Desert Fire History and Effects on the Phoenix, Arizona, Metropolitan Area

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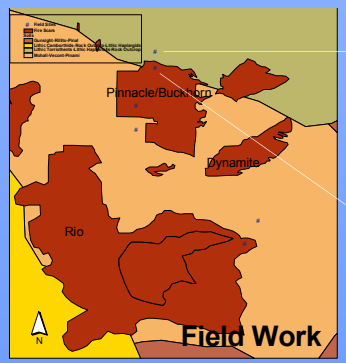
Abstract .The goal of the present research is to utilize remote sensing tools to reconstruct the extent and impact of fires in a desert-urban environment. Our results indicate that simple band stretches and albedo data successfully discriminated burned versus unburned regions. Variations in reflectance values between burned and unburned regions can be related directly to density of vegetation in these areas.

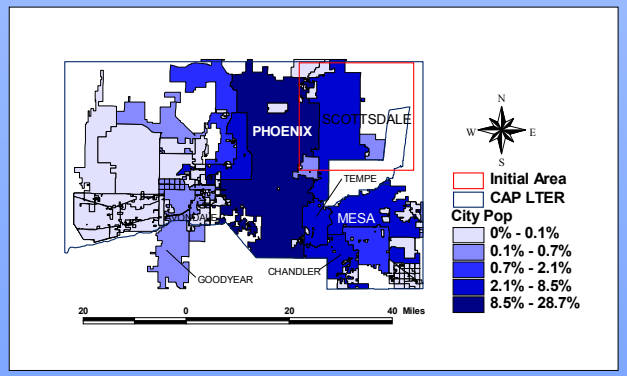
Data Collection and Assimilation

- satellite imagery used to identify spatial patterns of fires
- ground truth of fire scar information
- vegetation and soil data
- compilation of demographic, climate, CO_2, and soil data

Field work was conducted in early August 2001. Three field sites were located within fire scars and three additional sites were located outside fire scars. At each of the sites, three 100-meter modified belt-line transects located 25 meters apart were established to characterize the vegetation.

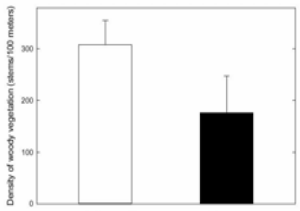


Landsat TM Scene 1998 False Color Image of bands 4,3,2



Summary of Initial Research

- Documented increased of fires
- Changes to the density of woody vegetation
- Band stretches and albedo are best used for discriminating burned versus unburned regions in a desert-urban environment

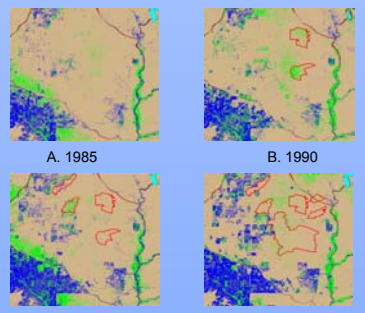


A F-max test of the woody vegetation count data revealed high heteroscedasticity in the vegetation data. A non-parametric analysis (Kruskal-Wallis ANOVA) of the field data revealed a significant difference between the number of woody stems in the burned and unburned areas.

Burned = 176.1 ± 71.2
Unburned = 307.9 ± 47.4
Kruskal-Wallis Test, Chi-Square = 5.08; P = 0.02

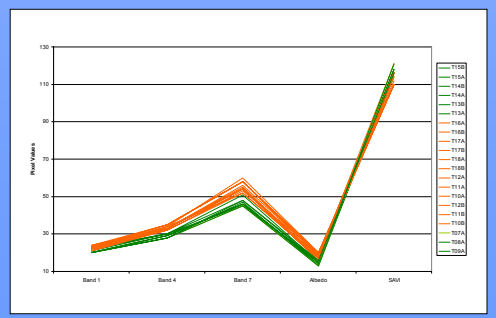
Results of Data Analysis

Identify and describe the spatial and temporal relationships between the human, physical, and biological data.



A. 1985 B. 1990 C. 1993 D. 1998

Increased fire frequency has accompanied increased development from 1985 to 1998. Fire scars (red polygons) are displayed on land cover classification. Time series is 1985 (A); 1990 (B); 1993 (C); and 1998 (D). Land cover types associated with human activities – dark blue; actively photosynthesizing vegetation – green; undisturbed desert – tan.



Composite spectra were derived from ETM+ band reflectance, visible to near infrared albedo, and calculated SAVI values for the field transect endpoints. Note the clear separation between unburned and burned transects in the visible to near infrared and albedo.