# UMBC Landscape GIS

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Grounds Maintenance

# Outline

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3. Results/Analysis
    a. Diversity
    b. Pest management
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# Background

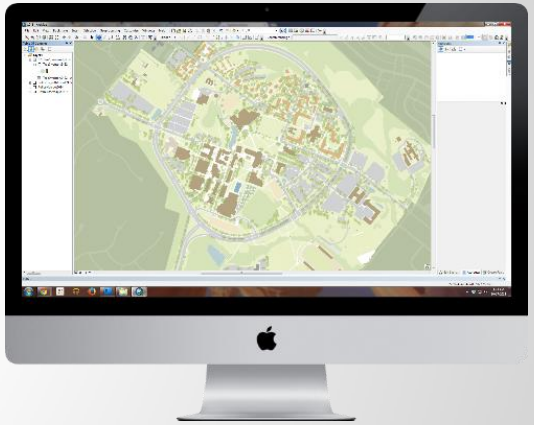
- Began project in June 2014
- Tasked with data collection of UMBC’s tree community
- Took it upon myself to figure out ways to analyze tree data and make use out of the investment made for the project

# Campus Tree Inventory

Detailed asset database

Preventive Maintenance


Informed decision making

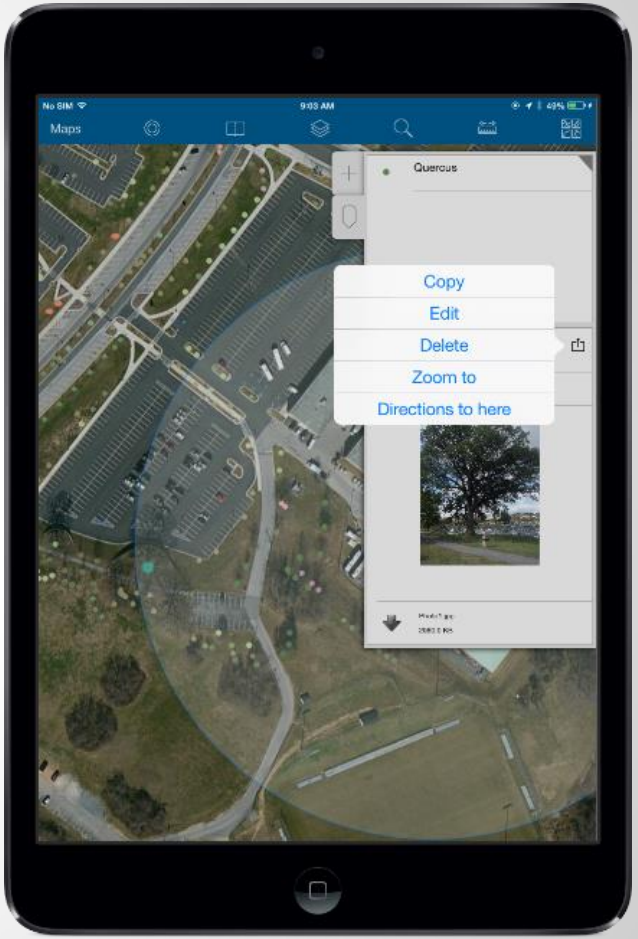


# Data Collection

- First started with ArcPad on Trimble Geoexplorer
  - Despite high accuracy capabilities, data collection speed was severely bottlenecked by outdated processing hardware
- Ultimately Shifted to ArcGIS Collector app


# Mobile Interface

- ArcGIS Collector App for iOS/Android
- Features
  - Faster processing than arcPad
  - Allows for offline data collection
  - data interoperability
  - Multiple users
  - Ability to assign photo attachments to point features
  - Compatible with Trimble devices (complicated)
  - Overall has an easy to understand user interface

