

Bird Diversity in Petaluma Wetlands

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Background

Our study was conducted in two adjacent public park lands in Petaluma, California: Shollenberger Park and Ellis Creek Water Recycling Facility.

- Shollenberger Park is 165 acres of former ranch land and river dredge dump site, converted to a wetland by construction of a levee. The park has been a popular recreation spot since it opened to the public in 1996.
- Ellis Creek Water Recycling Facility is a 270-acre tidal marsh made up of pools that aid in the water recycling process while creating new wetland habitat. Construction of the facility included trails that encircle the ponds and connect to Shollenberger trails, and opened to the public in 2009.

Both sites are fed by the Petaluma River at high tide, and by annual rainfall. In addition to providing members of the public with a beautifully landscaped recreation area, these two parks function as valuable habitat for endangered and threatened populations of Clapper Rail, Salt Marsh Harvest Mouse, Black Rail, and Western Pond Turtle. Since this area lies within the Pacific Flyway bird migration corridor, it provides migrating birds with a place to rest during their long journeys.

Methods

Our team accompanied the Petaluma Wetlands Alliance (PWA) on their bi-monthly bird surveys during the end of winter bird migration. We met with a group of PWA members just after sunrise for their March survey at Ellis Creek and again in April for their Shollenberger Park survey. As a group, we walked through each site and used binoculars, spotting scopes, and our ears to count as many individual birds and species as we could find. Any bird visible or audible from the park using our optical tools was counted. Since PWA has been conducting these surveys since 2010, we were able to use their past and current data to supplement our observations.

We used Simpson's Diversity Index to assess bird biodiversity in the wetlands. We grouped species by taxonomic order, which represents evolutionary relationships between bird species, and calculated the diversity index using the number of individuals in each taxonomic group instead of number if individuals in each separate species.

Acknowledgements

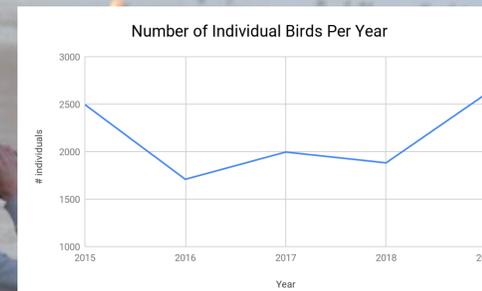
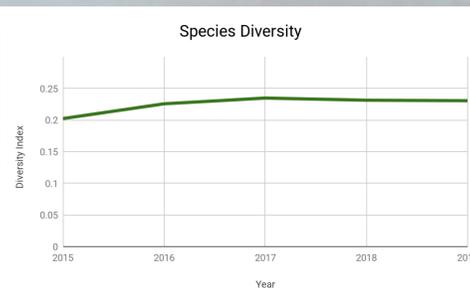
A very special thank you to Petaluma Wetlands Alliance
Photos courtesy of Miles and Teresa Tuffli



Question and Hypothesis

The purpose of this study is to explore changes in wetland bird population during the past five winters. We wonder if changes in winter precipitation affects the species richness (number of bird species observed) or the relative abundance (total number of individual birds observed).

We hypothesize that we will find lower numbers overall in years with drier winters.



	Swimmers	Aquatic-Aerialists	Long-legged waders	Smaller waders	Fowl-like birds	Birds of Prey	Other non-passerine birds	Passerine birds	Totals
March 2019 # species	18	4	10	5	0	7	5	30	79
# individuals	594	86	250	775	0	21	108	778	2612
	D= 0.231								
March 2018 # species	17	6	11	6	0	6	5	33	84
# individuals	496	29	115	352	0	13	107	770	1882
	D= 0.231								
March 2017 # species	4	3	10	5	2	4	2	4	34
# individuals	776	81	67	79	0	19	58	916	1996
	D= 0.235								
March 2016 # species	20	5	9	6	0	6	5	29	80
# individuals	577	60	52	111	0	12	143	754	1709
	D= 0.226								
March 2015 # species	20	4	9	9	1	6	6	26	81
# individuals	1197	54	58	671	2	15	5076	342	7496
	D= 0.202								



Discussion

We found that bird diversity recorded during PWA surveys has declined over the past few years. As urbanization inevitably increases, the creation and preservation of parks such as Shollenberger must be prioritized, because habitat loss is one of the leading factors of extinction for several species. The focus of our research was March from 2015-2019. Our research on precipitation levels indicated a continuous change throughout these years. These levels seemed to correlate with the Species Diversity Index of the same years.

Questions for future research:

1. How have the Petaluma wetlands been altered due to the rise in urbanization since the surveys began?
2. How do global precipitation levels impact migrating birds?
3. There have been plans to implement an asphalt factory along the river that runs parallel to the Petaluma marsh. How will this impact the bird diversity in the area?

Results

By using the Simpson's Diversity Index for years 2015-2019, our calculations revealed that bird species diversity has been declining over these years. The higher the diversity index, the more species diversity there is. But, our results indicated a declining species diversity index.

Precipitation Percentiles of the North Bay Area

Year (March)	Ranking
2015	Much below average
2016	Near average - above average
2017	Much above average
2018	Near average - below average
2019	Much above average

Record driest → Much below average → Below average → Near average → Above average → Much above average → Record wettest

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