREE ISLAND SPOIL	217	220	63	36	134
LONG REEF-DEADMAN ISLANDS	135	120			127.5
SOUTH OF SOUTH BIRD ISLAND	23	130	83	110	86.5
SUNDOWN ISLAND	50	75	84	80	72.2
SECOND CHAIN OF ISLANDS	64	75			69.5
SHAMROCK ISLAND		75		56	65.5
SOUTH LAND CUT	28	49	110	46	58.2
ARROYO COL INT SPOIL	111	38	63	4	54
SOUTH BAFFIN BAY ISLAND	58	54	32	30	43.5
NORTHEAST MANSFIELD INTERSECTION	22	52	12	40	38.5
DRESSING POINT ISLAND	30	45	22	14	27.7
GREEN HILL SPOIL ISLAND	6	25	12	64	26.7
LAGUNA VISTA SPOIL	2	10	48	38	24.5
PITA ISLAND/ HUMBLE CHANNEL	27	25	18	18	22
CEDAR LAKES	15	28	18	20	20.2
SOUTH BIRD ISLAND	6	24	20	30	20
PELICAN ISLAND SPOIL	36	12		10	19.3
CAUSEWAY ISLAND PLATFORMS	17	36		2	18.3
NORTH DEER ISLAND	20	20	20	10	17.5
LITTLE BAY		14		16	15
NAVAL AIR STATION ISLAND		20	14	7	13.7
THIRD CHAIN OF ISLANDS	0	15			7.5
WEST NUECES BAY	10	10		1	7
PORT ISABEL SPOIL	5	9			7
EAST NUECES BAY	4	9		7	6.7
SEADRIFT ISLAND		12		0	6
MARKER 81 SPOIL ISLAND	2	10	6	6	6
CAUSEWAY ISLANDS	7	6	6	5	6
MARKER 139-153 SPOIL (21-35)	0	3	6	11	5
LAVACA BAY SPOIL (51-63)	2	11	4	3	5
GREEN ISLAND CUT SPOIL	13	7	0	0	5
STEAMBOAT ISLAND		7		0	3.5
MARKER 91 SPOIL ISLAND	11	2	0	0	3.2
BIG BAYOU SPOIL	0	0	0	13	3.2
ROLLOVER PASS	3	3			3
NORTH YARBOROUGH PASS	0	0	8	2	2.5
LAVACA BAY SPOIL (63-77)	0	6	3	2	2.2
KENEDY CAUSEWAY ISLANDS	4	3	1	1	2.2
WEST BAY BIRD ISLAND	8	0	0	0	2
MARKER 69A SPOIL ISLAND	5	0	2	1	2
LITTLE PELICAN ISLAND	2	4	1	1	2
SMITH POINT ISLAND	2	3		0	1.7
SOUTHWEST MANSFIELD	0	5	1	0	1.5
SOUTH THREE ISLANDS	0	4	2	0	1.5
SOUTH YARBOROUGH PASS	0	0	6	0	1.5
MUSTANG BAYOU	0	0	5	1	1.5
DRUM BAY	4	1	1	0	1.5
SNAKE ISLAND	4	0	0		1.3
SOUTH DEER ISLAND	0	0	5	0	1.2
MCALLIS POINT	3	0	0	0	0.7
MARKER 85 A SPOIL ISLAND	1	0	1	0	0.5
ATKINSON ISLAND #1	1	0			0.5
NEW SPOIL BANK ISLANDS 12	0	1	0	0	0.2
MATAGORDA BAY SPOIL (39-51)	0	1	0	0	0.2
EAST ARROYO SPOIL	0	1	0	0	0.2
DANA COVE	1	0	0	0	0.2
ARCADIA REEF	0	0	1	0	0.2

ACTIVITIES 1991-1995

Activities during this period focused on evaluation of factors affecting Brown Pelican colony formation and an attempt to establish additional colonies by luring pelicans to currently unused sites through deployment of decoys.

Information provided here will include historical occurrence and trends of Brown Pelican nesting on the Texas coast. We will also discuss the potential threats that may be faced by this species.

