HADDINGTON WOODS "SOUTHERN SPECIES" EXPERIMENT: COMPARISON (FEBRUARY 2016-NOVEMBER 2017) OF SOUTHERN TREE AND SHRUB GROWTH AND HEALTH IN AN URBAN SETTING

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Background

Climate change, one of the global environmental issues of greatest concern in modern times, is occurring at a faster rate than it has during any geological period of time in the past 65 million years (Smith, 2014). Cities are studying how to maintain urban forests by planting climate change adapted species which are tolerant of drought, variation in temperature, and pests (McPherson & Albers, 2014; Muffly, 2008; Filmer, 2016). Philadelphia Parks and Recreation (PPR) is studying how to maintain its urban forest in a changing climate at Haddington Woods where southern tree and shrub species with northern limits just south of Philadelphia were planted in a deer exclosure in the fall of 2015 and measured and evaluated in Feb. 2016, Sept. 2016, and Nov. 2017.
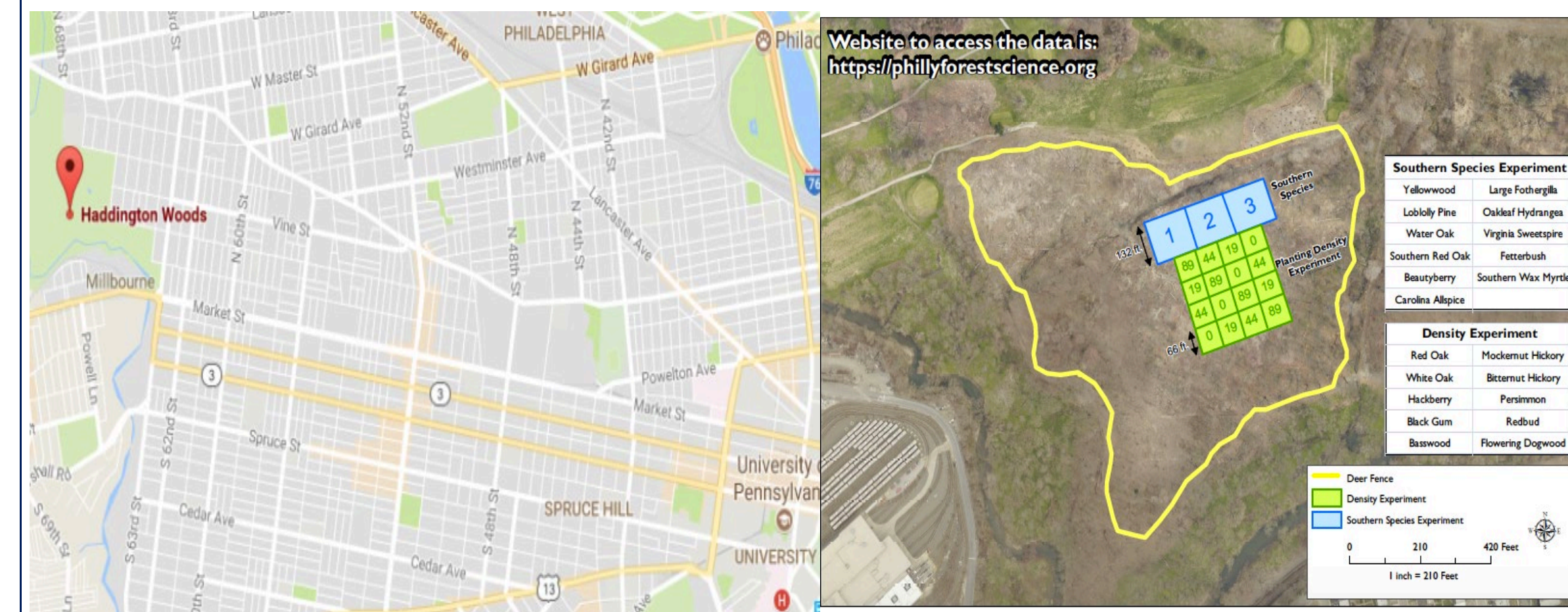
Site Description

Figure 1: Location of Haddington Woods (Google, 2017)

Website to access the data is: https://phillyforestscience.org

Figure 2: Layout of study site (Helm, 2017)

