Decades of Monitoring Trends in a Protected Breeding Bird Assemblage to Improve Riparian Conservation

Abstract

Riparian riparian systems are critical for birds and other wildlife and are disappearing as a result of habitat alteration and degradation. Documenting yearly trends in avian populations and communities in riparian habitats can inform management recommendations. We surveyed breeding bird assemblages at a subalpine wetland park in California across three time periods (1994 to 1998, 2004 to 2008, and 2014 to 2018). Of the 57 bird species observed there, twenty-two species were known to breed, and four are classified as riparian focal species for conservation. Species richness, diversity, and evenness showed little variability among years however, total individuals of all species territories, combined, showed statistically significant declines overall: Eight out of twenty-two species showed substantial declines, including three of the most notable conservation interest: Common Yellowthroat (Geothlypis trichas), Wilson’s Warbler (Wilsonia virens), and Song Sparrow (Melospiza melodia). These changes were not related to any measurable alteration in vegetation type, species on the plot, or prequotidionist elevation, but may be related to changes in habitat size and shape or changing land use patterns nearby. Management recommendations to benefit the avifauna include adaptive management during continued monitoring, and expansion of the park’s riparian habitat by enhancing plants in surrounding area restorations.

Introduction

Approaches to study the most rich and complex ecosystems (Naiman et al. 1993), although these areas are particularly important habitats for bird species (California in Moncrief et al. 1999), they are disappearing as a result of anthropogenic disturbance (Markwick et al. 2000). It is often unclear which riparian habitat factors influence local bird populations. Long-term monitoring of bird populations is useful for detecting local population trends and suggesting the degree to which changes can be attributed. This study extends the 14-year bird territory sampling effort by Riensche et al. (2010) in Coyote Hills Regional Park in Fremont, California.

Methods

Study Area — This study was conducted at Coyote Hills Regional Park (hereafter: “Coyote HIlls”) in Fremont, California. Coyote HIlls is 3.5 km long, almost 405 hectares in size, and contains one of the largest willow-dominated riparian woodlands, 8.5 hectares, remaining along the eastern shore of San Francisco Bay. Bird and Vegetation Surveys — Counts were conducted following standard Breeding Bird Census (BBC) procedures (Van Velzen 1972) across three time periods: Time period 1 (1994 to 1998), Time period 2 (2004 to 2008), and Time period 3 (2014 to 2018). A total of 144 BBC censuses were taken. All birds seen and heard were recorded and territory boundaries were determined based on repeated behavioral occurrences and simultaneous singing. Vegetation surveys are described in Riensche et al. (2010).

Statistical Analysis — Differences in population densities between were expressed as percentage change (Canterbury et al. 1997). Depending on the distribution and variance of each sample group, in order to correctly analyze the data, a one-way ANOVA, Kruskal-Wallis test, or non-parametric Kruskal-Wallis test was used to determine statistically significant differences in percent changes in population density per species, total breeding bird territories, and focal species territories between time periods. Differences were considered statistically significant at the 95% confidence level. Species richness, diversity, and evenness were computed to evaluate avian community structure per year (Yáñez 1980; Rothfels et al. 1990).

Results

The relative population densities of breeding species and those which declined are displayed in Table 1. The entire breeding bird assemblage showed a decrease in population density during this 24-year study period (F2,6 = 10.7, P < 0.05; Fig. 1). Among the Riparian Focal Species, territories of the Common Yellowthroat (F2,6 = 16.3, P < 0.05), Song Sparrow (F2,6 = 10.9, P < 0.05), and Wilson’s Warbler (F2,6 = 9.5, P < 0.05) decreased significantly between time period 1 (1994 to 1998) and time period 2 (2004 to 2008) and 3 (2014-2018; ANOVA, P < 0.05).

Figure 2 — There was a significant decrease in the number of territories of three of the four Riparian Focal Species. Total territories of Common Yellowthroat, Song Sparrows, and Wilson’s Warblers decreased between time period 1 and time periods 2 and 3 (ANOVA, P < 0.05). However, the number of Tree Swallow territories remained similar (Kruskal-Wallis, P = 0.05).

Discussion

Overall, there was a significant decline in total breeding bird territories across this 24-year span. We found that eight of the 22 breeding species at Coyote HIlls showed substantial declines, including three of the four Riparian Focal Species (Common Yellowthroat, Song Sparrow, Wilson’s Warbler; Tree Swallow). This indicates that a diverse and abundant breeding bird assemblage is an indicator of ecosystem health (The Riparian Bird Conservation Plan 2004), these results suggest a decrease in habitat quality over time. Factors influencing habitat quality in this study are unlikely to be due to changes in vegetation on the plot, as none were detected, but may be related to the habitat surrounding the site. Observed changes in size and shape of the park may explain the significant decline in some species. Width of riparian habitats can influence the distribution patterns of birds (Buskirk et al. 2012). This 24-year study may serve as a basis for evaluating future findings and assist in the conservation of riparian birds.

Authors

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Literature Cited


Yáñez, R.H. 1980. Breeding Bird Surveys: A strategy for reversing the decline of riparian associated birds in California, California Department of Fish and Game, Division of Fish and Game.


Table 1 — Change in population densities of breeding bird territories at Coyote Hills Regional Park across three time periods. Focal species for the Riparian Bird Conservation Plan are italic/bold. Significant changes at the 95% confidence level in population densities are noted by asterisks.

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<td>Tree Swallow</td>
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