

Gradient Analysis of Soil, Vegetation and Climate

On the

Tonto National Forest

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Gradient analysis is used to integrate soil and vegetation with climate on the Tonto National Forest. Soil moisture and temperature regimes, defined by Soil Taxonomy and supported by recent soil climate studies conducted within the Region and on the Forest, form the basis for the initial division of the climate gradient into uniform segments.

The gradient is further divided into life zones by correlating elevation, air temperature, precipitation, and indicator plants with soil moisture and temperature regimes. This is accomplished through a robust ordering program known as Non-parametric Multivariate Analysis (NMS) in PC-ORD (version 4.0). It arranges or ordines ecological site description plot data (approximately 150 soil and vegetation data elements per plot), plant data, soil climate data and climate data from NOAA weather stations into life zones. In part, this is accomplished by using standard gradient analysis techniques developed for complex, multivariate ecological data. Ordination output is not by itself definitive, but evaluates the arrangement of vegetation and soils along a climate gradient.

The final step consists of integrating soil categories (Soil Taxonomy) to form individual terrestrial ecosystems. The final gradient is a combination of both field knowledge and ordination results. The resultant organized alignment of terrestrial ecosystems is a continuum of plant communities and their associated soils that occur along a climate gradient ranging from low elevation, hot, dry Sonoran Desert to the high elevation, cool moist coniferous forests.