

# Effect of Hurricane Andrew on Louisiana's Nesting Bald Eagles

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*Abstract:* Hurricane Andrew, a Class 3 storm, entered St. Mary Parish, Louisiana, on 26 August 1992. Sixty-one (59%) of the state's bald eagle (*Haliaeetus leucocephalus*) nest territories were within the storm path, and, following the hurricane, 18 of these were classified as destroyed. Aerial nest survey data for 4 nesting seasons (1990–1994) were used to evaluate the effect of Hurricane Andrew on bald eagle reproductive success in Louisiana. Mean annual production per active territory was 1.40 (range 1.20–1.66) and per successful nest was 1.66 (range 1.45–1.85). Productivity (young/active territory) for hurricane affected nests (HAN) did not differ from non-affected nests (NAN) for any year except 1993–94, when production was higher in the HAN. Production declined for all nests between 1991–92 and 1992–93, possibly as a result of severe winter weather. Hurricane Andrew probably had no short term effect on Louisiana's bald eagle population.

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Bald eagles were reported as common residents in southern Louisiana during the early 1990s (Bailey 1919). Population levels were unknown during the early part of the century, and reached lows in the mid-1960s and 1970s (La. Dep. Wildl. Fish, unpubl. data). Many factors, including habitat destruction, human disturbance, shooting, and chemical contamination, contributed to the decline in bald eagle populations (Dugoni 1980). Personnel of the U.S. Fish and Wildlife Service (USFWS) reported 6 or 7 active bald eagle nests in Louisiana in 1972 (Lowery 1974). Formal Louisiana bald eagle surveys were initiated in 1974–75 and documented 5 active nesting territories, which increased to 80 active nesting territories in 1992–93 (Hess 1993).

Hurricane Andrew, a Class 3 storm generating 217 km/hr winds, entered St. Mary Parish from the Gulf of Mexico on 26 August 1992. The storm traveled in a northward direction damaging coastal wetlands (La. State Univ. 1992). Over 50% of the state's nesting territories were within the hurricane path. The Louisiana Department of Wildlife and Fisheries (LDWF) in conjunction with the USFWS developed this project to document the effect of Hurricane Andrew on Louisiana's bald eagle population, with special emphasis on nest productivity.

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## Methods

Louisiana bald eagle nesting territories were surveyed by fixed wing aircraft or helicopter during the 4-year study period (1990-91 to 1993-94). Survey techniques were similar to methodologies reported by Grier et al. (1981) for fixed-wing aircraft and Watson (1993) for helicopters. A Cessna 210, Cessna 185 float plane, or Bell Jet Ranger Model 206B helicopter was used. Air speed for the fixed-wing aircraft ranged from 80-90 knots, and altitude ranged from 20-100 m above treetops when visiting nests.

Survey work was concentrated along the marsh/swamp interface of fresh and intermediate marshes in coastal Louisiana (La. Dept. Wildl. Fish, unpubl. data). Nests were visited at least twice per year in south Louisiana where the majority of nests were located. Two nests in north Louisiana were visited once per year during the study period. Known or reported nests were regularly surveyed and many new nests were located when traveling from nest to nest. The number of active nesting territories increased as the study progressed due in part to an expanded survey effort and enhanced personnel expertise, similar to findings by Nesbitt et al. (1975). Survey results represent a minimum estimate of nesting territories since no systematic nor random survey technique was used.

Surveys began in mid to late January. Nesting territories were considered active if an adult was present at the nest (Sprunt et al. 1973, Nesbitt et al. 1975). Successful nests were those producing fledglings (McEwan and Hirth 1979).

Loran C navigation equipment (II Morrow) was used to map and locate nests during 1990-91 and 1991-92. Global Positioning System (GPS) equipment (Garmin 55) was used beginning 1992-93. GPS equipment produced precise latitude and longitude coordinates which facilitated nest visitation.

Hurricane Andrew affected coastal areas from New Iberia to Houma, Louisiana (Fig. 1). A total of 103 nesting territories were surveyed during 1992-93.