Historical Colony Sites and Trend Data

Mabie (1986) reviewed the historical information of colony location and current ownership and status. Pearson (1920) indicated that the historical population of the Brown Pelican in Texas numbered at least 5,000 pairs. An early decline in the population during the 1920's and 30's was attributed to persecution, particularly by fishermen who believed that the species was competing with them for fish resources. The populations underwent a dramatic decline that led to the extirpation of the species from the State of Louisiana and the decline of nesting in Texas to the point when, in 1964, no successful nesting was identified. This decline has been attributed to organochlorines which contaminated prey species and resulted in acute toxicity as well as reduced reproductive success in the pelican. Information gleaned from review of historical reports such as those provided in Oberholser (1974) is presented. Where possible source publications were reviewed to determine the extent of area covered by a particular surveyor. Data on historical colony use from 1855 to 1939 is provided in Table 3. Geographical distribution of these historical islands is illustrated in Figure 1. Egg collections (Anderson and Hickey, 1970) also provide information for breeding Brown Pelicans throughout the lower Texas Coast from 1886 through collections in 1951. Mabie (1986) suggests that several colonies were occupied by nesting pelicans between the 1940's and 1961. These islands include South Deer Island, Shell Island in Galveston Bay, and Coon Island. Geographical distribution of these historically used islands is illustrated in Figure 1.

Since the early 1960's, when concern for the plight of the species mounted, more accurate records were maintained that address nesting activity of the species on the Texas coast. Several sources of information have provided information on nesting Brown Pelicans on the Texas coast (Paul, 1977; King et al., 1977; Texas Colonial Waterbird Society, 1982; Mabie, 1986; Wagner and Lange, 1994; Lange, 1992; D. Blankinship, unpublished report; G. Blacklock, pers. comm.; E. Erfling, pers. comm.; C. Smith, pers. comm.; M. Lange, pers. comm.; M. Farmer, pers. comm.; W. Sohl, pers. comm.; R. Wahl, pers. comm.; P. Glass, pers. comm.). Colony use from 1963 to 1995 is provided in Tables 4 through 6. For some of these years, fledgling production is also included in the tables. For 1990 nesting, Texas Colonial Waterbird Society data were used in the table in order to be consistent. Our own data suggests that 675 to 685 nesting pairs produced between 693 and 793 fledglings. Geographical distribution of these recent nesting sites is illustrated in Figure 2.

The population of breeding Brown Pelicans has continued to grow throughout the 70's, 80's and 1990's, with 1995 nesting activity approaching that reported for historical populations. Figure 3 illustrates the increase of numbers of nesting pairs along the Texas coast since 1974. Growth in the nesting populations reflects an exponential growth rate with an intrinsic rate of increase (r) of approximately 0.27 (predicted growth illustrated by dotted curve in Figure 3). As can be seen from Table 6, however, only two islands represent more than 90% of breeding activity. Hopefully, the other islands used will continue to be used by nesting pelicans in 1996.

As these colonies grow, perhaps they will become the predictable colonies that Pelican Island in Corpus Christi Bay and Sundown Island in Matagorda Bay have become. Not reported in the tables are two nesting attempt in 1992 that were unsuccessful. Ten nests, some with 3 eggs present, were observed near the mouth of the Colorado River in West Matagorda Bay. Nesting was also attempted on Little Pelican Island in Galveston Island, but this attempt was also unsuccessful. Average annual fledgling production between 1967 and 1986 was approximately 1.3 fledglings/pair. Average annual increase in number of breeding pair between 1967 and 1995 was approximately 1.4. It is unknown how much exchange occurs between Mexican breeders and the Texas breeding population. Data from banded birds in the 1970's indicated that some of the population consisted of birds dispersing from Mexico, but recently no fledglings have been banded. Without data on bird movements, it is difficult to say whether Texas is serving as a source or a sink for dispersing Brown Pelicans. Blankinship (1987) reported nesting in Mexico in Laguna del Carmen and Laguna Machona, Hobox area (Laguna Yalahan), Isla Contoy area, Boca Paila area, and Bahia de la Ascension. No additional data is available to address the status and trends of Mexican populations.

