



Airborne Lidar and Aerial Imagery to Assess Potential Habitats for the Desert Tortoise (*Gopherus agassizii*)

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The desert Southwestern United States serves as the host to the habitat for several threatened and endangered species, one of which is the desert tortoise (*Gopherus agassizii*). The goal in this study was to develop a fine-scale, remote sensing-based model that predicts potential habitat locations of *G. agassizii* in the Boulder City (Nevada) Conversation Easement area (35,500 hectares). This was done by analyzing airborne Lidar data (5-7 points/m²) and color imagery (4 bands, 0.15 m resolution) and determining percent vegetation cover, shrub height and area, NDVI, and several geomorphic characteristics including slope, azimuth, roughness, etc. Other field data used herein include estimates of canopy area and species richness using 1271 line transects, and shrub height and canopy area using plant-specific measurements of ~200 plants. *Larrea tridentata* and *Ambrosia dumosa* shrubs were identified using an algorithm that obtained an optimum combination of NDVI and average reflectance of the four bands (IR, R, G, B) from pixels in each image. Results identified more than 65 million shrubs across the study area, and indicate that percent vegetation cover from the aerial imagery across the site (13.92%) compared favorably (14.52%) to the estimate obtained from the line transects, though the lidar method yielded shrub heights approximately 60% of measured shrub heights. Plants and landscape properties were combined with known locations of tortoise burrows (visually observed in 2014), yielding a predictive model of potential tortoise habitats. Masks were created using roughness coefficient, slope percent, azimuth of burrow openings, elevation and percent ground cover to isolate areas more likely to host habitats. Combined together, the masks isolated 55% of the total survey area, which would help target future field surveys. Overall, the vegetation map superimposed onto the background soil data could estimate the location of tortoise burrows.