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Progress Report

Brief Summary of Diazinon Temporal Trends Analysis from Surface Water Monitoring Data for the Westside Coalition from 2004 -2009

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Project Description

The objective of this pilot study was to conduct temporal trends analysis for diazinon monitoring data collected from the Westside Coalition from 2004 to 2009. A total of 774 diazinon measurements from 25 mainstem and tributary sites were included in this analysis. The analysis considered both water body size (mainstem and tributary sites) as well as season (irrigation season from March through August and non-irrigation season from September through February). Standard regression analysis was used to determine temporal trends of annual 90th centiles along with the associated r^2 and p values. If r^2 values (a measurement of the relationship of annual 90th centiles to each other) exceeded 0.25, the regression was considered to be meaningful in determining a trend. The p value – which measures the risk of being wrong – was interpreted in the content of the data set size. This data set is considered small because only six annual 90th centile values were used in the regression analysis. Therefore, the strict use of a p value $\leq$ 0.05 (a common cutpoint typically used in environmental data analysis) to indicate a meaningful trend was not considered necessary. Although in most cases presented below, the various regressions were significant at the $p \leq 0.05$.

The values used in the regression to represent annual concentrations by site size and season were 90th centiles. The 90th centile is a well accepted value used in ecological risk assessments and pesticide trends analysis that represents the tail of the data distribution. For example, a 90th centile of 10 ug/L means that 90% of the values in the data are below 10 ug/L or only 10% of the values exceed 10 ug/L. The regression analysis presented below was conducted on log transformed annual 90th centile values to improve the fit of the regression.

For diazinon measurements that were below the detection limit (DL), an assigned value of ½ the detection limit (a common approach) was used in the analysis. If only the reporting limit (RL) was reported, then ½ the reporting limit was used in the analysis. There are other options for addressing non-detected concentrations, such as selecting a random value between 0 and the detection limit, but for this initial analysis ½ the DL or RL was used. J values were also used if reported.

Results

Diazinon concentrations from the entire 6 year data set ranged from non-detected to 3,600 ng/L. Approximately 94 percent of the diazinon measurements were below the level of detection.

Results of 90th centile trends analysis considering both water body size (all sites, tributary sites and mainstem sites) and season (all seasons, irrigation season and non-irrigation season) are presented in Figures 1-9. The “Big Picture” trends result in Figure 1 which represents the entire data set - all sites over all seasons – shows a statistically significant declining trend in diazinon 90th centiles from 2004 to 2009 ($p = 0.005$ and $r^2 = 0.892$). A statistically significant declining trend was also reported for all sites during the irrigation season (Figure 2) and all sites during the non-irrigation season (Figure 3). For both of these figures the p value was less than 0.05 and the r^2 values exceeded 0.25.

Statistically significant declining temporal trends for diazinon 90th centiles for tributary sites during both seasons (Figure 4), the irrigation season (Figure 5) and the non-irrigation season (Figure 6) were also reported. As reported above, the p values were less than 0.05 and the r^2 values were greater than 0.25.

Regression analysis of diazinon 90th centiles for mainstem sites for all seasons (Figure 7) and the non-irrigation season (Figure 9) suggests declining concentrations during the 6 year period. However, both the p and r^2 values were weak. Diazinon 90th centiles for mainstem sites during the irrigation season in Figure 8 showed a slight increase over time although this increasing trend is not meaningful due to the very low r^2 and p value that could not be calculated due to lack of variance.

Summary

The results from this analysis showed the following:

- Statistically significant declining trends in diazinon 90th centiles were reported from all sites and tributary sites during all seasons, the irrigation season and the non-irrigation season from Westside Coalition sampling sites from 2004 to 2009.
- For mainstem sites sampled during all seasons and the non-irrigation season, declining trends in diazinon concentrations were suggested but not statistically confirmed.
- A slight increase in diazinon 90th centiles was suggested for mainstem sites during the irrigation season although this trend is not statistically meaningful.

Figure 1. Regression analysis of diazinon 90th centiles from 2004 to 2009 for all sites and all seasons (r^2=0.892, p=0.005).