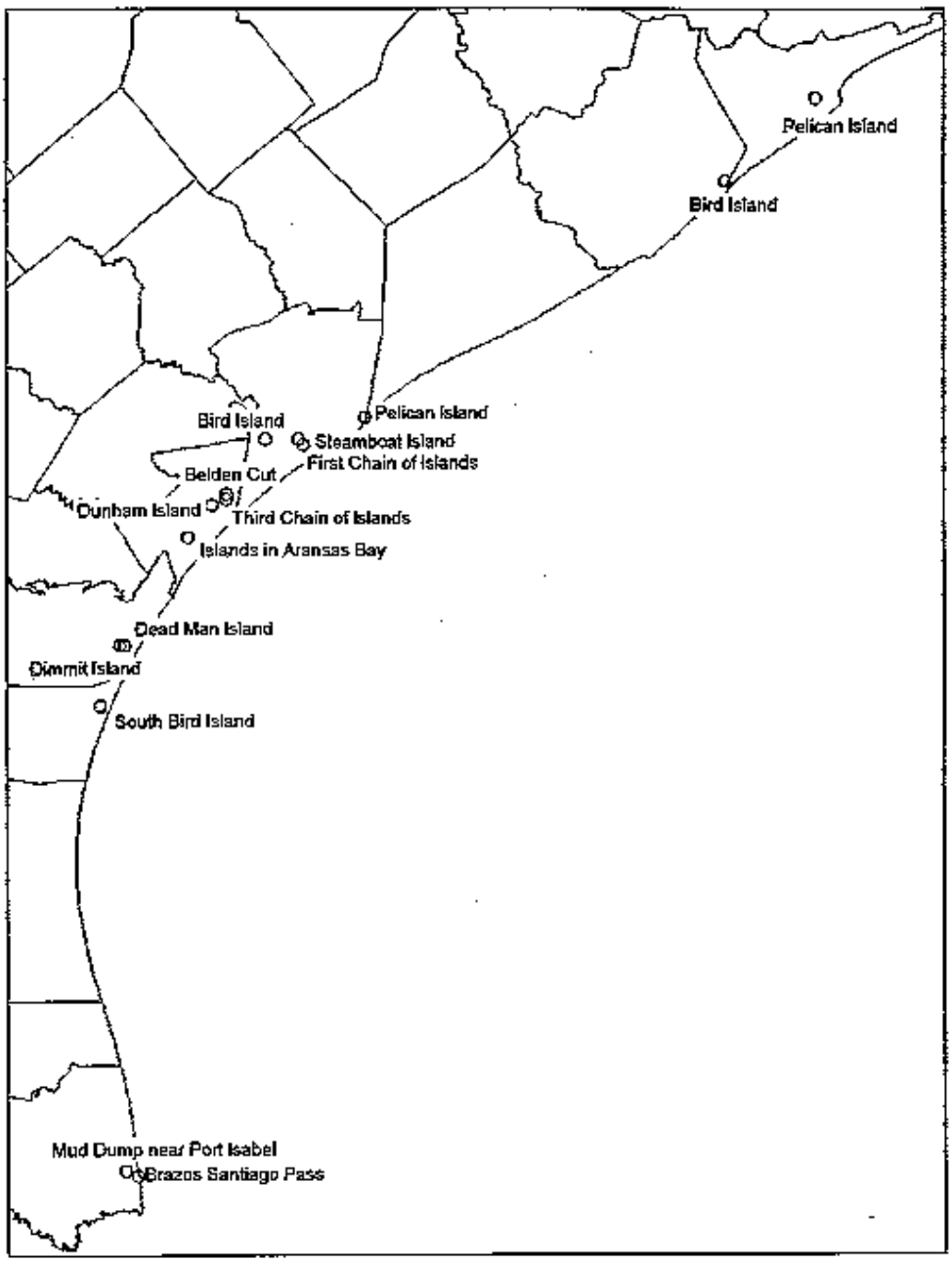

Figure 1. Map of islands used by nesting Brown Pelicans between 1855 and 1939. Additional information for these locations may be found in Table 3.

