Section V: Potato Pests

**SPATIAL AND TEMPORAL ANALYSIS OF APHIDS IN EASTERN OREGON**

M. L. Klein and S. I. Rondon
Oregon State University, Hermiston Agricultural Research and Extension Center
2121 S 1st St, Hermiston, OR 97838
matthew.klein@oregonstate.edu, silvia.rondon@oregonstate.edu

Geographic distributions of insect populations are driven by factors inherent to the species, such as developmental rate, within-species behavior, resource use patterns (Fievet et al. 2007), and by environmental variability in time and space (Nestel et al. 2004). Quantification of insect population dynamics through analysis of spatial-temporal variability may lead to enhanced pest management decisions. One foundation of integrated pest management (IPM) is that control measures are taken only when and where a pest population reaches or exceeds an economic threshold (Kogan 1998). However, efficient site-specific management tools can only be implemented if spatial distribution and temporal dynamics are sufficiently determined and modeled (Park and Tollefson 2005), and complemented with pest damage estimates from adequate monitoring. The challenge is that in field settings this does not always occur since increased monitoring efforts can be limited by time and cost constraints (Cullen et al. 2000).

Since the late 1970s, a trapping network consisting of roughly 30 traps across the lower Columbia Basin has been maintained by Oregon State University in order to provide potato growers with information on presence of key agricultural pests. Of the numerous potato pests that are routinely monitored, data on the Potato Aphid (PA) *Macrosiphum euphorbiae* Thomas (Hemiptera: Aphididae) and Green Peach Aphid (GPA) *Myzus persicae* Sulzer (Hemiptera: Aphididae) are routinely sought after by growers. Both, GPA and PA, can cause direct feeding damage but their ability to efficiently transmit viruses makes them a top priority of study. More recently, the Bird Cherry Oat Aphid (BCOA), *Rhopalosiphum padi* L. (Hemiptera: Aphididae), and upwards of 30 other aphid species have also been identified in or near potato fields (Murphy et al. 2013).

In the past, this trapping network was used to spatially analyze both potato tuberworm, *Phthorimaea operculella* Zeller (Lepidoptera: Gelechiidae) and beet leafhopper *Circulifer tenellus* Baker (Heteroptera: Cicadellidae) populations, but until this study, no spatial analysis has been conducted on aphid populations in the region. To accomplish this task, we compiled spatially referenced data from 2006 to 2014 on GPA, PA, and other aphids (OA). Using ArcGIS 10.2.2 we developed predictive distribution maps using a method known as indicator kriging. Indicator kriging is a non-parametric method of spatial mapping where count data are mapped as a probability of exceeding a predetermined threshold and the technique is robust enough to estimate whole distributions based off irregularly spaced point sources. We also charted aphid counts over time to visualize temporal dynamics. It is anticipated that complete analysis of these data will accurately represent regions at high risk and those at low risk for aphid colonization in a given year.

No precise economic thresholds exist for aphid control in commercial potatoes, which could be leading to unnecessary insecticide use. Reductions and/or more precise applications of various insect control tactics can potentially be achieved through the development of site-specific thresholds, the initiation of which requires accurate spatial-temporal data.