# 2014
# PROGRAM REVIEW

Vector Program
Environmental Health
Cabarrus Health Alliance

Approval received to set out light traps around the county including the municipalities that are not active in the program. In order to monitor for emergence of new species and insurgence of existing populations throughout the county. Continuation of this practice will proceed in the year 2015. Trapping locations will be varied based on the number of mosquitoes collected at each site location.

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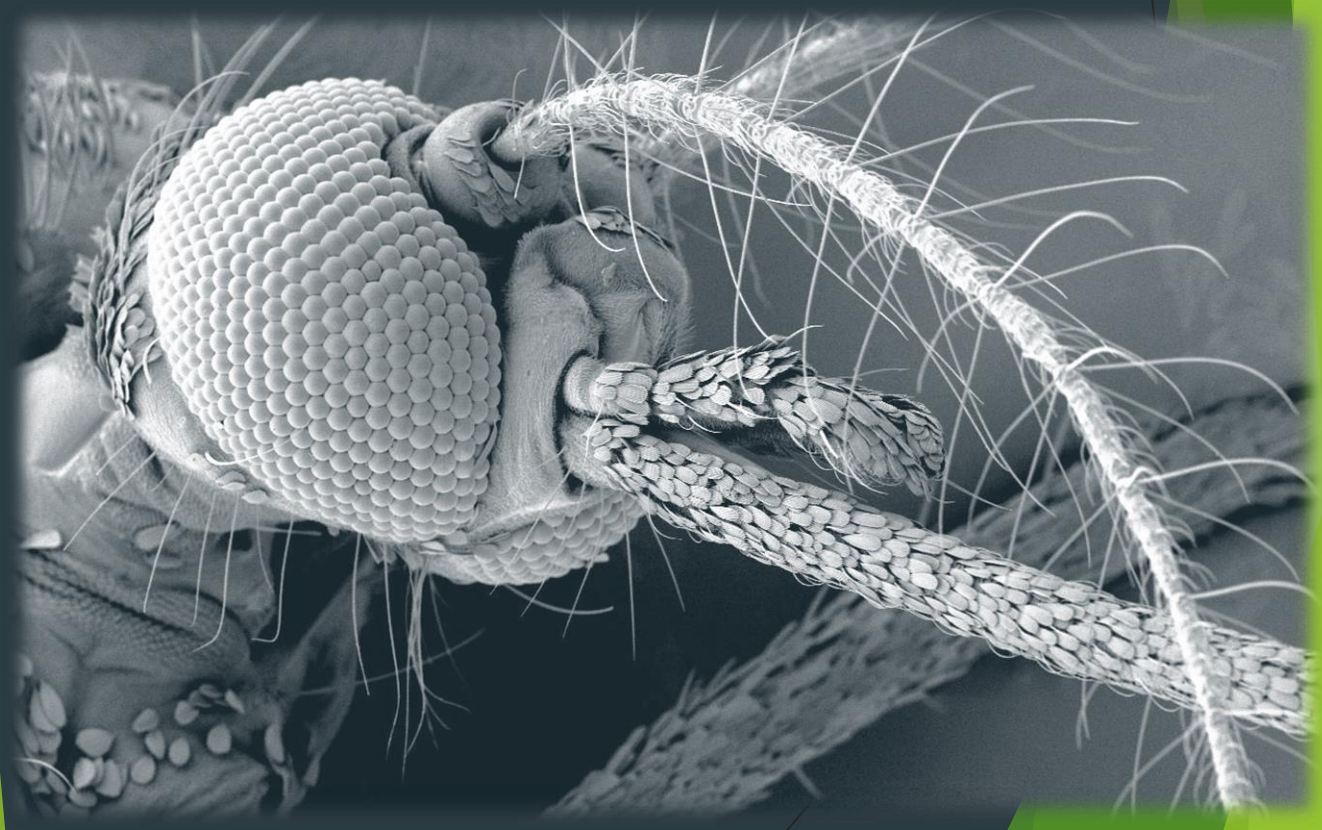
# Vector IPM Approach