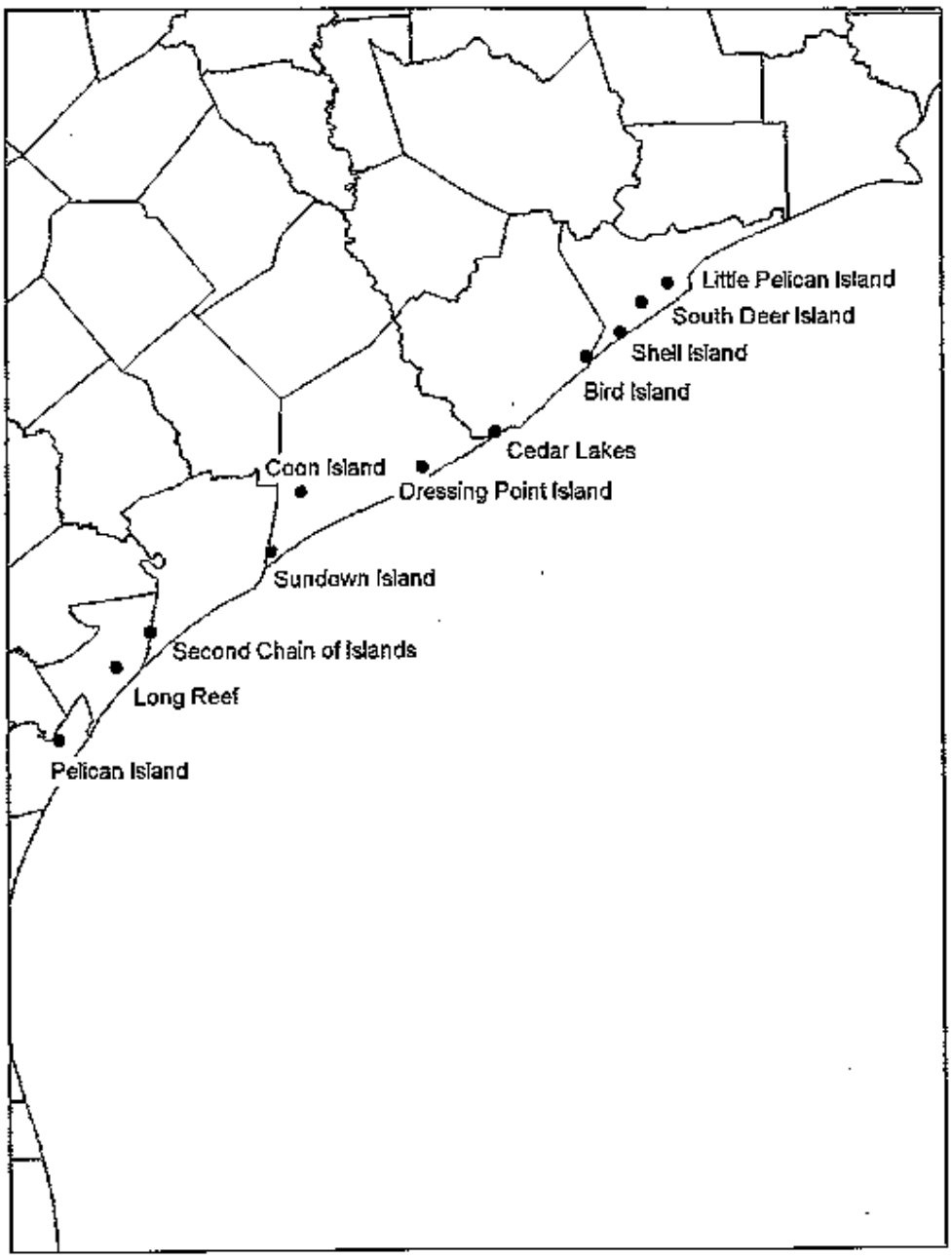

Figure 2. Map of locations of Brown Pelican nesting colonies that have been utilized on the Texas coast at some time between 1940 and the present. Additional information for nesting activity on many of these islands may be found in Tables 4, 5, and 6.