Southern Species Experiment

Yellowwood	Large Fothergilla
Loblolly Pine	Oakleaf Hydrangea
Water Oak	Virginia Sweetspire
Southern Red Oak	Fetterbush
Beautyberry	Southern Wax Myrtle
Carolina Allspice	

Density Experiment

Red Oak	Mockernut Hickory
White Oak	Bitternut Hickory
Hickberry	Persimmon
Black Gum	Redbud
Basswood	Flowering Dogwood

Site Description:
- Located in SW Philadelphia in Cobbs Creek Park (Figure 1)
- Acidic soils- pH of 4.9 to 6.0 (Web Soil Survey, 2018)
- Poor to well drained soils
- Three 132 ft x 132 ft plots in deer fence
- 11 Southern species planted (Table 1 and 2)

Table 1(left): Southern species selected for planting

| Scientific Name	Common Name
Cladrastis kentuckea	Yellowwood
Pinus taeda	Loblolly pine
Quercus falcata	Southern red oak
Callicarpa americana	Beautyberry
Calycanthus floridus	Carolina allspice
Fothergilla major	Witch-alder
Halesia carolina	Carolina silverbell
Hydrangea quercifolia	Oakleaf hydrangea
Itea virginica	Virginia sweetspire
Leucothoe fontanesiana	Drooping laurel
Morella cerifera	Southern bayberry

Methods

- Data collection in Nov. 2017 using same methods as previous surveys:
- Height (trees & shrubs)
- Caliper 6" from ground (trees)
- Spread along x & y axis (shrubs)
- Observation of health and surrounding debris & vines
- Data entered into phillyforestscience.com

Figure 3: Data collection (Willig, 2017)

Results and Discussion

Figure 4: Average growth of trees, height (cm)

