



Trends in abundance of wintering waterbirds relative to rainfall patterns at a central California estuary, 1972-2015

Lynne E. Stenzel and Gary W Page
Contact: lstenzel@pointblue.org

Wetlands in arid western North America are valuable habitats to humans, for their many water-related ecosystem services, and to wildlife, by providing water, food, and refuge in which they can complete important life cycle functions. Waterbirds are the most conspicuous wildlife inhabitants of wetlands. During winter, habitat for waterbirds in California comprises primarily coastal estuaries, whose water resources are consistent, and inland wetlands and agricultural lands, both of which are highly dependent on or influenced by annual precipitation. At Bolinas Lagoon, a shallow central California estuary, we monitored the numbers of waterbirds in winter during two periods, 1972–1993 and 1998–2015.

We were interested in how precipitation, changes in the extent of rice fields flooded in the Central Valley of California, and changes within the lagoon might affect the numbers of waterbirds there. The key landscape change that we anticipated affecting waterbird distribution and abundance

started in the 1990s, with a substantial increase in the extent of rice cultivation and a transition of post-harvest treatment of rice stubble from burning to flooding. Thus, we allowed for different abundance patterns in our models in the two survey periods. Over the 43 years period of the study, sedimentation was altering the bathymetry of the lagoon, decreasing the extent of subtidal and low intertidal areas and increasing the extent of high intertidal areas.

We found that precipitation, both in the year in which abundance was monitored and in the prior 1–4 years, was an important variable explaining abundance; accounting for precipitation allowed us to detect underlying trends for most taxa. We also found that for 12 of the 14 taxa that changed trajectories in the two survey periods, increases during the early period were followed by decreases in the later period. We failed to find a general difference in abundance patterns between species that forage primarily in subtidal or

low intertidal habitats compared to those that forage primarily in high intertidal or in vegetated marsh.

Main Points

Almost twice as many species increased in abundance at Bolinas Lagoon from 1972 to 1993 than decreased, whereas the opposite was true from 1998 to 2015.

Among 24 taxa that regularly used rice fields flooded after harvest, abundance patterns consistent with a distributional shift away from Bolinas Lagoon were twice as common as patterns inconsistent with such a shift.

This study underscores the importance to monitoring and conservation programs of identifying key drivers of species' abundance at individual sites and understanding how waterbirds respond to local and regional habitat changes.

Stenzel, L. E., and Page, G. W. 2018. doi 10.21199/SWB3.13
In Trends and traditions: Avifaunal change in western North America (W. D. Shuford, R. E. Gill Jr., and C. M. Handel, eds.), pp. 236–257. *Studies of Western Birds 3*. Western Field Ornithologists, Camarillo, CA.