A Spatial Point Pattern Analysis of the Potato Cyst Nematode *Globodera pallida* in Southern Idaho

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ABSTRACT

- The potato cyst nematode (PCN) *Globodera pallida* is a quarantine pest in Idaho.
- Spatial point pattern analysis was used to study the spatial distribution of PCN infested fields.
- Results showed the presence of spatially clustered PCN infested fields.
- Clustered PCN infested fields facilitate quarantine activities.

INTRODUCTION

- The potato cyst nematode (PCN) *Globodera pallida* was found in 2006 in Idaho.
- Point pattern analysis (PPA) was used to study the spatial distribution of PCN infested fields.
- The null hypothesis for PPA is complete spatial randomness modeled as a Poisson point process.
- Spatial interpolation was used under spatial dependency to estimate unknown values from known values of nearby locations.

OBJECTIVE

- Understand the distribution of PCN infested fields in Southern Idaho using spatial analysis techniques.

METHODS

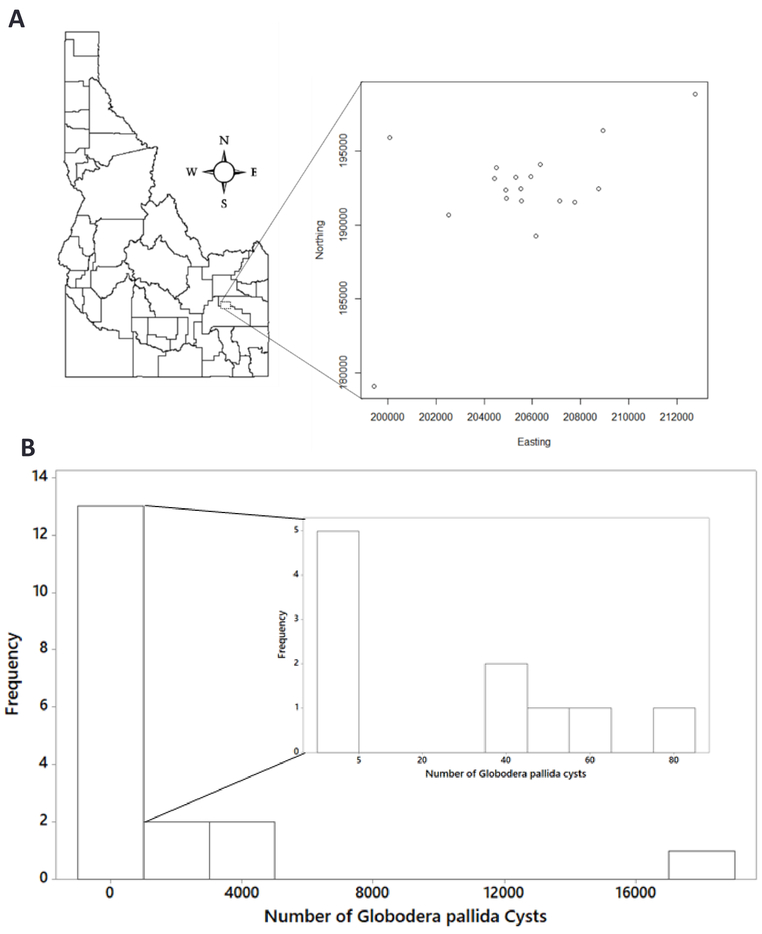

Fig. 1. A. Map of the state of Idaho (left) and location of the potato cyst nematode *Globodera pallida* in Southern Idaho (right). **B.** Histogram showed the distribution of *Globodera pallida* cysts collected during 2006-2014 for each reported infested field. **C.** Conceptual framework for spatial analysis of the potato cyst nematode *Globodera pallida* in Idaho. The diagram provides a summary of the methodology applied in this study. It consists of data retrieval, data analysis and processing using R programming software, and elaboration of a decision-making statement based on the results.