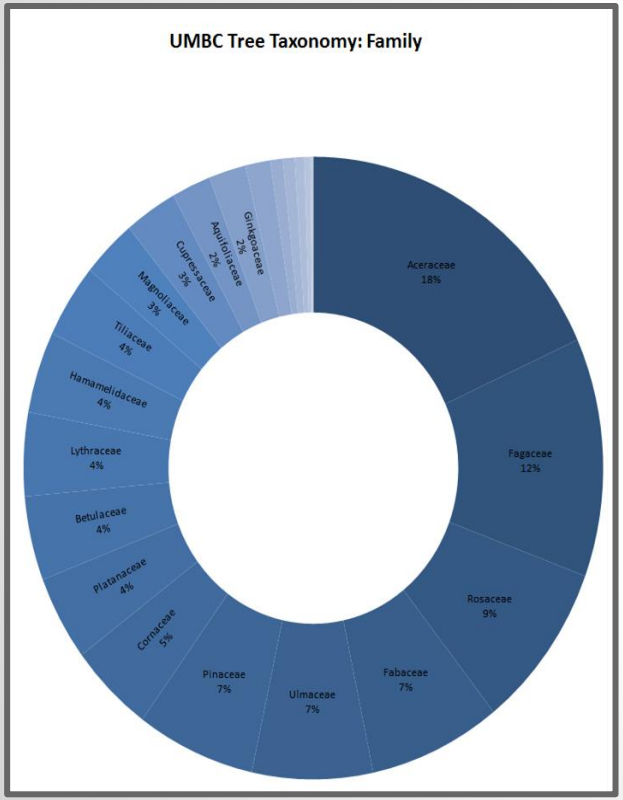



# Finished Database


Figure 2: Overview map of our GIS inventory


Figure 3: Zoomed in image of our GIS

# Results: Tree Diversity



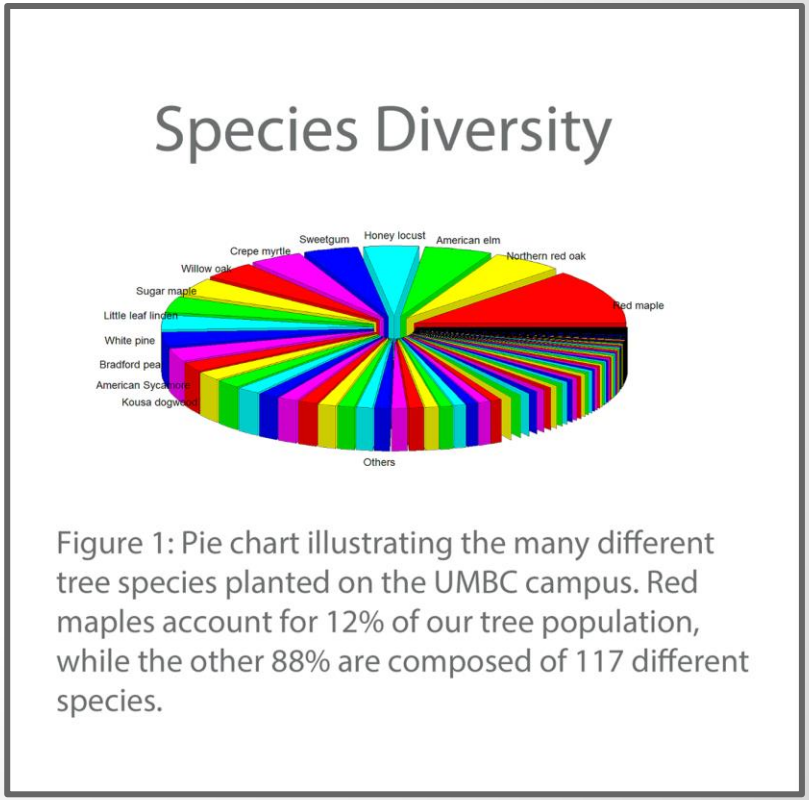




Figure 1: Pie chart illustrating the many different tree species planted on the UMBC campus. Red maples account for 12% of our tree population, while the other 88% are composed of 117 different species.