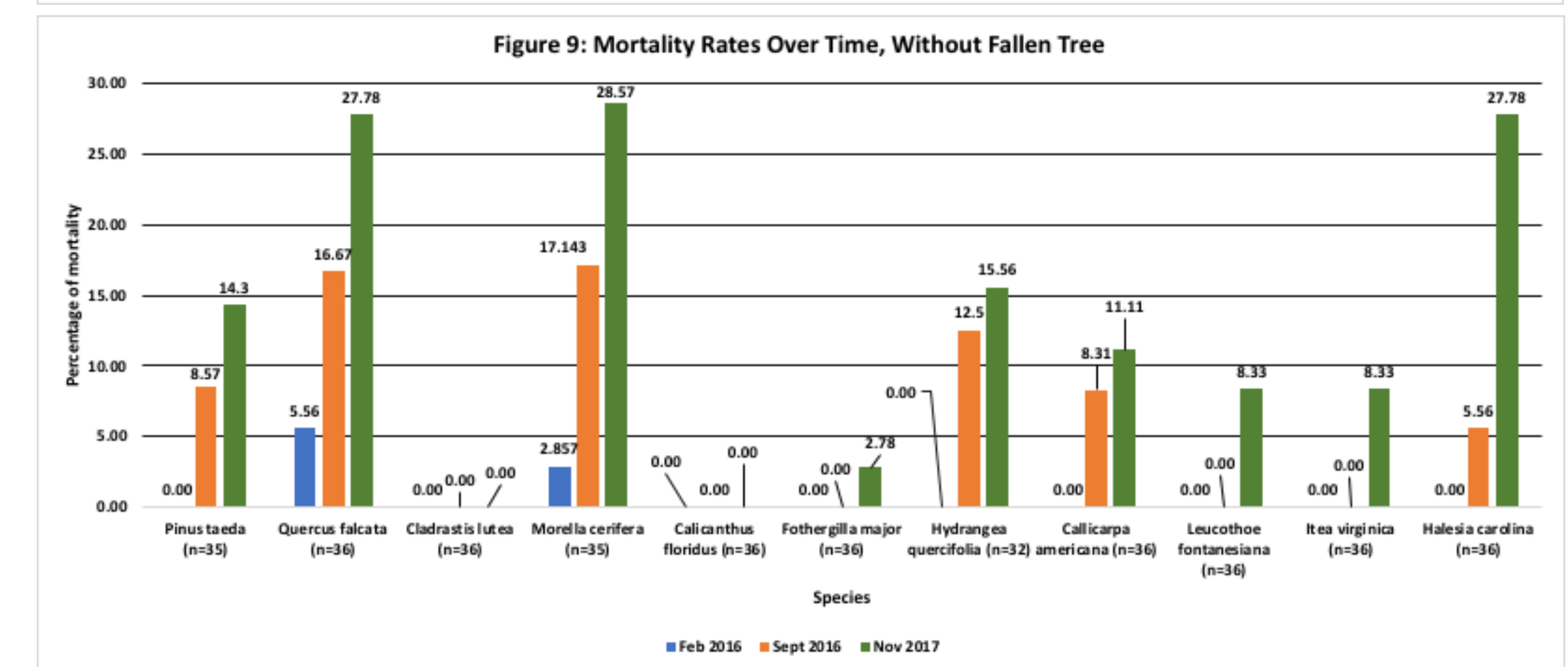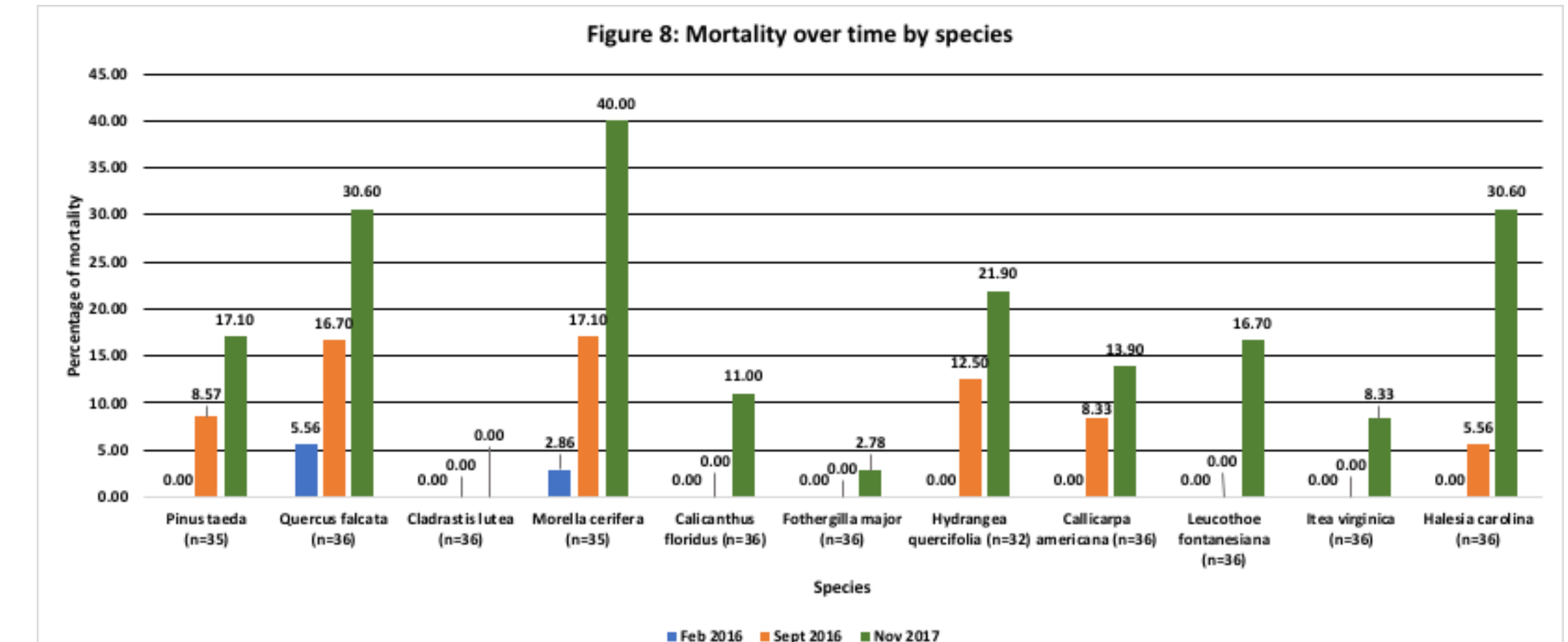Figure 5: Average growth of trees, caliper (cm)
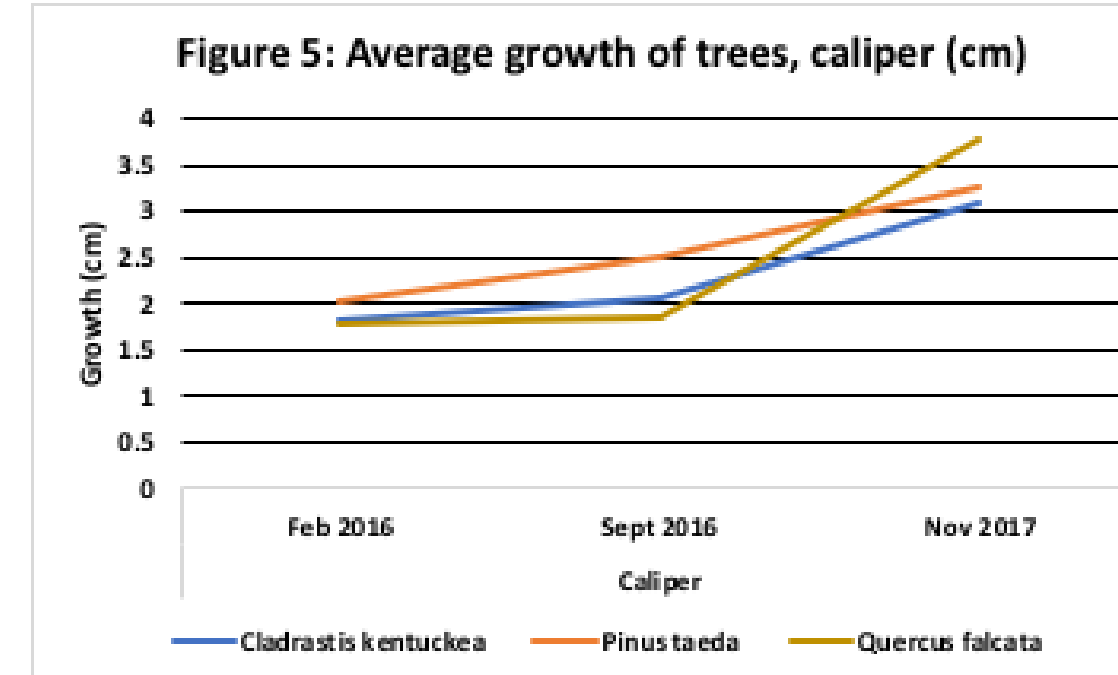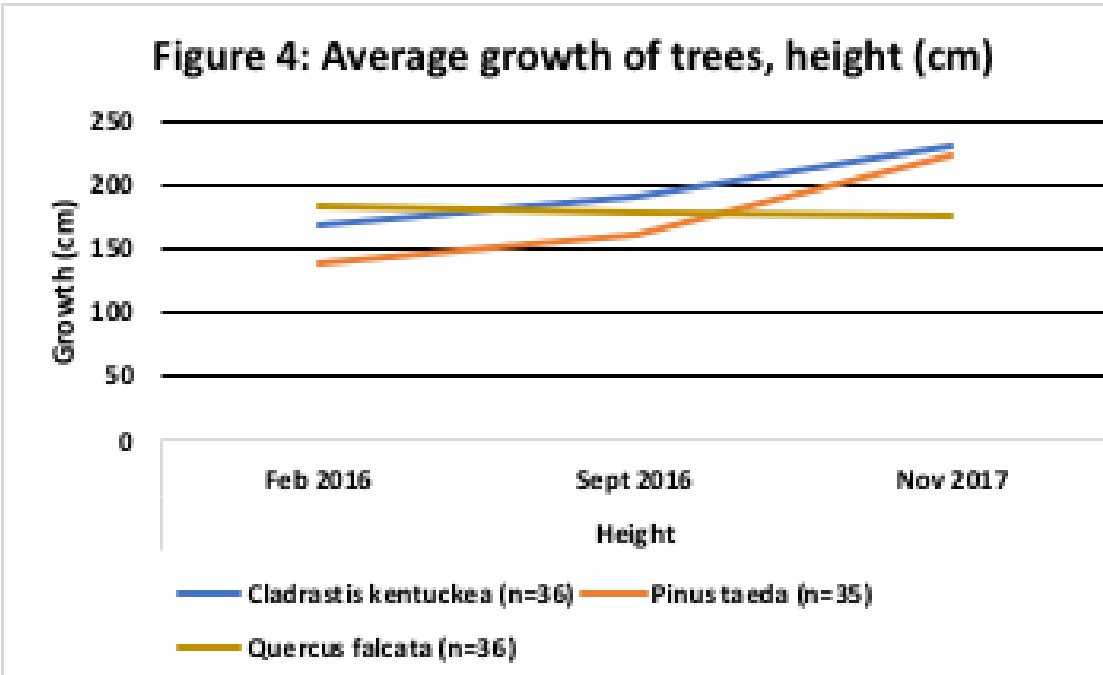
- Figure 4 and 5 shows average growth of tree species
- *Q. falcata* was the only tree to experience average height decline
- All tree species' average caliper increased

