Utilizing NASA Earth Observations to Determine Drought Dieback and Insect-related Damage in the Santa Monica Mountains, California

Abstract

The Santa Monica Mountains (SMM) lie between the city of Los Angeles and the San Fernando Valley, California, enduring as a steadfast haven for native vegetation, wildlife, and recreational activities. Both public and private conservation agencies have secured protection for much of the mountain range, however the severe California drought from 2011-2017 had a major impact on vegetation, including 11,000 acres of oak woodlands. The fall Santa Monica Mountains Ecological Forecasting II project explored how and why vegetation has changed from 2013-2017, a continuation study from the spring term that further investigated the effect of climate, harmful beetles, and varying topography on dieback. The heavy rains of the 2016-2017 winter allowed our team to investigate initial response to post-drought conditions. The team used ER-2 Airborne Visible Infrared Imaging Spectrometer (AVIRIS) imagery, climate data, digital elevation models, and *in situ* beetle and oak data to analyze the extent of vegetation loss over the course of the drought, including which areas will be most vulnerable to drought in the future. The results from these analyses will help the Resource Conservation District of the Santa Monica Mountains determine how to focus efforts towards regaining oak woodland vigor.

Methodology

Species Mapping Methods

Build spectral library using NPS veg map → Use MESMA to map target vegetation types for 2016 → Locate "dead" pixels for each veg. type → Find change in # dead pixels per veg type from 2013 to 2016 → Calculate acreage lost per veg type

Regression Analysis Methods

Decide spatial resolution for climate, topography, and live fraction → Run regression between predictor and response variables → Check regression results against hypotheses

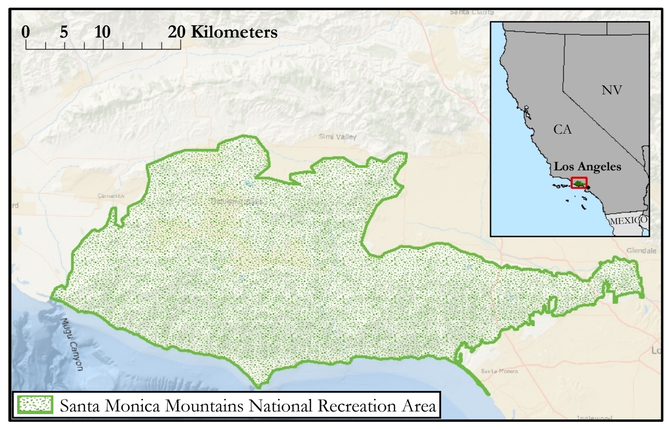
Project Partners

- Resource Conservation District of the Santa Monica Mountains
- National Parks Service, Santa Monica Mountains National Recreation Area
- California Department of Parks and Recreation, Los Angeles District
- California Department of Forestry and Fire Protection (CAL FIRE)
- County of Los Angeles Fire Department, Prevention Services Bureau, Forestry Division
- University of California, UC Cooperative Extension

Objectives

- **Determine** how much green vegetation has been lost in the SMM over the span of the drought
- **Analyze** the role of physical constraints (topographical and climatic) and harmful beetle infestations on oak dieback
- **Determine** areas in the SMM particularly likely to suffer from future drought

