

RESEARCH ARTICLE

Declining wintering shorebird populations at a temperate estuary in California: A 30-year perspectiveNils Warnock,^{*†} Scott Jennings, John P. Kelly,[†] T. Emiko Condeso, and David Lumpkin

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ABSTRACT

Worldwide, shorebird populations are declining. Our objectives were to examine abundance trends of shorebirds regularly wintering at Tomales Bay, Marin County, California, accounting for the local effects of rainfall, raptors, and the restoration of part of the bay to tidal wetlands. From November 1989 to February 2019, we conducted 177 comprehensive winter shorebird surveys of Tomales Bay; we averaged 5.7 ± 0.9 (mean \pm SD) winter surveys per year. In 30 yr, we counted 1,215,821 shorebirds of 31 species. We used generalized linear models and multi-model inference to evaluate trends in shorebird abundance while accounting for local sources of variation. We conducted separate analyses for 14 species seen in at least 20 of the 30 yr of monitoring and for all shorebird species combined. During the study, the abundance of all species combined declined 66% (52% in the North Bay and 81% in the South Bay) with the most rapid decline in the first 10 yr of monitoring. Of 13 species for which year was in the top model, 10 species decreased in abundance and 3 species increased. Dunlin and Western Sandpiper accounted for the greatest losses in total numbers. The best-supported models to estimate trends in shorebirds included predictors for year and North Bay vs. South Bay. Of the local variables we considered, rainfall was included in 10 of the 15 best-supported models (including all species combined), negatively affecting the numbers of all species except Willets. The wetland restoration project was included in 5 top models, with a short-term positive impact. Raptor abundance was included in 3 top models with mixed results. Our results show that effective conservation and management of local shorebird populations must be linked with regional/global efforts if we are to reverse negative shorebird trends.

Keywords: avian declines, habitat change, Pacific Americas Flyway, raptors, restoration, shorebirds, trends

LAY SUMMARY

- Given declining North American shorebird populations, we analyzed population trends of shorebirds wintering at Tomales Bay, Marin County, California, spanning 30 seasons from November 1989 to February 2019, and reasons for these trends.
- Survey teams counted over 1.2 million shorebirds of 31 species, of which we analyzed trends for 14 regularly occurring species.
- During this period, overall shorebird numbers declined by 66%; 10 species declined, 3 species increased, and 1 species did not change.
- Dunlin and Western Sandpiper suffered the greatest losses, while Least Sandpipers and yellowlegs (predominantly Greater Yellowlegs) increased the most.
- Effective conservation and management of local shorebird populations must be linked with regional/global efforts to reverse negative shorebird trends.

Disminución de poblaciones de aves playeras invernantes en un estuario templado en California: Una perspectiva de 30 años**RESUMEN**

Alrededor de todo el mundo, las poblaciones de aves playeras están disminuyendo. Nuestros objetivos fueron examinar las tendencias en abundancia de las aves playeras que invernán regularmente en la Bahía Tomales, Condado Marin, CA, considerando los efectos locales de la lluvia, las rapaces y la restauración de parte de la bahía a los humedales de marea. Desde noviembre de 1989 hasta febrero de 2019, realizamos 177 censos completos de aves playeras invernantes en la Bahía Tomales; promediamos 5.7 ± 0.9 (media \pm DE) censos de invierno por año. En 30 años, contamos 1,215,821 aves