Human disease surveillance provides an ongoing nationwide assessment of the human impact of WNV and other diseases. Over the past decade, this method has demonstrated where incidences of WNV disease's burden are greatest. However, human disease surveillance, by itself, is limited in its ability to predict the large focal outbreaks that have come to characterize this disease. These outbreaks typically intensify over as little as a couple of weeks; however, human case reports are lagging indicators of risk since case reports occur weeks after the time of infection. Thus, environmental surveillance –monitoring enzootic and epizootic WNV transmission in mosquitoes and birds –forms a timelier index of risk and is an important cornerstone for implementing effective WNV risk reduction efforts. Research and operational experience shows that increases in WNV infection rates in mosquito populations can provide an indicator of developing outbreak conditions several weeks in advance of the increases in human infections.

Programs must be sustainable over the long term in order to provide sufficient information to link surveillance indicators with the degree of human risk. Consistency also requires that mosquito collections be repeated at regular (weekly) intervals over the course of the transmission season, and that collections are made at fixed area collecting sites. Only through maintaining consistency can monitoring programs provide information useful in crafting thresholds to support decisions about vector actions and useful in providing the big picture to those community leaders that control monetary involvement in the vector program. The objective is to implement control measures sufficient to maintain mosquito abundance below levels that result in high risk of WNV transmission to humans. All resources and tools available for managing mosquito populations should be considered for use as technology and advancements in testing progress.

