

Connectivity among Burrowing Owl Populations on Military Lands across North America



Military Lands across North America



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Introduction

Many populations of western burrowing owl have been declining in North America. Consequently, the burrowing owl has been legally protected under international, federal, and state laws.

Burrowing Owls are very strongly associated with military installations throughout the western U.S., where the low vegetation cover apparently attracts owls. All these levels of legal protection pose a challenge to both military operations and the species' management on military lands. Therefore, better knowledge of the genetic structure of burrowing owl populations in North America is essential for evaluating state-level listing petitions and for designing local management plans for the species that include measures such as translocations. Legal protection of burrowing owls poses a challenge to military operations and the species' management on military lands.

We are evaluating the species' population structure on military lands and other locations throughout North America. We are using stable isotopes of owl feathers and molecular genetics based on blood samples to quantify the importance of DoD lands to Burrowing Owl populations in the region, and identify migratory linkages among DoD installations and lands managed by other state and federal partners.



Figure 1. Subset of 17 sampling locations for which we have completed analyses of blood samples.

Study Area & Methods

- Visited 39 DoD installations in 9 western states that have Burrowing Owls breeding on their base.
- Developed a large partnership with dozens of other federal and state agencies, universities, and non-governmental organizations in the U.S., Canada, and Mexico. These partners have provided >\$400,000 additional dollars to support the project.
- Trapped 3353 Burrowing Owls at 39 DoD installations and dozens of areas managed by other project partners in 2005-08 and collected feathers and blood samples from each owl following standardized protocols.
- Developed 8 new, highly variable DNA microsatellite markers for the species.
- Used markers to determine the genetic structure of Burrowing Owl populations throughout North America.
- Conducted stable isotope analyses on feathers to track the extent of annual breeding dispersal among populations in North America.

Results

- Preliminary microsatellite data from 746 owls from 17 sampling locations (Fig. 1) suggest low levels of genetic differentiation among burrowing owl populations (high frequency of emigration and immigration among populations).
- Almost all of the variation in allele frequencies (99%) occurred within (rather than among) sampling locations.
- Overall F_{ST} index, which measures the genetic differentiation among populations, is very low (<0.02).
- Preliminary stable isotope data also reveal high levels of connectivity among locations in North America.

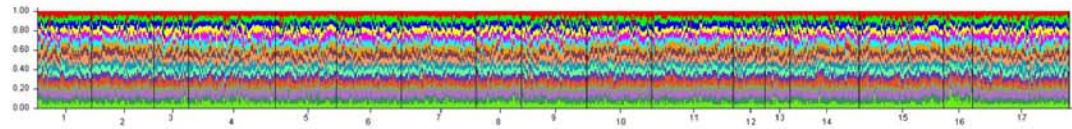


Figure 2. Owls in each location share alleles roughly equally with all other location. Each vertical bar is an individual owl, numbers on the x-axis are the 17 sampling locations, and each color represents an estimate of the proportion of genetic variation that each owl has inherited from ancestors in each of the 17 locations. Note that only location #16 looks differentiated.

Discussion

- Preliminary results suggest very high connectivity among populations (both on and off military installations).
- Burrowing owls may be best managed as one panmictic population rather than via local or even state-wide management efforts.
- Local or even regional conservation efforts in areas where owls are listed may not be effective due to high rates of long-distance dispersal movements (connectivity among populations).

