East Bay Regional Park District

Healthy Parks Healthy People

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

Abstract

Natural riparian systems are critical for birds and other wildlife yet 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 suburban wetland park in Central California across three time periods (1994 to 1998, 2004 to 2008, and 2014-2018). Of the seventy 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 those of notable conservation interest: Common Yellowthroat (*Geothlypis trichas*), Wilson's Warbler (*Wilsonia pusilla*), and Song Sparrow (*Melospiza melodia*). These changes were not related to any measurable alteration in vegetation type, species on the plot, or precipitation/climate, 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

Riparian habitats are among the most rich and complex ecosystems (Naiman et al. 1993). Although these areas are particularly important habitats for landbird species in California (Manley et al. 1993), they are disappearing as a result of anthropogenic disturbance (Merola-Zwartjes et al. 2005). 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 — Censuses 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 Analyses — Differences in population densities between were expressed as percentage change (Canterbury et al. 1997). Depending on the distribution and variance of each sample group, an analysis of variance (ANOVA) 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 (Yahner 1983; Rollfinke 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 ($F_{2,6} = 10.7$, $P < 0.05$; Fig. 1). Among the Riparian Focal Species, territories of the Common Yellowthroat ($F_{2,6} = 16.3$, $P < 0.05$), Song Sparrow ($F_{2,6} = 10.9$, $P < 0.05$), and Wilson's Warbler ($F_{2,6} = 9.54$, $P < 0.05$) decreased significantly between time period 1 (1994 to 1998) and time periods 2 (2004 to 2008) and 3 (2014 to 2018; Fig. 2). However, the number of Tree Swallow territories remained similar ($\chi^2 = 2.6$, $P < 0.05$, $df = 2$). The three variables describing the structure of the avian community showed no significant change among time periods.

Discussion

Overall, there was a significant decline in total breeding bird territories across this 24-year span. We found that eight out 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). Because Riparian Focal Species are important indicators 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 (Bueno et al. 2012). This 24-year study may serve as a basis for evaluating future findings and assist in the conservation of riparian birds.

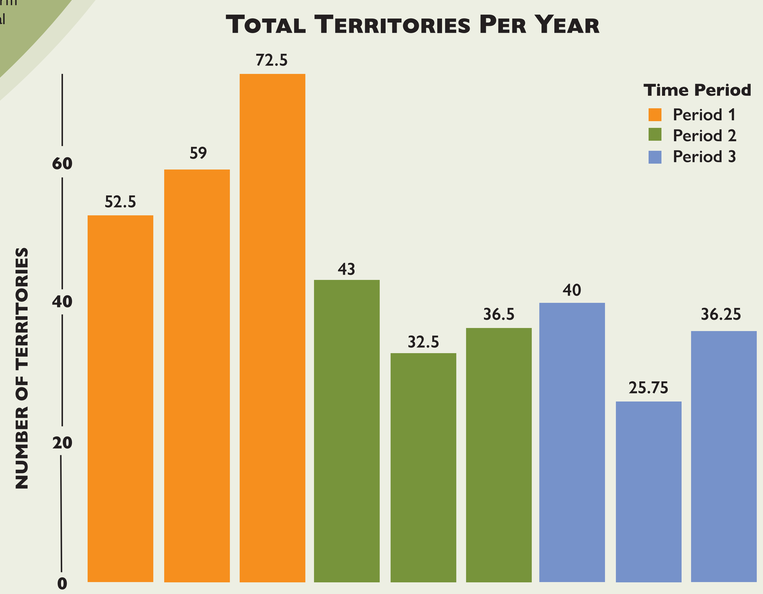

Figure 1 — Total breeding bird territories per year. There was a significant decrease in bird territory density from time period 1 (1994-1998) to time periods 2 (2004-2008) and 3 (2014-2018; ANOVA, $P < 0.05$).

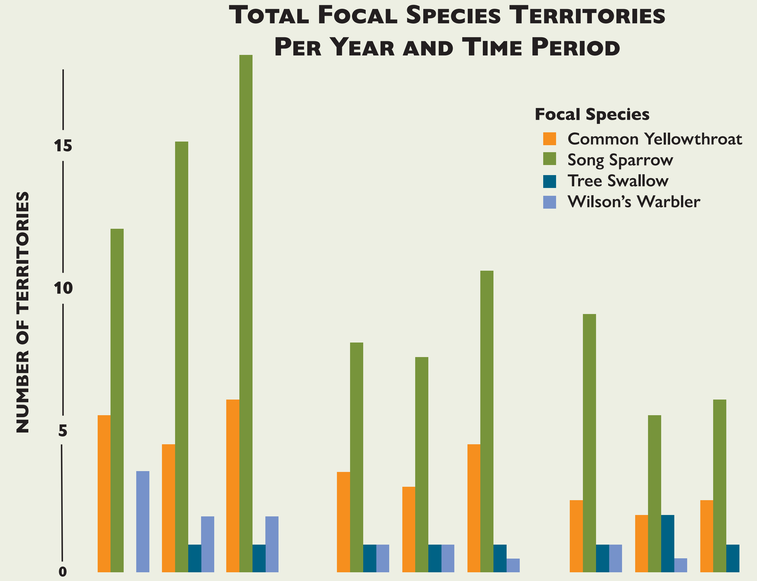

Figure 2 — There was a significant decrease in the number of territories of three of the four Riparian Focal Species. Total territories of Common Yellowthroats, Song Sparrows, and Wilson's Warblers decreased between time period 1 and time periods 2 and 3 (ANOVA, $P < 0.05$). However, the number of Tree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

