

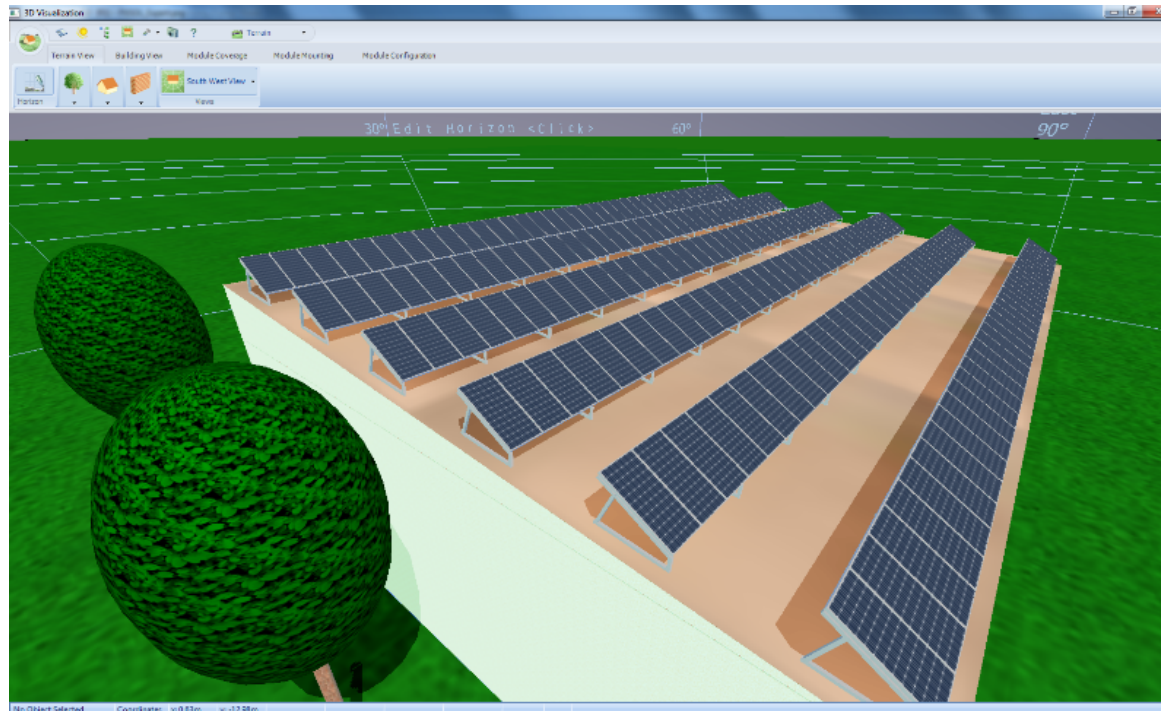
Estimating Canopy Height of Coastal Redwoods Using Tree Diameter and GIS



By: Alexander Sassoon & Anthony Palavi

Project Objectives

- To improve solar photovoltaic (PV) shading analysis at UCSC.
- Using a linear regression model, we want to define the relationship between tree diameter breast height (dbh) and tree height.



Introduction to Problem or Question

- Define optimal area in the northern end of UCSC campus where canopy cover is minimal for solar PV system.



Study Area

North UCSC campus

Site Survey (CISR)



Tree Points



Methods

Data Sources

- Annotation points
 - Physical Planning and Construction
- Canopy Data
 - recorded by **Center for Integrated Spatial Research (CISR)**.

