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COVER PHOTO: Whiskered Tern at Bunker Pond, Cape May Point State Park July 13, 1993. First North American record. Photo in color by Jim Williams.

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Status of Ospreys Nesting in New Jersey, 1984 through 1993

by KATHLEEN E. CLARK and C. DAVID JENKINS

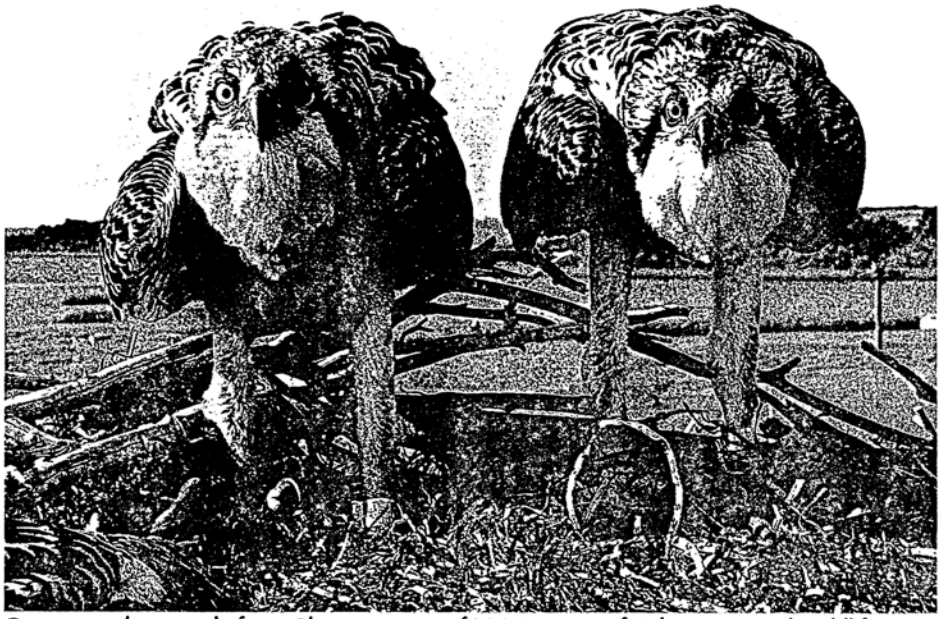
Introduction

The Osprey population in southern NJ, which numbered at least 300 nesting pairs prior to 1945, declined to about 50 pairs by 1975 with the lowest reproductive rate of all populations on the East coast (Henny 1977, Spitzer *et al.* 1983). The cause of this drastic decline, like the decline in many raptor species, was the indirect effect of the pesticide DDT, used for agricultural pest and mosquito control in the 1950's and early 1960's. DDT caused a deficiency in the way eggshells were produced, and eggs broke during incubation. The chemical was banned in NJ in 1968.

The Osprey was listed as endangered in NJ in 1973 when the state Endangered Species Conservation Act passed. The following year the Endangered and Nongame Species Program (ENSP) began a restoration program for the Osprey, and biologists transplanted healthier Osprey eggs from Maryland to active nests in Barnegat Bay (McLain and Schubert 1974). As the population increased slowly, nest structures were placed in salt marsh along the Atlantic coast to improve nesting habitat.

Statewide nesting activity and production has been monitored each year since 1979. Productivity improved each year: in 1979, production was estimated at 0.97 young per occupied nest, in 1980, 1.20, and in 1981, 1.02 (Frier 1981). From 1982 to 1984, Osprey production averaged 1.18 chicks per occupied nest. The official status of Ospreys in the state was changed from endangered to threatened in 1985, based on good reproduction, ospreys' acceptance of man-made nest structures, and the decline of persistent pesticides (Belton *et al.* 1982, Frier-Murza and Kell 1984, Niles *et al.* 1984). The Osprey remains the only species in NJ upgraded from endangered as a result of population recovery,

Despite the good production of Ospreys along the Atlantic coast, production in Salem County on Delaware Bay has been consistently low, The nine year production average (1985 through 1993) in Salem was 0.87 young per active nest, and has infrequently reached 1.0 young per nest, indicating an unstable population. The number of active nests in Salem has also declined after a high in 1984, perhaps related to poor production



Ospreys at the nest platform. Photo courtesy of N.J. Division of Fish, Game and Wildlife.

