Introduction
Climate gradients found along mountain sides provide an opportunity to study diverse plant communities within a small spatial extent. When the climate changes, the ecocline, or vegetation gradient, will presumably shift to follow the plants' ideal climate conditions (Figure 1). This process is taking place rapidly in the Deep Canyon Transect, a study site in the Santa Rosa Mountains in the desert of Southern California. The climate of this area has warmed over the past thirty years while annual rainfall variability has increased significantly. All plant communities, from Mojave cactus scrub to mixed conifer forest, have shifted up the mountain concurrently. No other type of disturbance besides a climate gradient shift could cause this synchronous move of diverse plant communities.

Methods
Live perennial plants were surveyed along a 400 m isocontour starting from 182 m elevation. The transect is located in the Santa Rosa Mountains in the desert of Southern California. The climate of this area has warmed over the past thirty years while annual rainfall variability has increased significantly. All plant communities, from Mojave cactus scrub to mixed conifer forest, have shifted up the mountain concurrently. No other type of disturbance besides a climate gradient shift could cause this synchronous move of diverse plant communities.

Results
Species movement, 1977 – 2007
Nine of the ten most widespread dominant species have shifted upwards, with an overall average of +64.7 m (Table 1). The change in mean elevation was independent of initial elevation. The mean distribution of the ten dominant plants has shifted asymmetrically, consistent with an upward shift (Figure 1). Climate change, 1947 – 1976 & 1977 – 2006
Precipitation variability, the snow/rain ratio, and mean temperature have significantly changed, consistent with an upward shift in climate conditions (Table 2). Precipitation has increased significantly, mitigating some of the upward pressure on plant ranges.

Literature cited

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Conclusions
Has the vegetation moved upward?
• Nine of the ten most widespread dominant species have shifted upwards, with a significant average shift of +64.7 m (Table 1).
• The shape of the mean plant distribution has changed from a symmetric distribution about the mean to a distribution skewed upwards in elevation (Figure 2).

Has the climate changed?
• The climate was significantly warmer in the period after the 1977 survey than before, and annual precipitation variability doubled after 1977.
• Increasing climate variability, including extreme drought events, is an expected result of greenhouse gas caused climate warming (Trenberth et al. 2007).
• Increasing mean annual temperatures due to the urban heat island effect were found in the nearby Coachella Valley and San Bernadino/Reserie areas (LaDochy et al. 2007).

Has the climate warming caused the plants to move upward?
• Given the temperature lapse rate of -0.007 °C m⁻¹ and climate warming of 0.5°C – 0.8°C, the temperature gradient has shifted an equivalent of 65 m – 103 m upwards, similar to the vegetation shift we found.
• Other causes besides climate change?
  • Successional changes are only an issue in the montane chaparral, which exhibited patterns similar to the other plant communities.
  • Fire regime change/forest thickening is not occurring in Deep Canyon; no increase in A. concolor was found.
  • Ozone pollution is thought to be low in the Santa Rosa Mountains, and has not caused conifer mortality.
  • Land use has changed somewhat: protection increased to include the upper half of the Deep Canyon Transect after 1977, yet mortality and upslope shifts were seen at all elevations.

• The only cause of species distribution change that explains the decrease in coverage below the mean elevation and a simultaneous increase above the mean elevation is climate warming and increasing precipitation variability (Figure 1, Table 1, Table 2).