The Living Campus: Mapping UC Berkeley's Ornamental Trees

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Abstract

The UC Berkeley campus is kept cool year round by a large community of trees. These trees are diverse in species, age, size, purpose of planting and abundance. One of the buildings protected by these trees is Mulford Hall where the Geospatial Innovation Facility is housed. Utilizing the tools of Global Positioning Systems (GPS) to collect point locations with specific data on each tree, and Geographic Information Systems (GIS) for representing the tree data collected, we are attempting to create a living map of the UC Berkeley campus tree population. To begin this project, we have compiled a comprehensive list of the species, genera, common name, conservation status and origin of varies various populations of trees known to exist on campus. We have utilized these data to create a functional data dictionary for field collection. With this we have begun to record the points collected and represent them within a GIS map.

The assessment of urban tree canopy benefits utilizing GPS, while collecting the critical parameters of tree type and species, is increasing in popularity as we enhance our understanding of its effective utilization. This type of mapping has applications in a wide range of disciplines, but is most commonly being utilized for assessment of energy cost savings and urban forest management. (Dwyer, 1999) As the data for this GIS map continues to be collected it is our intent to incorporate a teen outreach program into this research. This would allow local youth to gain some basic knowledge of GPS, GIS, Urban Ecology, Botany and Urban Forestry, while being exposed to UC Berkeley's campus. These data will eventually be made available through the GIF Lab in an interactive webGIS for academic and public use.

Aim

To learn to utilize the Geographic Information Systems (GIS) and Global Positioning Systems (GPS) to design an interactive living map of the trees of the UC Berkeley campus. This tool would allow for assessment of energy cost savings, urban forest management and academic utilization. It would also be available to the public to increase understanding of GIS maps and Urban Ecology.

Methods

Understanding GIS and GPS:
To initially form a basic understanding of the scope of GIS mapping two complete ESRI certification courses were completed at the onset of this project.

Tree Species Identification:
Utilizing the UC Berkeley library resources we located the "Trees of the Berkeley Campus" book. (Cockrell, 1976) As of that time there were almost 300 species of trees on campus. We then compiled a comprehensive list of the species, genera, common name, conservation status and origin of the various populations of trees. We also located 6 tree identification field guides from the primary regions of origin.

Data Dictionary Design:
To optimize our efficacy of the field equipment used, Trimble GeoXT and the Trimble Recon Pocket PC (GPS receivers), we created a detailed data dictionary that included fields for the following data:

- Tree Id (numeric field)
- Common Names (drop down options)
- Species (drop down options)
- Genera (drop down options)
- Conservation Status (drop down list)
- Diameter in cm (numeric field)
- Height in meters (numeric field)
- Condition/Health (drop down options)
- Year or Date Planted (blank field)
- Person or Occasion (blank field)
- Origin (drop down options)
- Surveyor (drop down options)
- Notes (blank field)

Figure 1 & 3. Camice Revier taking GPS point. Photo by Daniel Nowinski.

Figure 2-A,B & C. Ginkgo biloba (Maidenhair) tree #1. Photos by Camice Revier.

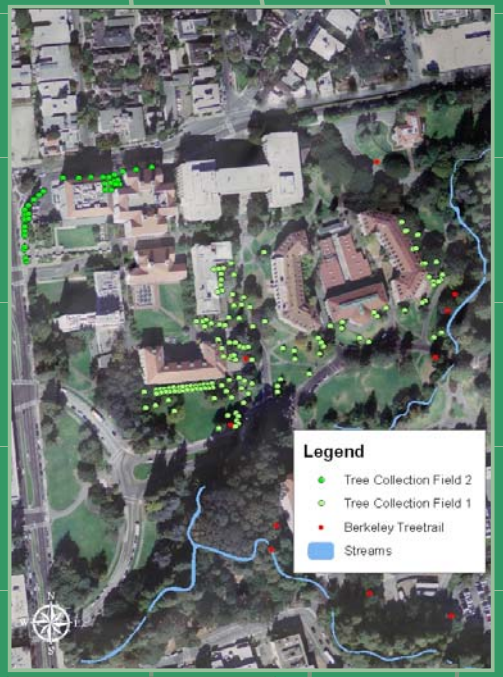

Figure 4. GIS map of the UC Berkeley campus with tree data points indicated.

Figure 5-A & B. Sequoia sempervirens (Coast Redwood) tree #5. Photos by Camice Revier.

Methods continued:

Field Practices:

- Utilized standard metric measuring tape to measure circumference of tree, divided by pi to determine diameter.
- Created tangent height gauge using a level and a right angle. Measured from middle of tree to standing position when top of tree was viewed via level right angle and ground to eye level to determine approximate height.
- Captured photo's of 1) entire tree, 2) trunk and 3) leaves (including any fruit or cones) for one representative tree in each grouping of same species.
- Determined species utilizing field guides and when necessary by taking sample leaf and fruit back for more detailed species search.
- Recorded GPS point utilizing receiver at each tree and recording all related data associated with that organism.
- When too few satellites were available at a trees location we utilized the offset feature by stepping back to a point with satellite coverage and recording the distance and bearing from tree.

Transferring Data to ArcMap:
After field data was collected it was then transferred to GPS Pathfinder Office and finally exported into the ArcMap displayed in Figure 4.

Discussion & Conclusion

The majority of this project research was spent on the design and methods to create an approach that can be utilized towards the ongoing completion of this living map of the UC Berkeley trees. Although this is a time consuming process the potential usefulness in forest land management, academic use and public education seems readily apparent. As this project evolved we realized that it had potential as a method of teen outreach and that this could be completed while compiling this data over the course of the next few of years. The planning of this outreach program seems the obvious next step to this project design. We feel this has the potential to connect local teens to GPS, GIS, Urban Ecology, Botany and Urban Forestry, while being exposed to UC Berkeley's campus.

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