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LONG-TERM POPULATION MONITORING OF OSPREY ALONG THE UMPQUA RIVER IN WESTERN OREGON

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Abstract.—From 1981–90, the osprey population along the Umpqua River between Roseburg and Reedsport, Oregon increased by 153% (17% annual rate). The first observed decrease in the population occurred in 1991 when one previously occupied breeding territory became vacant. Management activities on USDI Bureau of Land Management administered lands within the study area between 1981–88 consisted of the installation of 24 nesting platforms and 17 accessory perches. During this study, 15 of the platforms were occupied by breeding ospreys accounting for over 40% of the total population increase along the Umpqua River. Productivity surveys using either ground survey (1981 and 1984) or helicopter survey (1982, 1983, 1985–91) techniques estimated an average productivity of 1.21 (range = 0.87–1.86) fledglings/occupied territory, 1.33 (range = 0.93–1.93) fledglings/breeding attempt, and 2.04 (range = 1.50–2.47) fledglings/successful breeding attempt. Platform sites were more productive than natural nest substrates but the difference was not significant. The observed rate of increase of the osprey population between 1981–1990 was similar to that reported elsewhere where nest platforms have been installed to increase osprey numbers.

Key Words: *osprey;* Pandion haliaetus; *population monitoring; reproduction; artificial platforms; Oregon.*

Monitoreo poblacional a largo plazo de *Pandion haliaetus* a lo largo del Río Umpqua al Oeste de Oregon

Resumen.—Desde 1981 a 1991, las poblaciones de *Pandion haliaetus* a lo largo del Río Umpqua entre Roseburg y Reedsport, Oregon, han aumentado en un 153% (tasa anual: 17%). La primera disminución poblacional ocurrió en 1991, cuando un territorio reproductivo ocupado previamente quedó vacío. Las actividades de manejo del "USDI Bureau of Land Management," que administró tierras en el área de estudio durante 1981 a 1988, consistieron en la instalación de 24 plataformas de nidificación y 17 perchas accesorias. Durante este estudio, 15 de las plataformas fueron ocupadas por *P. haliaetus* reproductivos, aumentando sobre el 40% la población total a lo largo del Río Umpqua. Con técnicas de estimación de productividad vía rutas terrestres (1981 y 1984) o aéreas (1982, 1983, 1985 a 1991), se estimó una productividad promedio de 1.21 (rango = 0.87–1.86) volantones/territorio ocupado, 1.33 (rango = 0.93–1.93) volantones/esfuerzo reproductivo y 2.04 (rango = 1.50–2.47) volantones/esfuerzo reproductivo exitoso. Las plataformas fueron más productivas que los sustratos de nidificación naturles, pero la diferencia no fue significativa. La tasa de incremento poblacional observada para el águila pescadora entre 1981 y 1990, fue similar a otros sitios en los que se han instalado plataformas para incrementar el número de águilas pescadoras.

[Traducción de Ivan Lazo]

Population status and productivity of ospreys (*Pandion haliaetus*) was an issue of concern and study during the late 1960s and early 1970s as evidence mounted indicating that pesticides, specifically DDT, were influencing the survival and reproductive success of some fish-eating raptors (Ames 1966, Ames and Mersereau 1964, Keith 1966, Henny and Wight 1969, Ratcliffe 1967, Anderson and Hickey 1972, Henny 1977, Reese 1977, Spitzer et al. 1977) and peregrine falcons (*Falco peregrinus*) (Ratcliffe 1969, Snow 1972). More recently, the focus of studies has shifted toward understanding the general ecology of ospreys (Swenson 1978, Jamieson and Seymour 1983, Poole 1989) and effects of weather (Stinson et al. 1987, Machmer and Ydenberg 1990), foraging, and courtship feeding behavior on their reproduction (e.g., Poole 1985, Hagan and Walters 1990).

In 1981, the U.S. Department of the Interior, Bureau of Land Management (BLM) initiated a nesting platform project along the Umpqua River with the intent of enhancing nesting habitat for ospreys

(Witt 1990), thereby facilitating the recruitment of new breeders into the population (Postupalsky 1978), and potentially mitigating some of the historic impacts from nest tree loss. This study was conducted between 1980–91, to assess the utility of the nesting platforms, examine the patterns of osprey productivity, and assess population trends during the study period along the Umpqua River, Oregon.