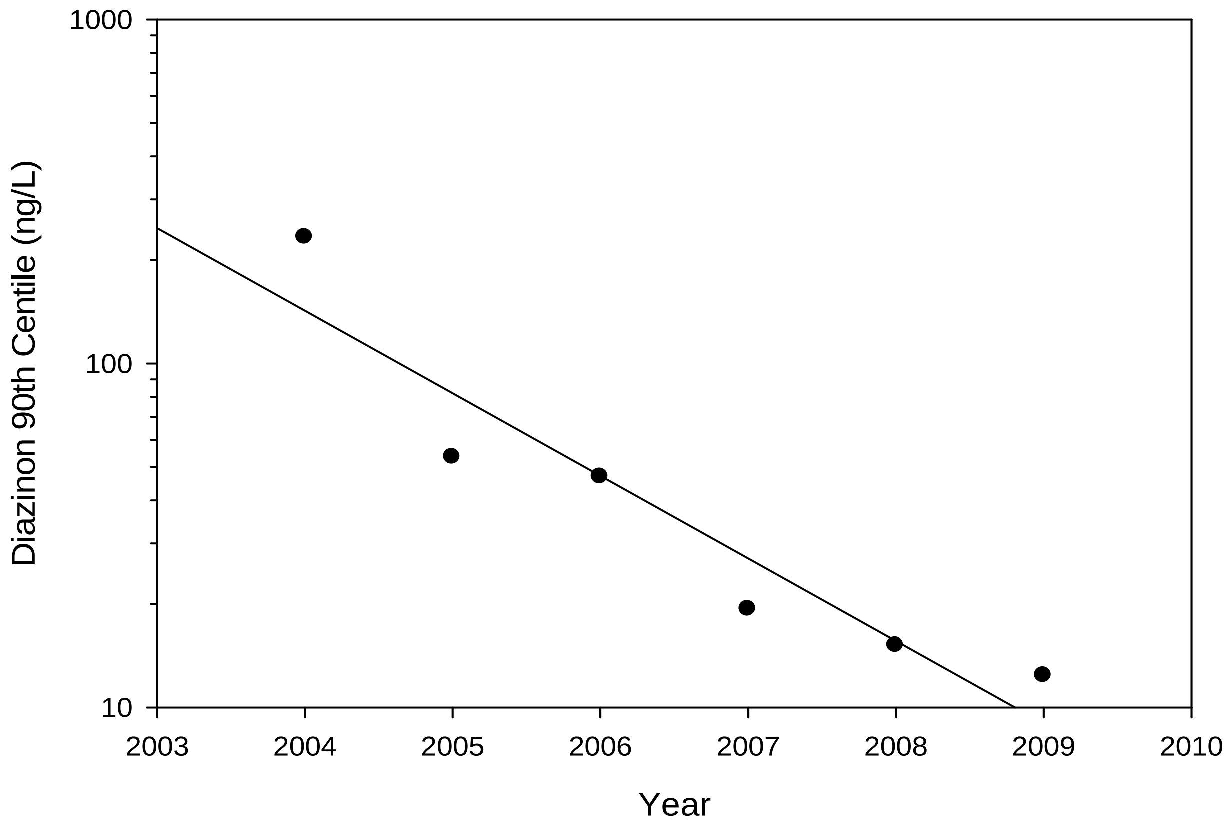

Figure 2. Regression analysis of diazinon 90th centiles from 2004 to 2009 for all sites during the irrigation season (r^2=0.886, p=0.005).