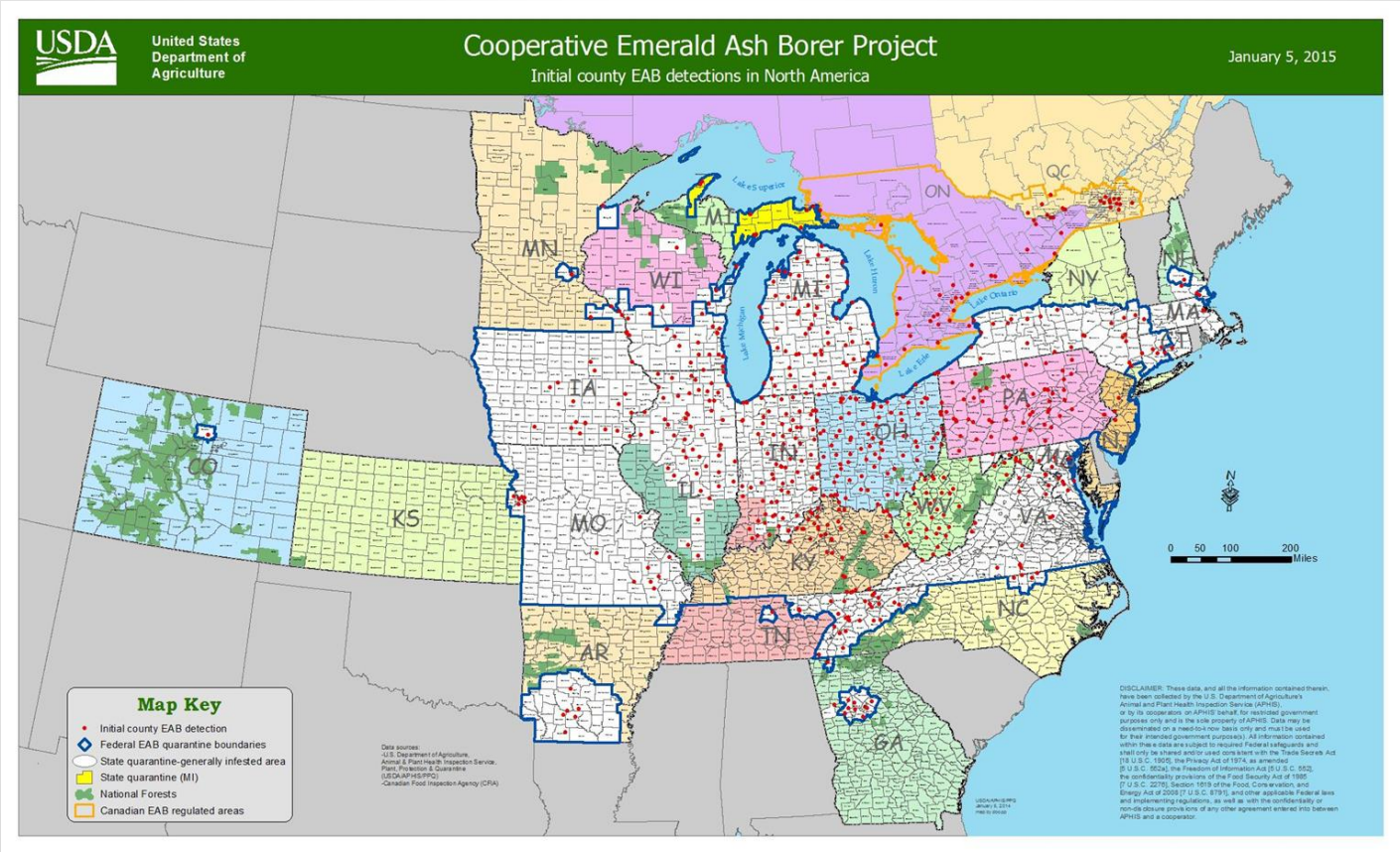
# Importance of street tree diversity

- Historical losses of species
  - American Chestnut blight
  - Dutch Elm Disease
- Future Pests
  - Emerald ash borer
  - Ambrosia beetle
  - Asian longhorn beetle