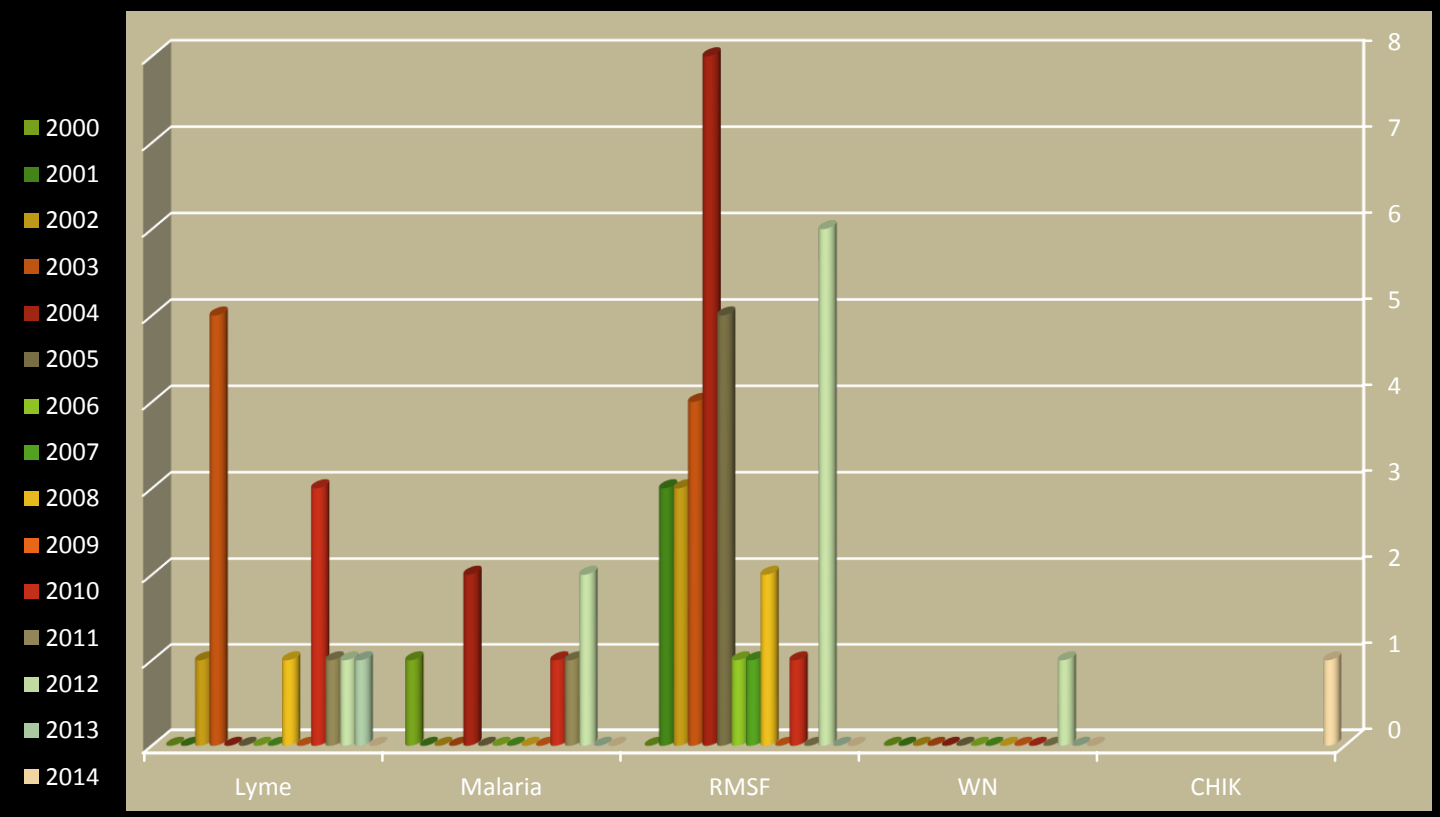
# 2013 Statistics

| | |
|---|---|
| 12 | Permanent Sites (PS) |
| 25 | Visits made to PS |
| 5.2 | Average treatment rate in weeks |
| 9 | Service Requests (SR) received |
| 0 | Media outreach/Formal presentations |
| 26 | Mosquito pools collected (larval and adult) |