	Mean Territories			% Change in Population Density	
Species	Time period 1 (1994-1998)	Time period 2 (2004-2008)	Time period 3 (2014-2018)	Time period 1 vs 2	Time period 1 vs 3
American Coot	1.00	0.00	0.00	*-100%	*-100%
Anna's Hummingbird	1.00	1.00	0.67	no change	-33%
Bewick's Wren	3.33	3.00	4.17	-10%	25%
Brown-headed Cowbird	2.67	1.00	1.00	-63%	-63%
Black Phoebe	0.83	0.33	0.33	-60%	-60%
Bushtit	4.33	2.00	1.00	*-54%	*-77%
California Towhee	2.50	1.00	0.67	-60%	*-73%
Chestnut-backed Chickadee	1.67	1.33	1.00	-20%	-40%
Common Yellowthroat	5.33	3.67	2.33	*-31%	*-56%
Downy Woodpecker	1.00	0.83	0.42	-17%	-58%
European Starling	1.83	0.00	0.00	*-100%	*-100%
Mallard	1.33	0.83	1.67	-38%	25%
Marsh Wren	7.00	5.17	2.33	-26%	*-67%
Mourning Dove	2.83	3.50	5.00	24%	76%
Pied-Billed Grebe	1.00	0.67	0.75	-33%	-25%
Scrub Jay	1.50	1.00	1.33	-33%	-11%
Song Sparrow	15.00	8.67	6.83	*-42%	*-54%
Rufous-sided Towhee	1.67	0.33	1.00	-80%	-40%
Tree Swallow	0.67	1.00	1.33	50%	100%
Virginia Rail	1.00	0.17	0.67	-83%	-33%
Wilson's Warbler	2.50	0.83	0.50	*-67%	*-80%
White-tailed Kite	0.83	0.67	0.67	-20%	-20%

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.

Authors

David L. Riensche[1], Alan Chan-Alvarado[1,2], and Christopher L. Kitting[3]

[1] East Bay Regional Park District, 2950 Peralta Oaks Court, P.O. Box 5381, Oakland, CA 94605.

[2] San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132

[3] California State University East Bay, 25800 Carlos Bee Boulevard, Hayward, CA 94542

Literature Cited

Bueno, A.S., R.S. Bruno, T.P. Pimentel, T.M. Sanaiotti, and W.E. Magnusson. 2012. The Width of Riparian Habitats for Understory Birds in an Amazonian Forest. Ecological Applications 22 (2):722–34.

Canterbury, G.E., and D.E. Blockstein. 1997. Local Changes in a Breeding Bird Community Following Forest Disturbance. Journal of Field Ornithology 68(4):537-546.

Manley, P. and C. Davidson. 1993. A risk analysis of Neotropical migrant birds in California, U.S. Forest Service report, Region 5. San Francisco, CA.

Merola-Zwartjes, M., and J.P. DeLong. 2005. Avian Species Assemblages on New Mexico Golf Courses: Surrogate Riparian Habitat for Birds? Wildlife Society Bulletin 33 (2):435–47.

Naiman, R.J., H. Decamps, and M. Pollock. 1993. The Role of Riparian Corridors in Maintaining Regional Biodiversity. Ecological Applications 3 (2):209–12.

Riensche, D.L., M. Morrow, M. Clark, and C.L. Kitting. 2010. Monitoring Trends in a Breeding Bird Assemblage with Implications for Riparian Conservation. Transactions of the Western Section of the Wildlife Society 46:7–2.

Riparian Habitat Joint Venture. 2004. Version 2.0. The riparian bird conservation plan: a strategy for reversing the decline of riparian associated birds in California. California Partners in Flight. PRBO Conservation Science, 4990 Shoreline Hwy., Stinson Beach, CA.

Rollfinke, B.F., R.H. Yahner, and J.S. Wakeley. 1990. Effects of Forest Irrigation on Long-Term Trends in Breeding-Bird Communities 10 (2):264–278.

Van Velzen, W.T. 1972. Breeding bird census instructions. American Birds. 26:1007-1010.

Yahner, R.H. 1983. Seasonal Dynamics, Habitat Relationships, and Management of Avifauna in Farmstead Shelterbelts. The Journal of Wildlife Management 47 (1):85–104.