METHODS

The study area along the Umpqua Rivers consisted of a 3 km wide and 154 km long transect between Roseburg and Reedsport, Oregon. Approximately 24 km of the area surveyed was along the North Umpqua and South Umpqua Rivers (see Fig. 1, Witt 1990). The dominant nesting habitat or nesting substrate along the Umpqua River occurred in the Western Hemlock Zone (*Tsuga heterophylla*), with a smaller portion of the study area being in an Oregon White Oak (*Quercus garryana*) community (Franklin and Dyrness 1973).

Based on the observed distribution of both occupied and unoccupied sites in 1980–81, 24 platforms and 17 accessory perch trees were installed between 1981–89. Installation of nesting platforms was based on availability of BLM administered lands within 400 m of the Umpqua River, the distance from occupied nests, proximity to foraging areas, and availability of live trees with a diameter at breast height (dbh) of at least 125 cm. Perch trees were created when it was subjectively determined that there was an inadequate number of perch sites available at the platform site. In a few instances, trees near the platform or perch trees were pruned to increase visibility from the site to adjacent water.

Trees selected for the placement of platforms were topped 5–8 cm above a whorl of limbs where the diameter of the tree was 12–15 cm (usually 46 m above the ground). All lateral limbs were pruned for 8–12 m below each platform and were cut 0.9–1.2 m from the bole of the tree; thereby, creating a visual appearance of a snag. Perch trees were treated in similar manner except that perch trees were topped where the diameter of the tree was between 6–9 cm.

Platforms were constructed using four 1.22 m western red cedar (*Thuja plicata*) 2 × 4's in a crisscross pattern producing an internal 0.6 × 0.6 m cup; two shorter 2 × 4's (0.92 m long) were placed in the center to anchor the platform to the top of the tree (see Poole 1989, Fig. 10.1 and Witt 1990, Fig. 2). Also, between the shorter 2 × 4's and the longer 2 × 4's of the platform, a 16½ gauge 2″ × 2″ wire was sandwiched in and secured to prevent egg loss through the nest (Ames and Mersereau 1964).

From 1980–91, the osprey nesting population within the study area was monitored by surveying the study area twice a year. The first visit, usually a ground survey from the existing road system for historically and newly occupied sites occurred during the first or second week in May. Categorization of each site was based on terminology used by Postupalsky (1974). An occupied territory was a site with nest and a pair of ospreys present, a breeding attempt was one in which eggs were present in the nest or where an adult bird was seen in incubating position, and a successful breeding attempt was a site where at least one young was raised to legal banding age. Productivity estimates were based on the number of young raised to banding age, and was calculated for occupied territories, breeding attempts, and successful breeding attempts. The second visit was a productivity survey and was completed during the last week of June in 1982–83 and 1985–91 using a helicopter. Due to fiscal constraints in 1981 and 1984, the surveys were conducted from the ground using a spotting scope during the first two weeks of July. If, during the helicopter survey, a nest contained birds that were not close to fledging, a third visit was made prior to fledging.

To determine the influence platforms may have had on productivity during the study, all breeding attempts were classified as either on natural or artificial substrates and their productivity was pooled for all years and analyzed using a one-tailed t-test and a one-tailed variance ratio test (Zar 1974). To examine population trends during the study the annual percent increase in the population was analyzed using log-linear regression.

RESULTS

The availability and use of platforms increased gradually during the study period, with 12.5% and 52.5% of the platforms occupied by breeding ospreys in 1981 and 1990, respectively. During the latter part of the study, ospreys began using standard wooden power poles ($N = 2$) and modified power poles ($N = 3$) erected by a local power company. In 1989 and 1990, breeding attempts on artificial structures (both platforms and power poles) represented 33.3% and 38.6% of the total breeding population in the study area, respectively.

Bald eagle (*Haliaeetus leucocephalus*) breeding territories between Roseburg and Elkton increased from two to five occupied sites during the study period. Two of the three new sites were on osprey platforms. In each case, eagles used platforms occupied by successfully breeding ospreys the year previous. After nesting 1 yr on these platforms, the eagles moved into adjacent forest stands and established nests in the lower crown of live trees. During the study period, only one bald eagle breeding attempt on platforms was successful fledging one eaglet.