# Arboviral Reports

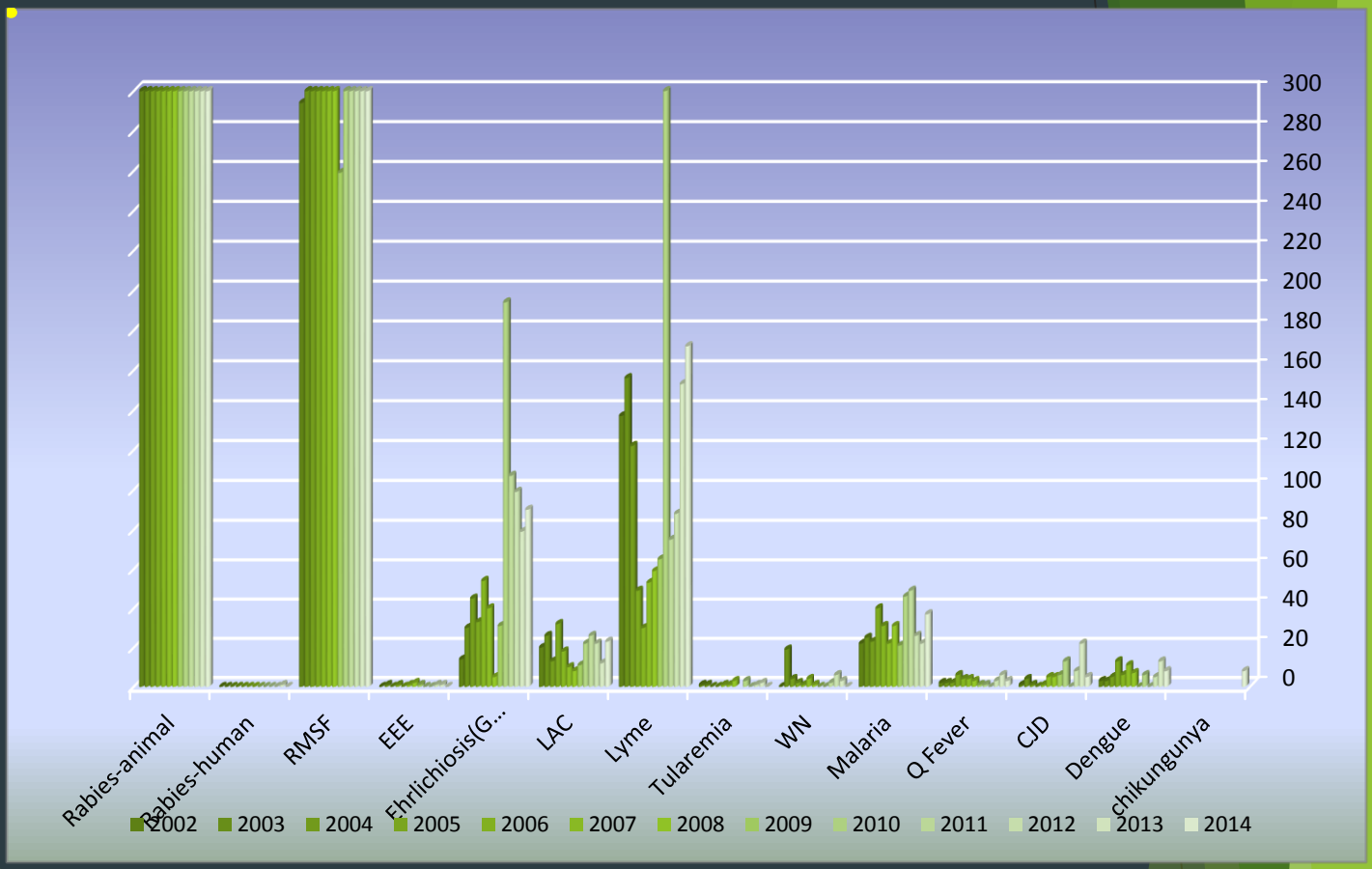
## Cabarrus County Statistics




| | '00 | '01 | '02 | '03 | '04 | '05 | '06 | '07 | '08 | '09 | '10 | '11 | '12 | '13 | '14 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lyme | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 0 | 1 | 6 | 3 | 1 | 1 | 1 | 0 | |
| Malaria | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 0 | 0 | |
| RMSF | 0 | 3 | 3 | 4 | 8 | 5 | 1 | 1 | 2 | 5 | 1 | 0 | 6 | 0 | 0 | |
| WN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | |
| CHIK | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | |

# VECTOR REPORT

## Select NC Arboviral Notifiable Diseases




| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rabies-animal | 702 | 773 | 582 | 459 | 512 | 472 | 454 | 392 | 397 | 429 | 431 | 380 | 352 |
| Rabies-human | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| RMSF | 294 | 331 | 535 | 625 | 842 | 665 | 515 | 259 | 505 | 332 | 570 | 393 | 509 |
| EEE | 0 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 0 | 1 | 1 | 0 |
| Ehrlichiosis(G&M) | 14 | 30 | 45 | 33 | 54 | 40 | 5 | 31 | 194 | 107 | 99 | 79 | 90 |
| LAC | 20 | 26 | 13 | 32 | 18 | 10 | 8 | 11 | 22 | 26 | 22 | 12 | 23 |
| Lyme | 137 | 156 | 122 | 49 | 30 | 53 | 59 | 65 | 417 | 75 | 88 | 153 | 172 |
| Tularemia | 1 | 1 | 0 | 0 | 1 | 1 | 3 | | 3 | 0 | 1 | 2 | 0 |
| WN | 0 | 19 | 4 | 2 | 1 | 4 | 1 | 0 | 0 | 2 | 6 | 3 | 0 |
| Malaria | 22 | 25 | 23 | 40 | 31 | 22 | 31 | 21 | 46 | 49 | 26 | 22 | 37 |
| Q Fever | 2 | 2 | 2 | 6 | 4 | 4 | 3 | 1 | 1 | 0 | 3 | 6 | 3 |
| CJD | 1 | 4 | 1 | 0 | 1 | 5 | 5 | 6 | 13 | 0 | 8 | 22 | 5 |
| Dengue | 3 | 3 | 5 | 13 | 6 | 11 | 7 | 0 | 6 | 0 | 5 | 13 | 8 |
| Chikungunya | - | - | - | - | - | - | - | - | - | - | - | - | 8 |