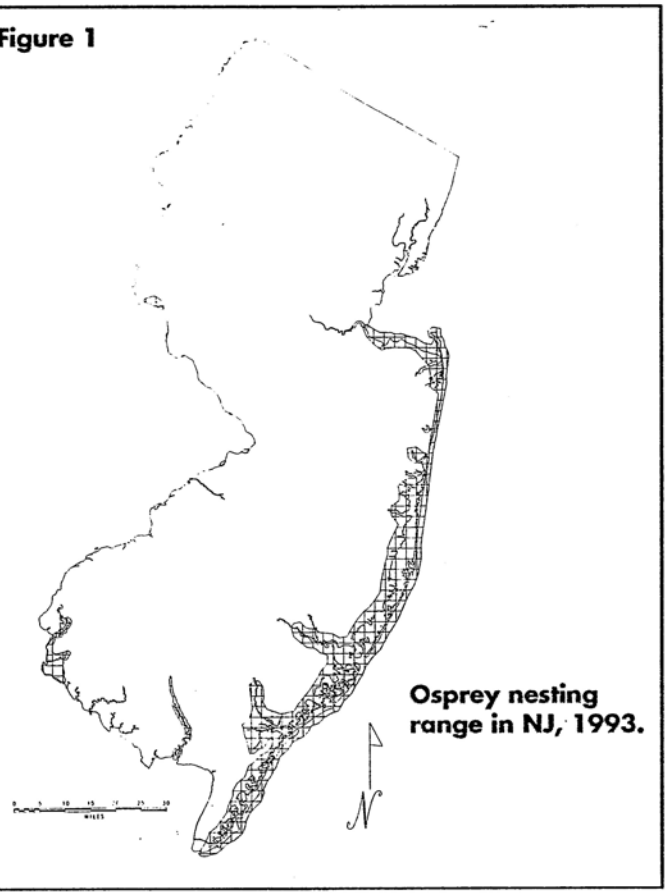
and a lack of young to replace adults.

Poor productivity at the Salem County colony was investigated in 1987-1989. The results showed that more nests failed and fewer eggs hatched in the Salem colony compared to Atlantic Coast birds (Steidl *et al.* 1991a). Although nestling mortality was similar to that of an Atlantic coast colony, nestlings in Salem were more often preyed upon by Great Horned Owls. Also, adults spent less time at the nest than adults on the Atlantic, perhaps flying greater distances for food, but spent about the same amount of time actually feeding young (Steidl *et al.* 1991a). Analysis of eggs showed that Salem County Ospreys had thinner eggshells (10.4% thin) compared to Atlantic Ospreys (4.7% thin) (Steidl *et al.* 1991b). Eggs from Salem contained higher levels of DDT metabolites (DDE and DDD), PCBs and dieldrin than Atlantic eggs. In a search for the source of these contaminants, samples of potential fish prey were taken from waters near each colony. The differences in fish contaminant levels accounted for the regional differences in Osprey egg levels (Steidl *et al.* 1991b). Although Osprey populations can survive eggshell thinning of 10% (Wiemeyer *et al.* 1989), the Salem County population is monitored closely to determine the long-term effects of moderate food chain contamination.

