

## **Impact of Citrus Greening on Citrus Operations in Florida**

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Florida is the largest orange producing state in the U.S. and the third largest producer in the world behind Brazil and China. Approximately 95% of all oranges grown in Florida are processed for juice (USDA-NASS, 2015). However, a bacterial disease known as citrus greening, or Huanglongbing (HLB) for its Chinese origin is jeopardizing the Florida citrus industry. HLB affects citrus trees' vascular system, limiting nutrient uptake. Consequently, the disease negatively affects yield, fruit size and quality, tree mortality, and cost of production. First found in Florida in 2005, HLB has spread rapidly across the state (CREC, 2015a).

To date, there is neither a cure nor an economically viable option for managing HLB infected trees. Since HLB was found,<sup>2</sup> orange acreage and yield in Florida decreased by 26% and 42%, respectively. Thus, orange production dropped from 242 to 104.6 million boxes in 2014. Even though the industry acknowledges that HLB has reached epidemic proportions across the state, estimates on the level of infection and its impact on citrus operations are scarce. Therefore, the purpose of this article is to present the first growers' survey-based estimates on both the level of infection and impact of HLB on citrus operations in Florida.

### ***Surveying the Florida Citrus Industry***

We conducted a survey of individuals involved in citrus production in Florida during a biannual event organized at the University of Florida, IFAS, Citrus Research and Education Center. There were 326 attendants to the event including growers, researchers, extension agents, media, and state officials. The number of growers was estimated at 200. The number of completed surveys was 76, giving a response rate of 38%. Survey participants operated 156,614 acres, which accounts for approximately 30% of the total acreage devoted to citrus in Florida.

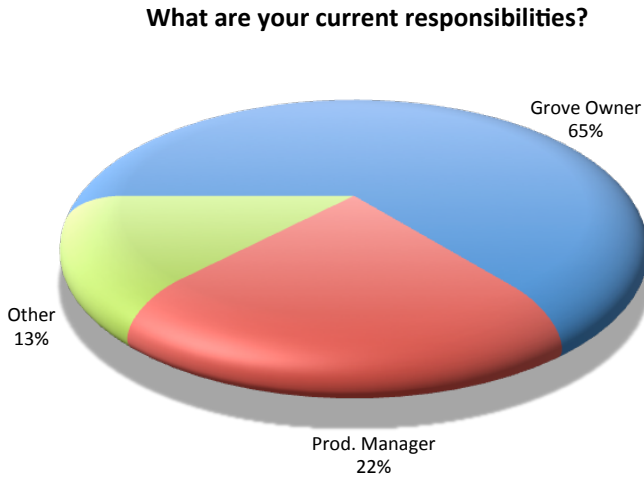
The proportion of grove owners and production managers that participated in the survey were 65% and 22%, respectively, while 13% of the respondents classified themselves as other (Figure 1). Those in the latter category defined their responsibilities as caretaker, nursery manager, manufacturer, processor, research farm manager, or researcher.

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<sup>2</sup> Even though HLB was first found in Florida in 2005, the initial figures we use next to illustrate its impact on the industry correspond to 2004 because they provide a better estimate of the scale of the industry prior to HLB. Florida was hit by four hurricanes between August and September of 2004. A little over a year later, in October 2005, another hurricane hit the state. Those hurricanes had a significant negative impact on yield and, therefore, production of oranges statewide in 2005, 2006, and 2007.

