Analysis of desert shrubs along first-order channels on desert piedmonts: possible indicators of ecosystem condition and historic variation

The goal was to determine if vegetation can signal ecosystem change from natural disturbance or military activities, and to better understand the relationship between vegetation changes and soil-hydrologic dynamics in the desert environment. The project was conducted at Yuma Proving Ground, AZ and results were reported in 2004. Our analyses showed a direct link between surface runoff, ephemeral channel flow and ecological condition. We concluded that vegetation along first- and higher -order stream channels provides an efficient means of examining ecosystem condition in arid environments.

Summary of Project Details: We first mapped the historic range in variation of select native desert shrub and tree species common in alluvial fans and first-order stream channels. Long term changes to ecosystem condition from climate change were observable from the vegetation, which would have pre-dated the military presence on that landscape. Then we evaluated changes in soil and surface hydrology due to either military activities or natural environmental variation. The analyses revealed considerable differences in soil characteristics, water conductivity, and soluble salt content in soils underlying desert pavements compared to soil underlying channel surfaces. Those two factors, soil and surface hydrology, accounted for most of the observable changes in ecosystem condition, especially the historic contraction of vegetation along the margins of alluvial fan surfaces. We showed the importance of certain linkages between precipitation events, soil properties, stream channels and vegetation. Those functional relationships create observable patterns that are measurable in vegetation, which in turn reflect ecosystem condition.

Management Implications: Although monitoring vegetation and particularly ironwood (*Olneya tesota*) along first-order channels may provide important information about overall ecologic condition, our findings suggest that overall, first-order drainages may be less sensitive to perturbation than expected. We recommended, in addition to vegetation monitoring, that military land managers include soil and hydrologic characterization to obtain data and knowledge of vegetation dynamics and soil-landscape relationships.

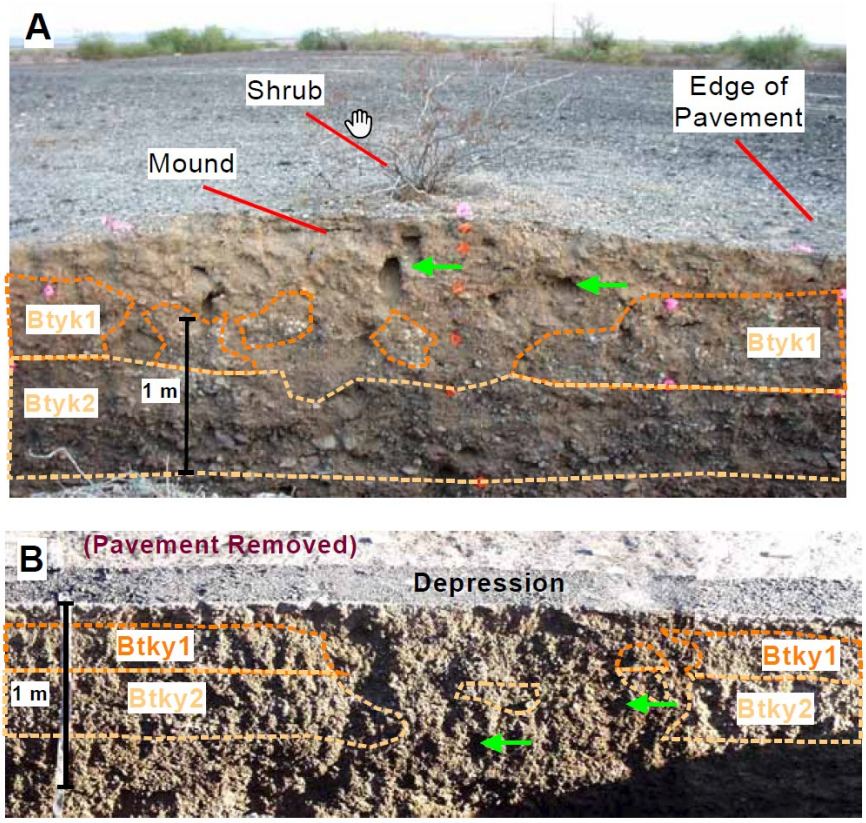

Figure 4.1.8. Trench exposing soil underlying plant mound scar (A) and plant scar depression (B) showing examples of krotovina and open animal burrows (green arrows) and truncated soil horizons (tan-reddish dashed lines). Soil horizons have been truncated by faunal burrowing.