

Analysis of Desert Shrubs Along First-Order Channels on Desert Piedmonts: Possible Indicators of Ecosystem Condition and Historic Variation

The goal was to assess the extent to which shrub and tree species along channels in the desert piedmonts signal environmental change and ecological condition. Approximately 70% of Department of Defense (DOD) lands are arid or semiarid desert, whose landscapes appear to be changing. At the Yuma Proving Ground (YPG) vegetation has decreased downstream of areas heavily impacted by military activities, although vegetation has also contracted where there is no military disturbance. We looked at the historic range of the desert vegetation on the alluvial fans and first-order channels, evaluated changes in soil and surface hydrology, and provided recommendations for procedures to monitor ecosystem status and identify impacts. Our results were reported in 2004. We found that climate and disturbance to surface water source areas were the primary factors that affected ecological condition as measured by the vegetation. We provided those details that allow for differentiating natural disturbance from that due to military activities.

Summary of Project Details: We hypothesized that the status of vegetation along first-order channels would provide a readily observable signal of ecosystem change. The vegetation species examined were creosotebush, ironwood and blue palo verde. Our approach was to conduct three interrelated components, (1) evaluate the historic range of plant variability; (2) characterize the correlation between soils and plant available water; and (3) evaluate the ecophysiological response of key desert plants along first-order drainages. All of our data were collected in the field at six study drainages which were within two plots. Results from our analyses are presented in figures and tables as well as photographs.

Management Implications: We confirmed that the vegetation along first and higher order channels are an efficient way to examine ecosystem condition in arid environments. We recommended some additional sampling strategies such as surveying plant-water usage over a range of drainage types, using leaf pubescence as a metric for plant health from a hydrologic perspective, and employ stable isotope analyses. We recommended using time-domain reflectometry to test soil moisture, conduct additional analyses of precipitation patterns and numerical modeling. We suggested using these strategies and techniques for soil and hydrologic characterization to benefit conservation managers and their agencies. We recommended integrating the vegetation dynamic-soil-landscape relationships in conjunction with geotechnical consultation to assess ecological condition.

**Bioturbation from
Roots and
Burrowing
Rodents**

**Deflation and
Collapse of
Mound**