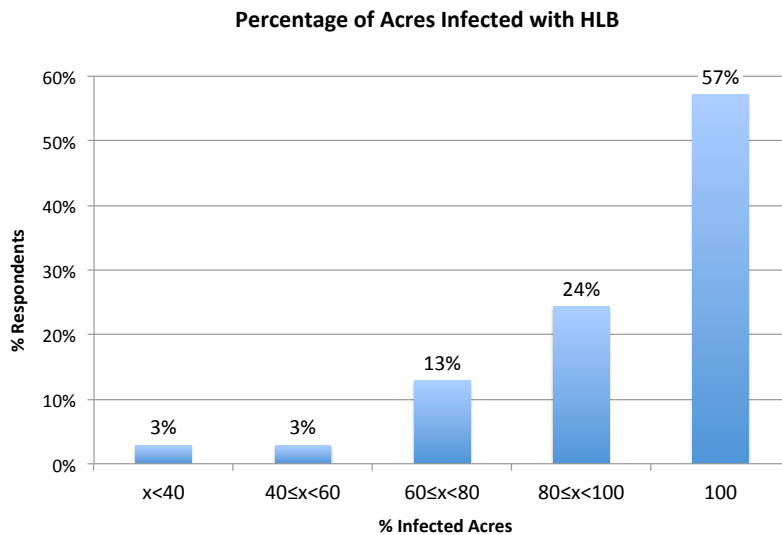
Figure 1



***Survey-based Estimates on HLB Impact***

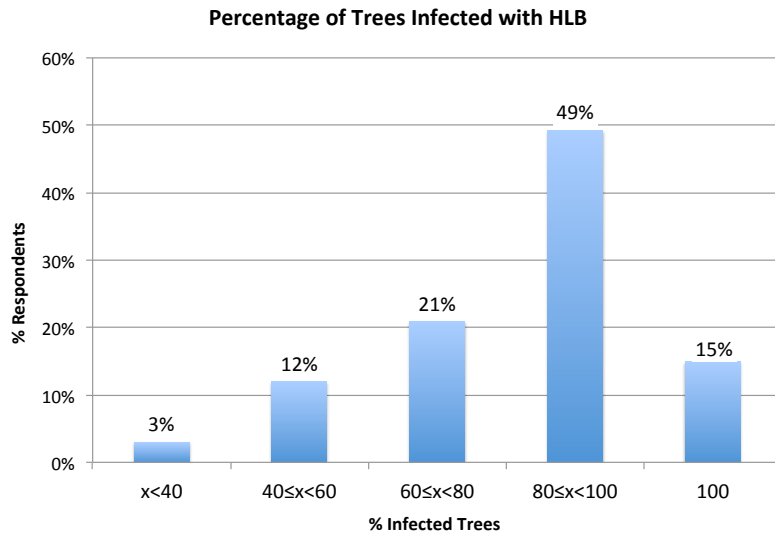
To quantify the impact of HLB on citrus operations in Florida we asked participants to answer three questions. The first question we asked them was to estimate the percentage of acres in their operations infected with HLB. The distribution of their responses is shown in Figure 2. The percentage of growers that indicated that 100% of their acres were infected — that is, at least one tree in every single acre of their groves was infected with the bacteria — was 57%. Another 24% of the participants stated that the percentage of acres in their operations infected with HLB was greater than or equal to 80% but less than 100%. Adding the two groups, 81% of the respondents asserted that the percentage of acres in their operations infected with HLB was between 80 and 100%. The average percentage of acres infected with the bacteria across responses was 90%.

Figure 2.



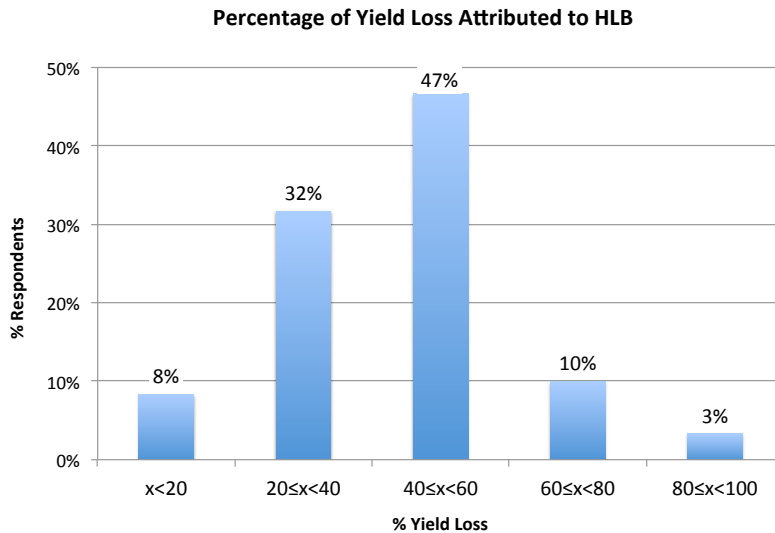
The second question we asked participants was to estimate the percentage of trees in their operations infected with HLB; the distribution of their responses is depicted in Figure 3. In this case, 49% of the individuals stated their operations have a percentage of infected trees that is greater than or equal to 80 but less than 100%, while 15% indicated that 100% of their trees are infected. Thus, these two groups account for 64% of the respondents. Taking the average across all responses, the average percentage of trees infected with HLB was 80%.

Figure 3.



The third question aimed at collecting data on the impact of the disease asked growers to estimate the average percentage yield loss per acre they attribute to HLB. A few of the responses to this question were in the form of ranges so we used the midpoint of the provided range. The distribution of the responses is shown in Figure 4. Combining the categories reporting a yield loss greater than 40% accounts for 60% of the respondents. In addition, the average percentage yield loss across all responses was 41%.

Figure 4.



