

STATUS OF OSPREYS NESTING ON SAN FRANCISCO BAY

ANTHONY J. BRAKE, 1201 Brickyard Way, Richmond, California 94801;
tonybrake@sbcglobal.net

HARVEY A. WILSON, 1113 Otis Drive, Alameda, California 94501;
harvmon@comcast.net

ROBIN LEONG, 336 Benson Avenue, Vallejo, California 94590

ALLEN M. FISH, Golden Gate Raptor Observatory, Building 1064, Fort Cronkhite, Sausalito, California 94965

ABSTRACT: Historical records from the early 1900s, as well as surveys updated in the late 1980s and more recent information from local breeding bird atlases, indicate that Ospreys rarely nested on San Francisco Bay prior to 2005. In 2013, we surveyed nesting Ospreys baywide and located 26 nesting pairs, 17 of which were successful and fledged 44 young. We also report on findings from previous annual nest surveys of a portion of San Francisco Bay beginning in 1999. These results demonstrate a greater breeding abundance than has previously been recognized. The density of Osprey nests is highest near the north end of San Francisco Bay, but nesting also appears to be expanding southward. Nearly all of the nests observed were built on artificial structures, some of which were inappropriate and required nests to be removed. Over half of unsuccessful pairs experienced significant human disturbance. We recommend that conservation efforts focus on reducing this ratio, and to help do so, we urge erecting nest platforms as part of efforts to deter nesting when it conflicts with human activity.

The Osprey (*Pandion haliaetus*) is a diurnal, piscivorous raptor that breeds or winters in a variety of habitats on all continents except Antarctica. Upon reaching maturity, the birds typically return close to their natal site to breed. Ospreys do not maintain or defend hunting territories but instead reuse the same nest each year and aggressively defend only the local area around the nest site, called the nesting territory. This results in nesting birds ranging from isolated single pairs to semicolonial groups (Poole 1989, Poole et al. 2002). Historically, Ospreys nested in trees, but with increasing human population and development they now readily nest on artificial structures when available. For example, in Chesapeake Bay, in 1973, 32% of the estimated 1450 Osprey pairs nested in trees, while in 1995 and 1996 only 7% of 3473 pairs nested in trees. The rest nested on artificial structures. In the Willamette River valley of Oregon, in 1976 all of the 13 Osprey nests were in trees, but by 2008, 88% (242 of 275) were on artificial sites, such as nesting platforms, power poles and towers, pilings, cell-phone towers, and bridges (Henny et al. 2010).

Early historical documentation of Ospreys nesting around San Francisco Bay is sparse. Grinnell and Wythe (1927) listed the Osprey as a very rare resident in the bay area. In their compilation of the birds of California, Grinnell and Miller (1944) noted that Ospreys were formerly found along the whole length of California, primarily on rivers and lakes, but had become much less common and were reduced to nesting at only a few sites. Both publications excluded San Francisco Bay as a location for Osprey nesting.

Henny and Anthony (1989) described the population breeding in Califor-

nia as located primarily in northern coastal and mountainous areas. Along the coast, they placed the southern boundary of the breeding population at Kent Lake in Marin County, north of San Francisco Bay. They also reported breeding pairs along the Sacramento River and in the central and southern Sierra Nevada. More recently, breeding pairs have also been reported in Orange County (Kerr 2007) and San Diego County, including on San Diego Bay (Unitt 2004).

Since the surveys by Henny and Anthony, breeding bird atlases have been compiled for the nine San Francisco Bay counties with tidelands. Six of these atlases do not list Osprey as breeding around the tidelands, including those for San Francisco (San Francisco Field Ornithologists 2003), Marin (Shuford 1993), Sonoma (Burridge 1995), Napa (Berner et al. 2003), Santa Clara (Bousman 2007), and San Mateo (Sequoia Audubon 2001) counties. For the three other counties, a nest was reported in Contra Costa County (near Point Pinole) in 1998 (Glover 2009), a pair summered in Alameda County at the mouth of San Lorenzo Creek in 1999 (Richmond et al. 2011), and beginning in 2005, Ospreys nested regularly at Mare Island in Solano County (Berner and Rippey in press).

The largest active Osprey colony located near San Francisco Bay is at Kent Lake, north of the Golden Gate in Marin County (Figure 1). Established in the mid-1960s, the colony reached a peak of 52 occupied nests in 1994 and has since maintained itself but at smaller numbers. All the nests at Kent Lake are in trees, dead or living (Jules Evens pers. comm.).

In this paper we update the status of Osprey nesting on San Francisco Bay on the basis of Leong's surveys at Mare Island from 1999 to 2013 and from a baywide survey by Brake, Wilson, and volunteers in 2013.