The number of occupied territories increased from 17 in 1981 to a high of 43 territories in 1990 for a 153% increase in the osprey population along the river (Fig. 1a). In 1991, the first decrease in the osprey population occurred when the number of occupied sites decreased by one site (Fig. 1b). Log-linear regression analysis of the increase indicated that there was a significant increase in the population ($R^2 = 0.804$, $F = 32.89$, $P < 0.0005$).

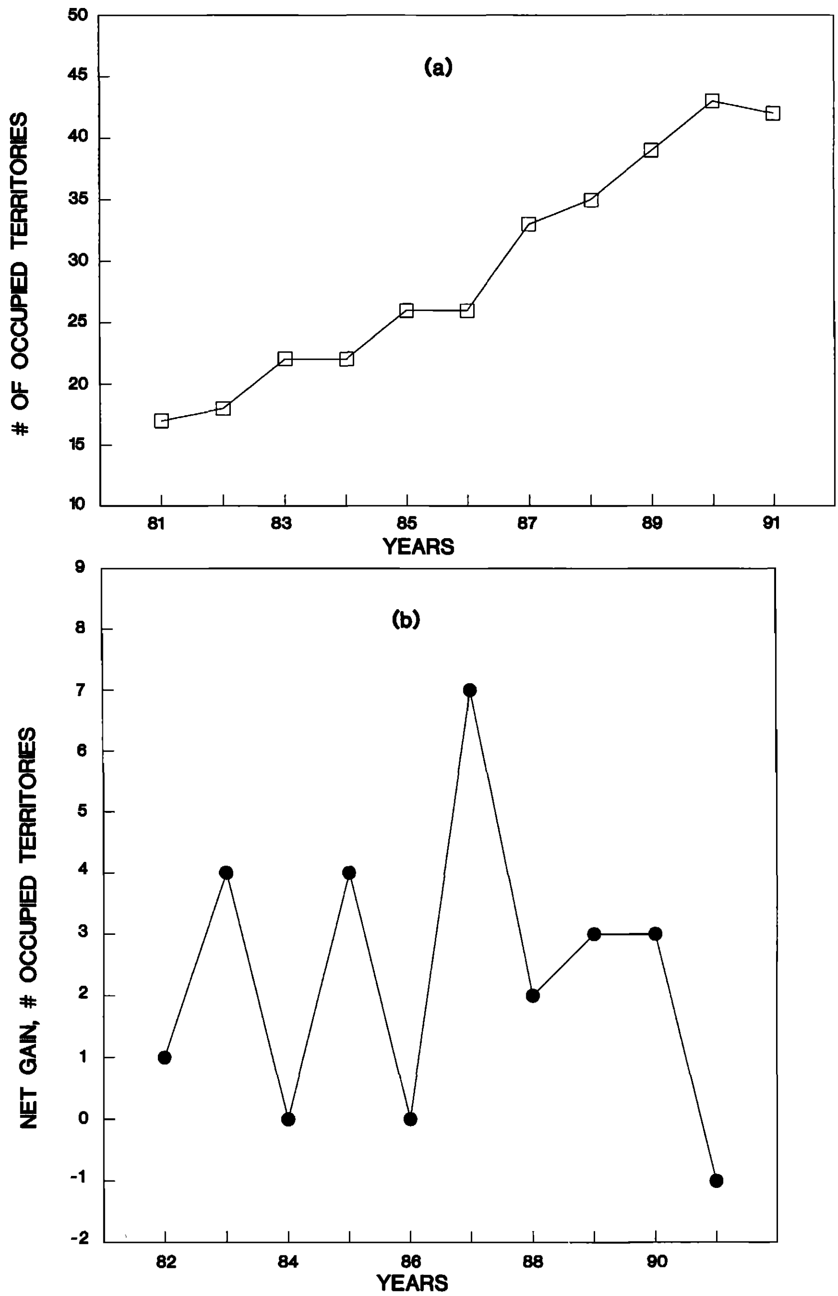

Figure 1. Osprey population changes within the Umpqua River study area. (a) The observed number of occupied territories between 1981–91. (b) The observed number of net gains or losses in the number of occupied territories between 1982–91.

