Monitoring Drought Conditions in the Sequoia National Forest in California by Using Satellite Imagery

Weng, Anthony

The objectives of this project were to determine the general response of vegetation to drought conditions; to test whether moisture deficiency was the limiting factor for vegetation growth in drought conditions; and to determine the temporal lag in vegetation response to varying severities of drought conditions. Vegetation conditions were assessed by computing NDVI (Normalized Difference Vegetation Index) and NDWI (Normalized Difference Water Index) values from NASA's MODIS (Moderate Resolution Imaging Spectroradiometer). The time frames for data selection were 2012-2016, the five most recent contiguous years of drought, and 2002-2006, the five most recent contiguous years of non-drought conditions. It is hypothesized that it is feasible to use satellite imagery to investigate vegetation response to drought conditions and that a temporal lag exists in the response of vegetation to drought conditions that can be determined. To test the hypotheses, a methodology was created which involved the synthesis of NDVI, NDWI, and additional indices and the determination of correlations among these indices. Results showed that vegetation water content and overall health as assessed by satellite data exhibited a detectable response to drought conditions, which can be generalized as an inhibition of vegetation growth. Additionally, satellite data analysis identified moisture deficiency as the limiting factor for vegetation growth in drought conditions, and the approximate length of the temporal lag between changing drought conditions and vegetation response was determined to be 32 days. Based on these results, the hypotheses were proven correct. Further research may be directed towards the incorporation of the time lag factor into the development of a drought predictive model.

Awards Won:

Third Award of $1,000