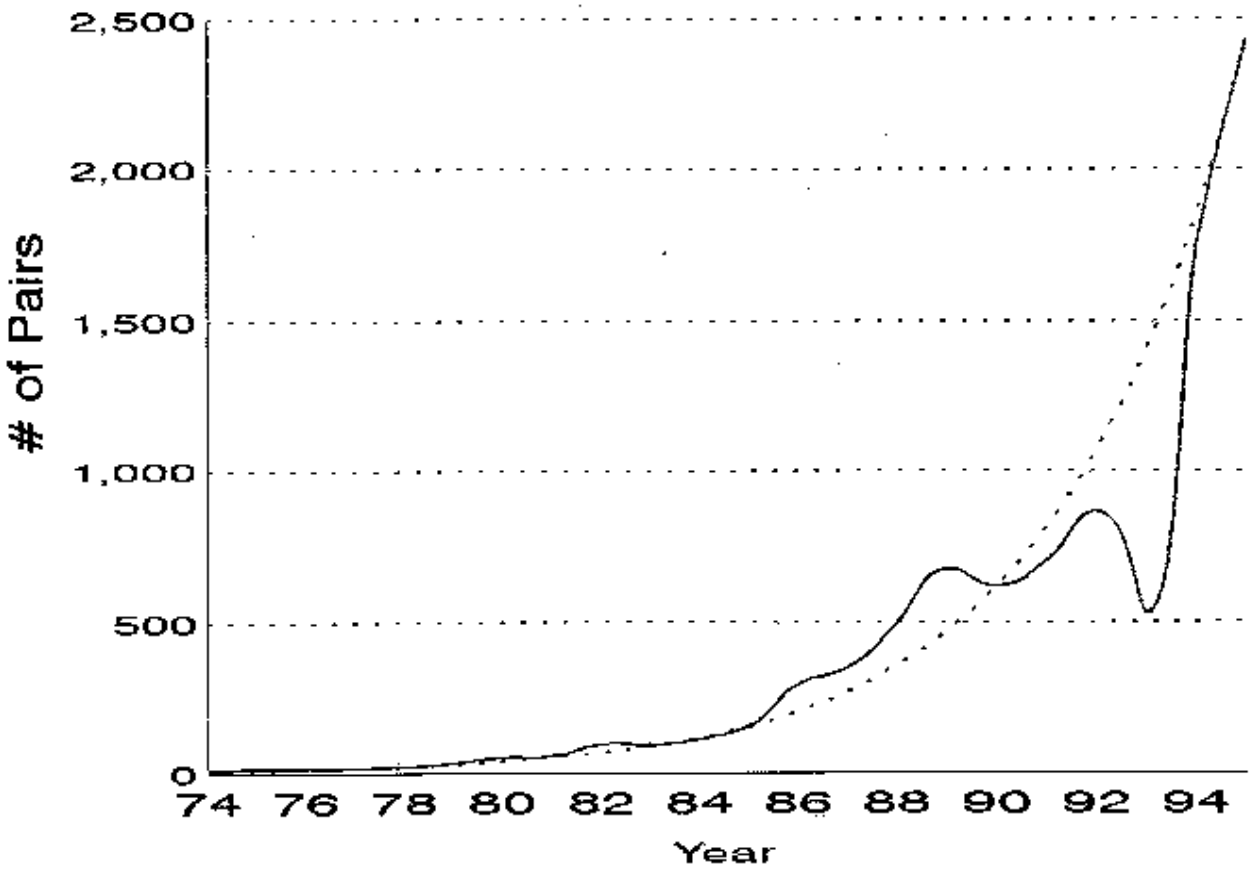

Figure 3. Graph of increase in population of nesting pairs of Brown Pelicans on the Texas coast since 1974. Solid line represents observed count of breeding pairs. Dotted line represents predicted exponential growth with intrinsic rate of increase of approximately 0.27.

Table 3. Historical nesting colonies for the Texas coast for the period 1855 to 1939. Asterisks indicate breeding reported for the year, numbers represent number of breeding pair unless otherwise indicated. The letter 'y' indicates young observed, 'e' indicates eggs observed.