Study Area



Earth Observations

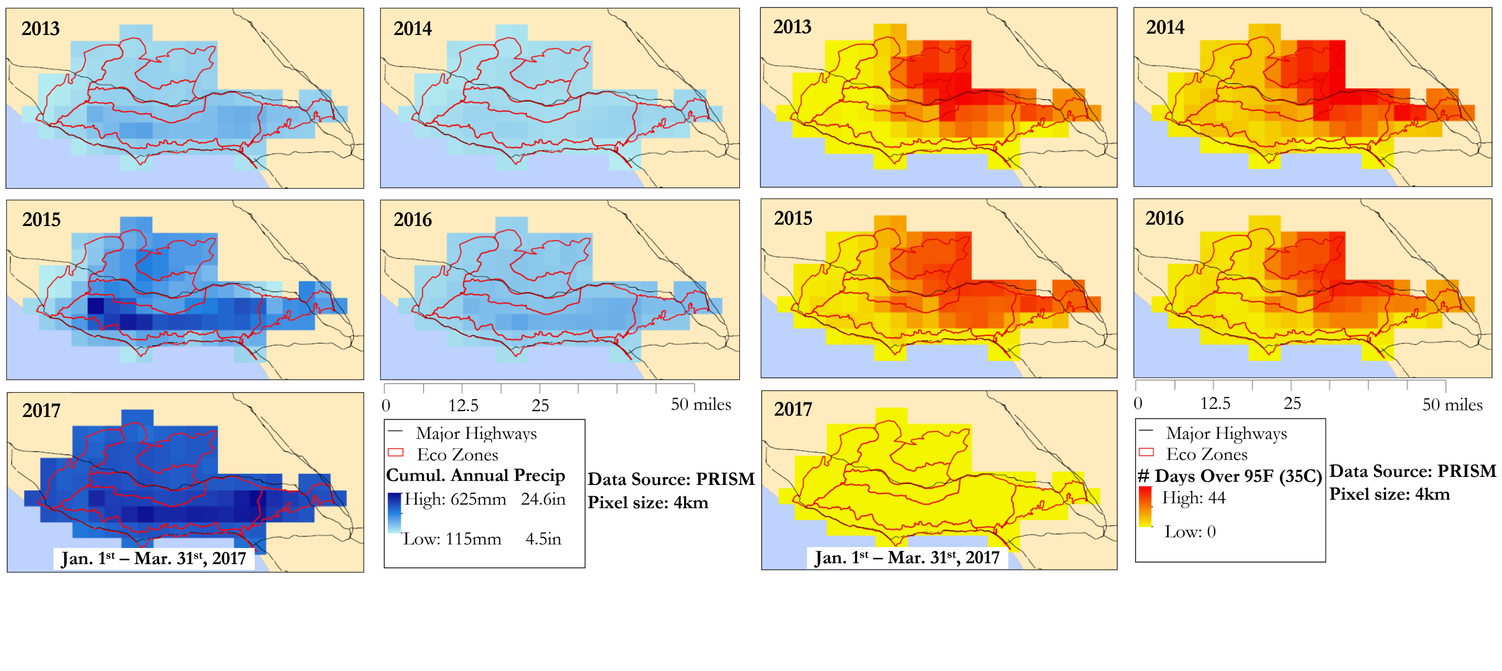
Shuttle Radar Topography Mission

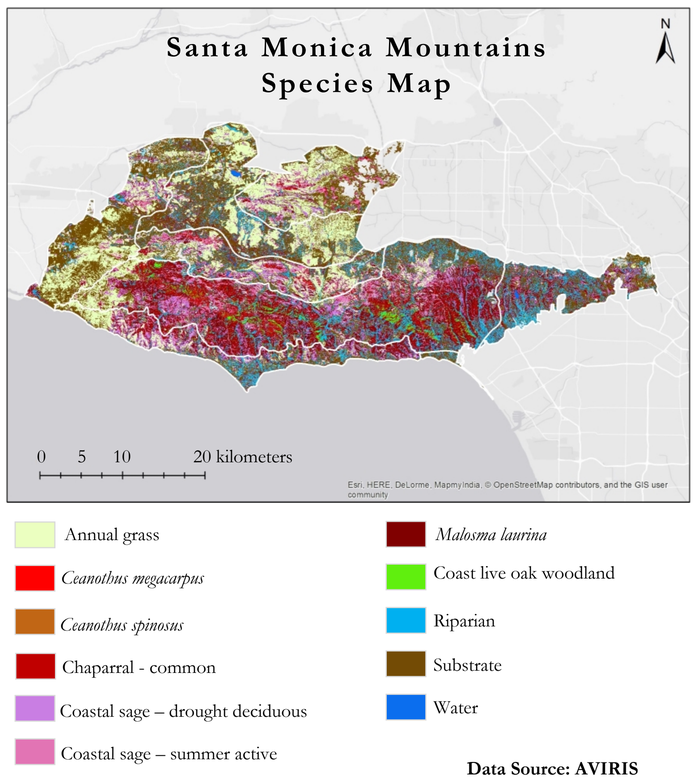
Airborne Visible/Infrared Imaging Spectrometer

Conclusions

- The severe drought weakened oak trees, making them more susceptible to attack from harmful beetles and resulting in greater dieback.
- The combination of NASA EOs and field data allow for an understanding of the affects of drought on multiple spatial scales (from landscape level to individual tree).

Results





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Acknowledgements

- Dr. Natasha Stavros (NASA Jet Propulsion Laboratory, California Institute of Technology)
- Erika Higa (NASA DEVELOP, NASA Jet Propulsion Laboratory)
- Rosi Dagit (Resource Conservation District of the Santa Monica Mountains)
- Emil Chang (NASA DEVELOP, NASA Jet Propulsion Laboratory)

California – JPL
Fall 2017

This material is based upon work supported by NASA through contract NNL16AA05C and cooperative agreement NNX14AB60A. Any mention of a commercial product, service, or activity in this material does not constitute NASA endorsement. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration and partner organizations.

Santa Monica Mountains Ecological Forecasting II