METHODS

Each year from 1999 through 2013, Leong surveyed nests of the Osprey and herons at Mare Island and the Vallejo waterfront (Solano County). Mare Island is the site of a naval shipyard that closed in 1996, but the area has not been extensively redeveloped, so numerous cranes and light poles that provide substrate for Osprey nests persist. These surveys took place between March and late July each year and were done either by car or on foot. The location of active nests was recorded and the behavior of adults and chicks was monitored during multiple visits.

Beginning in mid-summer 2012, Brake and Wilson extended Leong's work with an exploratory survey of nesting Ospreys throughout San Francisco and San Pablo bays, during which we found 18 nests and counted 30 young.

In 2013, under the auspices of the Golden Gate Raptor Observatory, we initiated a more thorough survey of the bays (Figure 1). Suisun Bay (not shown in Figure 1), east of the Carquinez Strait, is generally considered part of the San Francisco Bay complex, and Ospreys are known to nest there, but only on ships of the Maritime Administration Reserve Fleet. Because the administration actively deters Ospreys from nesting on some of the ships, we excluded Suisun Bay from the study area.

We began nest surveys early in the local breeding season, which is from

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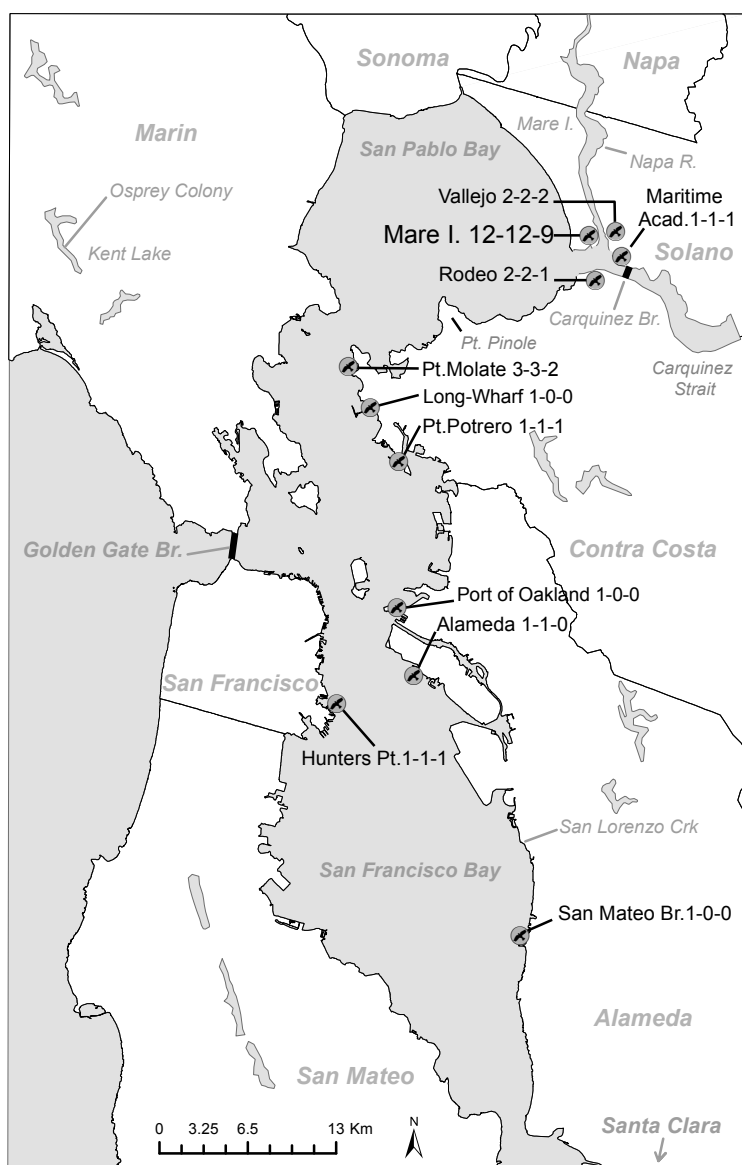


Figure 1. Locations of Osprey nests around the San Francisco Bay area in 2013. The three numerals for each location refer to number of territorial pairs, number of laying pairs, and number of successful pairs, respectively. For example, Mare Island had 12 territorial pairs, 12 laying pairs, and 9 successful pairs.

late February to late July. We visited nests found in 2012 as well as searching for new nests. Surveys were limited to within 300 meters of the bay's shoreline and were conducted on foot or from a car, ferry, or small boat. We solicited additional information on Osprey nesting by posting requests on local Internet birding forums. Each nest was photographed, and its location, substrate, status, number of chicks, and number of young fledged were recorded. We also recorded the behavior of adults and information regarding human disturbance of the nest. All nests were visited numerous times through the season.

