Riparian Raptors on USACE Projects: Osprey (*Pandion haliaetus*)

Figure 1. Osprey (Photo by Les Turner)

The osprey (Figure 1) is one of four raptor species included in a series of Engineer Research and Development Center (ERDC) technical notes produced under the Ecosystem Management and Restoration Research Program (EMRRP). These technical notes (ERDC TN-EMRRP-SI-(12-15)) identify riparian species potentially impacted by U.S. Army Corps of Engineers (Corps) reservoir operations. For management purposes, these raptors are considered riparian generalists because they inhabit riparian zones surrounding streams and lakes on Corps project lands but may seasonally use adjacent transitional and upland habitats. The other raptors in this grouping are the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and red-shouldered hawk (*Buteo lineatus*), each of which is discussed in a technical note describing the ecology, legal status, potential impacts, and management guidelines for the species. These technical notes are products of the EMRRP work unit entitled "Reservoir Operations - Impacts on Habitats of Target Species" and are linked to ERDC TN-EMRRP-SI-11, which describes the function of the work unit and the general status, impacts, recovery, and management of these four riparian raptors on Corps projects.

DISTRIBUTION: The osprey is distributed worldwide and is found on every continent except Antarctica (Henny 1986). In North America, ospreys breed from Alaska through Canada to the Pacific Northwest, western interior states, and Great Lakes Region, and along the Atlantic coast from the northeastern United States to Florida and the Gulf of Mexico (Figure 2). Populations winter in the West Indies, Central America, and South America to Argentina and Chile. Ospreys in southern Florida and Baja, California, are resident (nonmigratory) birds (Ogden 1977).

STATUS: Although not federally endangered or threatened, the osprey is considered a sensitive species in at least 29 states (Table 1). Osprey populations severely declined with the advent of modern pesticides following World War II but began to recover with the banning of DDT in 1972 and the implementation of protective management measures by natural resource agencies and private organizations (Poole 1989). The osprey receives protection under the Lacey Act, the Migratory Bird Treaty Act, and the Convention on International Trade in Endangered Species of Wild Flora and Fauna.

HABITAT: Osprey populations in the United States are often associated with marine habitats, but inland nesting occurs along large rivers, lakes, and reservoirs (Henny 1986). Nests are typically built in the tops of tall, standing trees in or near water but may occasionally be located from 2 to 9 miles (3 to 15 km) away (Poole 1989). Isolated trees, snags, flat-topped artificial platforms, channel markers, duck blinds, and power poles are preferred nest sites. In open terrain ospreys may build on the ground, in large cacti, or on rock cliffs (Henny 1986).