Location	1855-58	1878	1889	1893	1905	1909	1919	1920	1923	1926	1927	1928	1931	1934	1935	1936	1938	1939
Pelican Island (Galveston Bay)	*																	
Bird Island (San Luis Pass)															y	41	300	
Pelican Island (Pass Cavallo)									7									
First Chain of Islands (formerly nested)																		
Ship Island (Calhoun Co.)													*					
Shell Island (San Antonio Bay) location uncertain												25-30						
Bird Island (San Antonio Bay)					*													
Bolivar Cut													*	*				
Third Chain of Islands														100's	*			
Dunham Island								304 y										
Islands in Aransas Bay				*														
Spoil Banks, Nueces Co.																		*
Pelican Island ? (Corpus Christi Bay)		2500																
Dinnit Island 1000's nested	*	*	*	*														
Deadman Island (Corpus Christi Pass)								1000										
South Bird Island (Kleberg Co.)			700			e & y	>1000	48		100's	*	*						
Mud Dump near Port Isabel											*							
Brazos Santiago Pass											*							

Table 4. Number of nests with number of fledglings produced from each colony in parentheses. Nesting data for 1963 as reported in Paul (1977), all other data as reported in King et al. (1977).

	Year											
Colony	63	64	65	66	67	68	69	70	71	72	73	74
Little Pelican Island		0	0	0	0	0	0	0	0	0	0	0
Sundown Island		0	0	0	0	0	0	0	0	0	0	3(0)
Second Chain of Islands		0	2	0	0	2(4)	0	3(0)	0	6(1)	6(11)	4(1)
Long Reef - Deadman Island		0	0	0	0	0	5(7)	0	0	0	0	0
Cedar Lakes		0	0	0	0	0	0	0	0	0	0	0
Dressing Point		0	0	0	0	0	0	0	0	0	0	0
Pelican Island Spoil		0	0	0	4(4)	0	0	5(9)	3(3)	3(0)	0	0
Total	14(18)	0	2	0	4(4)	2(4)	5(7)	8(9)	3(3)	9(1)	6(11)	7(1)

Table 5. Number of brown pelican nests for each colony for the period 1975 through 1986. Data through 1980 from Texas Colonial Waterbird Society (1982), 1981 through 1985 courtesy Lange (1992). Nest counts for 1975, 1981, and 1983 from Blankinship (unpublished reports). Total nest counts and fledgling production for 1975 - 1981 as reported in King et al. (1985), for 1982 - 1986 from Blankinship (unpublished reports). Ranges provided in total nest counts for 1978-1982 are due to nest abandonment and possible renesting making more precise counts impossible.

	Year											
Colony	75	76	77	78	79	80	81	82	83	84	85	86
Little Pelican Island	0	0	0	0	0	0	0	0	0	0	0	0
Sundown Island	0	0	0	0	0	0	0	0	0	0	0	0
Second Chain of Islands	0	8	0	0	0	22	13	16	16	0	0	0
Long Reef-Deadman I.	0	0	9	10	17	0	0	0	0	0	0	0
Cedar Lakes	0	0	0	0	0	0	1	0	0	0	0	0
Dressing Point	0	0	0	0	0	0	0	0	0	0	0	0
Pelican Island Spoil	18	8	8	14	13	30	43	83	80	115	160	300
Total Nest Counts	18	16	17	23-35	33-38	40-54	57	91-107	96	115	160	300
Fledglings Produced	9	16	34	37	46	76	46	168	184	230	>300	500

Table 6. Number of brown pelican nests for each colony for the period 1987 through 1995.. Data from G. Blacklock (pers. comm.), E. Erfling (pers. comm.), M. Farmer (pers. comm.), Lange (1992), C. Smith (pers. comm.), W. Sohl (pers. comm.) and personal observations.

	Year								
Colony	87	88	89	90	91	92	93	94	95
Little Pelican Island	0	0	0	0	0	0	0	125	>125
Sundown Island	2	0	60	100	153	263	300	>500	780
Second Chain of Islands	0	0	10	0	0	0	0	0	0
Long Reef - Deadman Island	0	0	0	0	0	0	0	0	0
Cedar Lakes	0	0	14	0	0	0	0	0	0
Dressing Point	0	0	25	19	0	0	0	0	15
Pelican Island Spoil	350	500	565	500	550	600	230	1126	1500
Total	352	500	674	619	703	863	530	1751	2420

Factors Affecting Brown Pelican Colony Formation

Several factors were suggested that may have important implications in the establishment of new colonies along the coast.

