

# Using a Spatially Autoregressive Model to Identify Factors Influencing Clustering of *Halyomorpha halys*



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## Background

Brown marmorated stink bug (*Halyomorpha halys*) is an invasive pest of multiple crops, posing a high risk to growers in the mid-Atlantic region (Leskey et al. 2012). In order to combat this threat, many growers have resorted to multiple pesticide applications throughout the growing season, disrupting established IPM programs. It is important that we gain an understanding of where populations of *H. halys* are in the field and what factors may be driving these populations to cluster to help mitigate further damage to crops and the environment.

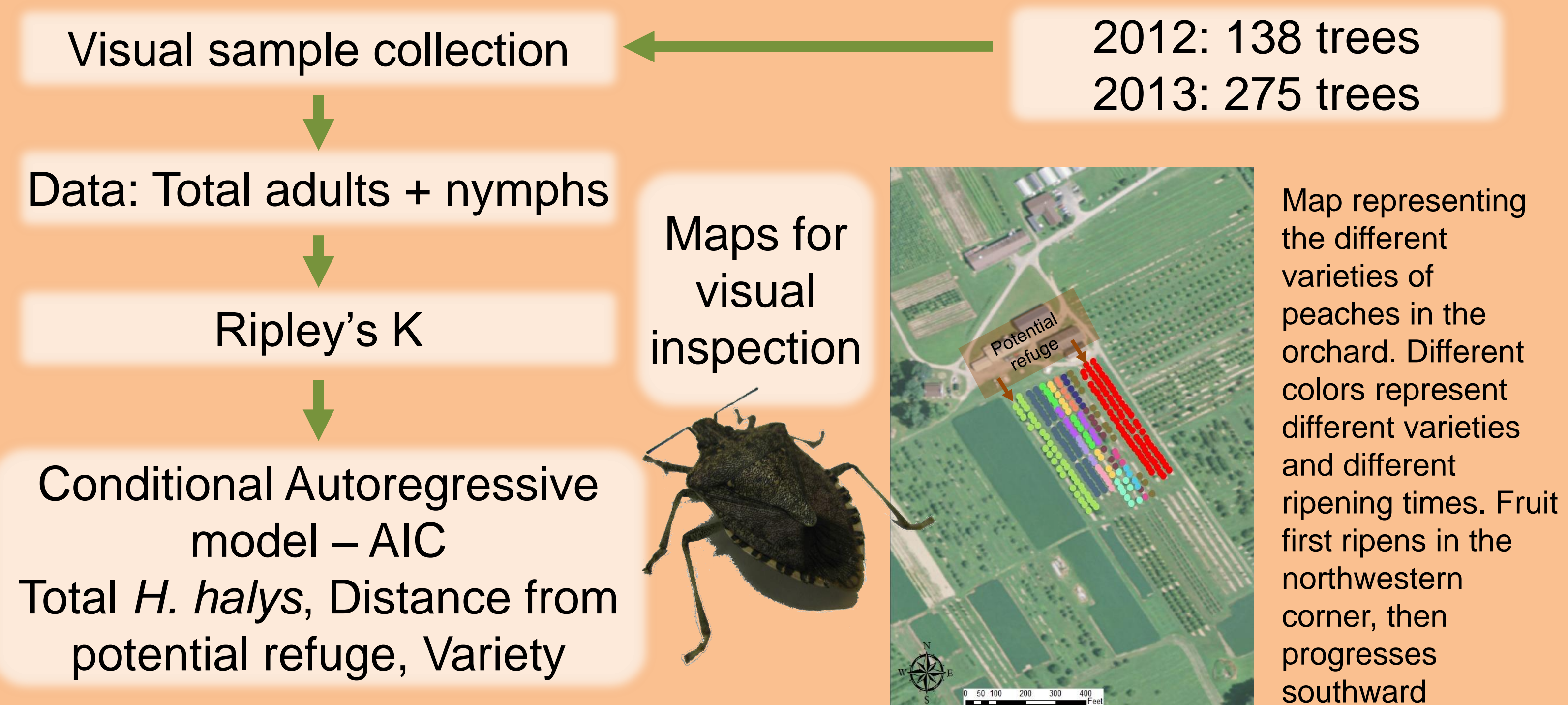
To identify factors influencing the clustering of brown marmorated stink bug (*Halyomorpha halys*), this study investigated populations of *H. halys* throughout a peach orchard located at a research station in New Jersey. For three summers, populations were tracked, and the number of individuals was recorded. Factors such as variety and distance from potential refuges were included in a spatially autoregressive model to determine if they contributed to clustering populations

