Mosquito Surveillance Report

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Contents

Executive Summary

Most Recent Collection

As predicted, mosquito numbers remained low over recent weeks, following from 229 per trap on September 2nd to 103 per trap on September 9th. (September 09, 2014).

Forecast

We forecast that mosquito levels will rise slightly by the end of the month, reaching a weekly rate of approximately 212 mosquitoes per trap by the end of the week-end (70% confidence interval of 55-373).

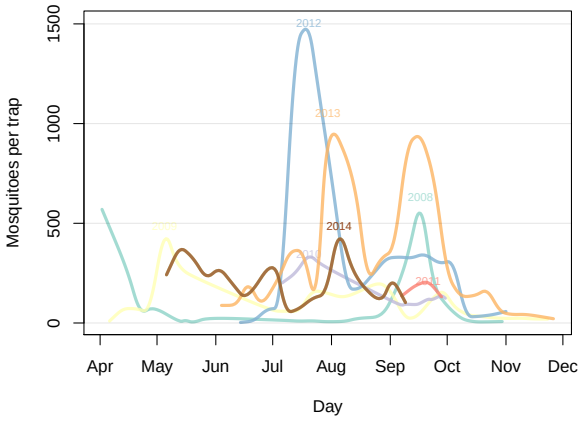
Predictive Model Validation

At 103 specimens per trap, the most recent collection was higher than our prediction of 155, but remained within the 70% confidence range of 0-257.

Visual Overview

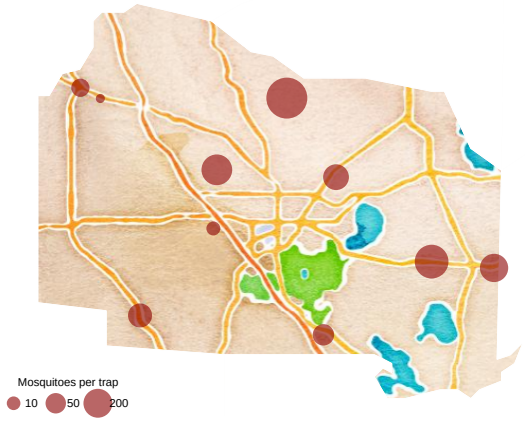
Time

The current mosquito population is lower than usual for this time of year (and significantly lower than last year's mid-September spike).



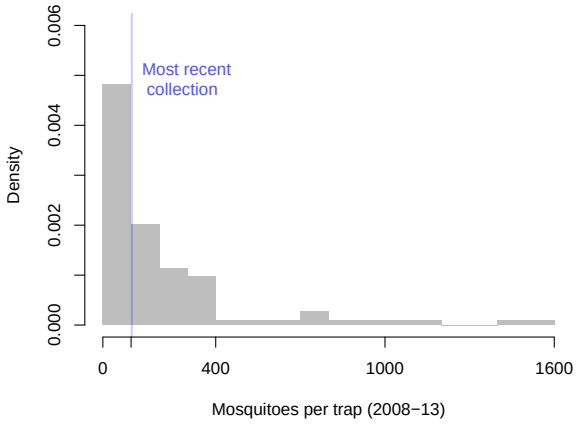
Space

Mosquitoes were largely scattered throughout the county, with a slight concentration in the northern traps.



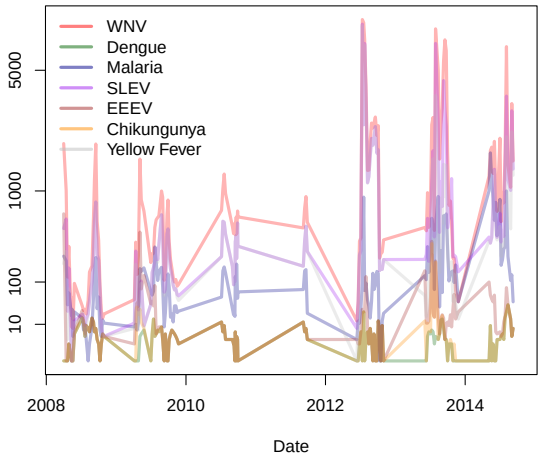
Normality

The most recent collection was at levels equivalent to approximately the 48th percentile of historical (2008-13) levels.



