

## **Association of Vegetation Composition and Canopy Structure with Songbirds in California Valley Grasslands**

Sasha Gennet  
Michele Hammond  
James Bartolome

Sasha Gennet presented a small component of a larger, long-term research project initiated in 2002 by James Bartolome, East Bay Regional Park District and UC Berkeley's collaborative grasslands monitoring program. The goal of the program is to investigate the effects of grazing management in addition to several environmental variables such as annual weather, soils, topography, and landscape characteristics on the plant, avian, and small mammal communities within East Bay Regional Park grasslands. The program aims to develop a better understanding of the driving factors and trends in these non-equilibrium grassland ecosystems. Sasha's presentation focused on the 2004 and 2005 data that was collected on the grassland songbird guild as part of the larger program.

Researchers aimed to determine whether grassland birds are associated with the structural complexity of the local plant community; variance in canopy height, presence of litter, and bare ground were the structural attributes quantified. Researchers also looked at the relationship between the abundance of native plants and grassland songbirds since the species likely coevolved an association. Scientists also investigated the key question regarding whether or not grassland songbirds preferentially utilize grazed sites in the park district. Researchers also classified specific identifiable plant communities within the Valley Grassland matrix to see whether there is any association between communities and songbird abundance.

The project area consists of eight study sites on East Bay Regional Park District lands, a patchwork of public lands totaling close to 100,000 acres in Contra Costa and Alameda counties. The project also includes a ninth site on army reserve land in Dublin. The region is characterized by a Mediterranean climate with cool winters and hot, dry summers, and averaging fifty centimeters of rainfall annually. Valley grassland ecosystems of the East Bay have been heavily impacted and due to development have become islands of habitat in a sea of urban sprawl. Therefore, quantifying the effects of plant community composition, land use, and landscape characteristics on birds utilizing the remaining habitat is quite urgent. Four songbird species were studied as part of the grassland-dependent songbird guild. The species range from the Grasshopper Sparrow (*Ammodramus savannarum*), which is a habitat specialist and quite rare, to the Western Meadowlark (*Sturnella neglecta*), at the opposite end of the spectrum, which is a habitat generalist and is common in many grasslands across the country. The Savannah Sparrow (*Passerculus sandwichensis*) and Horned Lark (*Eremophila alpestris*) were the other two species researched and fall in between the aforementioned species in terms of abundance and special habitat requirements. Grasshopper sparrows are of particular concern because they have experienced a widespread decline in recent years and are considered rare in California. Data is collected three times annually at each of 62 plots located at eight sites within the park district.

During the breeding season from March 15 through June 15 three ten-minute point counts are conducted for songbirds utilizing the standard variable-radius circular plot method. Vegetation plots coincide with the bird count areas and data is gathered within plots 36 meters in diameter utilizing four line point transects with forty points per line. Species and height data as well as litter and bare soil are recorded along the vegetation transects.

As expected, data demonstrated that Meadowlarks were three to four times more frequently observed than Grasshopper Sparrows. Sasha noted that researchers presume that each sighting represents a breeding pair, as females tend to be quite secretive during the breeding season. Since low numbers of songbirds were recorded, the data was converted to a binary response variable indicating either the presence or absence of the songbirds. Analyses were run for all four songbirds together, and for each of the four species independently. The predictor variables in the full model for the logistic regression included: grazing (binary), percent native composition, coefficient of variation percent height (continuous), percent litter cover (continuous), percent bare ground or rock (continuous), and solar radiation (continuous). Classification of plant communities was accomplished using a cluster analysis to identify eight distinct plant communities that remained surprisingly consistent between years. An indicator species analysis was performed to provide an index of frequency and abundance in identified sub-groupings. A multi-response permutation procedure was then run to check the strength of the relationships. A non-parametric multiple group comparison was also utilized.

The results for all birds indicated that grassland-dependent passerines in Valley Grasslands within the East Bay Regional Park District, as an avifaunal guild, were not significantly associated with structure or plant composition. However, the guild was observed to be consistently positively associated with grazing, as expected.

Western Meadowlarks demonstrated no clear patterns, which is logical given this generalist's ability to do well in a variety of habitats. Although some variables pertaining to structure did demonstrate positive coefficients, they could not be reliably separated and were therefore not included in the final model.

Numbers were too low to be statistically significant; however Horned Larks appear to associate with community composition and canopy structure, favoring a high degree of variation in canopy height. Furthermore, Horned Larks were only observed in grazed plots.

Results for Savannah Sparrows were similar to Horned Larks; the sparrows are strongly associated with community composition and various measures of canopy structure. However some specific measures of structure really can't be separated, such as percent litter and percent bare ground. Savannah Sparrows were also observed to be associated primarily with grazed plots; one Savannah Sparrow was recorded in an ungrazed plot in 2005.

Grasshopper Sparrows were only observed on twenty-five occasions over two years, making it impossible to draw any statistically significant conclusions. However, qualitative evidence of the interaction between Grasshopper Sparrows and the study variables was evident. No ungrazed

plots contained the sparrows in 2004 or 2005. An odds-ratio comparison was performed and indicated that plots with more than five percent cover of native plant species were 8.6 times more likely to contain Grasshopper Sparrows, and additionally, that grazed plots are 9.4 times more likely to contain more than five percent cover of native species. In sum, plots containing more native plants were more likely to contain Grasshopper Sparrows, and grazed plots were more likely to contain more native species.

Key findings include the strong preferential use of grazed plots by all four species studied. Excluding Western Meadowlarks all species demonstrated patchy, sparse distribution, and possibly due to niche saturation. Horned Larks and Savannah Sparrows are associated with plant community composition. There were inconsistent responses among the four bird species to predictor variables of structure, and the presence of native plants.

In conclusion, there is no indication from this analysis that ongoing livestock grazing in East Bay Regional Park District Grasslands is negatively impacting songbird populations. Also, songbird species had variable associations with measurements of structure and species composition, suggesting that a mosaic of landscapes is preferable for maintaining these species.