# Case Study: Emerald Ash Borer

- Beetle that found its way into the U.S. from asia
- Highly destructive to ash trees throughout the midwest and east
- Threatens to kill over 5 billion trees in 25 states
- Locally, in 2009, the US Forest Service estimated there were 212,000 Ash Trees growing in Baltimore area
  - 5,000 of those trees considered to be street trees
- Removal and replacement of just the street trees could cost ~1.6 million dollars along baltimore streets in the next few years

# EAB distribution




Source: USDA

# Results: Critical Health Zones

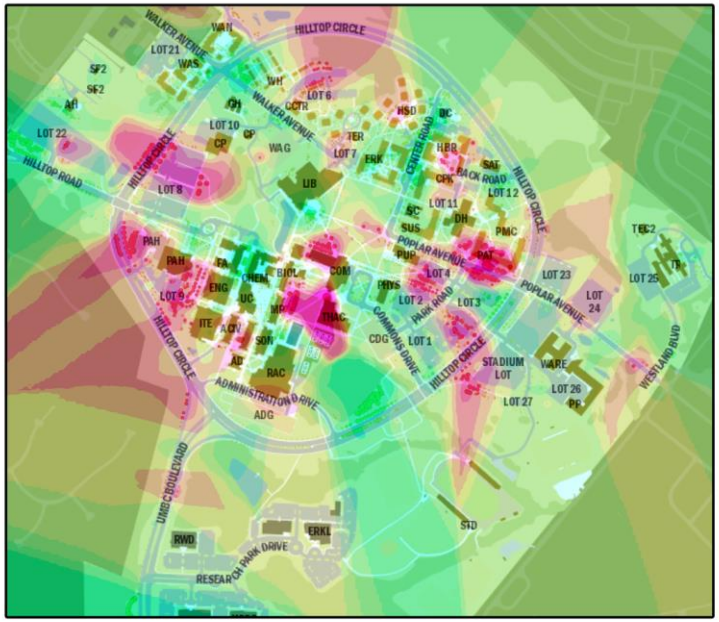
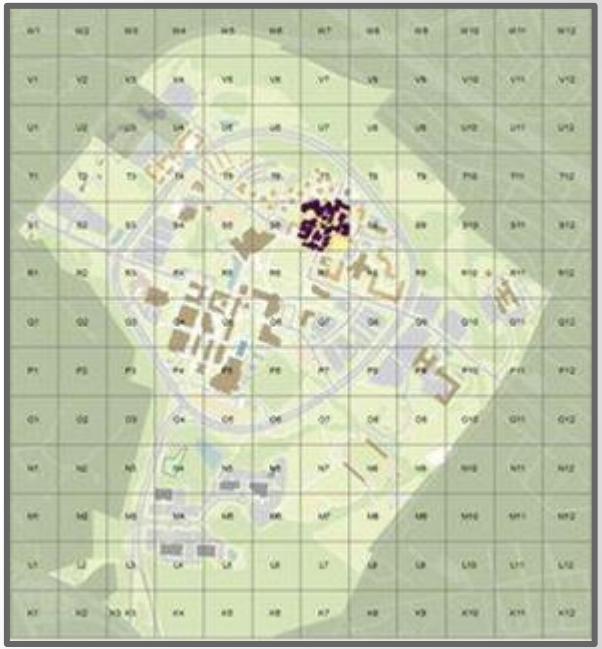



figure 4: hotspot analysis used to identify areas of our campus in which trees are in poor health