# CDC GUIDELINES

## Arboviral Families

| | |
|---|---|
| *Flaviviridae* | West Nile |
| | St. Louis |
| *Bunyaviridae* | LaCrosse |
| | Hantavirus |
| *Togaviridae* | Eastern Equine |
| | Chikungunya |
| *Enterobacteriaceae* | Plague |
| *Rickettsiaceae* | Ehrlichiosis |
| | Rocky Mountain Spotted Fever |
| *Rhabdoviridae* | Rabies |
| *Spirochaetaceae* | Lyme disease |
| *Francisellaceae* | Tularemia |

# Surveillance

Mosquito

•A key “tool for quantifying the intensity of virus transmission in the area”; important when making threat assessments

•Distinguishes between the vector density and infection rates

Human

“Human case surveillance alone should not be used for the detection of arbovirus activity” as **this is what vector control is trying to avoid**. Other surveillance tools need to be used in order to safeguard human health.

•Case definition combines confirmed and probable cases together for the purpose of counting.

# Response

## Phased response guidelines to surveillance data

•“Prevention and control measures, regardless of intensity, may not prevent all arboviral infections in humans.”

•Response will vary by region and will depend on the surveillance data as evidence of activity levels.

•“..the following factors should be considered when translating these guidelines into a plan of action”

- •Current and predicted weather patterns
- •Surveillance data indicators and trends
- •Working budget and infrastructure
- •Public participation
- •Projected arboviral activity for the area
- •Other ongoing control activities

# Response

| Risk Level | Human outbreak probability | Recommended response |
|---|---|---|
| 0 | None<br>Off-season; adult vectors inactive; climate unsuitable | Develop a response plan. Secure surveillance and control resources necessary to enable emergency response. Initiate community outreach and public education programs. |
| 1 | Remote<br>Spring, summer, fall; areas anticipating arboviral activity based on previous data in the area; no current surveillance of virus activity in the community | Response level 0 plus; conduct entomologic survey (inventory and map mosquito populations, monitor larval and adult mosquito density), initiate source reduction; use larvicide at specific sources identified by surveillance as likely amplifying and bridge vectors species, vector and virus surveillance; community outreach and public education programs focused on risk potential, personal protection, emphasizing residential source reduction; maintain surveillance |
| 2 | Low<br>Summer or fall; areas with limited or sporadic viral epizootic activity in birds and/or mosquitoes. No positives prior to August | Response level 1, plus; increase larval control, source reduction and public education emphasizing personal protection measures, particularly among the elderly. Enhance human surveillance and activities to further quantify epizootic activity (e.g.. mosquito trapping and testing). |
| 3 | Moderate<br>Spring, summer or fall; initial confirmation of viral activity in non-humans before August; human case or sustained viral activity in mammals/mosquitoes | Response level 2, plus; intensify adult mosquito collection in areas of perceived human risk, initiate adult mosquito control if available, initiate visible activities in community to increase attention to virus transmission risk, work with collaborators to reduce risks to elderly |
| 4 | High<br>Spring, summer, fall; viral activity suggesting a high risk of human infection (e.g. early summer high avian counts, sustained mosquito positives of multiple species, rising vet/human cases. Repeated areas of viral activity. | Response level 3 plus: Expand public information program to include TV, CHA website and newspapers (use of repellents, personal protection, continued source reduction, risk communication about adult mosquito control). Increase visibility of public messages, engage key local partners (e.g.. government officials, religious leaders) to speak about arboviral transmission; intensify adult mosquito control program, repeating applications in areas of high risk or human cases. |
| 5 | Outbreak in progress<br>Multiple confirmed cases in humans; conditions favoring continued transmission to humans (e.g.. persistent high infection rate in mosquitoes, continued avian mortality due to viral activity) | Response level 4, plus; intensify emergency adult mosquito control program repeating applications as necessary to achieve adequate control. Monitor efficacy of spraying on target mosquito populations. If outbreak is widespread coordinate with adjacent counties for broad coverage ; emphasize urgency of personal protection media and emphasize use of repellent at visible public events. |