We report nesting status and productivity in the terminology of Steenhof and Newton (2007). Two Ospreys occupying a nesting territory were a *territorial pair*. Territorial pairs that laid eggs were *laying pairs*. Territorial pairs that fledged at least one young were *successful pairs*. A nesting territory was *occupied* if it contained a pair that engaged in courtship or mating behavior, territory-defense behavior, nest building or refurbishing, incubation for long periods, or if eggs or chicks were present. We defined a pair as laying if we observed incubation for long periods or if eggs or chicks were present. We considered chicks *fledged* when they were 45 days old, which is about 80% of their average age at fledging of 55 days (Poole 1989). We estimated age by visiting nests frequently, usually at least once per week, during the latter part of the incubation and nestling period and noting the date when chick-feeding behavior was first observed and by aging the chicks when they were first visible. We continued regular visits until all of the nestlings had fledged. We report *nesting success* as both the ratio of successful pairs to territorial pairs and the ratio of successful pairs to laying pairs. We report *productivity* as the number of chicks fledged both per territorial pair and per laying pair.

RESULTS

Surveys 1999–2013, Mare Island, Vallejo

From 1999 through 2002, one pair of Ospreys nested annually on Mare Island and none nested on the Vallejo waterfront. In 2003, this increased to two pairs on Mare Island, four in 2004, and five in both 2005 and 2006 before dipping to four in 2007. Since then the number of nesting pairs found at Mare Island/Vallejo has increased steadily, rising to 14 in 2013.

Surveys 2013, Baywide

During the 2013 baywide survey, we found 26 territorial pairs (Table 1; Figure 1), which included all 16 pairs found during the exploratory survey in 2012. Of the additional 8 pairs found in 2013, five were in areas thoroughly surveyed in 2012, so we believe they were newly established in 2013 (two pairs at Mare Island and one each at Point Molate, port of Oakland, and San Mateo Bridge). The remaining three pairs were in areas not thoroughly surveyed in 2012, and the structure and appearance of nests suggest these pairs may have been overlooked (Rodeo 1 and 2, Long Wharf).

Of the 26 pairs found, 23 were laying pairs, of which 17 were successful. Of the nine pairs that were not successful, six laying pairs failed and

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Table 1 Pairs of Nesting Ospreys Found During the 2013 Survey of San Francisco Bay

Location	Nearest city	Nest substrate ^a	Territorial pairs	Laying pairs	Successful pairs	Young fledged
Hunters Point	San Francisco	A	1	1	1	2
San Mateo Bridge	San Mateo	E	1	0	0	0
Alameda Point	Alameda	E	1	1	0	0
Port of Oakland	Oakland	A	1	0	0	0
Point Potrero	Richmond	C	1	1	1	3
Point Molate	Richmond	A, B, D	3	3	2	6
Long Wharf	Richmond	B	1	0	0	0
Maritime Academy	Vallejo	A	1	1	1	3
Mare Island	Vallejo	A, C, E	12	12	9	22
Vallejo	Vallejo	D, E	2	2	2	6
Rodeo	Rodeo	B	2	2	1	2
Total			26	23	17	44

^aA, light pole; B, utility pole; C, crane; D, piling; E, other.

three pairs did not lay eggs. Nesting success was 17/26 (0.65) for territorial pairs and 17/23 (0.74) for laying pairs. Laying pairs fledged 44 young for a productivity of 1.7 young per territorial pair and 1.9 young per laying pair.

In our study area, we first observed building or maintenance of nests on 22 February, and the first sign of a pair at a nest on 27 February. Behavior indicating incubation was first observed on March 28. Dates of hatching ranged from 24 April to 21 May. Fledging was first observed on 22 June, and all young had fledged by 30 July.

Nest Locations and Substrates

All but one of the pairs nested on the east side of the bay (Figure 1). The highest concentration of pairs was at Mare Island/Vallejo, which represented 54% (14/26) of all pairs, 65% (11/17) of all successful pairs, and 33% (3/9) of all unsuccessful pairs. The bay south of Mare Island/Vallejo had 46% (12/26) of all pairs, 35% (6/17) of all successful pairs, and 67% (6/9) of all unsuccessful pairs.

Twenty-five nests (96%) were on artificial structures. Of these, 13 (52%) were on either utility poles or light poles (e.g., Figure 2A) and 6 (24%) were on either active commercial cranes or infrequently moved cranes at a former shipyard (Figure 2B). The remaining six nests (24%) were located on a variety of structures, including a building roof, a ship, and near-shore pilings. One nest at Mare Island was located on a palm tree that had a flattened top.