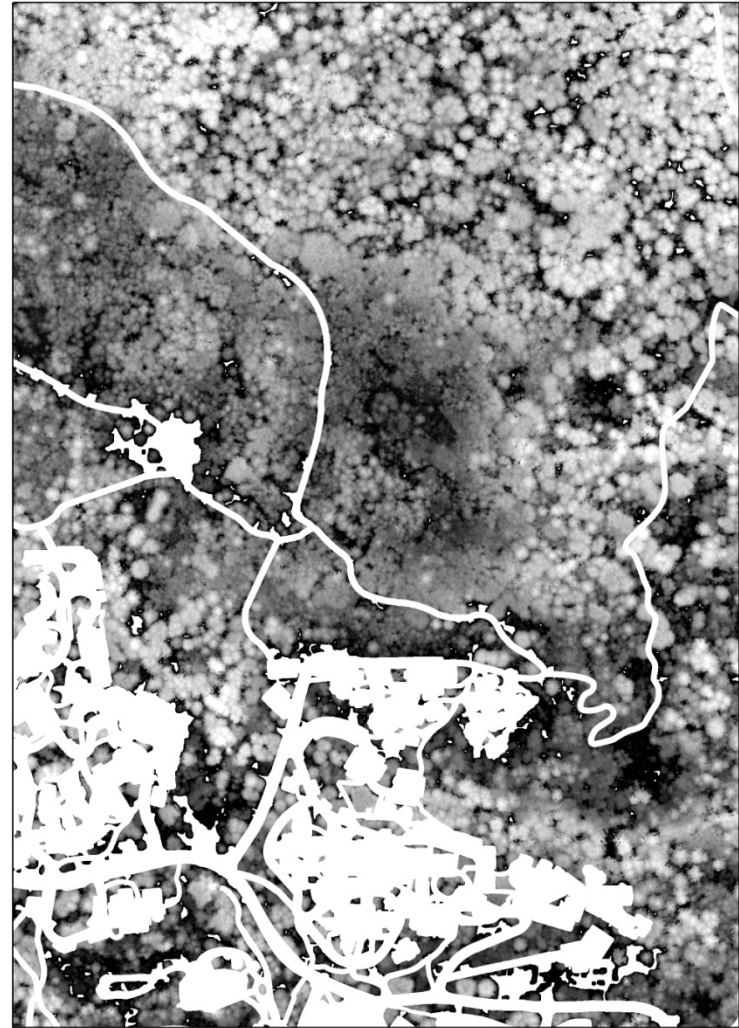
Data Processing & Analysis

- Linear regression model:
 $y = m \cdot x + b$
- Variables:
 - Independent = x = dbh
 - Dependent = y = canopy height

