Hillsborough County ranks fifth in the state of Florida for ornamental plant production (Hodges, et al., 2015). There are about 400 registered nurseries, of which 245 are wholesale nurseries (FDACS, 2016). Growers produce on approximately 3400 acres within the county according to Hillsborough County Property Appraiser tax rolls and the direct value of the crops grown by these nurseries was estimated at $148 million in 2015 calculating from wage data (FLDEO, 2016). The most common commodity grown in the area are containerized woody ornamental plants. It is common for nurseries to apply approximately 0.3 inches/acre/day in overhead irrigation water to satisfy evapotranspiration requirements for plant growth. This translates to about 8150 gallons/acre in irrigation on a daily basis. Improvements on irrigation efficiencies and application rates can result in tremendous savings of gallons of water pumped from the aquifer.

One of the ways to test for irrigation effectiveness is to conduct a distribution uniformity test. Distribution uniformity (DU) is the quantification of how evenly an application of irrigation water is applied over a given area. (Haman and Yeager, 2015) It is measured by capturing irrigation water in cans or cups and calculated by taking the average lowest quarter volume and dividing it by the average overall volume of irrigation. The value will be expressed as a percentage after multiplying by 100. Distribution uniformity test quantifies how evenly an application of irrigation water is applied over a given area, so to lower the DU, the greater the irrigation run time that is needed to meet the intended application amount desired on all plants in the area being irrigated.

Another important piece of information for growers irrigating plants is the application rate. The application rate (AR) is the amount of irrigation water delivered to an area over a specified time. This is calculated by capturing water in cups or cans and determining the depth of water applied over that area and dividing by the time it took to apply that depth. This is commonly expressed in inches/hour.

To assist container nursery growers with implementing best management practices in Hillsborough County and beyond, to effectively apply irrigation water, we wanted to determine DUs and ARs from a sample of nurseries with different systems.

### Materials and Methods

Woody ornamental container nurseries were selected from within Hillsborough County with overhead irrigation and a willingness to cooperate with extension. A minimum of two field visits were made with each participating nursery to obtain two sets of data measurements. The procedure for determining DU and AR was followed from Million and Yeager, 2015. Irrigation start times were nursery specific and did not deviate from their current practices. Irrigation duration was dependent upon nursery needs and was usually determined by personnel at the nursery. Twenty capture cups with a volume measuring 1050 mL and a top area of 95 cm² (United Solutions, Leominster, MA) were placed on the ground mat, usually between plants, and evenly positioned in an area approximately 1500 ft². Blocks were selected with three-gallon, spaced plants that were early in the production cycle. Cups remained during the entire irrigation event. Irrigation volumes were measured with a graduated cyl-
A map was made of the placement of each cup within the test block for future reference. Irrigation DUs were determined by the equation:

$$DU = \frac{\text{average low quarter volume}}{\text{overall average volume}} \times 100\%$$

Irrigation ARs were determined by the equation:

$$AR = \frac{\text{volume of irrigation captured}}{\text{area of capture surface} / \text{duration of irrigation event}}$$

AR is expressed as inches of irrigation per hour.

**Results and Discussion**

Average irrigation DUs for all nurseries sampled was surprisingly, fairly consistent. Two nurseries used mini-Wobbler® sprinklers and four used impact sprinklers for irrigation delivery. DUs averaged 80% ± STD of 4.2 (Table 1). The highest DU sample was 86% while the lowest was 71%. There was some variation between the two samplings at the same nursery. Three nurseries were sampled in the same location of plant blocks for both irrigation events. The other three nurseries were sampled in different locations at each nursery. Irrigation ARs were also fairly consistent across nurseries and sprinkler type. ARs ranged from 0.11–0.42 inches/hour with an average of 0.30 inches/hour ± STD of 0.08. Many factors can interfere with the DU of an irrigation system; namely, design, crop heights or obstructions, wind speed, wind direction, faulty rain sensors, water pressure, sprinkler deflections, riser spacing, riser angles, sprinkler selection, sprinkler orifice wear, nozzle rotations, block or field edge coverage, and/or multiple zone settings where there is an overlap of irrigation. Nurseries that were visited, could improve their DU with the correction of one or more of the following items previously mentioned. Common problems among nurseries were orifice size among sprinklers or different sprinkler types within a given block, wind interference of sprinkler pattern, and matching sprinkler output to sprinkler patterns at edges of blocks.

Information from this survey will be used for future extension best management practice education efforts and advice for cost-share opportunities for growers. Growers or others who are interested and would like to see a video on the methods we used to gather DU and AR data, can visit FDACS site for the manual entitled Water Quality/Quantity Best Management Practices for Florida Nurseries (FDACS, 2014).

**Literature Cited**