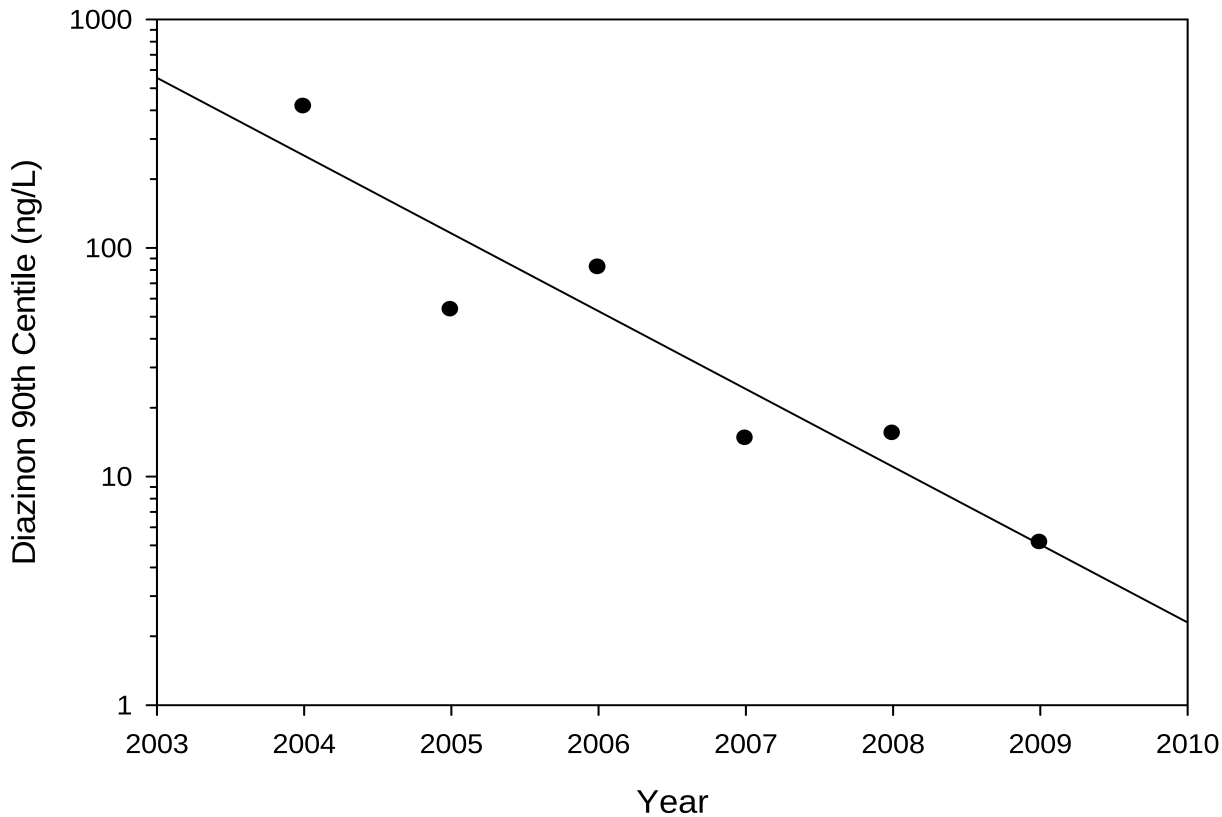

Figure 3. Regression analysis of diazinon 90th centiles from 2004 to 2009 for all sites during the non-irrigation season (r^2=0.749, p=0.026).