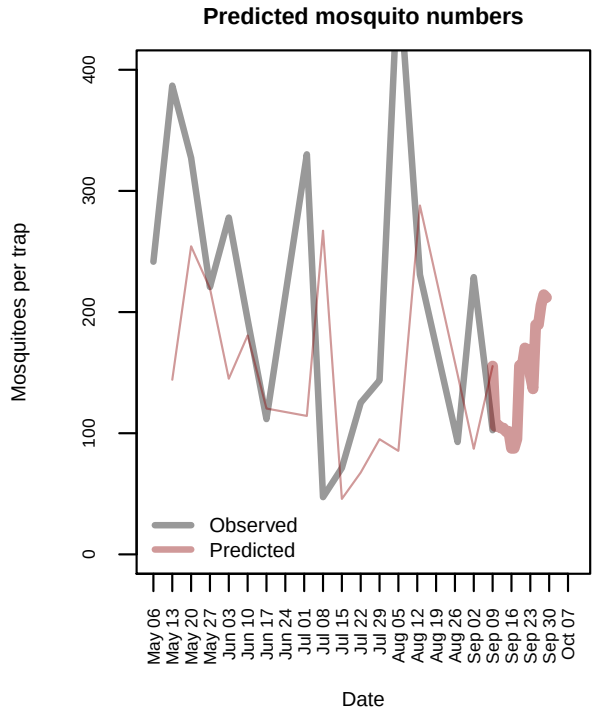
Disease Vectors

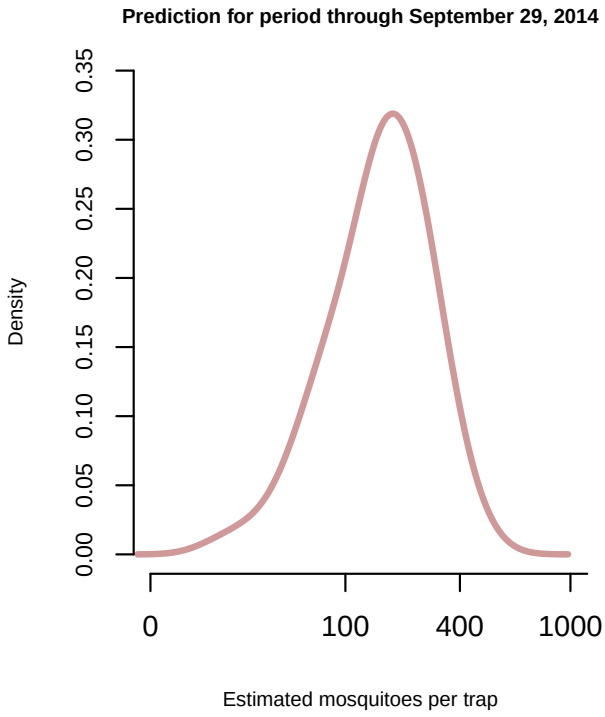
No vector of any diseases has seen significant increases over the last few weeks.

