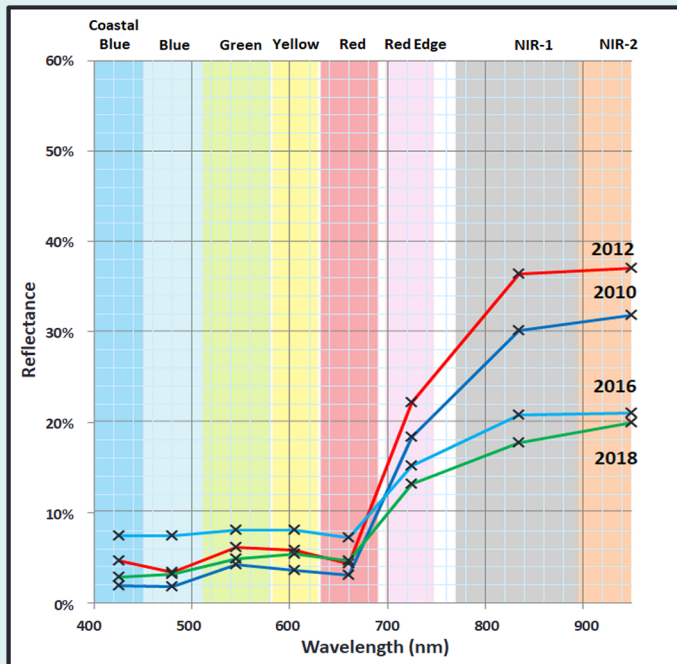


Monitoring of Tree Stress using Spectral Reflectance Analysis with high resolution WorldView-2 & 3 satellite data

Satellite data : WorldView-2 & 3 Panchromatic + 8 multispectral bands
Imagery resolution : Panchromatic 50 cm, Multispectral 2 m
Collection dates : 07/04/2010, 28/04/2012, 24/05/2016, 11/04/2018
Location : Paramount Blvd, California, USA
Tree No. : 10

Spectral Reflectance Curves



Spectral Reflectance Percentage

Generated with DigitalGlobe Atmospheric Compensation (AComp) WV-2 satellite data. AComp is a proprietary technology which automatically measures and compensates for atmospheric variability from pixel to pixel within a scene.

Band	Wavelength (nm)	07/04/2010	28/04/2012	24/05/2016	11/04/2018
Coastal Blue	425	1.93%	4.65%	7.39%	2.86%
Blue	480	1.82%	3.41%	7.44%	3.19%
Green	545	4.30%	6.11%	8.07%	4.86%
Yellow	605	3.58%	5.87%	8.07%	5.40%
Red	660	3.03%	4.40%	7.27%	4.63%
Red Edge	725	18.36%	22.18%	15.19%	13.12%
NIR-1	835	30.17%	36.41%	20.76%	17.70%
NIR-2	950	31.80%	37.09%	21.04%	19.97%

Overall
Rating

Good	Fair		Poor
			✓
Improving	Stable	Fluctuating	Declining
			✓

Spectral Reflectance Analysis

Geocarto's Spectral Reflectance Analysis uses 1.84 m high resolution multispectral 8-band data collected by WorldView-2 satellite. This new technology reveals tree stress caused by biotic and abiotic factors. It is based on variation in chlorophyll content and degradation of leaf cellular structure. These symptoms are not discernible externally. When this technology is integrated with onsite inspection undertaken by arborists, it will greatly enhance tree monitoring and management.

Interpretation of Spectral Reflectance Curves

Dominant Factor	Spectral Band	Tree Reflectance %	Indications	2010	2012	2016	2018
Leaf Cellular Structure	NIR	High	Healthy, Improving		✓		
		Minor Change	Stable				
		Low	Stressed, Declining			✓	✓
Chlorophyll Content	Red Edge	High	Healthy, Improving		✓		
		Minor Change	Stable				
		Low	Stressed, Declining			✓	✓
	Red	Low = High Absorption	Healthy, Improving				✓
		Minor Change	Stable				
		High = Low Absorption	Stressed, Declining		✓	✓	



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