Monitoring of Colonial Nesting Waterbirds on the Upper Mississippi River National Wildlife and Fish Refuge

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Introduction

The Upper Mississippi River National Wildlife and Fish Refuge encompasses terrestrial and aquatic habitats along 420 km of the Mississippi River from Wabasha, Minnesota downstream to approximately Clinton, Iowa (Pools 4–14). Currently, 6 species of colonial nesting waterbirds are known to have breeding populations on portions of the Mississippi River associated with the Refuge:

- Double-crested cormorant (*Phalacrocorax auritus*)
- American white pelican (*Pelecanus erythrorhynchos*)
- Great blue heron (*Ardea herodias*)
- Great egret (*Ardea alba*)
- Cattle egret (*Bubulcus ibis*)
- Black tern (*Chlidonias niger*)

The Refuge has monitored breeding colonies since the 1960s but standardization of methodology and consistency of effort was not initiated until the 1990s.

Methods

- Ground counts/direct observation (1974–present)
- Aerial photography (1994–present)
  - Oblique 35-mm color slides; app. 72 m above ground level (1993–2002)
  - Large format vertical photos; app. 305 m above ground level (2003–2007)
  - Color infrared vertical photos; app. 450 m above ground level; geo-referenced (2009–present)

Datasets

- Double-crested cormorant (1983–present)
  - Colony location
  - Number of nests (spring)
- American white pelican (2007–present)
  - Colony location
  - Number of nests (spring)
  - Number of young (summer)
- Great blue heron/great egret/cattle egret (1960–present)
  - Colony location
  - Number of nests (spring)
  - Young per nest (summer)
- Black tern (1984–1998)
  - Colony location
  - Number of nests (spring)

Acknowledgements

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Great Blue Heron Data

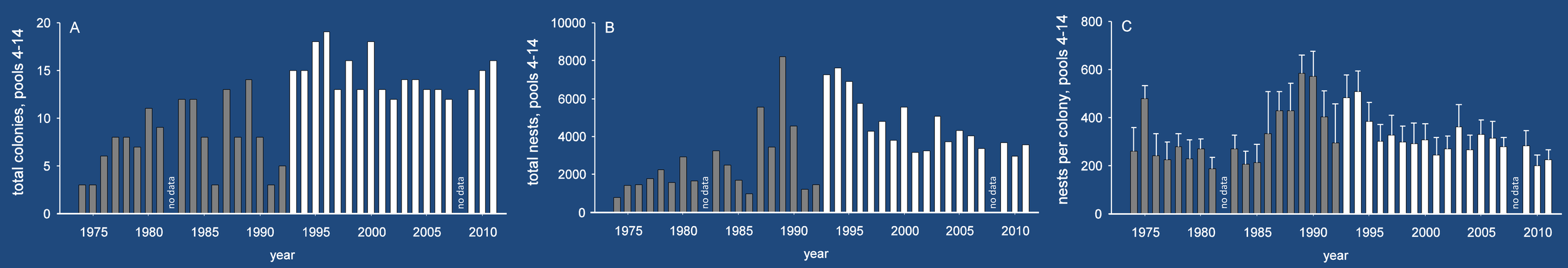

Figure 1. Total number of great blue heron colonies (A), nests (B), and mean ± SE nests per colony (C) on Pools 4–14 during 1974–2011. Data collection during 1974–1993 (gray bars) was inconsistent relative to 1994–2011 (white bars).

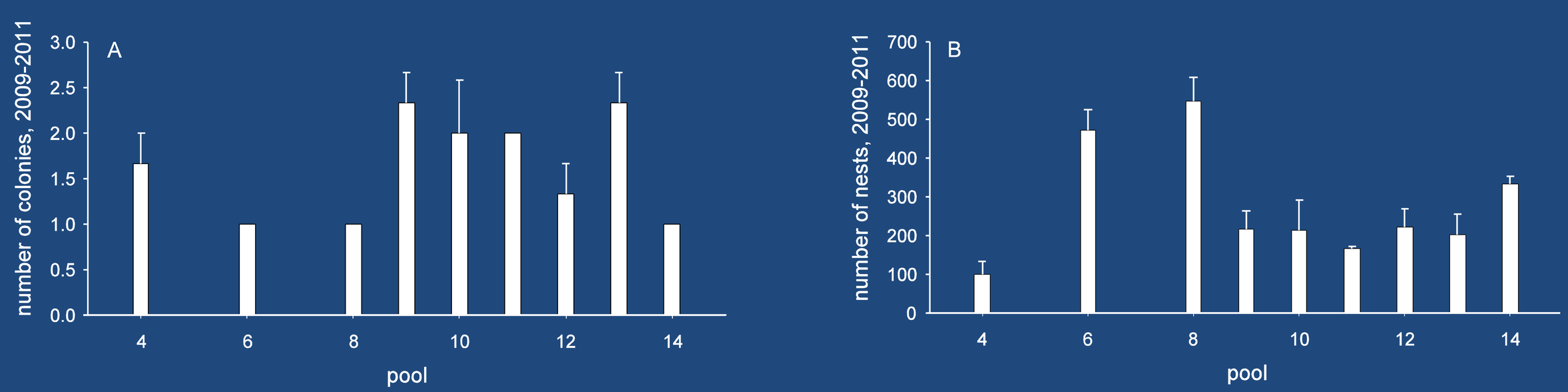

Figure 2. Mean ± SE great blue heron colonies (A) and nests (B) in pools 4–14 during 2009–2011.