

Mosquitoes and Where They Hide



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Tucson Man Holes and Culverts

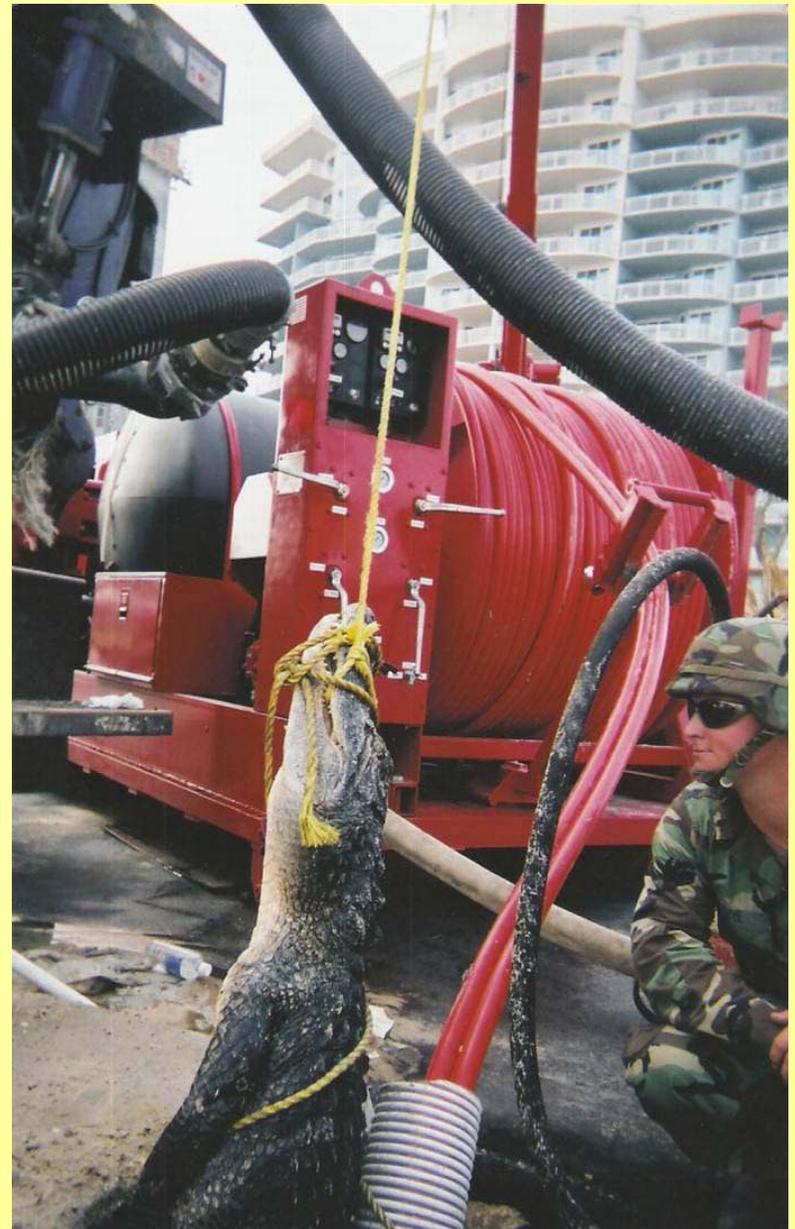


Sewers and Culverts

Many things have been found in the sewer systems in the world. Along with the examples shown here mosquitoes are known to breed in the sewers when they settle and form stagnant pools. The object of this presentation is to determine if there is any correlation between complaints of mosquito infestation received by the Pima County Health Department and the Sewers and Culverts.



Africanized Bees in Tucson



Alligator in Mississippi

What I Did

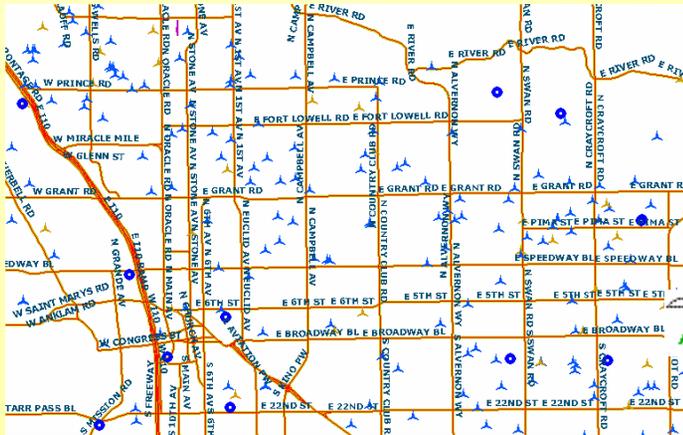
Data Collection

- Dissected the Pima County DOT shapefile of the city drainage system into two shapefiles containing only the manholes or the catchbasins
- Digitized the mosquito complaints for 2008 through October 15th for 2008
- Rain gages digitized from Rainlog.org with the amount of rainfall from the previous 10 day correlated to each complaint.