### ***Analysis by Region***

To analyze the survey responses by region, we categorized the location of the participants' operations into: (1) Central Florida (Ridge), (2) Central and Southwest Florida, and (3) Southwest Florida. Column 1 in Table 1 shows that 44 participants had operations in Central Florida; 11 had operations in both Central and Southwest Florida, and 21 in Southwest Florida.

Column 2 in Table 1 shows the average size of the operation for each region, were 693, 1,962, and 5,818 acres for Central Florida, Central/Southwest Florida and Southwest Florida, respectively. The average operation size is significantly larger in Southwest Florida than in Central Florida as the result of three severe freezes that affected the state's citrus trees in the 1980's, which caused the death of a large proportion of citrus trees. The industry responded by planting new larger groves further south of what used to be the state's primary citrus growing region, Central Florida.

Even though the majority of the respondents in our sample were from Central Florida, much of the acreage was from Southwest Florida (Column 3 in Table 1), which resembles the actual citrus acreage distribution reflected in the 2014 USDA Florida Citrus Statistics (USDA-NASS, 2015). In our sample, 71% of the total acreage is in SW, 18% in Central Florida, and 11% is distributed across both regions. USDA reports that 54% of the total citrus acreage was in SW in 2014 while 29% was in the Ridge. This distribution also closely follows the regional contributions in terms of production (boxes), with the SW contributing 52% of total production and the Ridge region contributing 30%.

**Table 1. Responses by Region**

<b>Region</b>	(1) <b>Surveys Count</b>	(2) <b>Average # Acres</b>	(3) <b>Total Acres</b>	(4) <b>Average % Infected acres</b>	(5) <b>Average % Infected Trees</b>	(6) <b>Average % Yield Loss</b>
Central	44	693	28,414	88	83	45
Central/SW	11	1,962	17,655	90	74	37
Southwest	21	5,818	110,545	92	77	33

Columns 4, 5 and 6 show the average percentage of HLB infected acres, infected trees, and HLB-related yield loss per acre, respectively. Interestingly, the percentage of HLB infected acres in Southwest Florida was 4% larger relative to Central Florida but the percentage of infected trees was 6% lower in the former region relative to the latter. Furthermore, the average percentage yield loss per acre in Southwest Florida was 12% lower than in Central Florida. The percentage of infected acres and average percentage yield loss for operations with groves in both Central and Southwest Florida were the mid-point relative to the other two regions, but the percentage of infected trees was the lowest.

It can be argued that the lower percentage of infected trees and percentage yield loss in Southwest Florida relative to Central Florida is due to the size of the operations. Larger citrus growing operations can attain economies of scale. Moreover, those operations are typically owned by corporations that can also be integrated into the processing or packing of the fruit. Such integration can allow a higher level of spending in the caretaking of trees relative to the smaller operations found in Central Florida.

Another important consideration regarding the size of operations is related to Citrus Health Management Areas (CHMAs). CHMAs are a voluntary area wide pest management approach suggested by researchers from the University of Florida to control the Asian Citrus Psyllid (ACP). Each CHMA constitutes a grouping of growers who work cooperatively to coordinate insecticide application to control the spread of ACP across neighboring commercial citrus groves. The idea behind this cooperative effort is that it provides a larger and more lasting effect relative to individual (uncoordinated) farm sprays because it minimizes movement of psyllids between groves (CREC, 2015b). However, due to the decrease in profitability, many growers have cut back on inputs for caretaking of trees, including insecticide applications. Thus, they either do not participate in CHMAs, or do so in a limited fashion. However, by doing so, those growers impose a cost on their neighbors. Larger operations are less dependent upon the willingness of neighboring growers to participate in CHMAs and are, therefore, better able to control for ACP and manage the impact of HLB.

### **Summary**

The Florida citrus industry currently faces the challenges imposed by HLB: decreasing yields and production, lower quality fruit, and higher tree mortality

rates; all of which have resulted in an increased cost of production. This article summarizes the results of a survey conducted to obtain the level of infection and impact of HLB on citrus operations in Florida. We found that, on average, the current percentage of HLB-infected acres and trees in a citrus operation in Florida is 90% and 80%, respectively. Furthermore, compared to pre-HLB levels, the average percentage yield loss is 41%. However, citrus operations in Central Florida experience a 12% higher yield loss relative to those in Southwest Florida. These findings are useful in providing growers, stakeholders, researchers, and governmental agencies an industry-wide status of the progress and impact of HLB.

**References:**

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[http://www.crec.ifas.ufl.edu/extension/chmas/chma\\_overview.shtml](http://www.crec.ifas.ufl.edu/extension/chmas/chma_overview.shtml)

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