Sixty-one (59%) nesting territories were located within the hurricane path, and 18 nests (17%) were categorized as hurricane affected nests (HAN) by helicopter survey 1 and 15 November 1992. All HAN nests were either destroyed or exhibited obvious signs of hurricane damage.

Chi-square contingency tables were used to compare young/active territory for hurricane affected nests versus non-affected nests (NAN) for each of the 4 survey years. The same procedure was used to compare young/active territory in 1991–92 versus 1992–93 for both HAN and NAN.

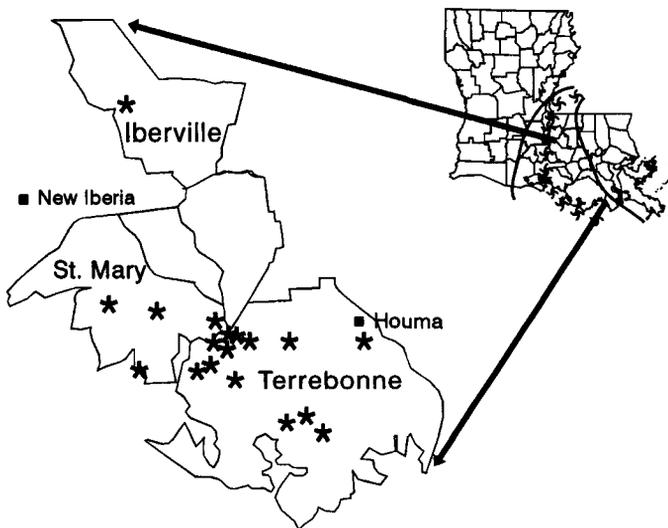
## Results

Louisiana's bald eagle productivity was calculated by year from 1990–91 to 1993–94 (Table 1). Mean annual production per active territory was 1.40 (range 1.20–1.66) and per successful nest was 1.66 (range 1.45–1.85).

HAN production did not differ from NAN production for any year except 1993–94, when production was higher in the HAN (Table 2). Production in 1992–93 declined from 1991–92 in the HAN ( $\chi^2 = 10.091$ , 2 df,  $P < 0.01$ ). However, production also declined in the NAN for the same period ( $\chi^2 = 9.637$ , 3 df,  $P < 0.05$ ).

## Discussion

A comparison of fledgling production prior to and after Hurricane Andrew demonstrated the storm had no detectable short-term effect on Louisiana bald



**Figure 1.** Location of Hurricane Andrew path through Louisiana and destroyed or damaged bald eagle (*Haliaeetus leucocephalus*) nests (\*) in Terrebonne, St. Mary, and Iberville parishes.

**Table 1.** Louisiana Bald Eagle production data<sup>a</sup> from aerial surveys, 1990–91–1993–94.

Year	Active territories			Successful nests			Young produced			Young/Active territory			Young/successful nest		
	HA	NA	TOT	HA	NA	TOT	HA	NA	TOT	HA	NA	TOT	HA	NA	TOT
1990–91	10	30	40	8	27	35	12	42	54	1.20	1.40	1.35	1.50	1.56	1.54
1991–92	17	36	53	16	34	50	29	59	88	1.71	1.64	1.66	1.81	1.74	1.76
1992–93	12	68	80	9	57	66	11	85	96	0.92	1.25	1.20	1.22	1.49	1.45
1993–94	11	79	90	10	61	71	20	111	131	1.82	1.41	1.46	2.00	1.82	1.85
Weighted average										1.44	1.39	1.40	1.67	1.66	1.66

<sup>a</sup>HA = Hurricane Affected Nests; NA = Non-hurricane Affected Nests; TOT = total.

**Table 2.** Louisiana bald eagle productivity comparisons between hurricane affected nests (HAN) and non-hurricane affected nests (NAN), 1990–91–1993–94.