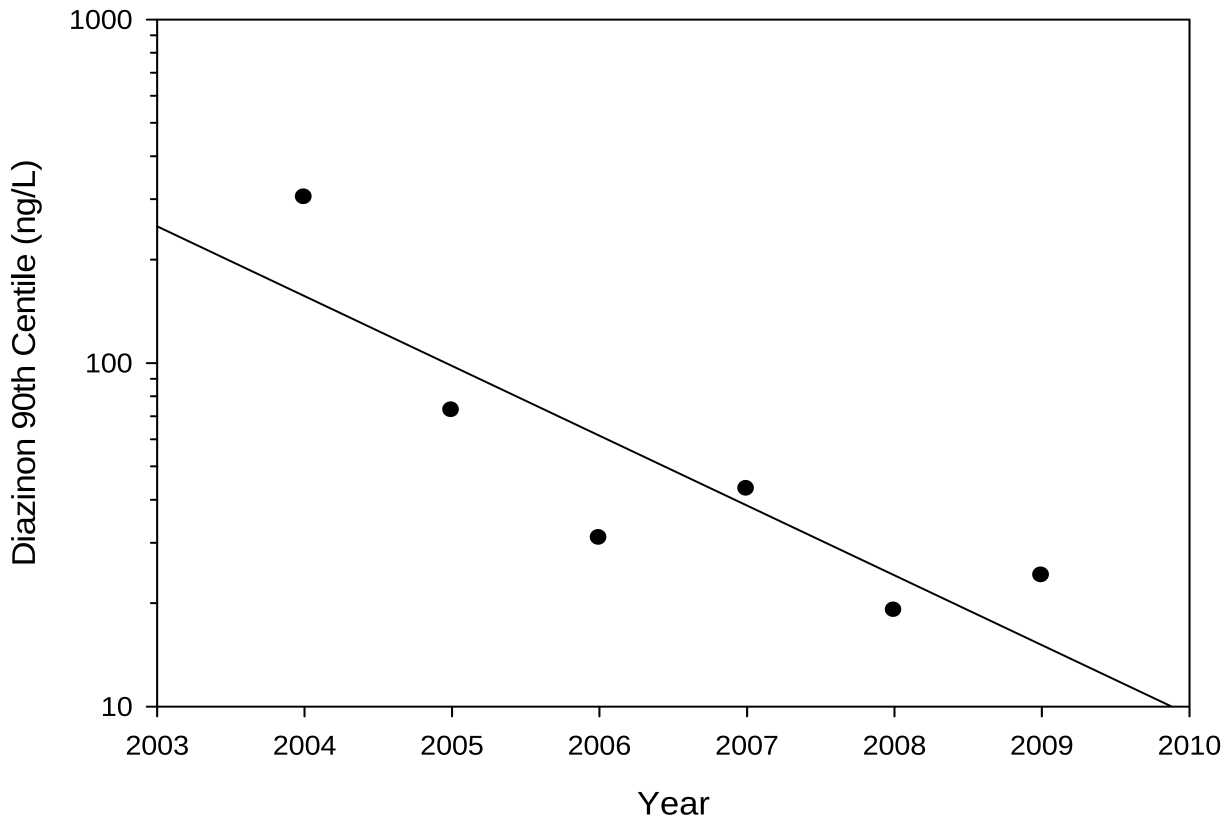

Figure 4. Regression analysis of diazinon 90th centiles from 2004 to 2009 for tributary sites during all seasons (r^2=0.883, p=0.005).