Figure 6: Average growth of shrubs, height (cm)

Figure 7: Average growth of shrubs, spread (cm)
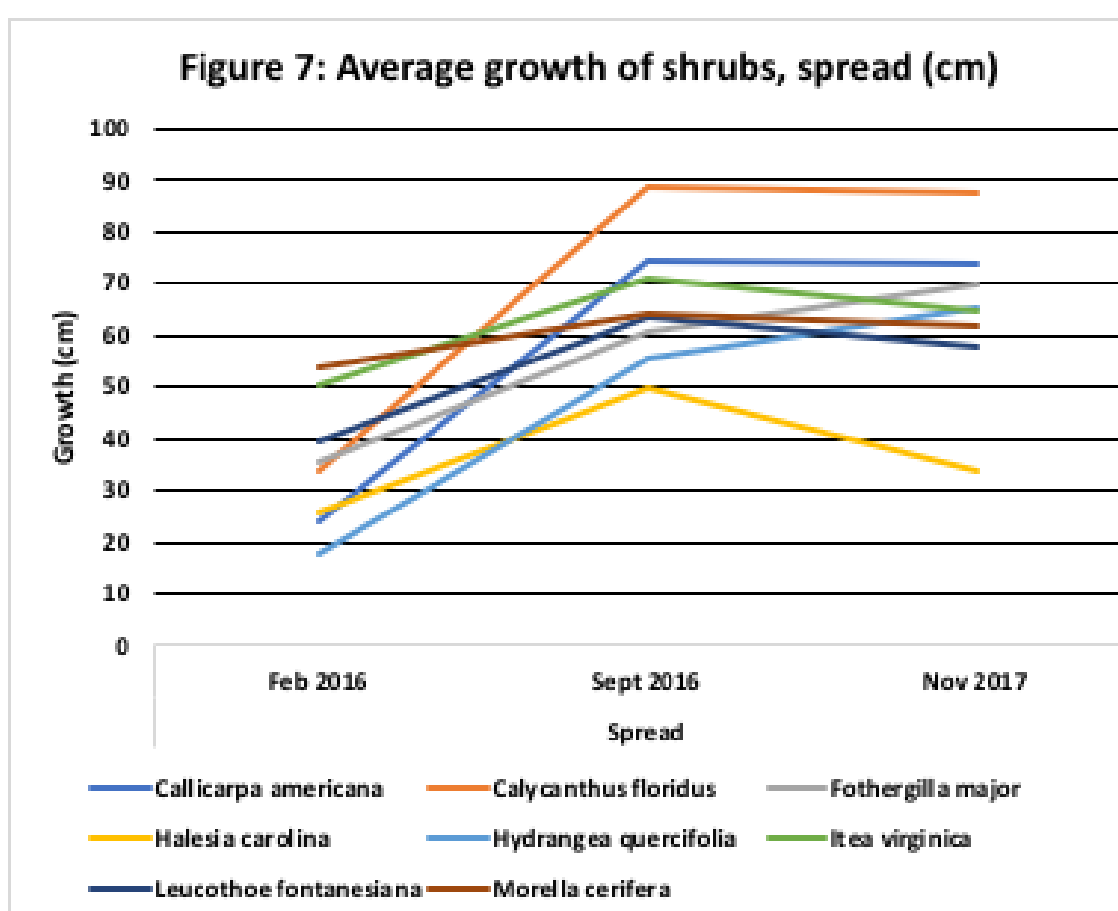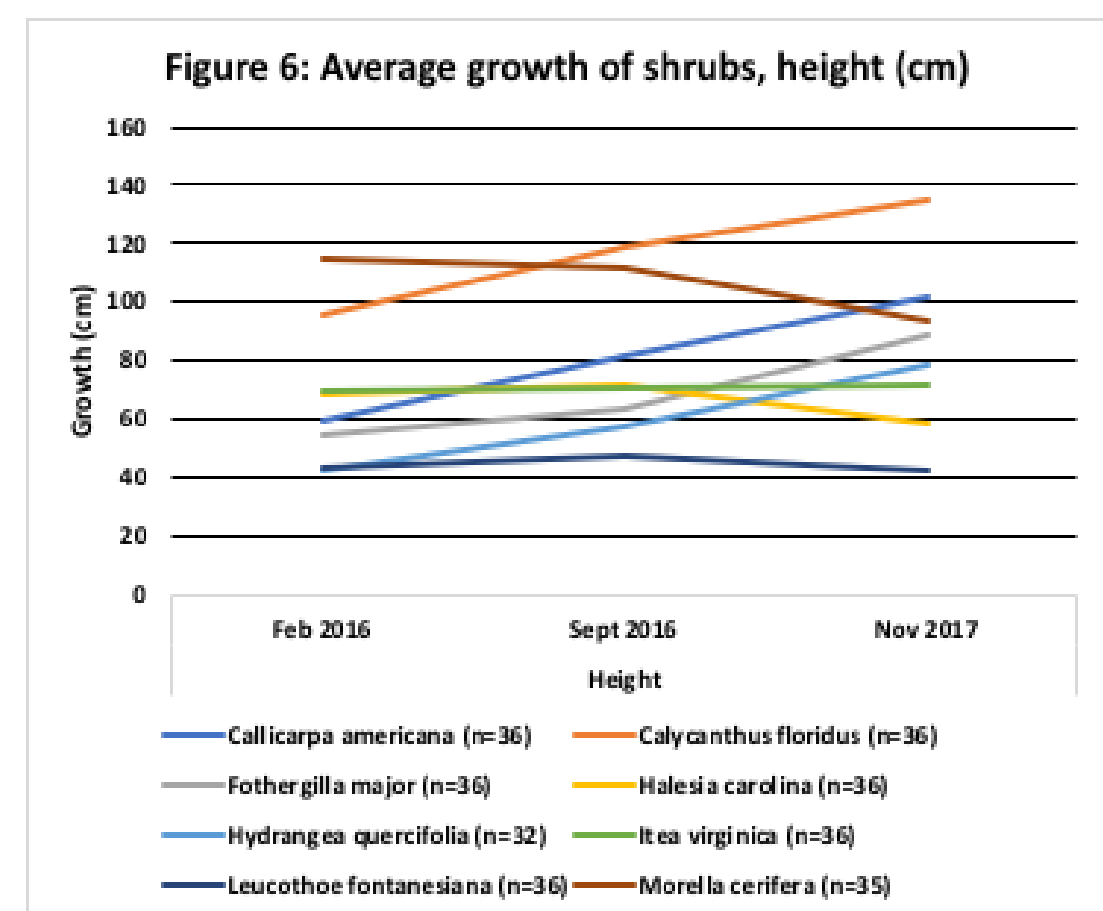
- Figure 6 and 7 shows average growth of shrub species
- *H. carolina*, *L. fontanesiana*, and *M. cerifera* experienced average height decline
  - *H. carolina* decreased 9.7cm, *L. fontanesiana* declined 0.9cm, and *M. cerifera* declined 60.7 cm
  - minimal spread growth compared to other species, *H. carolina* only 7.6cm and *M. cerifera* with 8.36cm
- Highest average height growth was *C. americana* with 42.2 cm
- Highest average spread growth was *C. floridus* with 49.9 cm

Results and Discussion (continued)

Figure 8: Mortality over time by species

Figure 9: Mortality Rates Over Time, Without Fallen Tree

- Fig. 8 shows mortality rates in plot with fallen tree (intentionally cut down)
- Fig. 9 shows mortality rates with fallen tree removed
- Highest mortality rates in *Q. falcata*, *H. carolina*, and *M. cerifera*

Conclusion and Recommendations

- Most specimens of southern tree and shrub species planted in the fall of 2015 have survived through Nov. 2017 with all three tree species showing an average increase in caliper and two of three species showing an average increase in height with
- The average height of five of eight shrub species increased and all shrub species showing an average increase in spread
- Continued annual measurement and evaluation are needed to determine suitability for widespread planting
- Recommendations include:
  - Addition of rain gauge at site to better understand rainfall inputs
  - Plant species identification training for maintenance crew to avoid unintentional damage of plants while clearing
  - Engage students and community members in ecological studies

Works Cited

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