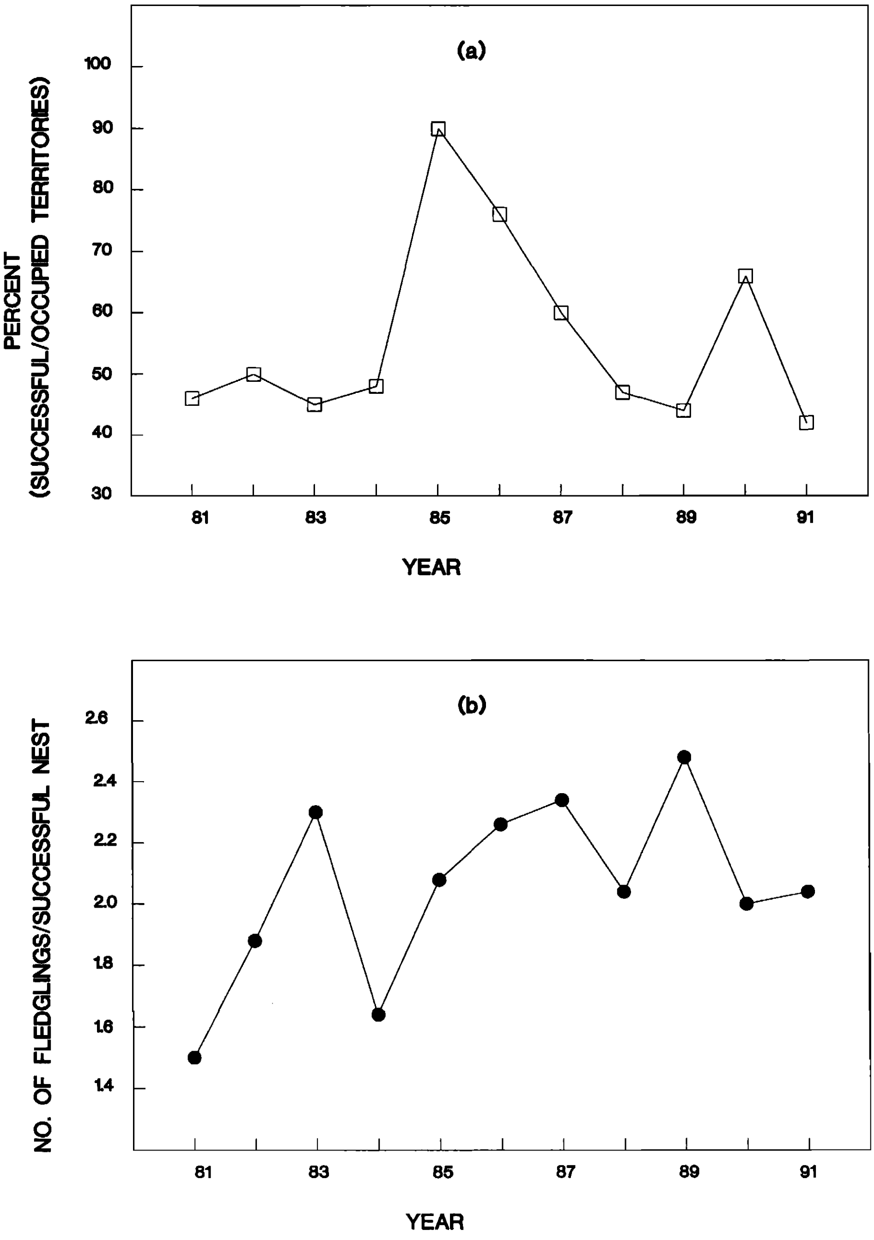

Figure 2. Breeding success of the ospreys along the Umpqua River. (a) The percent of the occupied territories that were successful between 1981–91. (b) The mean number of fledglings produced per successful breeding attempt.

Similarly, the number of breeding attempts increased from 14 in 1981 to 41 in 1990. This increase was also irregular and the overall pattern changed in 1991 when the number of breeding attempts decreased by two.

Overall, the mean productivity of the osprey population during the study was 1.21 fledglings per occupied territory (range = 0.87–1.86, N = 303) and 1.33 fledglings per breeding attempt (range = 0.93–1.93, N = 193, Fig. 2). Only 17 fledglings were produced in 1982 but the number increased to a high of 62 fledglings in 1990. The percent of oc-