Canopy Height Layer

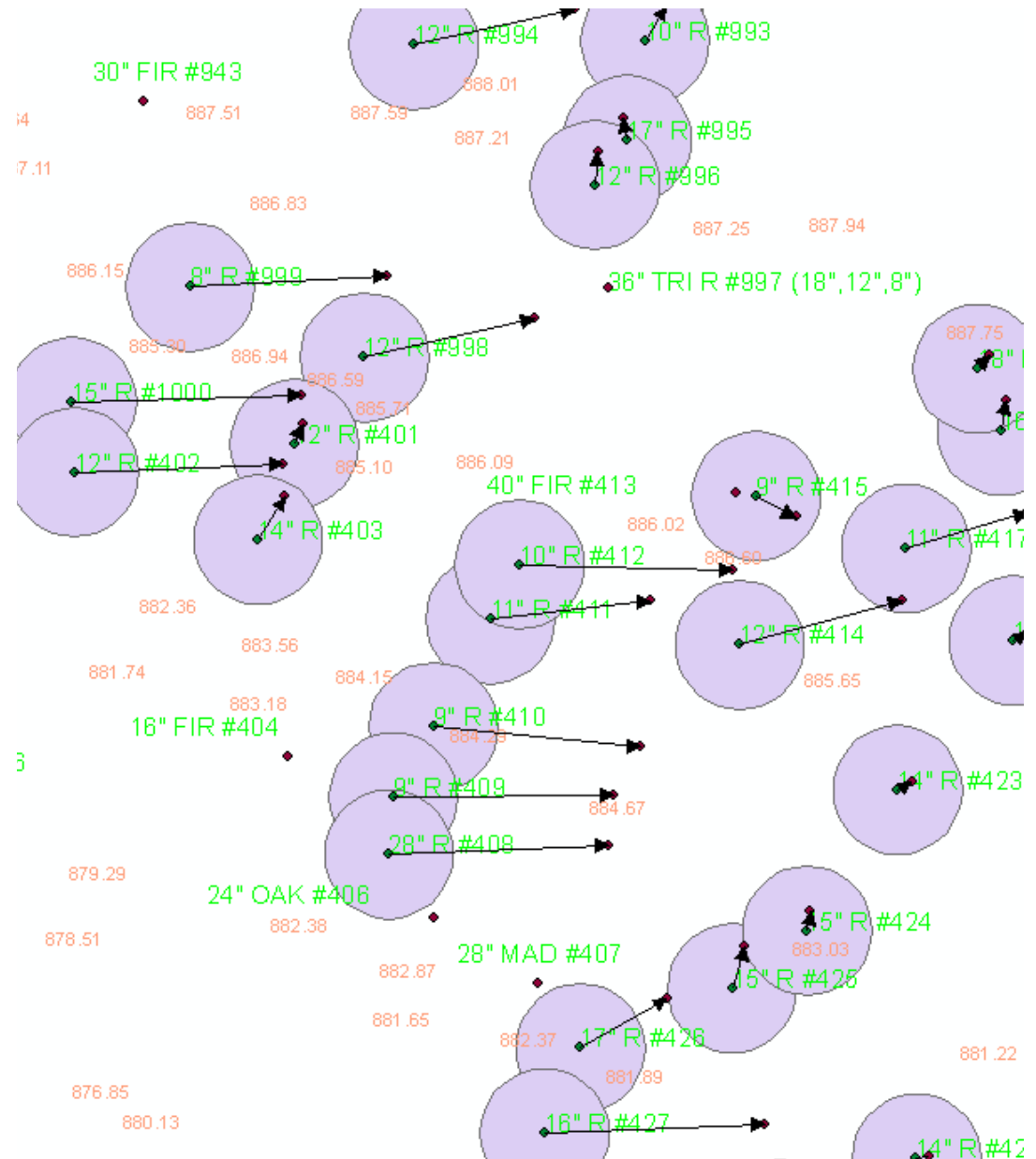
Calculation:

$$\begin{aligned} & \text{(first to return)} \\ & - \text{(last to return)} \\ & \hline & = \text{canopy height} \end{aligned}$$