# Results: Zone specific species analysis

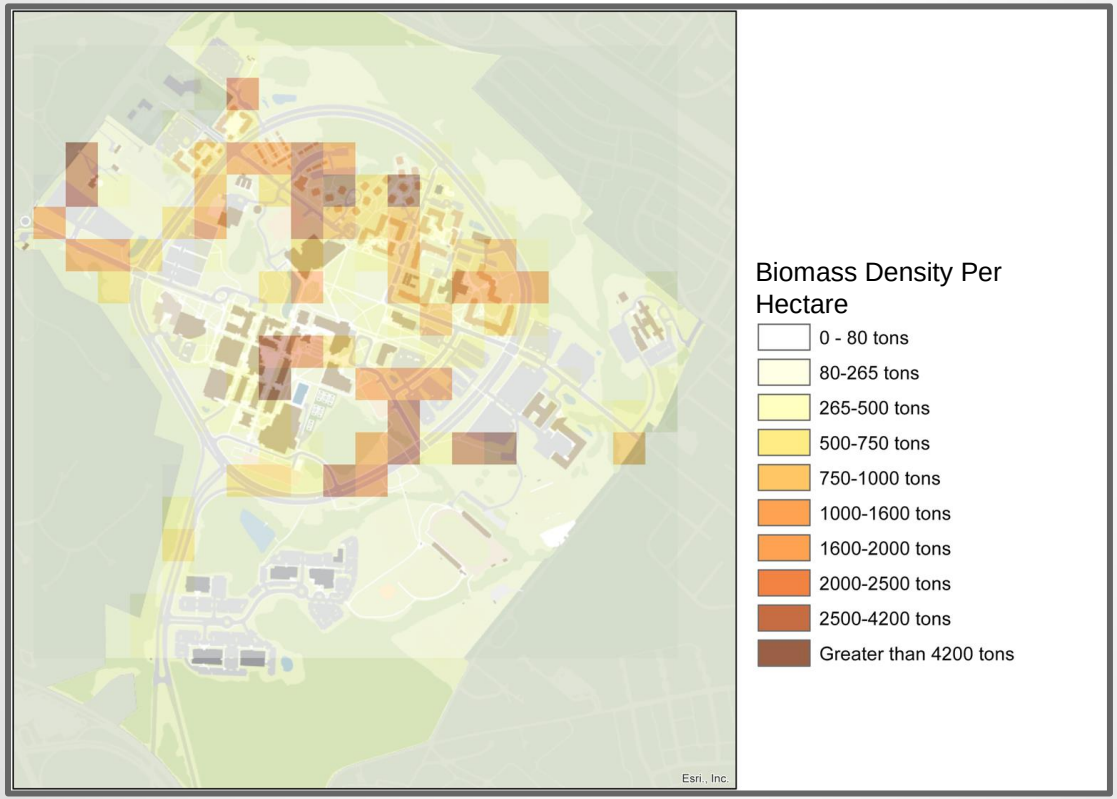
- Quick study to see if certain species have a significantly greater average relative health compared to other trees within the same zone
- clipped trees within 250m by 250m zones
- Ran ANOVA test between genus groups and their relative health
- Many zones had no significant difference between species and health
- Zones that did report a significant difference were also analyzed by a tukeyHSD test to see what specific genus had greater relative health than others



| | | | | |
|---|---|---|---|---|
| Ilex-Gleditsia | 2.714286e+00 | 0.8510688 | 4.5775027 | 0.0003231 |
| Magnolia-Gleditsia | 3.000000e+00 | -0.1362615 | 6.1362615 | 0.0733842 |
| Morus-Gleditsia | 1.000000e+00 | -4.1026298 | 6.1026298 | 0.9998842 |
| Platanus-Gleditsia | 2.115385e+00 | 0.4812352 | 3.7495340 | 0.0023111 |

Disclaimer- Many environmental factors could play into the assessment of relative health (planting location, soil depth), and thus this assessment can only be used as a source of observation

# Results: Biomass



# Live Operations Database

- Designed for day-to-day department operations
- Multiple web maps created for different operations, such as pruning schedules and pest scouting
    - Each web map can show and edit specific attributes from the master tree inventory feature class
- Allows for continued data collection for maintenance and pest history on each tree
- Can be used to plan work operations, to plan future maintenance efforts, and to plan future planting efforts