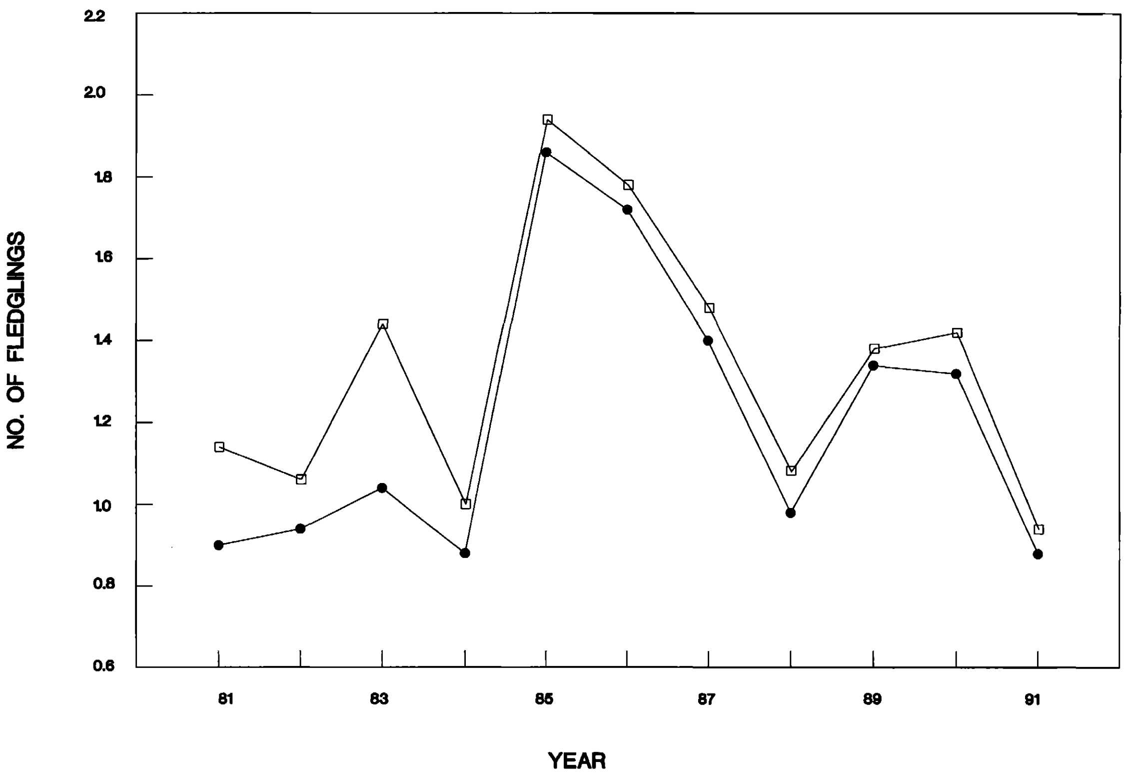

Figure 3. The mean reproductive rate for ospreys along the Umpqua River between 1981–91. Mean number of fledglings produced per occupied territory (solid circles) and the mean number of fledglings produced per breeding attempt (open squares).

cupied territories that were successful ranged from 42% in 1991 to 90% in 1985 (Fig. 3a) and the percent of breeding attempts that were successful ranged from 45% in 1991 to 93% in 1985. The number of fledglings produced per successful nest each year varied and was a function of the increasing population size and the highly variable reproductive rate (Fig. 3b).

The mean reproductive rate of ospreys using artificial platforms was 1.48 fledglings per breeding attempt (range = 0.86–2.22, $N = 99$). On naturally occurring substrates, the rate was 1.27 fledglings per breeding attempt (range = 0.85–1.83, $N = 204$). This difference in productivity between the two substrates was not significant ($t = 1.426$, df = 301, $P > 0.05$).

The mean reproductive rate of successful breeding attempts on artificial platforms was 2.21 fledglings per site (range = 1.50–2.57, $N = 66$) while on natural substrates, the rate was 2.05 fledglings per site (range = 1.40–2.43, $N = 127$). Here also, analysis of the productivity from the two types of substrates indicated the difference was not significant ($t = 1.46$, df = 191, $P > 0.05$).

DISCUSSION

In Oregon, ospreys were thought to be rare (Gabrielson and Jewett 1940, Marshall 1969) until a mail survey by Roberts and Lind (1977) estimated a minimum population of 121 nesting pairs in 1971. The highest concentrations of birds were found at Crane Prairie Reservoir, Lookout Point Reservoir, and along the Rogue River. Henny et al. (1978), using ground and aerial surveys, estimated the number of nesting pairs in Oregon at 308 in 1976, with major concentrations at Crane Prairie Reservoir and the adjacent Deschutes National Forest, coastal lakes and reservoirs between Florence and North Bend, Rogue River, Lane County reservoirs, and the Umpqua River. These estimates may have been representative of the osprey population during the 1970s, but given the present level of occupation along the Umpqua River, the current population levels in Oregon are probably much higher than the estimates made by Henny et al. (1978).