Proximity to Passes

Since pelicans locate their prey visually and dive into the water from a height to catch fish (Orians, 1969; Schreiber, 1977), they require water with high visibility and adequate prey density. This is particularly true during the nesting season since it may require as much as 50 kilograms of fish to raise a nestling pelican (Schreiber, 1976). Texas bays are very turbid during the spring and summer, with clear water consistently available only along the gulf shore. Pelican colonies are commonly on islands associated with passes to the Gulf (Table 7.) Non-breeding pelicans also seem to use areas surrounding these passes (P. Glass, pers. comm.; D. Blankinship, pers. comm.). In addition to water clarity and prey availability, there may be aerodynamic reasons for locating nest sites near passes.

Table 7. Selected nesting localities for the brown pelican along the Texas coast, identifying the nearest pass and the distance to the Gulf side of that pass (to the nearest mile).

Colony	Bay	Near Pass	Distance
Pelican Island	Galveston	Bolivar Roads	5
South Deer Island	W. Galveston	Bolivar Roads	10+
Shell Island	W. Galveston	San Louis Pass	10
Bird Island	W. Galveston	San Louis Pass	2
Cedar Lakes	Cedar Lakes	None	
Dressing Point	E. Matagorda	None	
Dog Reef Islands	Matagorda	Colorado River	3
Coon Island	Tres Palacios	Pass Cavallo	10+
Pelican Island	Matagorda	Pass Cavallo	1
Sundown Island	Matagorda	Pass Cavallo	3
Shell Island	San Antonio	Cedar Bayou	10+
First Chain	Espirito Santo	Pass Cavallo	10+
Steamboat Island	Espirito Santo	Pass Cavallo	10+
Bird Island	San Antonio	Cedar Bayou	10+
Second Chain	San Antonio	Cedar Bayou	9
Belden Cut	Mesquite	Cedar Bayou	6
Third Chain	Mesquite	Cedar Bayou	6
Dunham Island	Aransas	Cedar Bayou	6
Long Reef	Aransas	Cedar Bayou	7
Dimmit Island	Corpus Christi	Corpus Christi Pass	7
Deadman Island	Corpus Christi	Corpus Christi Pass	3
Pelican Island	Corpus Christi	Aransas Pass	7
S. Bird Island	Laguna Madre	Corpus Christi Pass	10+

Prey Abundance

Several authors suggest that breeding success in pelicans may be related to the abundance of prey fishes (Schreiber and Schreiber, 1983; Mendenhall and Prouty, 1978; Anderson and Hickey, 1970; Anderson et al., 1975, 1982). In Texas, passes may provide reliable concentrations of prey species including white mullet (*Mugil curema*) and menhaden (*Brevoortia* sp.) (Moore, 1974; Hoese and Moore, 1977). Future research should address the association between concentrations of prey species and brown pelican breeding localities.

Nest Substrate

In Texas, pelicans nest on the ground or near ground level. There appears to be no preference for particular vegetation types. Brown pelicans nest on prostrate succulents (such as *Sesuvium portulacastrum*), low shrubs (*Borrichia frutescens*), among sunflowers (*Helianthus* sp.), cordgrass (*Spartina spartinae*), and mesquite (*Prosopis* sp.). Some nests are on sparsely vegetated shell, or sand and shell.

Human Disturbance

Human disturbance of pelican nesting is a limiting factor identified by the recovery plan (USFWS 1979) and other authors (Oberholser 1974, Jehl 1973, Anderson 1988). Anderson (1988) found that pelicans moved to sites remote from human disturbance.

Use of Decoys to Encourage Nesting

Full body Canada Goose decoys were modified and painted to closely resemble brown pelicans. Forty-eight decoys with alert heads were obtained and pelicans bills, with pouches, were fabricated from 3/4 inch western red cedar, coated with an oil primer and attached to the decoy heads. Bill colors were painted over the primer and the head was painted in the pattern of a breeding adult Brown Pelican, following photographs and observations of wild birds.

