The Boston College Tree Inventory

In the summer of 2008, Boston College began a comprehensive inventory of all trees contained within its three campuses: Newton, Chestnut Hill, and Brighton. This project has made use of Geographic Information System (GIS) technology and the standard analog tools of forestry. This student-driven project was begun under the stewardship of the Office of Sustainability and at the end of 2009 stewardship was transferred to Dr. Colleen Hitchcock in the Biology Department. While the data collected represents the work of many students at the heart of the project was Kevin Keegan '10, who spent many countless hours hugging our campus trees.

Campus trees are an invaluable resource for ecology students at Boston College. This student supported project is comprised of an inventory of 5,133 individual trees representing 98 species on the Brighton and Main campuses.. Students inventoried all of Upper Campus and the Hammond Triangle, and approximately one-fifth of Middle and Lower Campuses. The data is housed in shapefile format and includes information regarding the location, dimensions, health and taxonomic name for individual trees. . The program was initiated to develop data to be used to calculate Boston College's carbon footprint, but the inventory could also be used for a number of other practical applications. This data will be available for student research focused on our campus trees.

How is G.I.S. being used for the tree inventory at Boston College?

A base map was acquired from the MassGIS website. MassGIS is the Commonwealth's Office of Geographic and Environmental Information, within the Massachusetts Executive Office of Energy and Environmental Affairs. MassGIS is in charge of the collection, storage and dissemination of geographic data, consequently they have mapped and spatially referenced the entire state.

For every tree, a point of data is created and placed on the map. Once the point is placed on the map, it acquires the spatial reference of the map. If a point is placed on the map where an American Linden is gracefully shading Linden Lane, then that point will acquire the real life longitude and latitude of that tree.

What tools are being used?

-Standard 20th Century arborist tools: ruler, circumference tape, long distance tape measure, and utility belt.

-Hardware: PDA's and Desktops. Each inventory team is equipped with one PDA which contains the necessary software to record tree data. Once data collection is finished for the day, the data is uploaded to a desktop which is used to store the data and to further manipulate it.

-Software: the ArcGIS suite of applications that includes ArcMap and ArcPad. ArcMap is an application that enables the manipulation and creation of GIS data. ArcPad is the same, but minimized so that it can operate smoothly on a PDA.

What information is being gathered?

Species: What the heck is this woody growth next to Gasson? When feasible this information was gathered to the species level, in some cases only the genus could be determined. Using GPS, a point was added for each tree.

Diameter at Breast Height (DBH): DBH - Diameter of the stem at breast height in inches. This is a standard forestry measurement of 1.4 m above the ground. Determined using measuring tape designed to measure diameters. If there were multiple stems (greater than 1 inch) their individual diameters were added together.
DBH is used in correlation with other measurements as an estimation of wood volume of a tree. Additionally, because DBH growth is constant and non-reversible, it can be used towards an estimation of a tree's age.

Height, Average Height to Canopy, Average Crown Spread, Stems at Breast Height: All four measurements are used together with DBH to estimate a tree's wood volume.

STEMS - Number of stems greater than 1 inch in diameter that the tree had at breast height (1.4 m)

HEIGHT - Height of the tree in feet. It is determined using a clinometer and a measuring tape.

HTCROWN - Height to crown from the ground in feet. Determined using clinometer and measuring tape, or at times only measuring tape was needed. One to two measurements were taken depending on the irregularity of the shape of the crown bottom. If two were taken the value of HTCROWN is an average.

AVGCROWNSP - Average crown spread. Two measurements using measuring tape were taken perpendicular to each other. AVGCROWNSP is the average of the two in feet.

Health: A tree is determined to be in either "poor", "fair", or "good" health according to specific criteria.

Conflict: Is this tree leaning on power lines? Is there a cable bolted to this tree? Generally, is there a foreign object within or without the tree which is or will be causing harm to it?

Why is this information being gathered?

The tree inventory is one of our most valuable ecological assets on campus that provides an outdoor laboratory for ecological studies at the university. This data set is available for use by students or faculty alike and has been used in advanced ecological courses as well as projects in the Lynch School.

Individuals interested in the composition or basic demography of the campus forest can easily query the dat. For instance, if one wanted to know the position of all of the Trees-of -Heaven, which are highly invasive, they could easily isolate them on a map of campus using ArcMap. Additionally, seeing as how Eastern Hemlocks are dying throughout their habitat, the inventory could be used to identify the necessary felling of trees and new plantings.

A prime educational opportunity lies within the tree inventory as well. Boston College offers a GIS class through the Department of Earth and Environmental Sciences. Students could potentially further their knowledge of GIS and associated programs through work on the inventory.