Year	Young/Active nest		$\chi^2$	df	P
	HAN	NAN			
1990–91	1.20	1.40	0.758	2	>0.20
1991–92	1.71	1.64	1.428	2	>0.20
1992–93	0.92	1.25	2.432	3	>0.20
1993–94	1.82	1.41	8.493	3	<0.05

eagle nesting. Mean annual Louisiana production of 1.40 exceeded that reported by Sprunt et al. (1973) and McEwan and Hirth (1979), 0.73 and 1.14 young/active territory, respectively. Sprunt et al. (1973) reported more breeding bald eagles in Florida than any state except Alaska. An apparent stable population of 50 to 55 Everglades National Park bald eagle pairs were intensively studied from 1961 to 1972. McEwan and Hirth (1979) suggests a growing eagle population in north-central Florida, since reproductive rates were equal to the highest rates reported for the species by Sprunt et al. (1973). The Southeastern States Bald Eagle Recovery Plan (U.S. Fish and Wild. Serv. 1984) suggests that breeding productivity, over a 3-year average, should be >0.9 young/occupied nest and >1.5 young/successful nest for delisting purposes. A more conservative production calculation method was used in this report which calculated young/active territory rather than young/occupied nest. An occupied nest (or occupied breeding area) was defined by the Recovery Plan as a breeding attempt by a pair of eagles, whereas our definition of active nest included some nests where no actual breeding attempt occurred.

Although mean annual young/active territory production was high at 1.40, the number of active territories within the hurricane affected area declined after 1991–92. Many factors such as survey technique, human disturbance, industrial development, and natural attrition which are outside the scope of this study could have caused the decline.

Production was significantly greater ( $P < 0.05$ ) for HAN versus NAN for 1993–94 which indicates Hurricane Andrew did not limit productivity. Curnutt and Robertson (1993) reported hurricane nest destruction at the beginning of nest activity in Florida Bay during 1960 and 1965. Approximately half of the nesting pairs built new nests after the storms.

Harris et al. (1987) reported substantial nest loss due to storms and lightning. Approximately 11% of occupied nests were destroyed annually which suggests that severe weather, storms, and hurricanes may limit productivity.

We identified 18 (24%) active nests destroyed by the hurricane. Fifteen (83%) of the destroyed nests were rebuilt within the same nesting territory immediately following the storm (1992–93), and a cumulative total of 17 (94%) were rebuilt by the year after the storm (1993–94) (Table 3). This supports Harris et al. (1987) observations on nest reconstruction and nest site tenacity.

There was a decline ( $P < 0.01$ ) in production in the HAN between 1991–92 and 1992–93. Production also declined ( $P < 0.05$ ) in the NAN for the same time period. This reflects an overall decline in average productivity (1.20) for the state's 1992–93 nesting population. Inclement winter weather and reduced food supplies due to a massive fish kill after the storm (Walker 1992) were probable causes of the 1992–93 productivity decline.

Hurricane Andrew was a severe storm that had the potential to adversely affect Louisiana's nesting bald eagle population because over half of the state's

**Table 3.** Reconstruction chronology and productivity of eagle nests destroyed by Hurricane Andrew, 25–26 August 1992.

Nesting territory	Reconstruction chronology	Young/Active nest	
		1992–93	1993–94
Bay Wallace	a	0	d
Bayou Black	a	1	2
Lake Penchant	a	1	d
South Avoca Island	a	2	0
Amelia	a	1	d
West Mauvais Bois	a	1	2
Garden City Field	a	0	2
Sugar Ridge	a	1	2
Big Horn Bayou	a	1	2
Belle Isle	a	1	2
La Pointe	a	0	2
East Park	a	0	d
North Turtle Bayou No. 2	a	0	c
North Turtle Bayou No. 3	a	0	1
North Burke Canal	a	2	3
Bayou Penchant	b	c	0
Grand Lake Flats	b	c	2
Marsha	c	c	c

<sup>a</sup>1992–93.

<sup>b</sup>1993–94.

<sup>c</sup>Deserted.

<sup>d</sup>Inactive.

nesting territories were located in its path. Hurricane Andrew did not significantly affect production. Storm damage assessment monitoring will continue through 1997–98. Our observations suggest periodically severe winter weather may have an adverse impact on Louisiana bald eagle productivity. An evaluation of the impact of winter weather on eagles should be begun as soon as possible.

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