An historical example of the loss of habitat due to the draining and the associated impacts on ospreys was reported by Henny (1988) for Tule Lake in the Klamath Basin. He examined the historical field records and an unpublished manuscript and found that a very large osprey colony existed during the late nineteenth century at the northeast corner of Tule Lake along the Oregon border. He hypothesized that a radical decline in the osprey population occurred in the basin when construction work began on the U.S. Bureau of Reclamation's Klamath Project to drain Tule Lake in 1906.

More recently, Henny and Anthony (1989) reviewed the status and the reproductive performance of ospreys in the western states and found productivity usually ranged from 0.95–1.3 young per occupied territory and that organochlorine contaminants were still a problem during the 1980s for a few individual birds and in some localized areas. They concluded that recent population increases and range expansions were, in part, due to reduced DDE residues in the West.

The most likely explanation for the population increase during this study is a combined response by ospreys to the improved nesting habitat conditions along the river and to generally lower levels of pesticide contamination in the western United States (Henny and Anthony 1989).

The reproductive rates of the osprey varied considerably during the 11-yr period of the study. The coefficient of variation was 27.8% for the annual percent of occupied territories that were successful, 22.7% for the annual percent of breeding attempts that were successful, 29.0 % for the productivity of occupied territories, 24.4% for the productivity of breeding attempts, and 15.1% for the productivity of successful breeding attempts. When designing a long-term monitoring strategy for ospreys, consideration should be given to this variability in productivity and one should clearly expect years of low reproduction, even with healthy growing populations. Therefore, I would recommend sampling the population every three or four years to reduce the chance of only sampling low reproductive years, which may be weather dependent and cyclic in nature.

The rate of the population increase observed during this study was similar to the 64% increase observed between 1966–72 on Fletcher Pond by Postupalsky (1978) and the 54% increase observed by Spitzer et al. (1983) from 1976–81 between New York City and Boston. In contrast, Rhodes (1972) observed an initial 160% increase in the population after installing only 12 artificial structures on an island refuge in Chesapeake Bay. The larger rate of increase was probably due to a smaller initial population (four to six nests on the ground) and to a virtual lack of suitable nesting habitat on the island. After the initial increase in the population the ospreys continued to increase but at a rate of about 38% over the next 3 years.

Unlike this study, the reproductive performance of ospreys has been shown to be greater on artificial than on natural substrates (Seymour and Bancroft 1983, Westall 1983). On Sanibel Island, Westall (1983) found production averaged 1.47 fledglings per breeding attempt on artificial structures and only 0.69 fledglings per breeding attempt on natural sites. In northeastern Nova Scotia, Seymour and Bancroft (1983) found mean production to be 1.29 fledglings per occupied nest on utility poles and 1.09 fledglings per occupied nest on natural sites. Similarly, Postupalsky (1978) found in Michigan that productivity was twice that recorded on natural sites. In contrast to these three studies, Rhodes (1977) observed during a 5-yr study on an island in Chesapeake Bay that productivity was 1.4 fledglings per breeding attempt on platform structures and 1.9 fledglings per breeding attempt at other sites (both natural and other man-made structures). The differing results from these studies may be related to the fact that they were not designed as controlled experiments and, therefore, influenced by several sources of bias (Postupalsky and Stackpole 1974).

During the 11 years of the study, platform occupancy rate (in terms of platform years) was 46%. Although lower than elsewhere, the rate was comparable to the 50–60% occupancy rates reported in California (Garber et al. 1974), Maryland (Reese 1977), and Michigan (Postupalsky 1978), but it was considerably lower than the 70% rate observed in Florida (Westall 1983) and the 78% rate found in the Chesapeake Bay (Rhodes 1977).

From a management perspective, the use of platforms and power poles along a river system clearly can be an effective tool for managing an expanding osprey population. Based on the fact that as much as 62.5% of the platform sites were occupied and pairs establishing themselves on platform sites accounted for over 40% of the total population increase along the Umpqua River, the installation of artificial platforms has played an important role in contributing to the expansion of ospreys along this river.

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