Preliminary Analysis of Desert Vegetation From the 200 Sites Survey

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Abstract

In accordance with its mission to study the ecological characteristics of a large urban center, the CAP-LTER has recently undertaken a large scale sampling of the Phoenix metropolitan area and the surrounding landscape. A sample point was randomly assigned from each of two hundred grid cells established over the study area. Data collected at each point includes information describing the plants, arthropods, birds, soils, and human influences within a 900 m2 quadrat. This poster presents the results of initial analyses conducted on the plant data collected in undeveloped desert locales. NMS ordination was used to generate graphs of species similarity between site groupings. These groups include: outlying areas beyond the urban fringe versus remnant patches within the urban matrix, disturbed versus non-disturbed areas, habitat types (e.g. flats, washes, slopes), and Arizona Uplands versus Lower Colorado River provinces of the Sonoran desert. It was found that habitat type, disturbance status, and province identity influences mean species richness. According to the ordination graphs, habitat type and location relative to the urban fringe produced a high degree of clustering in at least some of the groups; province has slight clustering, whereas disturbance showed no evidence of clustering.

Introduction

Ordination is a multivariate technique for arranging sample points in a small number of dimensions by species similarity. Sites with similar species composition are placed closer together than unlike sites. Since raw data is multidimensional by nature, it is necessary to reduce the visual complexity in order to discern patterns. As the program uses a progressively lower number of dimensions to plot the data, stress can increase; this means that the difference between the raw data and the computational structure is high. Non-metric multidimensional scaling (NMS) can be used in order to find the lowest number of dimensions with minimal levels of stress. Incorporation of secondary data on site characteristics allows for a comparison of different sites types. In these analyses, I found that using three dimensions minimizes stress. I selected the view that maximizes separation of site types for the poster out of a possible three.

Habitat types and disturbance conditions were assigned based on site descriptions and photographs. Habitat classification is based on the dominant habitat feature associated with each quadrat. The Wash category applies to significant arroyos that dominate the plot. Due to the large quadrat size (900 m²), more than one feature may be captured, as is the case with Slope / Wash. Assessment of disturbance conditions include significantly disturbed, minimally disturbed and intact, and intermediate (borderline), according to on-site assessment and photographs. Province type and location in relation to the urban fringe were assigned using ArcView GIS. The CAP-LTER is situated at the junction of the Lower Colorado River Valley Desertscrub and the Arizona Upland Desertscub province. The Upland occupies a higher elevation than the LCRV and tends to have a more complex vegetative physiognomy. Boundary location refers to whether a site is inside, outside, or on the edge of the urban matrix.

Habitat Types

Figure 1: A. The slopes and low elevation flats form two distinct clusters, indicating a dissimilar species constituency. This does not mean that they share no species, but that the two groupings display distinct species assemblages. Low flats tend to be dominated by Larrea tridentata and Ambrosia spp. As (**B**) shows, slopes tend to be more species rich than low flats. The low recorded richness of wash plots is likely an artifact of individual spacing (and low sample size); since these channels are periodically exposed to flood and scour, there tends to be a lower number of individuals per unit area. In general, it appears that slopes and high elevation have the highest species richness.

Province

Figure 2: A. There is some degree of clustering, but significant overlap exists. While each province has species not found in the other, both provinces share many species. Some common species of the LCRV are present in the uplands at a much reduced abundance, including creosote bush. **B.** The Upland had a higher mean species richness than the LCRV. Part of the reason is that Uplands tend to have a higher abundance of slope habitat, which provides more microhabitat heterogeneity than the low flat dominated LCRV.

Disturbance

Figure 4: A. There is no evidence in this view for a clustering of sites by disturbance status. All types intermingle and do not form distinct associations. Disturbance likely has a differential effect on different community types. In low flat vegetation, species richness tends to be low, so disturbance may only serve to reduce the number of individuals and increase the spacing between each. On more species rich locales, there is a lower evenness of individuals, which means that the individual to species ratio should be lower than in the low flat, even if There are more individuals. Hence, for the same number of individuals removed, a species poor site will have a lower probability of losing species. In this case, disturbance may have the effect of making the species rich and poor sites more equitable in species numbers (for alpha diversity; not necessarily for beta diversity). **B.** As expected, significantly and moderately disturbed sites have few species on average than intact sites.
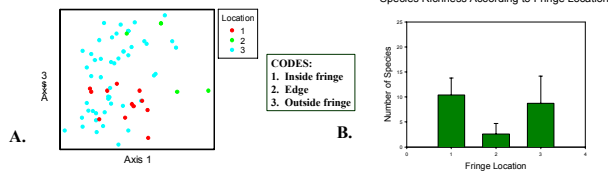
Location Relative to Edge

Figure 3: A. Sites within the city tend to cluster within a subset of the outlying sites. This is likely a result of urban land use planning. All land types do not have equal chance of protection. All too common and lacking in aesthetic charm, very little of the original low flat habitat within the city has been preserved. Therefore, the urban sites are biased toward higher species richness, as may be found within the mountain parks. This is supported by **B**, which shows the mean richness of interior sites slightly higher than the outlying. Note that the standard deviation of interior sites is lower than the outlying locales. Edge richness was low, but this may be due to small sample size (four sites).
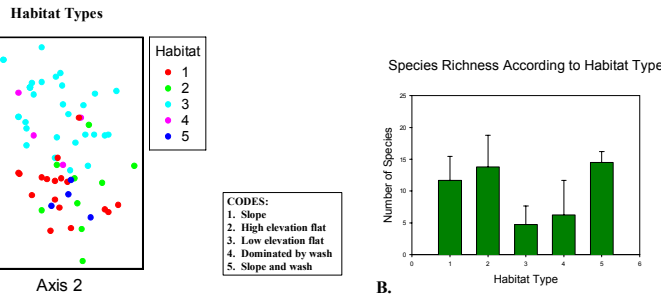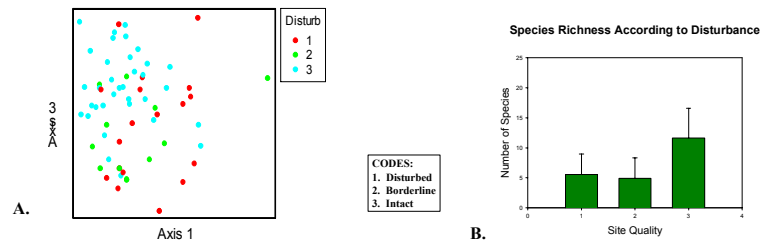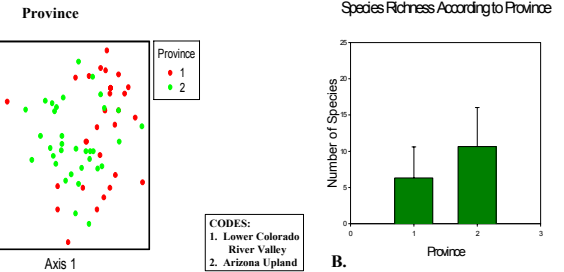
Future Directions:

1. Generate a community classification for desert vegetation within the CAP-LTER study area. This was begun, but was not ready in time for the poster session.

2. Calculate community coverages for the CAP-LTER study area based on the community classification.

3. Formalize statistical comparisons between groups.

4. Investigate patterns of frequency and abundance, using species cover and individual count data.

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