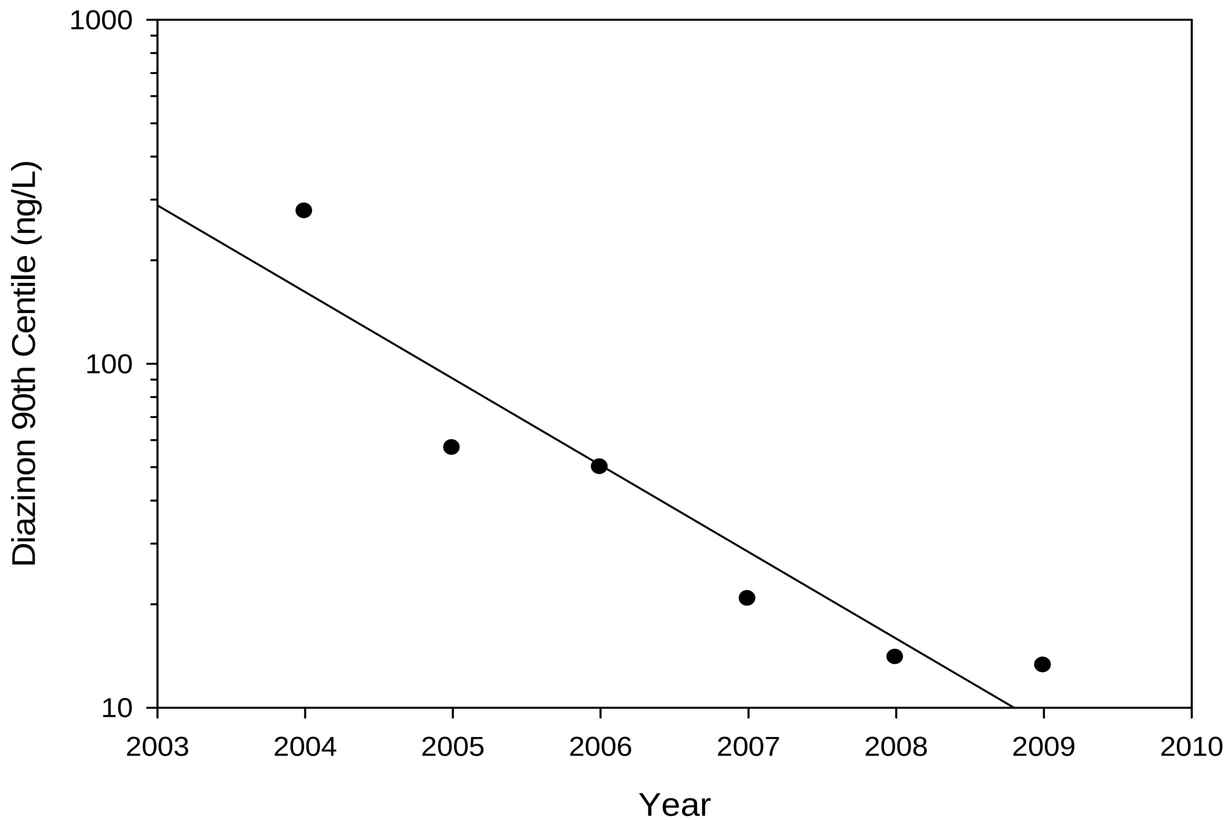

Figure 5. Regression analysis of diazinon 90th centiles from 2004 to 2009 for tributary sites during the irrigation season (r^2=0.900, p=0.004).