# Prevention

- "Responsible control programs target vector and nuisance populations for control and avoid managing habitats that support benign species" – LARVAL IDENTIFICATION/IPM
- Monitoring species within the community and documenting the abundance of population dynamics – ADULT MOSQUITO COLLECTING
- Source reduction is either through sanitation (by the property owner) and/or water management (usually falls within the municipalities' jurisdiction).
- Chemical control includes larviciding (effective part of IPM) and adulticiding (use based on surveillance data, confirmed cases and availability).
- Resistance management is not a forefront issue due to the change in products used in the earlier mosquito program and what is currently used. There are periodical evaluation of the efficacy of each of the pesticides used. An annual test area is chosen which is usually a treatment site that has a high larval count. After treatment is applied, it is revisited later that day to confirm the kill rate and if necessary, the following day. Both the MMF and the Bti substances are verified for efficacy at least once a season.

# Control

- *Gambusia affinis* (mosquito fish) do provide some natural form of control. The native fish are found within Cabarrus county and are occasionally captured and released into areas where natural predators would help to reduce the mosquito population on a long term basis.
- Adult mosquito predators include "*Toxorhynchites rutilus*, the predacious mosquito; copepods, the parasitic nematode *Romanomermis* and the fungus *Lagenidium giganteum"*. Only *Toxorhynchites rutilus* are commonly used as a part of IPM due to the ease of capture, identification and in office rearing.
- Recent experiments have concluded that the fathead minnow, bluegill sunfish, freshwater killifish and the pumpkinseed sunfish eat enough mosquito larvae to be included in lists of options of use in IPM plans.
- Using biological control is ideal because there are no foreign elements introduced into the environment, only a rearrangement of local predators. Biological control does fall short in several areas. First of all, there is a lot of time involved in baiting and catching the desired predator (or culturing) and collecting enough to release into the breeding ground to survive and thrive. This is time and labor intensive and establishment of the introduced agent is always questionable; a 'wait and see' approach. Biological control is a good addition to IPM but cannot be used exclusively due to time restraints (mosquito life cycle and establishment of a new predator into the food web) and the need to control infested areas immediately.

# Management

•"Detection of epizootic transmission of enzootic arboviruses typically precedes detection of human cases by several days to 2 weeks or longer. If adequate surveillance is in place, the lead time between detecting significant levels of epizootic transmission and occurrence of human cases can be increased, which will allow for more effective intervention practices. Early-season detection of enzootic or epizootic arboviral activity appears to be correlated with increased risk of human cases later in the season. Control activity should be intensified in response to evidence of virus transmission, as deemed necessary by the local health departments. Such programs should consist of public education…,municipal larval control…,adult mosquito control…and continued surveillance to monitor virus activity and efficacy of control measures." "As evidence of sustained or intensified virus transmission in an area increases, emergency response should be implemented. This is particularly important in areas where vector surveillance indicates that infection rates in vector mosquitoes are increasing or that potential accessory vectors (e.g. mammalophilic species) are infected with the virus. "

•-quotes are taken from the CDC vector control manual

<u>Education and Information</u>

•Target individual, household and community

•Website updates with highlighted news and posted 'how to' videos

•Media –news interviews and presentations as opportunities provide

<u>Research Priorities</u>

•Monitor the vector species for the area and the immergence of new species

# Budget

I. Management

A. Program Coordinator
B. Sidelined EHS (2) with pesticide license
D. Maintenance of RS status and active PCO-PH licensure