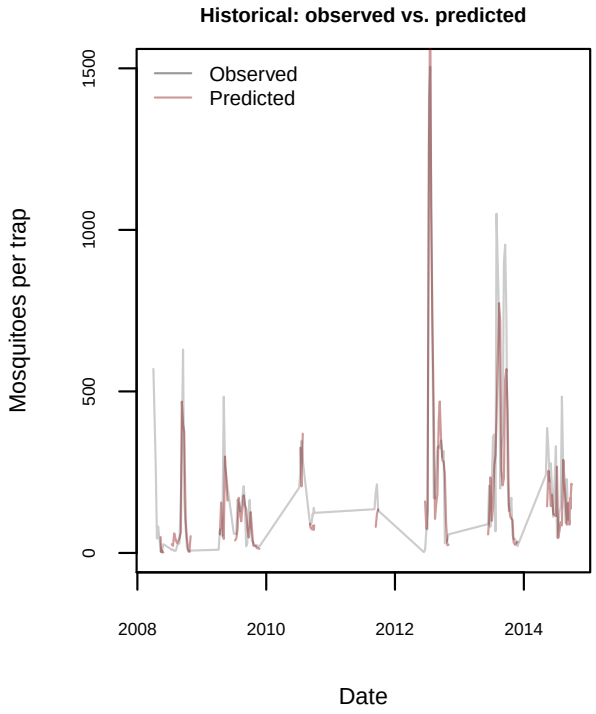


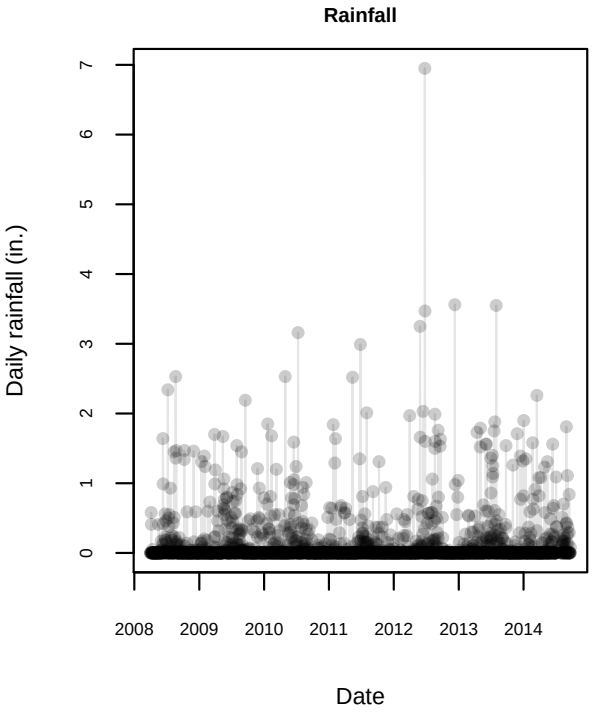
Forecast

We use recursive, quadratic linear regression modelling to forecast the average number of mosquitoes per trap up to 15 days in advance.[1]