## Research Questions

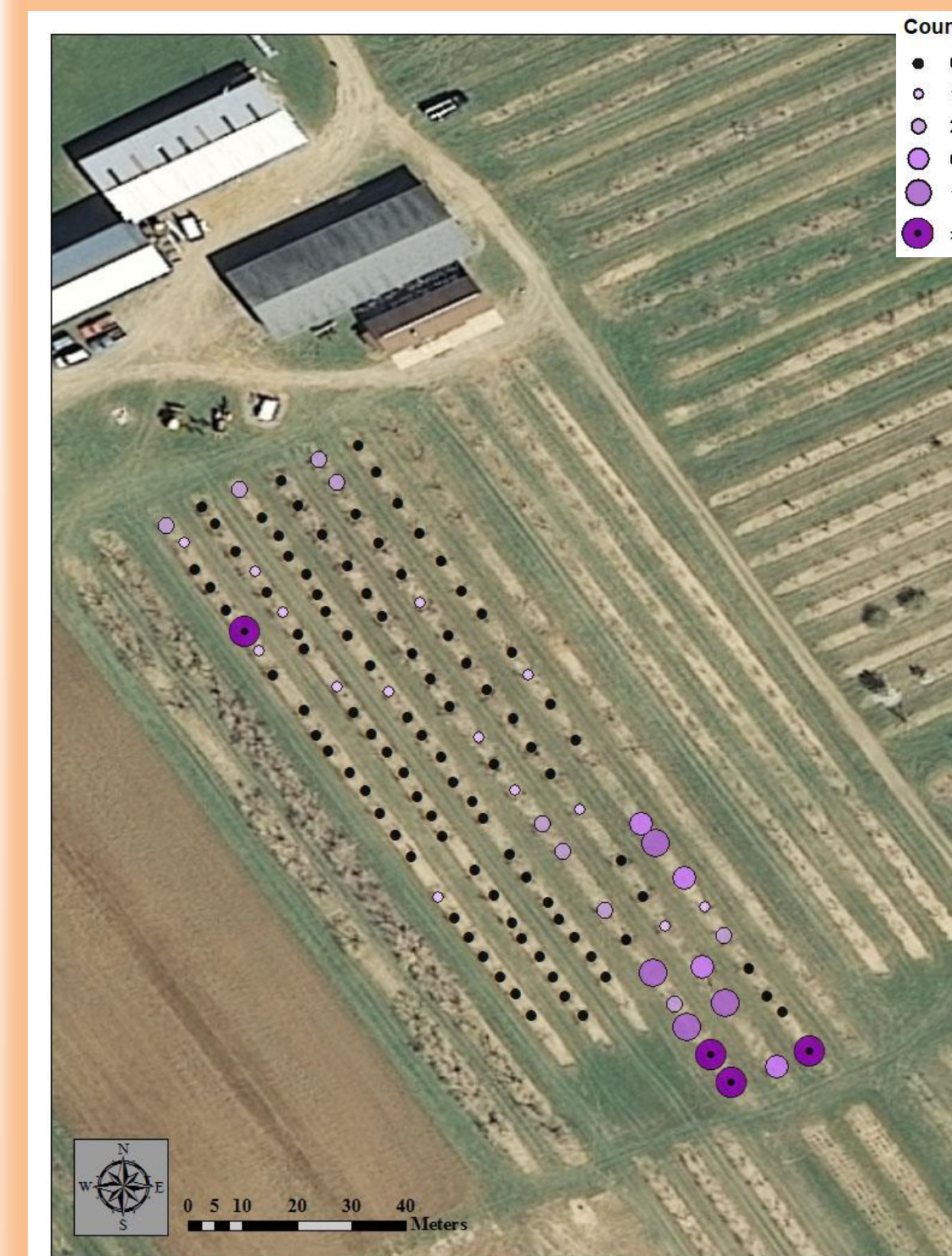
- Are populations of *Halyomorpha halys* clustering in a specific part of a peach orchard?
- What landscape factors (variety, proximity to potential refuges) may be contributing to the clustering of populations of *Halyomorpha halys* in peach orchards?

## Materials and Methods

Data was collected over three summers (2012, 2013, 2014) in a peach orchard at a Rutgers research station in New Jersey. The number of egg masses, nymphs, and adults was counted on all trees at the sampled orchard. Sampling occurred weekly from May through September.