DISCUSSION

Available literature indicates that since the early 1900s Ospreys have nested on San Francisco Bay only rarely. Our studies documented a steady increase in nesting pairs, especially at Mare Island/Vallejo since 1999. Our 2013 baywide survey produced 26 nesting pairs, about half of which nested

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Figure 2. Osprey nests on artificial structures around San Francisco Bay. (A) Light structure on pier, Mare Island, from which three young fledged. (B) Operating crane on Mare Island where, not surprisingly, the pair failed. (C) Enshrouded nest and PVC deterrent devices installed to prevent use by Ospreys of an existing nest at Point Molate. Note the adult Osprey perched on a deterrent device. (D) Successfully used alternative nest structure installed near the nest shown in (C) with three nearly fledged nestlings.

Photos by Anthony J. Brake

at Mare Island/Vallejo and the remainder south of there, predominately along the eastern shore of the bay.

We believe that the concentration of nests at Mare Island/Vallejo and the timing of population growth may be traceable to several factors. Mare Island/Vallejo is at the confluence of the Napa River and Carquinez Strait, both of which add large amounts of fresh water to the bay at various times through the year, resulting in a zone of relatively low salinity (Jassby et al. 1995), which may influence the availability of fish the Osprey prefers (Dege and Brown 2004). In addition, over the last 10 years the turbidity of the water in the bay has diminished (Schoellhamer 2011), and this turbidity is an important determinant of the Osprey's hunting success (Vana-Miller 1987). Finally, when the Mare Island Naval Shipyard closed in 1996, light poles, cranes, and other structures became available as potential nesting sites, and they host 11 of the 12 nests found there in 2013.

Population Growth

Additional study is needed to quantify the status of the bay's Osprey population, but several findings suggest the population is growing and expanding geographically. Between 2007 and 2013, the number of nesting pairs at

Mare Island/Vallejo grew steadily from four to 14 nests, implying that food supply, availability of nest sites, or other variables have not yet begun to limit population growth at Mare Island/Vallejo. In addition, in 2013, Brake and Wilson found Osprey nests at Point Molate, the port of Oakland, and the San Mateo Bridge that were not present during our exploratory survey in 2012, indicating that the number of nesting pairs south of Mare Island/Vallejo is increasing as well. Finally, in 2013 the number of fledged young per laying pair was 1.9. This compares favorably to the annual productivity range of 1.11 to 2.09 per laying pair at the Kent Lake Osprey colony in Marin County (Figure 1) between 1981 and its peak year of growth in 1994 (J. Evens pers. comm.).

Conservation Issues

Ospreys nesting on the bay strongly preferred artificial structures, entailing the need for nesting on inappropriate structures to be deterred and for shielding of nests from human disturbance. In 2013, these issues affected five of nine unsuccessful pairs (56%). An incubated nest on a working barge-crane at Mare Island, an occupied nest on a power pole at Long Wharf, and an occupied nest on a light pole at the port of Oakland were removed to deter nesting. Significant human disturbance contributed to two additional pairs abandoning their nests: one pair incubating at Mare Island abandoned its nest when the former shipyard crane supporting it was moved, and another nest at Point Molate was abandoned after people began fishing within a few meters of the nest, which was located near eye level. While Ospreys are somewhat tolerant of human disturbance, they are particularly sensitive to abrupt or sporadic disturbance after nesting has begun (Levenson and Koplin 1984, Vana-Miller 1987).

To address these adverse effects on nesting success, we recommend tracking the ratio of nest failures related to disturbance. In 2013, this ratio was needlessly high (56%), and we urge that conservation efforts focus on reducing it to at least 25%, preferably lower. To help accomplish this, we recommend integrating the providing of nest platforms into efforts at deterrence, which typically include only removing nests and installing deterrence devices such as flagging, domed or peaked objects, or flexible plastic pipe structures. Ospreys are unusually persistent, and when their nests are removed birds will frequently try to build one or more new nests at the same or nearby locations, thus prolonging attempts at deterrence. If a platform is erected, however, Ospreys will usually nest on the platform in either the same or the following nesting season (Poole 1989, APLIC 2006). This approach promotes the success of deterrence and enhances the success of the affected pairs. For example, in 2013 at Rodeo, an incubated nest on live electrical wires collapsed. Subsequently, a nest platform was installed on the pole, and the pair used the platform in 2014, rather than attempting to nest on the wires again. In another case, after an attempt at deterring the nest at Point Molate in early 2014 (by covering the previously used nest with black fabric and adding flexible T-shaped devices constructed from PVC pipe; Figure 2C), the pair began building new nests on nearby utility poles, including a pole with live electrical wires. The pair continued building in spite

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of continued efforts at deterrence until a platform was installed approximately 400 meters from the existing nest. The pair then quickly occupied the nest platform, adding nest material and commencing incubation (Figure 2D). We hope these results will serve as a model for conservation measures to be used routinely where Osprey nesting may conflict with human activities.

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