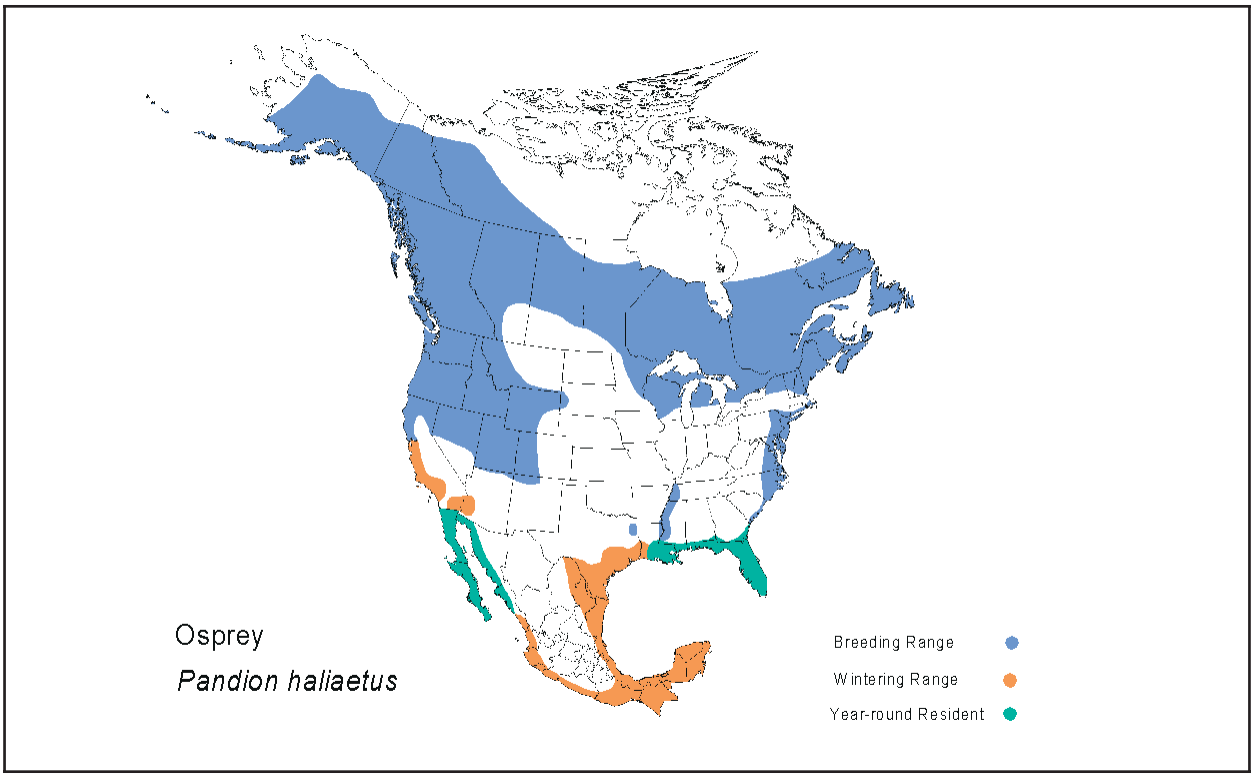

Figure 2. Range of the osprey in North America and Mexico

The substrate must be able to support the nest, which is approximately 3 ft (1 m) in diameter and 1 to 2 ft (0.3 to 0.6 m) in depth (Bent 1937). It is constructed of large sticks, lining materials (e.g., kelp, seaweed, and grass), and some man-made materials (Poole 1989). The area around the nest must provide clear access for landing and contain a suitable perch for the male.

BEHAVIOR: Fall migration occurs from late August through November with peak periods in September (Henny 1986). The return migration of various age classes is described as follows: (1) 1-year-olds do not return to the United States; (2) an estimated 28 to 55 percent of the 2-year-olds return to their natal vicinity; and (3) nearly all birds at least 3 years old return to the breeding grounds, as breeding begins at 3 years of age (Henny and Van Velzen 1972). Ospreys arrive on the breeding grounds from late March in northern California (Garber 1972) to mid-April in Nova Scotia (Prevost, Bancroft, and Seymour 1978). Birds nest in solitary pairs or loosely spaced colonies (Poole 1989). Established pairs refurbish their old nests or rebuild destroyed nests near the old site, while new pairs must find nest sites. Ospreys are monogamous, but the pair bond is reestablished each year through the courtship ritual, in which the male climbs, dives, and hovers, sometimes carrying a fish. Both birds build the nest, then the male provides food to the female and assists with incubation and feeding of the young until the departure of juveniles.

REPRODUCTION: Resident populations begin laying eggs in December and continue into April, whereas those farther north begin laying in response to increasing seasonal temperatures (Westall 1986). Clutch size ranges from 2 to 4 eggs laid 1 to 2 days apart (Poole 1989). Hatching occurs 5 to 6 weeks later in the sequence in which eggs were laid, and young fledge in approximately 8 weeks. Various rates of reproductive success have been reported for different populations. The

fledging rate needed to maintain a stable population has been estimated as low as 0.80 young per active nest for some populations (Spitzer, Poole, and Scheibel 1983) and as high as 0.95 to 1.3 young per breeding age pair per year for others (Henny and Wight 1969).