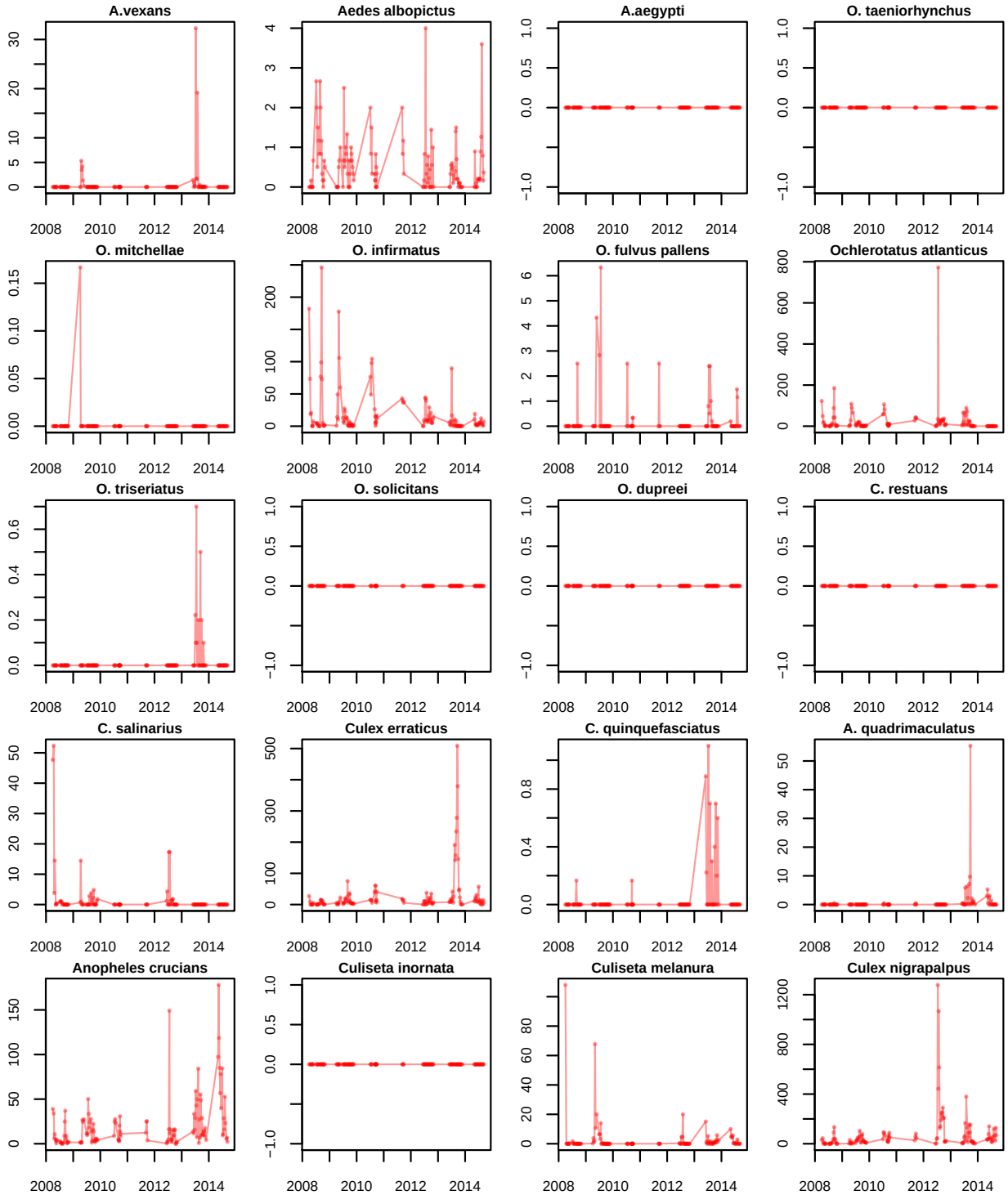
[1] We are actively experimenting with non-parametric approaches to improve modelling accuracy, and expect to have a modified KNN model with better results by late September.