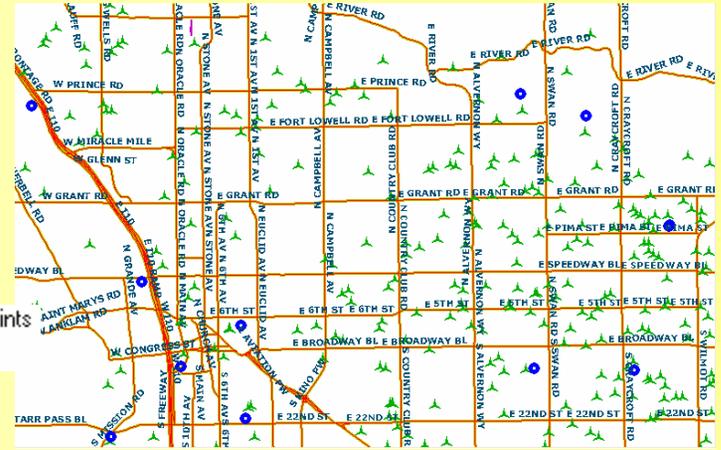
Data Analysis

- Average nearest Neighbor to determine if the complaints are clustered.
- Generated Near Tables to ascertain the closest rain gage to the complaints.
- Moran's I to see if there is any autocorrelation
- Chi squared Goodness of Fit

Previous Years Complaint Distribution



2006 Mosquito Complaints



2006 Complaints

2007 Complaints

-  2007 Mosquito Complaints
-  Not Treated
-  Treated



2008 Complaints

-  2008 Mosquito Complaints
-  Not Treated
-  Treated

Chi Square Calculation con't

Zone	Area	Area Portion	Complaints Reported	Expected Complaints
< 600 ft	469792236	0.403658978	67	63.37
> 600 ft	694042241	0.596341022	90	93.63
Total	1163834477		157	157

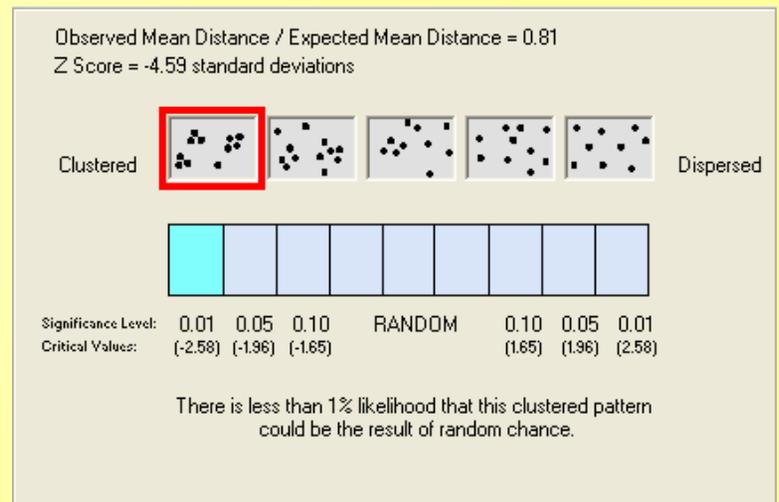
$$\text{Chi Square} = \sum_i \sum_j (O_{ij} - E_{ij})^2 / E_{ij}$$