FOOD HABITS: Ospreys feed almost entirely on live fish, consuming a wide variety of species, especially surface fish and those of shallow flats and shorelines (Poole 1989). Ospreys forage mostly over water at altitudes of 16 to 130 ft (5 to 40 m), plunging feetfirst into the water to capture prey. A single osprey may consume from 0.4 to 0.9 lb (200 to 400 g) of fish per day (Cramp 1980), and a pair rearing two young will eat about 375 lb (170 kg) of fish during a breeding season (Nordbakke 1980). Intercolony differences in osprey growth rate are primarily a function of local food abundance and availability, whereas intracolony differences may result from differential male foraging ability, age, or experience (Steidl and Griffin 1991). Environmental factors that impact foraging are storms (Poole 1989), freezing conditions or high water temperatures (Prevost 1977), low nutrient content of the water resource (Garber 1972), and warm surface-water temperature or tidal activity that drives fish to lower depths (Ueoka and Koplin 1973).

IMPACTS: In the early 1900s, declines in osprey populations resulted chiefly from human disturbances, particularly shooting, egg collecting, and loss of habitat through logging, agriculture, and urban development (Zarn 1974). Organochlorines introduced into the environment as pesticides in the mid-1940s were linked to the dramatic decline of osprey populations (Poole 1989). These compounds (DDT, DDE, and PCBs) accumulated in the tissues of prey ingested by ospreys and inhibited normal eggshell production. The resultant thinning caused increased egg breakage and embryo mortality. Most osprey populations have generally recovered from the effects of organochlorines except in certain heavily contaminated environments such as Delaware Bay (Steidl, Griffin, and Niles 1991). Mercury accumulation has been studied but has shown no effect on fledgling production on reservoirs (DesGranges et al. 1998).

MANAGEMENT: Management for ospreys in the United States has consisted primarily of these practices: (1) construction of nest platforms, (2) creation of osprey management areas near nests designed for this species, and (3) reintroduction of ospreys at locations without breeding ospreys (Henny 1986). Providing nest sites and hacking young birds into the wild have been particularly effective in helping to reestablish populations, as those birds are now returning to breed in the areas where they were fledged or released. Nesting platforms are particularly beneficial where traditional nesting habitat is disappearing. Ospreys sometimes select platforms over natural sites, presumably because of the greater platform stability and relative ease of nest construction. Designs for the construction of artificial osprey nest platforms for a variety of habitats can be found in Martin, Mitchell, and Hammer (1986) and Ewins (1994). Locations of nest structures should allow either minimum exposure to human activity or early habituation to man, so that a sudden flurry of human activity near the nest (e.g., opening of fishing season) will not disrupt nesting activities (Poole 1989). During breeding season, human activities (e.g., timber harvest, road construction) should be modified or eliminated within a buffer zone of 165 to 220 yd (150 to 200 m) around a nest. Management activities within 44 yd (40 m) of any nest tree should be limited to measures beneficial to maintaining the nest site (Henny 1986). Guidelines for managing snags and other aspects of the habitat surrounding osprey nests are also provided in Henny (1986).

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Table 1
Osprey (*Pandion Haliaetus*) State Protection Status

State	Status	State	Status
Alabama	SP	Montana	
Alaska	SSC[1]	Nebraska	
Arizona		Nevada	WL
Arkansas	SSC	New Hampshire	ST
California	SSC	New Jersey	ST
Colorado	SSC	New Mexico	SSC
Connecticut		New York	SSC
Delaware	SSC	North Carolina	
Florida	SSC[2]	North Dakota	SSC
Georgia	SSC	Ohio	SE
Hawaii		Oklahoma	
Idaho		Oregon	
Illinois	SE	Pennsylvania	SE[3]
Indiana	SE	Rhode Island	SSC
Iowa		South Carolina	
Kansas		South Dakota	ST
Kentucky	ST	Tennessee	ST
Louisiana	SSC	Texas	
Maine		Utah	SSC
Maryland		Vermont	SE
Massachusetts		Virginia	
Michigan	ST	Washington	SSC
Minnesota		West Virginia	SSC
Mississippi	SSC	Wisconsin	ST
Missouri	SSC[4]	Wyoming	

[1] U.S. Forest Service sensitive species.
[2] Monroe County only.
[3] Proposed state status is threatened.
[4] Believed to be extirpated from the state.

FE= Federally endangered species
FT= Federally threatened species
SE= State endangered species
ST= State threatened species
SP= State protected
SSC= State species of special concern
WL= State watch list species (no state protection)