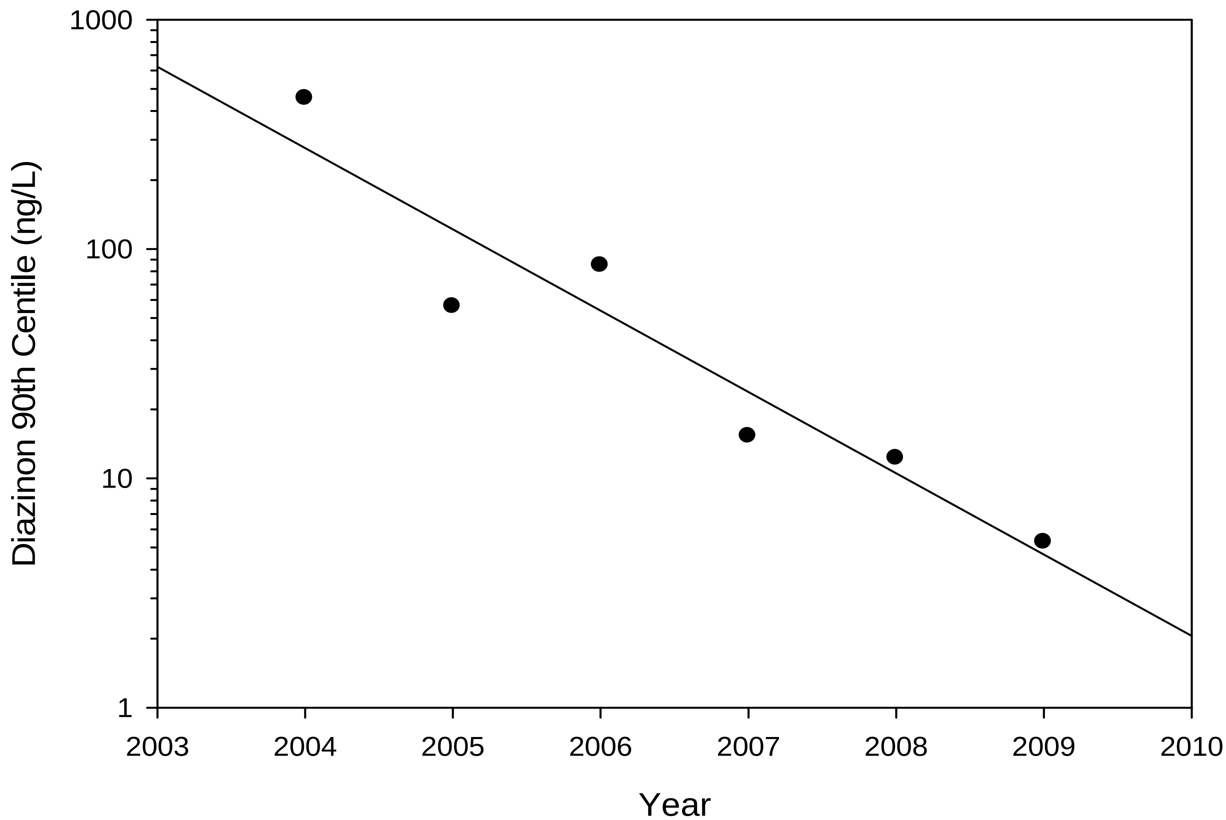

Figure 6. Regression analysis of diazinon 90th centiles from 2004 to 2009 for tributary sites during the non-irrigation season (r^2=0.696, p=0.039).