Methods

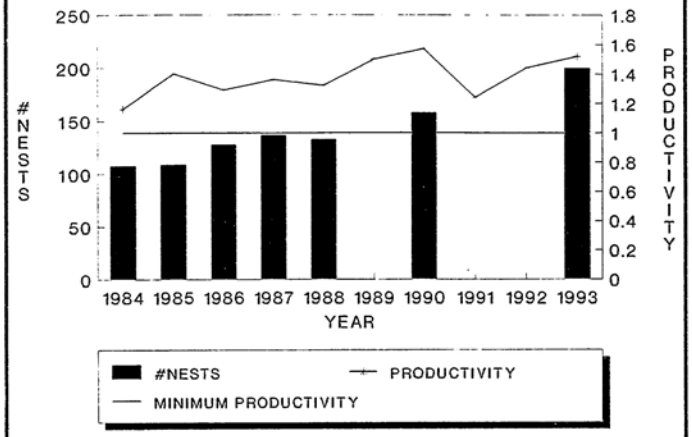
We conducted aerial surveys to determine distribution and reproductive status of Ospreys every year until 1988, and now conduct them every two years (except for 1991-92). The survey flights cover most of the osprey's nesting range, along the Atlantic coast from Sandy Hook to Cape May, and the Maurice River and Artificial Island area on Delaware Bay (Fig. 1).

Figure 1



Osprey nesting range in NJ, 1993.

Figure 2
Osprey nests and productivity in NJ, 1984-1993.



We estimate productivity from known-outcome nests only. Nest success is measured by number of young observed during nest visits when young are banded, in mid-June to early July. Staff and cooperators with federal permits band young in colonies on the Atlantic coast, and on Delaware Bay on the Maurice River and Salem County. Areas sampled for productivity cover the entire nesting range. At nest visits, banders record the number of nestlings, and band young with size eight lock-on federal bands We recorded possible failed nests as those occupied by at least one adult but without chicks or eggs. Unhatched eggs are collected in nests where incubation has ceased, and stored for future contaminant analysis research.

Much of NJ's Osprey population nests on artificial nest structures. Staff and volunteers build new nest structures with emphasis on placing them in coastal areas lacking structures. Structures are generally of single-pole design with a cross-structure or box on top (3.0-5.0 m high), but many in predator-free island habitat are four-post structures 1.3-2.0 m in height.

Results and Discussion

In 1993, Ospreys reached a population of 200 active nests, an 85% increase from ten years ago (Table 1, Fig. 2), and up 300% from 1974 levels. Most of the population growth has been along the Atlantic coast in localized areas, especially Avalon-Stone Harbor and Wildwood (Cape May County), Great Egg Harbor (Cape May-Atlantic counties), and Sedge Islands Wildlife Management Area in Ocean County. This kind of colony growth could be expected, since male Ospreys tend to return to nest within 10 km of their natal area (Poole 1989). Further, nesting Ospreys are faithful to the same nest year after year.

The new nest on the upper Delaware River (Hunterdon County) is likely a result of another phase of the ENSP Osprey management project. Biologists released through "hacking" a total of 37 Ospreys on northern NJ lakes in 1985 through 1989, to help restore the birds to that part of their historic range (Sciascia 1990). These Ospreys should seek nest sites on the northern lakes and rivers once they reach breeding age.

Productivity

Productivity has averaged 1.37 young per active nest in the last

Table 1. Osprey nesting and productivity in New Jersey, 1984-1993, by county.

County	1984	1985	1986	1987	1988	1989[a]	1990	1991[a]	1992[a]	1993	Overall
Atlantic	11	12	14	19	16		22			26	
Burlington	2	2	2	2	2		2			4	
Cape May	53	56	63	61	64		73			85	
Camden	0	0	0	0	1		1			1	
Cumberland	2	3	3	5	7		7			11	
Hunterdon	0	0	0	0	0		0			1	
Monmouth	5	5	6	7	8		8			10	
Ocean	21	20	31	32	24		38			50	
Salem	14	11	9	11	11		7			12	
Total Nests	108	109	128	137	133		158			200	
Productivity[b]	1.16	1.40	1.29	1.36	1.32	1.50	1.57	1.24	1.44	1.52	1.37
Sample size (n)	105	108	122	119	115	60	67	88	105	67	956

a No aerial survey conducted
b Productivity estimate from sampled regions

ten years (Table 1, Fig. 2). This rate of production is well above the minimum necessary to maintain a population (Spitzer *et al.* 1983). Further, productivity in the last few years remained high, indicating the population will continue to grow.