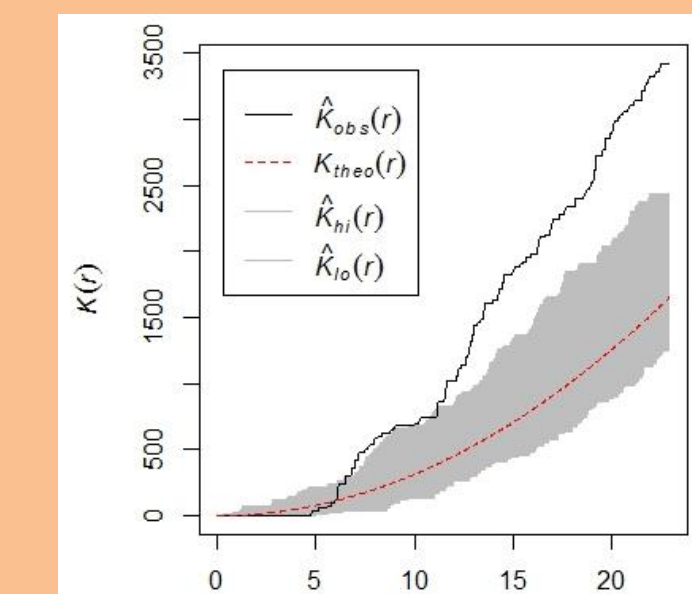
## Results



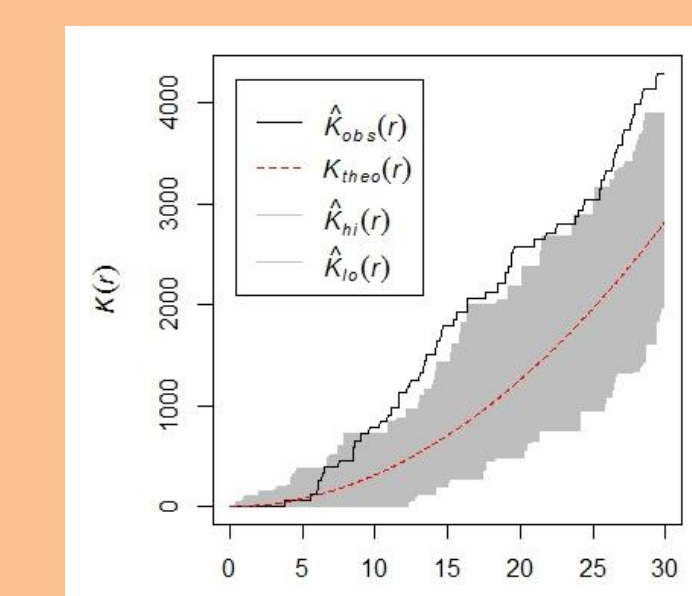
Map representing counts of *H. halys* from 8/30/2012



Map representing counts of *H. halys* from 8/27/2013



Ripley's K of populations of *H. halys* on 8/30/2012



Ripley's K of populations of *H. halys* on 8/27/2013

## Conditional Autoregressive Model

| Formula                    | AIC Score |
|----------------------------|-----------|
| Total ~ Distance           | 834.44    |
| Total ~ Variety            | 830.480   |
| Total ~ Distance + Variety | 829.37    |

AIC Scores for Conditional Autoregressive Model for 8/30/2012

| Formula                    | AIC Score |
|----------------------------|-----------|
| Total ~ Distance           | 340.53    |
| Total ~ Variety            | 339.04    |
| Total ~ Distance + Variety | 340.95    |

AIC Scores for Conditional Autoregressive Model for 8/27/2013

## Discussion

- Maps - populations of *H. halys* when peaches are ready or past harvest. The dates sampled in 2012 and 2013 reflected the highest populations of *H. halys* in those seasons.
- The Ripley's K tests show that *H. halys* populations are clustering.
- Distance from potential refuges does not seem to fit the model. This is most likely due to the fact that late in the season, *H. halys* are either migrating in from other host plants, or are the offspring of previous generations

## Conclusions

1. Populations of *Halyomorpha halys* are clustering in peach orchards.
2. Distribution of *Halyomorpha halys* populations in the latter part of the season in this specific peach orchard when populations are higher seems to be affected by variety.

## Ongoing analyses and other projects

I am teasing apart the effects of the different landscape factors and adding additional factors such as proximity to other potential host plants. I am also investigating how damage is tied to the clustering of *H. halys* and landscape factors



### About the Author

Noel Hahn is a Ph.D. candidate in the department of Entomology at Rutgers University. He earned his Masters in Entomology at Michigan State University under Rufus Isaacs researching blueberry gall midge.

### References

Leskey, Tracy C. et al. (2012) Pest status of the brown marmorated stink bug, *Halyomorpha halys* in the USA. *Outlooks on Pest Management*, 23:5: 218 – 226

### Acknowledgements

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