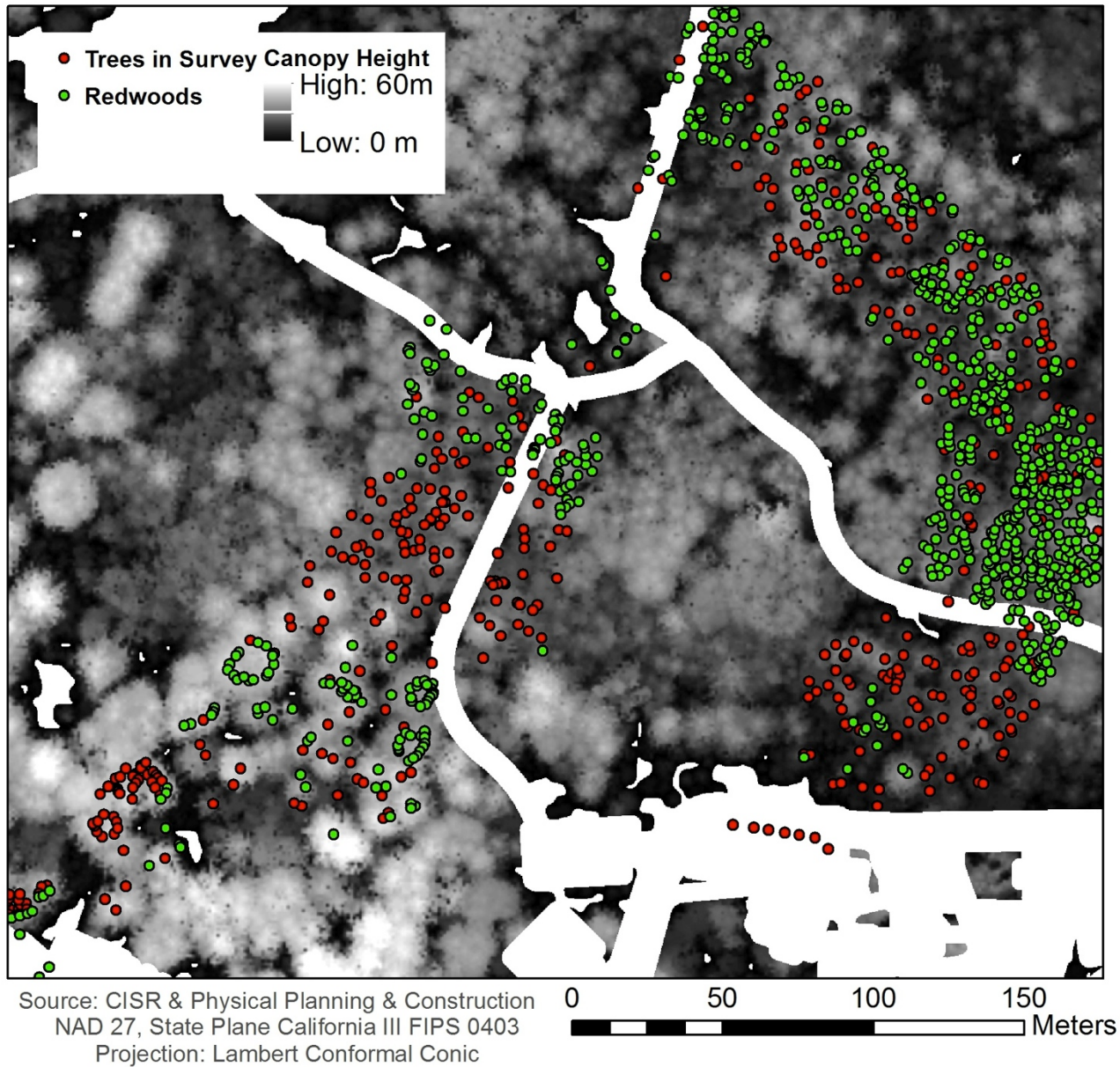


Annotation Points Layer

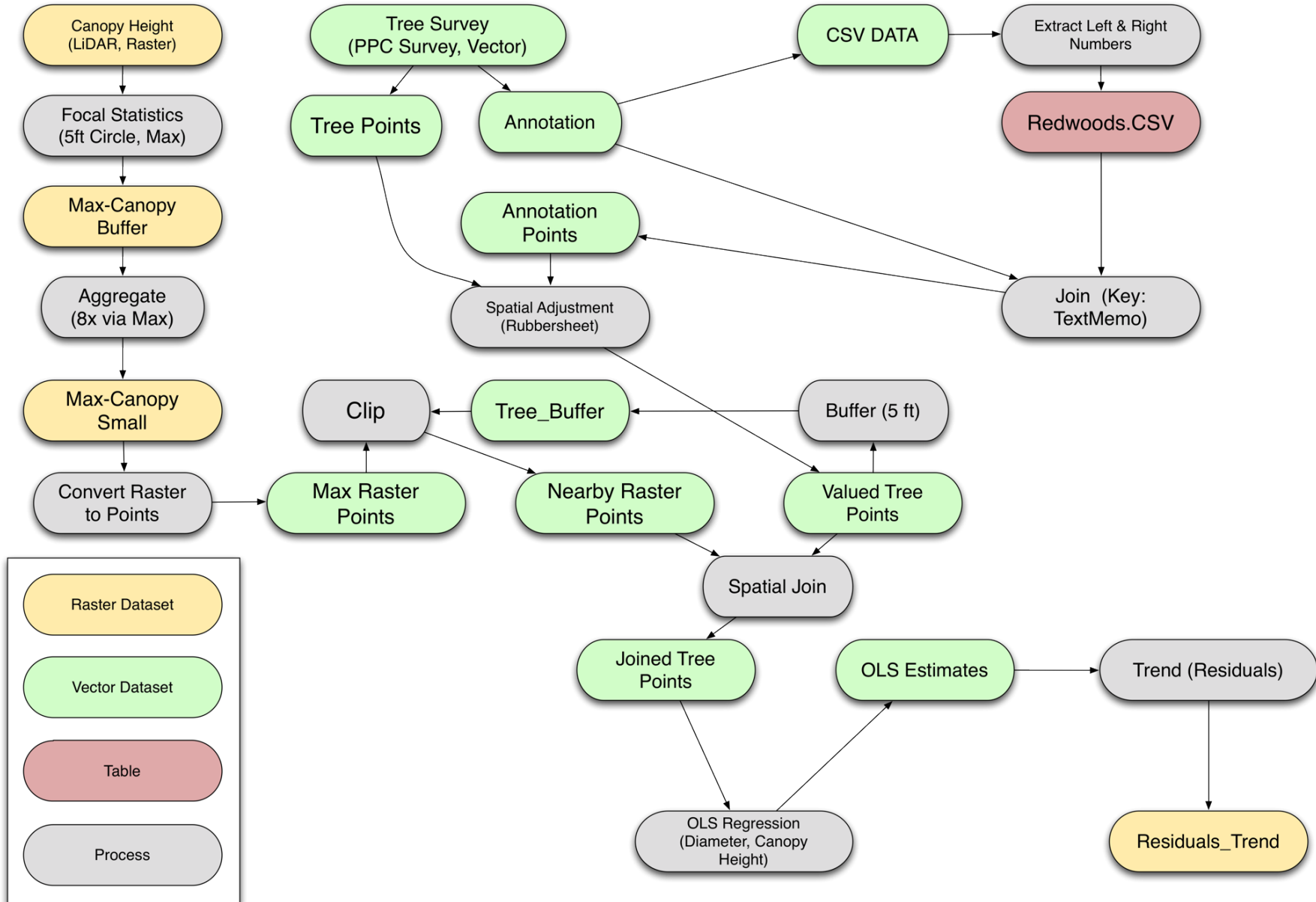
- The Tree Survey came as a Drawing File (DWG)
- Tree locations were found in the points layer, but attributes were found in the annotation layer.
- Attribute Data had to be manually moved over the tree points in a 1:1 relationship.
- Redwoods that couldn't be effectively sampled and other tree species were separated out and not included in operations.