Site selection for deployment of these decoys was made in 1992 on the basis of site visits to verify the presence of loafing adult pelicans and the presence of appropriate characteristics to indicate that the island may serve as a potential nesting site. Mansfield Intersection island was chosen as a potential site due to the occurrence of loafing adults, the presence of appropriate substrate and proximity to the Mansfield Channel Pass. A second site was chosen because of its proximity to the site of a previous unsuccessful nesting attempt, and the presence of appropriate characteristics. This site was located near the mouth of the Colorado River in West Matagorda Bay and is referred to as Dog Reef.

In 1993, twenty decoys were deployed on the two islands in February. Although large numbers of adults (more than 40 at Mansfield Intersection, and more than 200 at Dog Reef) were seen at both sites during May and June, no nesting was detected. Signs to indicate the sensitivity of the sites to human disturbance were erected. However, the Mansfield Intersection has significant boat traffic around it and a local fishing guide indicated that the Dog Reef Islands receive significant disturbance from air boat traffic.

In 1994, twenty decoys were deployed on the Dog Reef Islands in February. Decoys were not deployed at Port Mansfield. The largest number of pelicans were seen near the site on May 5, 1994; 5 adults and 12 juveniles. A local observer (Raymond Cox, pers. comm.) noted brown pelicans carrying sticks to the decoyed island in mid-April. No evidence of pelican nesting was found when the island was intensively searched in late June. Substantial fire ant activity was noted during the late June visit and the effect of this activity on nest site selection is unknown.

In 1995, twenty decoys were deployed on the Dog Reef Islands and on Second Chain of Islands (a historical pelican nesting site) in February. No nesting occurred on either island.

Threats

Pollution

All of the islands currently used by nesting Brown Pelicans occur adjacent to major transportation corridors. Several of the most important ones occur at the intersections of heavily used transport routes. These routes are used to transport petroleum products and the potential for adverse impacts associated with spills of these products is great. During 1995, two spills occurred which raised concern as to impacts to Sundown Island and Pelican Island, the two most important nesting islands on the coast. An oil spill which distributed a heavy product along the Texas coast south to Padre Island entered Matagorda Bay and threatened to impact Sundown Island. This spill occurred prior to the onset of nesting activity, so the threat was greatest for adults using the pass. In April of 1995, a cumene spill occurred near Ingleside on the north side of Corpus Christi Bay. This product is a volatile product which produces dangerous vapors. The public was evacuated from the area of the spill and the wind blew the plume of volatilized product over Pelican Island. Luckily, no mortality was detected as a result of this spill. These two spills do serve to illustrate the threat to these breeding colonies as a result of oil or toxic spills.

Human Disturbance

Human disturbance continues to be a concern relative to development of additional pelican colonies. The U. S. Fish and Wildlife Service successfully publicized the young colony forming on Little Pelican Island, and this publicity may have aided in allowing this colony to be productive. Continued disturbance has been reported for the Dog Reef Islands, and no additional nesting has taken place on these islands. Additional publicity and wardening may be required before additional islands are colonized.

Erosion

The occurrence of these islands on heavily used transport routes contributes to their erosion. All of the currently important nesting islands were produced as a result of dredge disposal, and maintenance of these islands may require continued placement of dredge material on them. Other erosion control management should be accomplished where possible. Currently, negotiations are being made to provide for deposition of dredge material on Sundown and Pelican Islands.

Predators

Predators continue to be a threat to many of the waterbirds colonies. Many of these mammalian predators can be controlled on islands where a continuous influx of predators does not occur. Currently, predators are not posing a serious threat to existing Brown Pelican colonies.

Imported Fire Ants

Imported fire ants have been implicated as deleterious factors in the reproduction of colonial waterbirds. The importance of this pest relative to Brown Pelican nesting activity and colony formation is unclear, and further research on effects and management should be supported.

Causeway and Other Mortalities

The Port Isabel Causeway continues to be a source of mortality during north fronts when pelicans fly over the causeway, are forced down on the deck of the bridge by turbulence, and are struck by cars. The Texas Department of Transportation has taken steps to reduce this mortality. Additional morbidity and mortality can be attributed annually to entanglement with fishing gear.

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