City of Pasadena’s Tree Canopy Analysis

Identifying the Forest from the Trees
• Located in Los Angeles County, CA
• Home to the Rose Bowl, Rose Parade, NASA’s Jet Propulsion Lab, CalTech, and many historic home and neighborhoods
• 23.5 sq mi.
• 146,000 residents
• 1 Star Status with Urban Accords
• 60,000 street trees
• 25,000 park trees
• Awards from National Arbor Day Foundation:
  • 7 Tree City USA Awards
  • 6 Tree City USA Growth Awards
  • 5 Tree Line City USA Awards
Electromagnetic Spectrum

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Shorter Wavelengths

Longer Wavelengths

- Gamma rays
- X-rays
- Ultraviolet rays
- Infrared rays
- Visible light
- Shortwave
- Longwave

Wavelength (nanometers):
- 400
- 500
- 600
- 700

Wavelength (meters):
- $10^{-14}$
- $10^{-12}$
- $10^{-10}$
- $10^{-8}$
- $10^{-6}$
- $10^{-4}$
- $10^{-2}$
- 1
- $10^2$
- $10^4$
Electromagnetic Reflectance

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Emitted Solar Radiation

Reflected Near IR

PASADENA
3 Band Photos

**Regular Photos**
- Red 255,0,0
- Green 0,255,0
- Blue 0,0,255

**Near Infra-Red Photos**
- Near IR 255,0,0
- Red 0,255,0
- Green 0,0,255

*Image of Pasadena cityscape showing different color bands for regular and near infra-red photos.*
Normalized Difference Vegetation Index (NDVI)

\[
NDVI = \frac{(\text{NIR} - \text{RED})}{(\text{NIR} + \text{RED})}
\]

- Used to identify vegetation based on Near IR reflectance
- The higher the value the more healthy the vegetation
- Inverse can also be used to find water
Elevation Models

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Bald Earth Model
Representation of Earth’s surface

Surface Model
Includes terrain and objects above terrain
- Buildings
- Trees
Tying it All Together

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- Vegetation versus Non-Vegetation
  > Vegetation NDVI value of 0.035 or greater
- Canopy versus Turf
  > Elevation difference 8 feet or greater
Resulting Tree Canopy

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Canopy Land Area Model

*Model was created using ArcGIS 9.3*
Results

• The City of Pasadena contains 6.58 square miles of tree canopy!
• Over 28 percent of the City of Pasadena is covered by tree canopy!
• Over 18 percent of Pasadena’s tree canopy is located within the public right of way!