A lack of suitable nest structures may now limit population growth on the Atlantic Coast. One of the impacts of development has been loss of suitable habitat in the form of nest trees and disturbance-free areas. Ospreys now use mostly artificial wooden structures and old telephone poles (75.5%), but also use transmission towers, channel markers, trees and duck blinds (Table 2). Ospreys are better able to adapt to many different available structures, as well as to adjust to higher levels of human activity than many wildlife species (Poole 1989).

Salem County Colony

This colony continues to be an area of concern. In 1993 ten nests were active, and six of those were successful in producing six young, for a production rate of 0.60. In recent years Salem has had 10-12 active nests, with moderate to poor production each year (Clark 1990). All nests are in salt marsh on transmission towers emanating from Salem-Hope Creek Nuclear Generating Station.

The decline in number of nests in recent years and continuing low productivity are elements of a declining population (Table 1, Salem County up to 1990). A recent study revealed contamination of the food chain possibly causing lower hatchability of eggs (Steidl *et al.* 1991a). This might be expected from high levels of embryotoxic PCB isomers, as reported by Kubiak *et al.* (1989) with Forster's Terns. Specific PCB isomers that may be responsible for problems at Salem are now being studied by ENSP; results are expected in late 1994.

Salem Ospreys also face predation by Great Horned Owls (Steidl *et al.*, 1991a); Osprey nest defense is likely impaired by the structure of their transmission tower nest locations. ENSP and PSE&G biologists have managed the nests recently to address this problem: a nest structure was provided on a corner outside the tower structure at ten nests, to allow adult Ospreys a larger area in which to defend their nest. In 1993 one pair nested in the corner platform and was the only pair to fledge two young.

Although higher contaminant levels have been associated with fish from Delaware Bay, a recent Osprey colony also on the bay on Maurice River in Cumberland County has grown. In 1984 there were just two nests on Maurice River, and in 1993 that number was 11. We tested Maurice River Ospreys for contaminants and eggshell thinning, and found a level intermediate between Salem and Atlantic Ospreys (Steidl *et al.* 1991b).

Banding

A total of 131 nestlings were banded by staff and volunteers in 1993. In the last ten years, over 1,040 Ospreys have been banded in

Table 2.
Structures used for nesting by NJ Ospreys in 1993.

Structure	# Nests (%)
Pole, platform, old telephone pole	151 (75.5%)
Transmission tower	15 (7.5%)
Tree	13 (6.5%)
Channel Marker	13 (6.5%)
Ground	3 (1.5%)
Abandoned house, crane and barge	4 (2.0%)
Antenna tower	1 (0.5%)
TOTAL	200 (100%)

NJ nests. This information represents an important monitoring tool for Osprey survival, migration, and nest area selection patterns (see Poole 1989).

Conclusions

The state's population of Ospreys has grown substantially since the recovery program began in 1974, reaching 200 nests in 1993. Ospreys have expanded to inhabit much of their historic range, and are just beginning to reach into northern NJ. Overall Ospreys have shown an ability to adapt to our human-altered environment, yet they remain an important species to monitor the health of that environment. Ospreys continue to reflect problems of contaminants in some estuarine habitats, suggesting to biologists the areas and types of toxics to monitor. Biologists and citizens will need to continue their management efforts to maintain good nesting habitat for this species.

Acknowledgments

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—Kathleen E. Clark and C. David Jenkins
Endangered and Nongame Species Program
NJ Division of Fish, Game and Wildlife
P.O. Box 236
Tuckahoe, NJ 08250-0236