II. Funding

A. Municipalities – voluntary participation
1. Cabarrus County (rural) $10,761.90
2. Mt. Pleasant $417.60

III. Administrative/Logistics

A. Annual evaluation of Vector Control Plan - equipment
1. Replace broken equipment as needed
2. Use efficacy data from the summer to maintain pesticides that are effective and economical

B. Enforcement of abatement
1. No county ordinance regarding abatement. There is a city ordinance in Kannapolis and Concord that refers to standing water and miscellaneous containers that hold water including items such as rimless tires. Those referrals go through the local Code Enforcement agencies.
2. CHA's CEO has the recourse of declaring an imminent health hazard for a situation or the General Statutes defining of a Public Health nuisance is an option as well.
3. Standard protocol for community change is through education, on site visits, mailed letters, phone calls, or referrals to code enforcement officers.

C. Record keeping/Documentation
1. SDS and labels maintained in designated areas to meet OSHA requirements.
2. On site visits, complaints calls, when and where of action taken
3. Phone calls requesting service
4. Meetings, presentation and media outreaches
5. Emergency plans and contacts
6. Reportable diseases and annual data reports
7. Budget updates
8. CE courses
9. Vector website under Environmental Health that includes all rel relevant information as a resource for the community.

D. Mosquito species

*1.Aedes*

*a. albopictus*
*b. aegypti*
*c. vexans*

*2. Anopheles*

*a. bradleyi/crucians*
*b. quadrimaculatus*
*c. punctipennis*

*3. Culex*

*a. erraticus*
*b. pipiens*
*c. restuans*
*d. salinarius*
*e. territans*

*4. Culiseta melanura*
*5. Fulvus pallens*
*6. Ochlerotatus*

*a. atlanticus*
*b. canadensis*
*c. infirmatus*
*d. japonicus*
*e. triseriatus*

*7. Orthopodymia signifera*
*8. Psorophora*

*a. ciliata*
*b. columbiae*
*c. ferox*
*d. howardii*

*9. Toxorhynchites rutilus*
*10. Uranotania sapphirina*

IV. Community

A. Treatment areas

1. Complaint driven service requests; **only for those that are in the participating areas**
2. Permanent sites
3. Log all on site visits made per year

V. Operational Procedures

A. Survey
B. Monitor through fieldwork
C. Control

1. Larvicide
2. IPM
3. Source reduction
4. Light trapping

# 2015 PROGRAM OUTLOOK

The big news that came in 2013-2014 was the Chikungunya virus. The virus has been identified since the 50's but just in the last decade has it spread beyond its self contained boundaries. Chikungunya [CHIKV] bounced along the Caribbean islands and into St. Martin in 2013 and then a confirmed case the following year in Puerto Rico. Due to the proximity of the island to Florida key, an alert was sent out to be prepared for possible transmission into the United States.

CHA was proactive in setting up a communication web within the agency that included the lab, communicable disease nurses, public relations and environmental health staff. Although the system was not needed to be activated, the infrastructure for public health response is in place.

The concern with CHIKV is twofold. Its similarity in symptoms to dengue, brings more of a community issue when comparing this virus to West Nile. WNV is a very mild and many of those exposed never had any symptoms at all. Not so with CHIKV. The second item of concern would be the vectors. Mosquito species are distinct in their breeding sites and areas of exposure to the community. WN is vectored by Culex which is established but not that common. CHIKV on the other hand, is vectored by *Aedes albopictus* and *Aedes aegypti* which are both plentiful throughout the county and breeding sites occur in rural areas of higher population.

The benefit of an active Vector Control Program, is the accumulation of data and surveillance within the community that allows for quick recognition of heightened bridge vector populations. Being established in neighborhoods and areas with highly susceptible people and already having knowledge of areas of potential/observed breeding sources within the proximity, allows for a comprehensive and specific plan action when a positive case is identified.

Fixed region adult trapping will continue this summer for the purpose of monitoring for new species and to track population densities.