Test it against the Null Hypothesis that the two variables are not associated

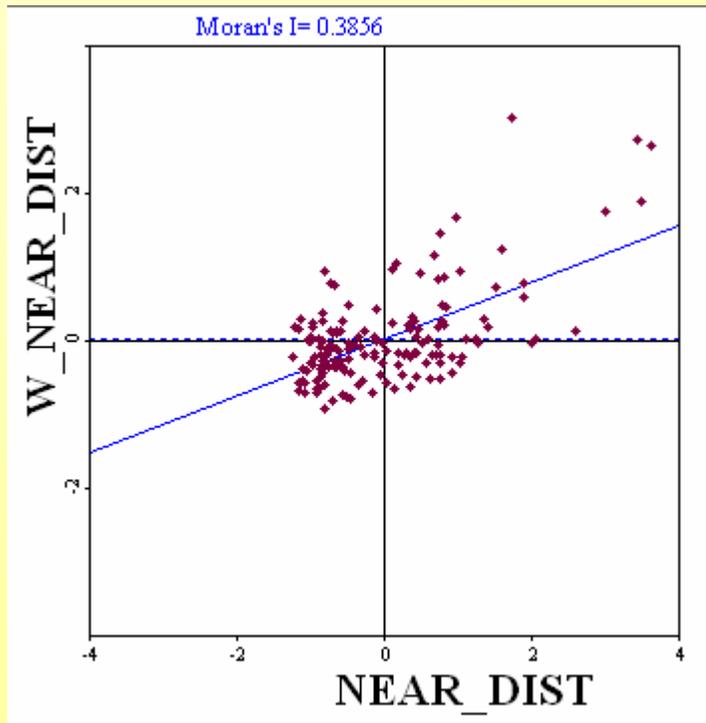
Average Nearest Neighbor

Average Nearest Neighbor Summary

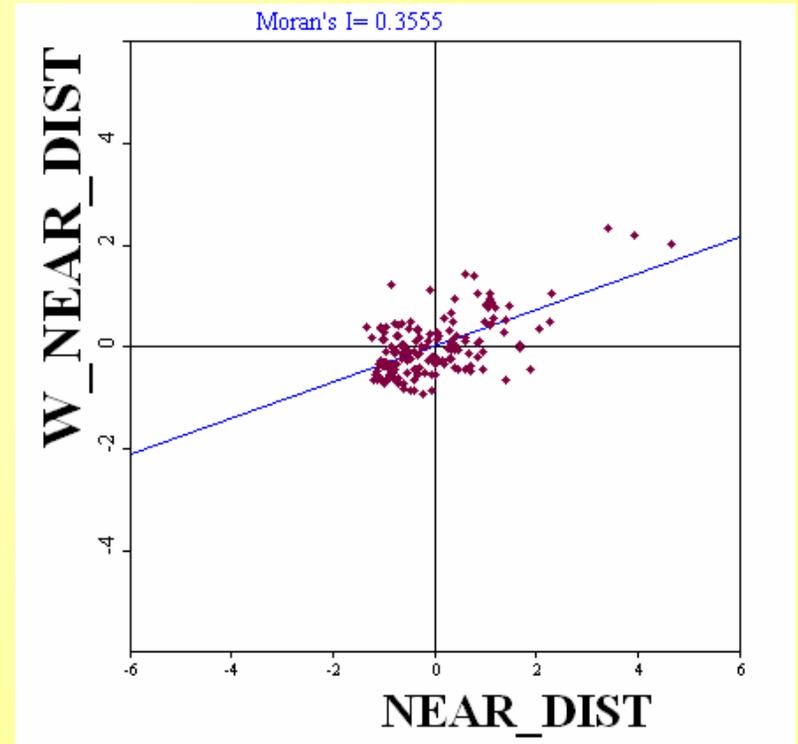
Observed Mean Distance: 1094.354060
Expected Mean Distance: 1353.531824
Nearest Neighbor Ratio: 0.808517
Z Score: -4.589971
p-value: 0.000004



Moran I



Catch Basin



Manhole

Catchbasins

Complaint intersecting Catchbasin

Catchbasin Zone	Chi Square	Cramer's V
300	0.6078	0.0622
600	0.3478	0.047
900	0.4597	0.0541

Complaint with Rain Events intersecting Catchbasin

Catchbasin Zone	Chi Square	Cramer's V
300	0.1055	0.0298
600	0.8604	0.085
900	0.0915	0.0277

Man Hole

Complaint intersecting Manholes

Catchbasin Zone	Chi Square	Cramer's V
300	0.0441	0.0168
600	0.1713	0.033
900	0.0443	0.0168

Complaint with Rain Events intersecting Manholes

Catchbasin Zone	Chi Square	Cramer's V
300	0.0125	0.0102
600	0.2552	0.0463
900	0.2674	0.0474

$$P(X^2 \geq 0.455) = 0.5$$

$$P(X^2 \geq 0.016) = 0.9$$

Conclusion

- The City of Tucson sewer system does not appear to contribute to local mosquito infestations
- Data from previous years should be included to add a temporal aspect.

Thank you