RESULTS

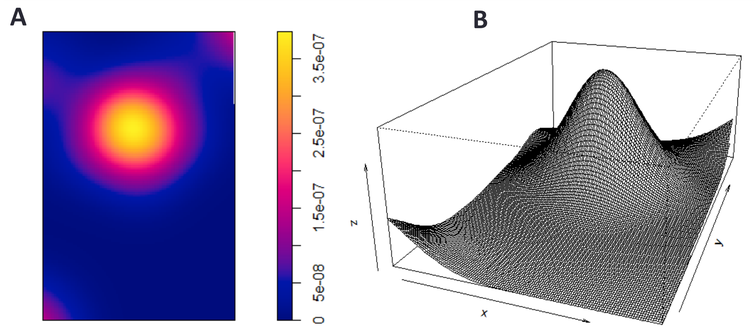

Fig. 2. A. Spectral analysis of the Kernel density estimate showed the location of the highest densities of the potato cyst nematode *Globodera pallida* infested fields. **B.** 3-D representation of the kernel density estimation.

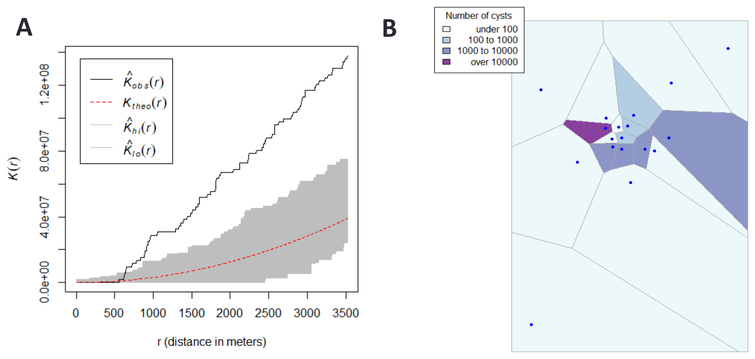

Fig. 3. A. Ripley's K function plot showed the presence of spatial clustering of PCN infested fields (quadrat test, *p*-value < 0.05). **B.** Nearest neighbor interpolation showed low, medium and high number of *Globodera pallid*a cysts in each Voronoi polygon.

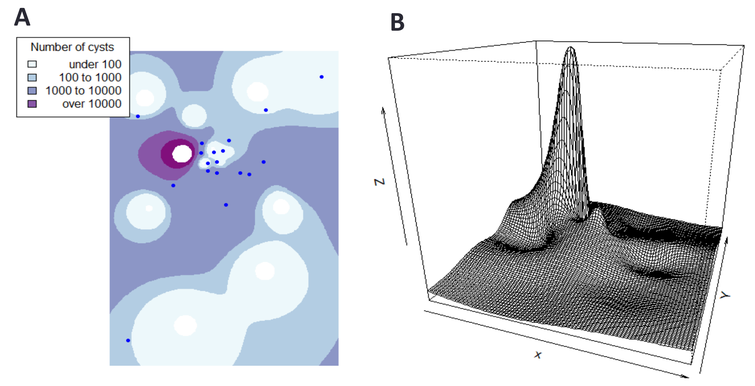

Fig. 4. A. Inverse distance weighting used weighted mean of nearby observations for interpolation. **B.** 3-D representation of the inverse distance weighting interpolation showed a smoothed peak landscape.

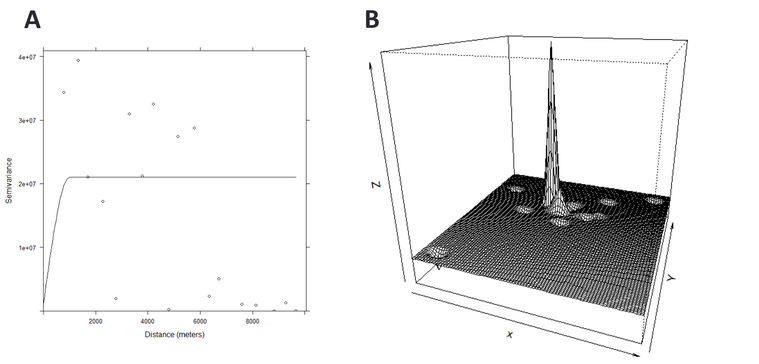

Fig. 5. A. Kriging spherical semivariogram showed a spatial correlation in the number of *Globodera pallida* cysts per field at short distances. Model parameters: psill=2e+07, nugget=1e+06, range=1000**. B.** 3-D representation of the Kriging model showing a high angle peak landscape of interpolated cyst number**.**

CONCLUSIONS

- This study provides important information on the intensity and directionality of PCN in Idaho.

References
R Core Team. 2017. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/.
Skantar, A.M., Handoo, Z.A., Carta, L.K., Chitwood, D.J. 2007. Morphological and molecular identification of *Globodera pallida*. J. Nematol., 39: 133-144

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