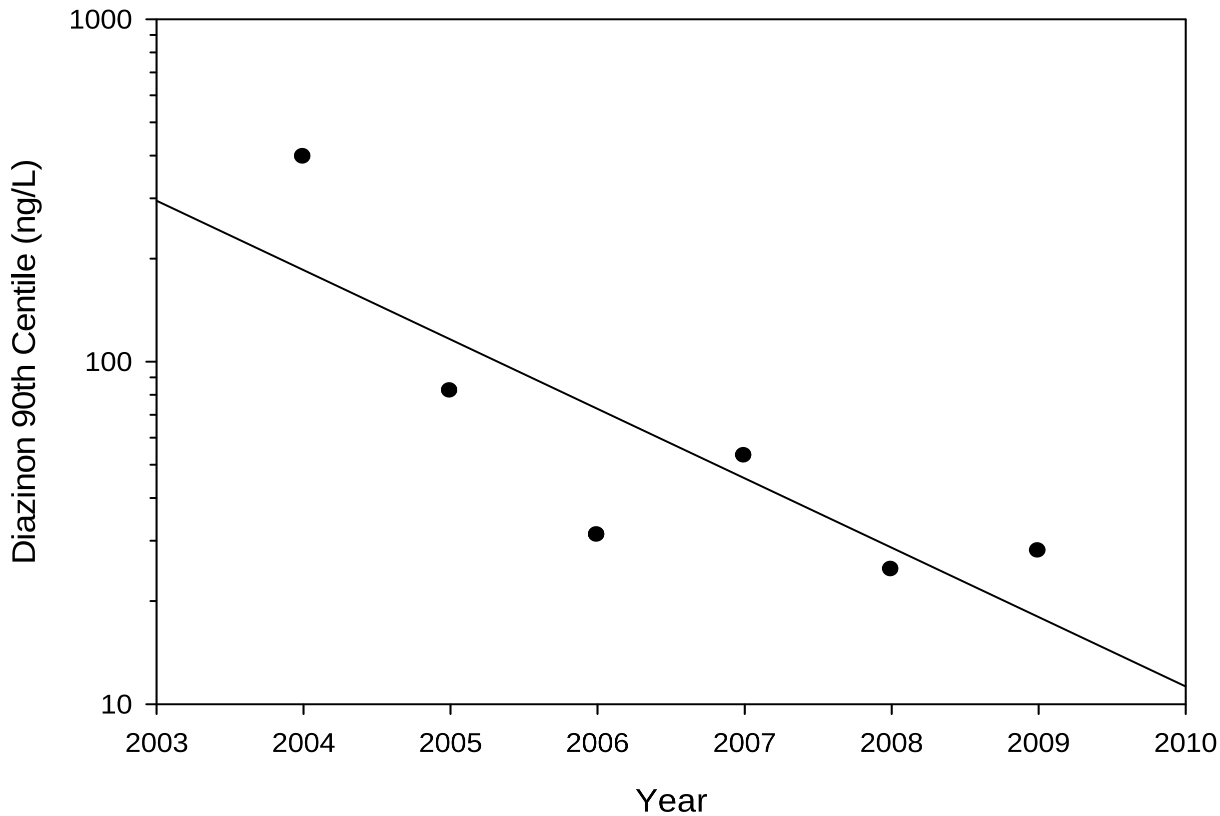

Figure 7. Regression analysis of diazinon 90th centiles from 2004 to 2009 for mainstem sites during all seasons (r^2=0.189, p=0.464). The 90th centile for 2009 could not be calculated (CNC) due to a lack of variance in the diazinon data for that year.

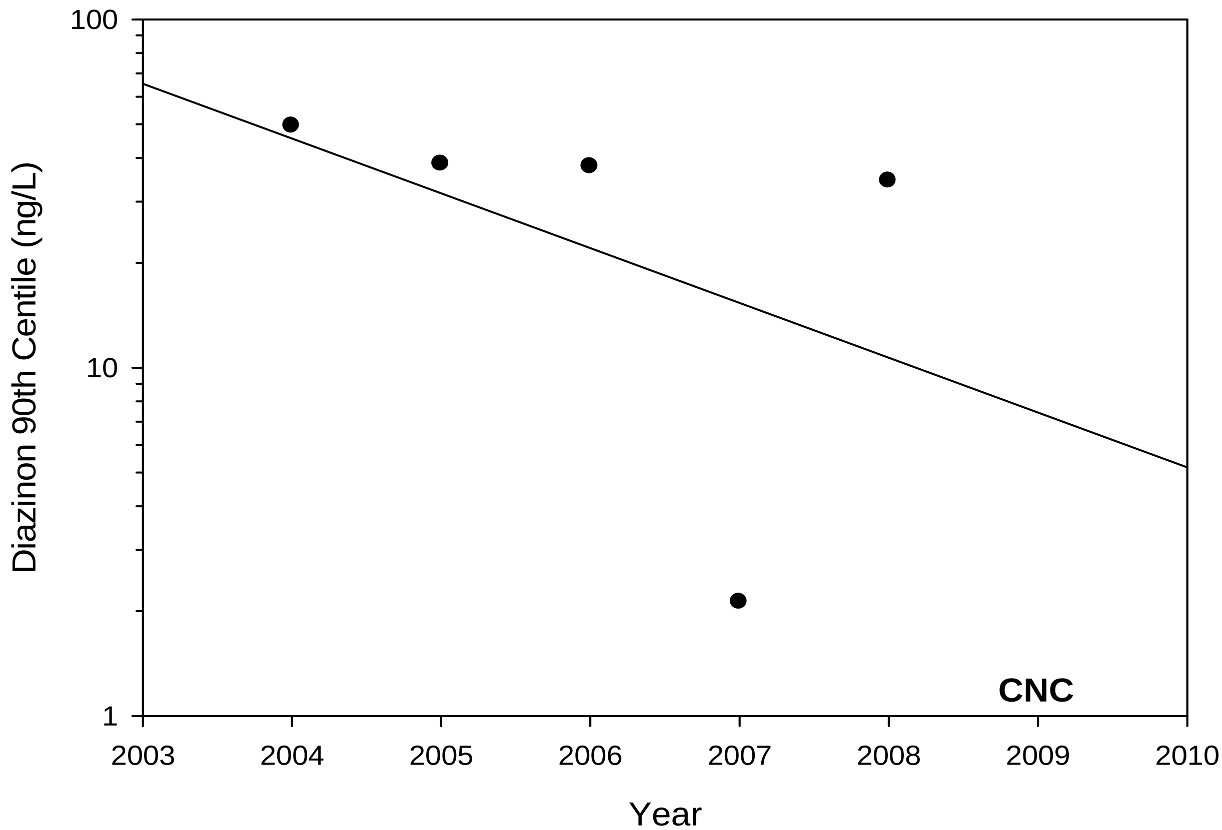

Figure 8. Regression analysis of diazinon 90th centiles from 2004 to 2009 for mainstem sites during the irrigation season (r^2=0.082, p=NV). The p-value was not valid (NV) due to unequal variance among the 90th percentiles. The 90th centiles for 2004, 2006, and 2009 could not be calculated (CNC) due to a lack of variance in the diazinon data for those years.