Tree Survey & Canopy Height

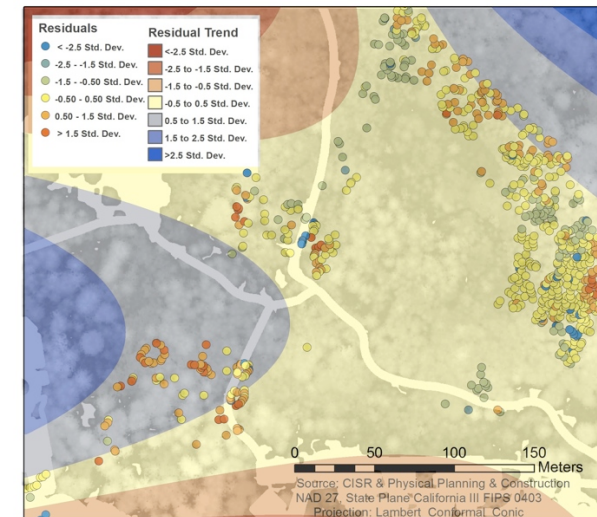
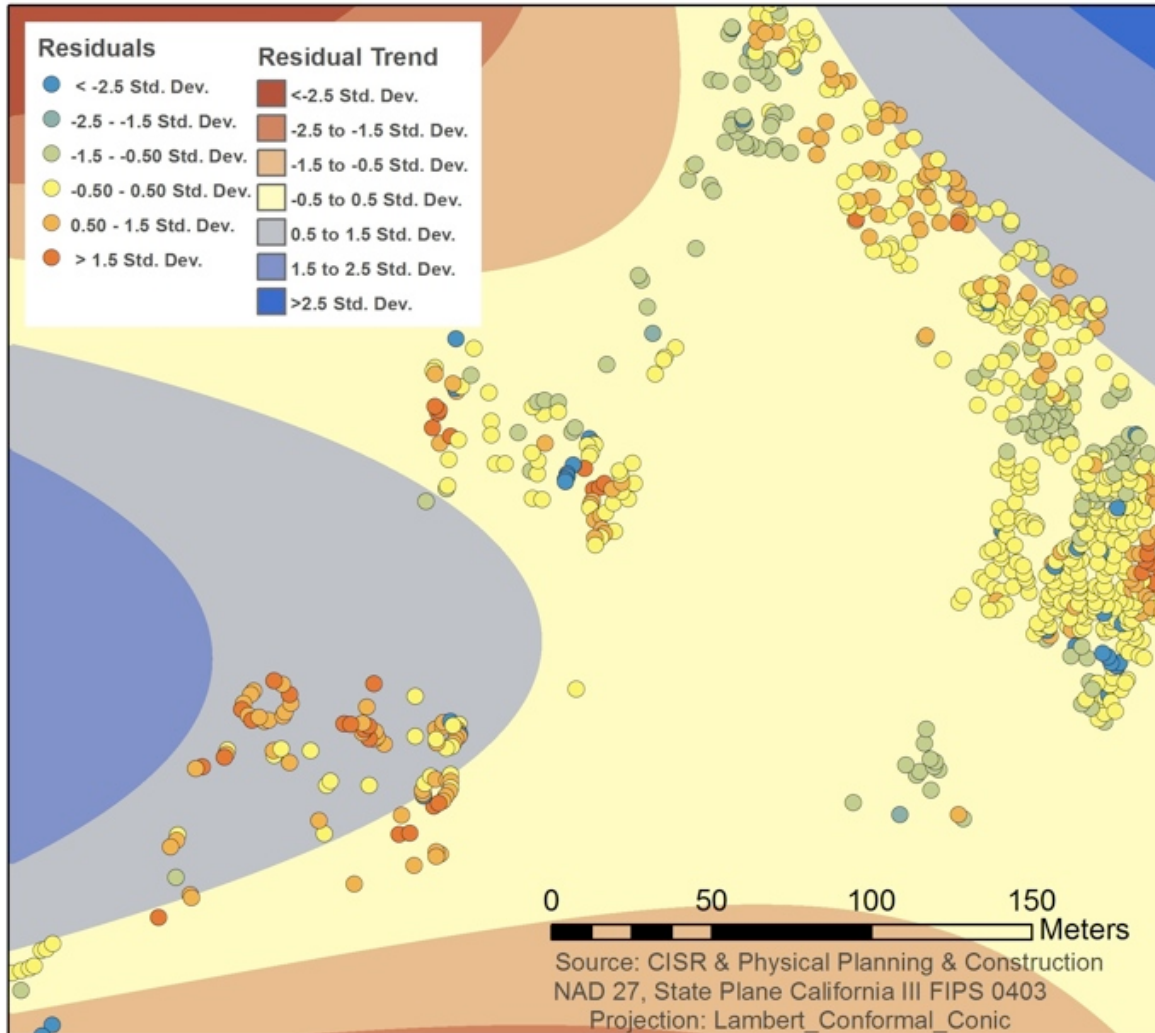


Flow Chart



Trend Map

Residual Error Mapping and 3rd-Order Trend



Results and Discussion

OLS Results

Variable	Coefficient	Std Error	P-Value
Intercept	57.449610	2.304216	0.000000*
Diameter	1.833093	0.137959	0.000000*

* Statistically significant at the 0.05 level.

$$Y = mX + b \longrightarrow [\text{Tree Height}] = 1.833[\text{Tree Diameter}] + 57.45$$