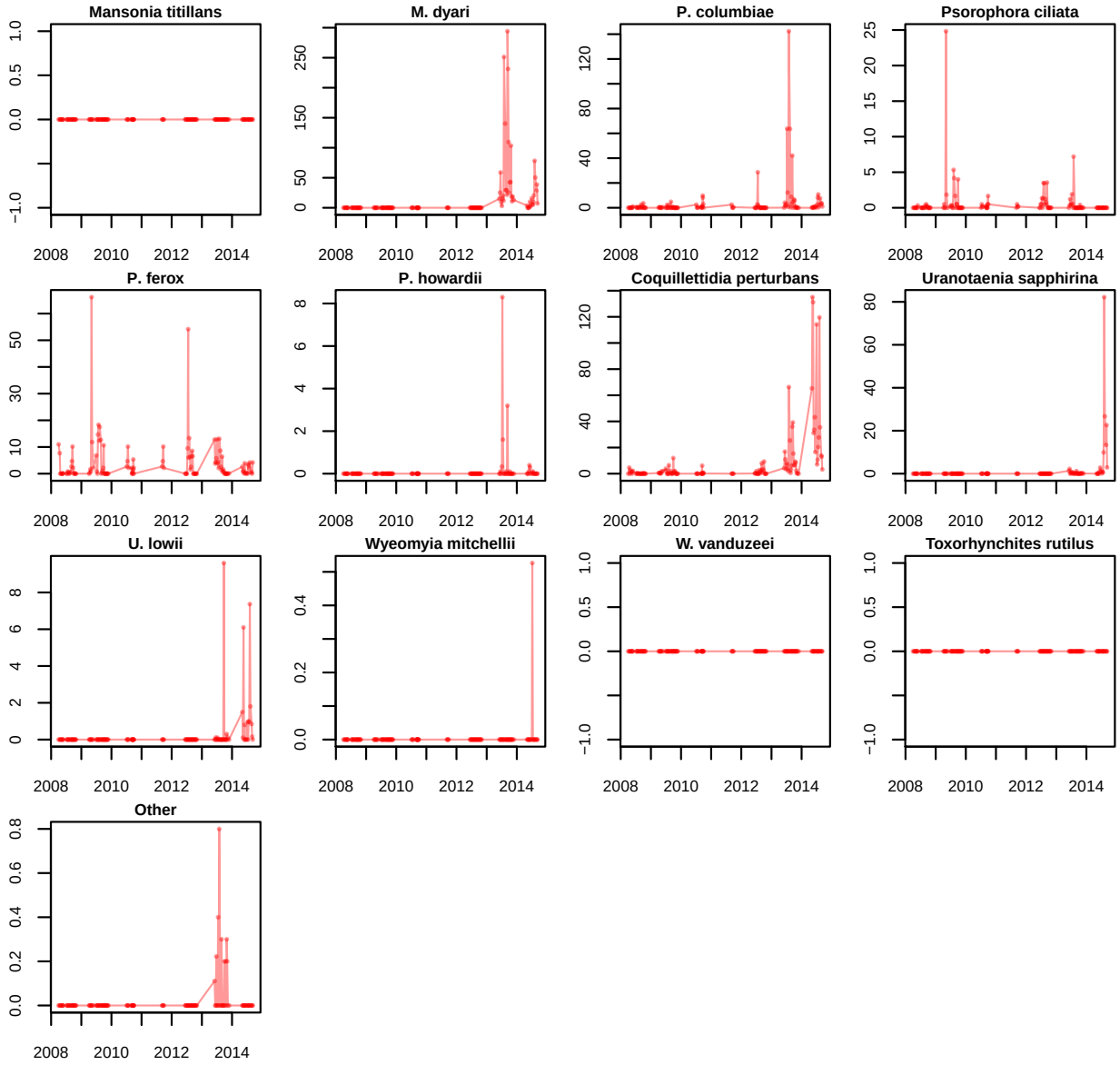
Vectors of Disease by Location

Mosquito species cabale of carrying WNV and SLEV were most prevalent in recent trap collections.

Mosquito Types

No species saw abnormal increases in recent weeks.




Mansonia titillans
M. dyari
P. columbiae
Psorophora ciliata
P. ferox
P. howardii
Coquillettidia perturbans
Uranotaenia sapphirina
U. lowii
Wyeomyia mitchellii
W. vanduzeei
Toxorhynchites rutilus
Other
2008
2010
2012
2014

Details of Predictive Model

Historically, the model has performed well, correctly predicting the late summer spikes in 2012 and 2013. Given the preference for accuracy at high numbers, the model intentionally includes outlying high observations, thereby weighting them.

Having simulated more than 65,000 unique models, our best fit equation (using the sum of least squares approach) was:

$$\hat{Y} = \beta_0 + \beta_1^2(5.6508) + \beta_2(0.5938)$$

where $\hat{Y}$ is the estimated mean number of mosquitoes per trap, β_0 is set to 0, β_1 is the cumulative rainfall in the period 15 to 29 days prior to the date of prediction and β_2 is the mean number of mosquitoes per trap in the most recent prior trap collection.

Though an original model relied only on rainfall, incorporating the most recent trap predicition saw our R-squared improve from 0.52 to 0.82. This means that we can now explain over 80% of the variance in mosquito populations up to 15 days ahead of time.