

## **SEQUOIA AND KINGS CANYON NATIONAL PARKS: VULNERABILITY OF GIANT SEQUOIA TO MOISTURE STRESS IN A CHANGING CLIMATE (2A)**

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Giant sequoia trees and their ecosystems are unique to the Sierra Nevada, where most groves are federally managed. Increasing temperatures over the next several decades may create conditions unfavorable to giant sequoia. In order to effectively and efficiently allocate management efforts to conserve this tree species, the vulnerability of giant sequoia groves to drought/water stress must be evaluated. This study took NDWI as the indicator of moisture conditions to evaluate the vulnerability of giant sequoia groves to moisture stress under a changing climate. The temporal changing trend in NDWI, the correlation between NDWI and precipitation and temperature, and the relationship between the vulnerability of giant sequoia groves to moisture stress and their moisture conditions were analyzed. Results showed that in the period from 1984 to 2010: 1) NDWI is an effective indicator of climate change which shows a slightly negative response to temperature and a strongly positive response to precipitation; 2) the drier the sequoia grove, the more sensitive to climate change it might be; 3) In addition to climatic factors, fire event and snow cover can also affect NDWI: the former one matches well with obvious decreases in NDWI (and NDVI) time-series, the latter one have a positive correlation with NDWI in March, April, May, and June. 4) NDWI has a positive but very weak correlation with Topography Wetness Index (TWI) implying that variations in local soil water content might have a little contribution to changes in tree moisture. 5) In general, a lower NDWI grove has a higher vulnerability to climate change (especially to reduction in precipitation), and a higher NDWI grove one has a lower vulnerability. Also, a comparison between within-grove NDWI variances over the 27 years and 27-year average NDWIs over all groves indicates a similar result. Moreover, combined TWI and 27-year average NDWI can function as an indicator of the vulnerability to moisture stress.

Key words: moisture stress, giant sequoia