

## ABSTRACT

Vernal pools are rare, seasonal pools that form in landscape depressions and create temporary habitat for many floral and faunal taxa. In California, as much as 90% of historic vernal pool area has been displaced by agriculture and urbanization. Pools are commonly inhabited by endemic, threatened, and endangered plants and animals, and are critical breeding areas for California tiger salamanders (*Ambystoma californiense*) and fairy shrimp (*Linderiella occidentalis*). Seasonal inundation and desiccation are driving factors behind the biotic community structure around pools, both spatially and compositionally.

At Fort Ord, California, a rare subset of vernal pools occur perched atop relict sand dunes in an arid chaparral environment. Fifteen vernal pools have been previously identified within the base's historic firing range impact area. At least 45 other lowland meadows within the impact area meet pool topographic requirements and were evaluated for their potential to be vernal habitats. This thesis proposes an object-based method of extracting vegetative patterns from VHSR Ikonos and WorldView 2 satellite imagery, to compare persistence in vegetative patterns over time. Classification results from three aeriels collected over an 80-year interval were subjected to a geospatial change analysis, and used to make short- and long-term comparisons of known vernal meadows to themselves and other meadows in the study area. Two new metrics, the Persistence Index and Weighted Intervals Persistence Index, were created for this study. These indices normalize changes in geometric properties, enabling comparisons between known vernal areas and study sites, and between self-same sites sampled at different times. PI and WIPI results were consistent with the results from other analyzed metrics.

Strong persistence in several study sites, comparable to that of the known vernal areas, likely indicates latent presence of a seasonal hydric regime and an elevation-based hydrological gradient. The results of this study show that there is no statistically significant difference between the way that vernal and other meadows change shape and size over time. This result means that a number of lowland meadows in the impact area may have active or dormant vernal pools because the two groups cannot be empirically differentiated from one another. This study also positively confirmed the presence of at least five previously unrecognized vernal areas through the detection of water in multiple aerial images. These findings merit further on-the-ground investigation, as well as a geographical reconsideration of current conservation efforts.