National Aeronautics and Space Administration



PUERTO RICO AGRICULTURE

Utilizing NASA Earth Observations to Map the Spread of the Red Palm Mite, *Raoiella indica* Hirst, in Puerto Rico, for Detection, Management, and Conservation Sara Lubkin Julia Marrs Sean McCartney Alison Thieme

Red Palm Mite (Raoiella indica Hirst)

- Highly invasive pest species
- Potential for detrimental economic impact on:
 - Coconut palms
 - Ornamental palms
 - Plantains
 - Bananas
 - Ginger
 - ▶ And more...



Red Palm Mite Damage



Image Credit: USDA ARS

Red Palm Mite (Raoiella indica Hirst)

- Native to southern Asia and the Middle East
- Dispersed by hurricanes, wind, anthropogenic activity
- First discovered in Caribbean in 2003





Red Palm Mite Invasion





Community Concerns

Tourism

Reduces beauty of palms
Restricts flower and palm sales

Crop Yields

70% drop in coconut yield
Potential vector of fungal infections



Community Concerns





Partners



- United States Department of Agriculture Agricultural Research Service (USDA ARS)
- Dr. José Carlos Verle Rodrigues University of Puerto Rico (UPR)



Study Area and Study Period



Study Period: January 2002 to March 2016

> **Study Area:** Puerto Rico



50 km

Normalized Difference Vegetation Index

High: 1 Low: -1



NASA Earth Observations

Landsat 7

Enhanced Thematic Mapper Plus (ETM+)

Landsat 8 Operational Land Imager(OLI)









Methodology



Landsat Imagery and *in situ* Palm Locations

Vegetation Indices and Spectral Bands Supervised Classification



 Decision tree achieved classification accuracy of 86%







Decision Tree Predictions - 2002



Basemap credit: Esri, HERE, DeLorne, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Analysis









Source: University of Arizona DroughtView

Scaled Data Value

Percent Reflectance

е.





Spectral Signatures in El Salvador study Area







Source: University of Arizona DroughtView

Limitations of Study

Finer Resolution

Larger Study Areas

Edge Effects



Conclusions

Image Credit: Jose Rodrigues

 Yellowed vegetation can be identified on Landsat imagery

Healthy : Damaged vegetation is consistent with infestation timeline



Future Work

Tracking of red palm mite infestations should include use of higher resolution imagery or of larger coconut palm plantations as in situ training sites.

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