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Contaminant Exposure and Potential Reproductive Effects on Ospreys Nesting in Delaware Bay and River

Delaware Bay is part of the National Estuary Program, the Western Hemisphere Shorebird Reserve Network, on the “Last Great Place” list of The Nature Conservancy, and a Wetland of International Significance (Dove and Nyman 1995). The river and bay provide critical breeding and migratory stopover habitat for many species of waterbirds, including ospreys (*Pandion haliaetus*). The coastal zone in Delaware is highly industrialized, with factories producing steel (Citi Steel), manufacturing industrial and commercial chemicals and plastics (DuPont, General Chemical, ICI Americas, Oxychem, Standard Chlorine, Kaneka Delaware Corporation, Formosa Plastics) and refining petroleum (Motiva). Over 50 Superfund sites in Pennsylvania are located within the Delaware River watershed, and an additional 63 Superfund sites are located within Delaware. The Delaware Bay is the largest oil transfer port of entry on the east coast, and agricultural lands and intensive poultry farming surround it. In addition to industrial and agricultural stressors, the Delaware Bay has a higher population density and greater proportion of urban area than the Chesapeake Bay. With restrictions on the use of DDT and other organochlorine pesticides, reproductive performance of Delaware River and Bay ospreys has improved. However, parts of the Delaware Bay are characterized as having poor water quality, and ospreys have not returned to many areas on the river and bay.



Most water quality problems and human health advisories for the consumption of shellfish and finfish species are for the area north of the C&D Canal. The present study was undertaken to document exposure to traditional contaminants (e.g., pesticides, total PCB and toxic PCB congeners, mercury) and contemporary pollutants (e.g., surfactants including alkylphenols and ethoxylates, flame retardants including brominated diphenyl ethers, and perfluorinated compounds) and to examine potential adverse effects of environmental contaminants on reproduction of this highly valued species.

Progress to Date:

In 2002, ospreys nesting on navigational markers, osprey platforms and other structures were studied over the course of the breeding season in the Delaware River and Bay

between Indian River Bay in Delaware and East Stroudsburg, Pennsylvania. From 39 nests sampled in the Inland Bays, Central Delaware, North Delaware, and Pennsylvania (12 in Indian River and Rehoboth Bays; 12 between Lewes, DE and the C&D canal; 12 between the C&D canal and Trenton, NJ; and 3 near East Stroudsburg, PA), a single egg was collected for contaminant analysis, and blood and feather samples were collected from near fledging young for metal analysis. Nest success (hatching of eggs, and fledging of young) was monitored to determine potential relationships between contaminant exposure and reproductive success.

Nesting density of ospreys was greatest in the reference site (Indian River and Rehoboth Bays) compared to other areas on the river and bay. There were no significant differences in reproductive success among the different regions of the study area. Overall productivity was adequate to sustain the population. Preliminary findings suggest that the concentrations of DDT metabolites, dieldrin, heptachlor epoxide, several components of chlordane, and total PCBs in sample eggs were generally greater in the North compared to the Central and Inland Bays regions, but below levels that are expected to adversely affect the reproductive success of ospreys.

Management Implications and Research Needs:

Although contaminants in parts of the Delaware River and Bay appear to be affecting aquatic invertebrates and fish, there is little evidence to suggest they are adversely affecting osprey reproduction on a large scale. Further research is underway to evaluate the contribution of contaminants in comparison to other habitat factors in determining nest site location and breeding success. Findings from such work may serve as a guide for the installation of additional nest platforms.

