THE PHYTOGEOGRAPHY OF NEW MEXICO CACTACEAE

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by

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INTRODUCTION

It is clear that cacti are well adapted to desert habitats. Cacti, like other desert perennials, are exposed to extreme temperatures and periods of minimal water availability. Therefore, they have evolved morphological, physiological, and reproductive mechanisms to successfully persist in such a harsh environment. Several of the following attributes suit them well to arid regions: the ability to store large quantities of water at the cellular level and a low surface area to biomass ratio, the ability to survive long periods without precipitation, the potential for a high water use efficiency, and the ability to begin growth rapidly following precipitation (Teeri et al., 1978).

Cacti have been studied in relation to temperature and water stress. Dinger and Patten's (1974) work suggests that differential transpiration rates and maintenance of a positive carbon balance are key factors in determining potential species ranges. From investigations of the branching habits of the saguaro (Carnegiea gigantea) on a local scale, Yeaton et al. (1980) found morphology was related to different moisture regimes.

Other studies have emphasized plant distribution and response to varying temperature gradients. Ehleringer et al. (1980) concluded that the northern orientation of

Copiapoa species in the Atacama Desert of Chile is an adaptation in response to seasonal temperature fluctuations. Lewis and Nobel's (1977) quantitative study on the energy budget of the barrel cactus, Ferocactus acanthodes, determined the influence of plant shape, ribbing, and spination in modifying the amplitude of diurnal temperatures. Furthermore, work by Nobel (1978, 1980a, 1980b) suggests a strong interplay of morphological variation and minimum temperature to upper and northern range limits of cylindrical cacti.

Using a synoptic approach, Teeri et al. (1978) investigated the simultaneous influences of temperature and moisture availability on the distribution of indigenous cacti in North America. A battery of temperature and moisture variables of different as well as large regions within North America was examined to find the climatic variables which significantly correlated with the distribution of cacti. The number of species of Cactaceae, expressed as a percent of the total Spermatophyte flora within each region, was used. The most highly correlated variables with this cactus proportion were measures of moisture availability during fall and winter months. It was concluded that cactus species form a larger fraction of the flora in regions having both low soil moisture availability and high rates of evaporation.