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Edge Effects and *Huanglongbing*

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Huanglongbing (HLB), spread by a psyllid vector, is globally considered a major threat to commercial and sustainable citrus production. Better understanding of the vector-mediated patterns of HLB spread is essential to inform and maximize disease management. From previous studies, edge effects are a significant characteristic of the HLB pathosystem and have been observed predominately in larger plantings. In this study, we investigated 1) the impact of different edge classes and orientations, 2) the quantitative influence of distance from edges, and 3) the temporal dynamics of each edge effect. Spatial analyses of edge effects were conducted on two years of HLB incidence data from the Southern Gardens plantation in south Florida. The Southern Gardens dataset consists of multiple surveys for more than 250,000 citrus trees in 180 blocks. The blocks are arranged in six rows of 30 blocks, and each block typically contains around 1500 trees. Each block usually contains trees of the same age and variety. Based on the shape and orientation of the plantation (Fig. 1), five different edge types were classified, including ponds, main roads (NS and WE), and internal plantation edges (voids) between blocks (NS and WE). With variation due to variety and tree age taken into account, results clearly showed significant edge effects for ponds, NS and WE main roads, and the estimated distance of influence from an edge (i.e., 120, 130 and 90m, respectively). These edge effects were consistently significant across different assessment dates, although the magnitude of the effect varied temporally. Compared with tree age and variety, higher intensity of infected trees was initially found at the borders of ponds. No obvious edge effects were found for internal plantation edges, which was probably due to their associated small void width. To further examine the temporal nature of within-grove edge effects, an experiment was designed to determine if *Diaphorina citri* populations along edges of groves vary according to time-of-day and time-of-year in relation to the azimuth of the sun. Three citrus groves, each divided into nine sampling areas (corresponding to four cardinal directions, four intercardinal directions [e.g., northeast], and an interior sampling area) consisting of 30 trees each, were surveyed for *D. citri* using a stem tap method (1). To maximize exposure to incident sunrays, sampling areas consisted of trees within the two outermost rows (except for the interior sampling area). Groves were sampled three times per day (during the 3h including and after sunrise, surrounding solar noon, and before and including sunset) and three times per year (corresponding to intervals of time surrounding the summer solstice, autumnal equinox, and winter solstice that maintain a 5° error range of the azimuth during the midpoint of each time-of-day sampling period). Preliminary results indicate there were more *D. citri* found in the south, north, east, and northeast sampling areas at sunset within the summer solstice sampling period than in other sampling areas. Differences were seen among sampling areas for other time-of-year and time-of-day combinations but were not substantial within the currently unrepeated experiment. More data

will be collected over the 2013 to 2014 growing seasons. The determined edge effects can be identified and investigated to better understand the general HLB risk and contribution to potential epidemics. Placing more emphasis on management practices at plantation edges should result in improved HLB disease control.

1. Hall, D. G., and Hentz, M. G. 2010. Sticky trap and stem-tap sampling protocols for the Asian citrus psyllid (*Hemiptera: Psyllidae*). Journal of Economic Entomology 103(2):541-549.

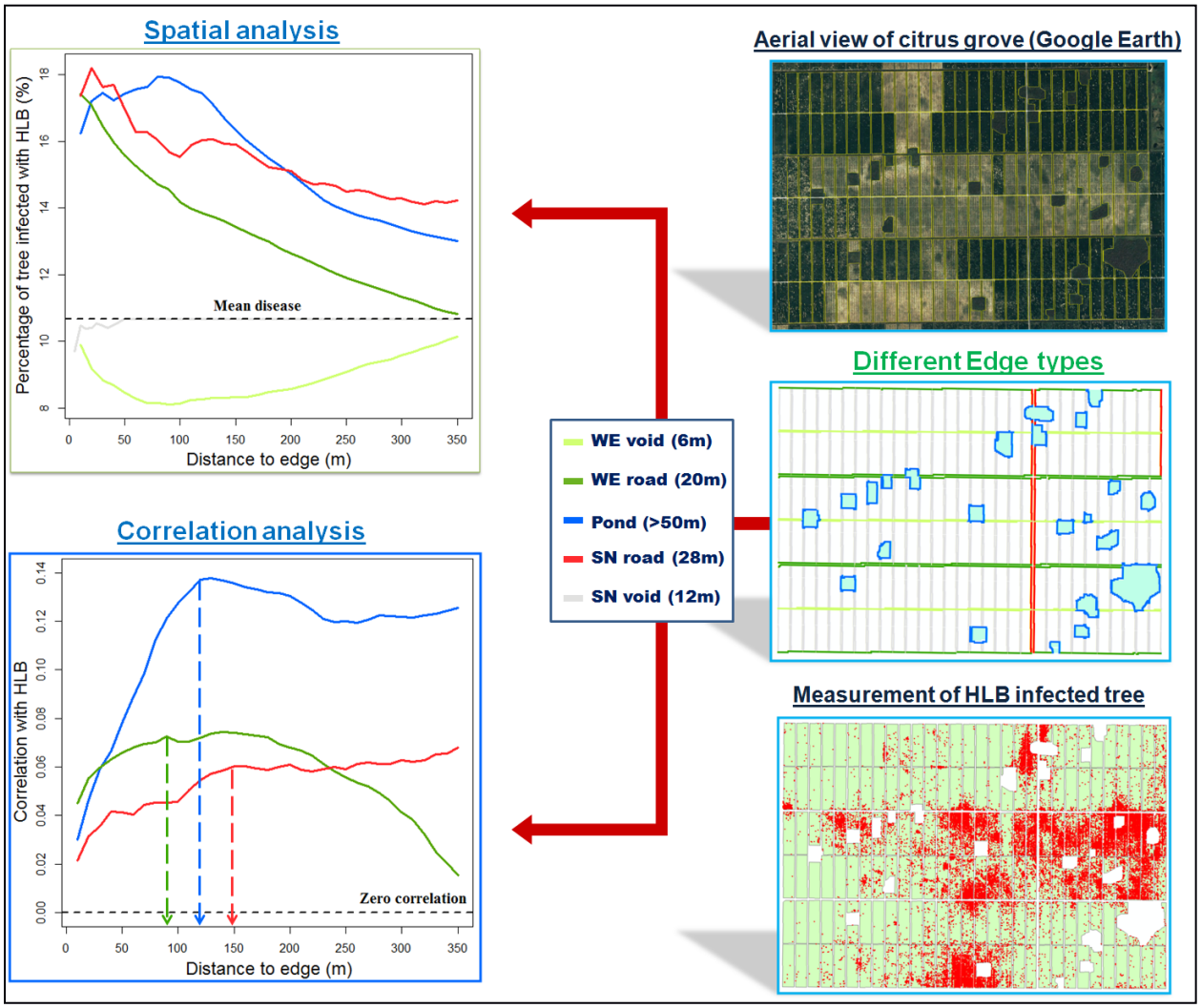

Figure 1. Edge classification and modeling for the Southern Gardens plantation in South Florida.