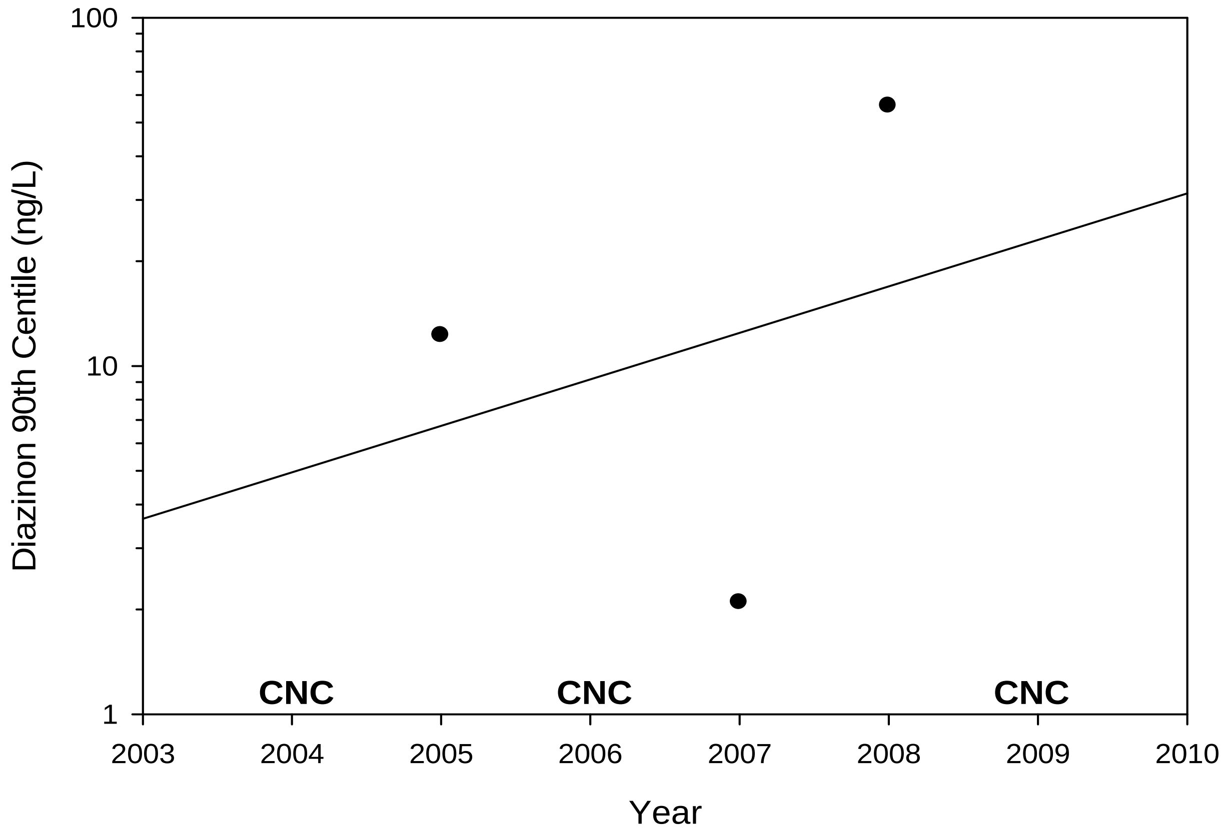

Figure 9. Regression analysis of diazinon 90th centiles from 2004 to 2009 for mainstem sites during the non-irrigation season (r^2=0.625, p=NV). The p-value was not valid (NV) due to unequal variance among the 90th percentiles. The 90th centile for 2008 and 2009 could not be calculated (CNC) due to a lack of variance in the diazinon data for those years.