ADA COUNTY
Weed, Pest, and Mosquito Abatement
Desiree Keeney; Field Operations Manager

2014 Mosquito Annual Report

Mission Statement

The mission of Ada County Mosquito Abatement District is to control mosquitoes that are both a nuisance and potential vector of disease to Ada County residents.

District's Brief History

Ada County's original Mosquito Abatement District (MAD) was the Three-Mile Creek District established in 1974, which included 12 sq miles between Cloverdale and Cole Roads and Franklin and Columbia Roads. There were several district annexations made over the next few decades, and in 2004 Ada County Board of County Commissioners agreed to incorporate and operate what was then called the Southwest Ada County Mosquito Abatement District. Today, the district is known as Ada County Mosquito Abatement District (ACMAD) and covers 406 sq miles, with the majority of the district covering major residential and urban areas.

ACMAD Management and Staff

Brian Wilbur, Director
Desireé Keeney, Field Operations Manager
Becky Wood, Administration Operations Manager
Additional Staff: 5 Fulltime Field Employees, and up to 16 seasonal employees; 1 Fulltime GIS Analyst (shared with Weed and Pest); 4 Fulltime administration staff (shared with Weed and Pest).

Training and Education

Continuing education and training of staff is a primary objective of our program in order to use the best management practices available. The majority of training also contributes for recertification credits through the Idaho State Department of Agriculture to continue to carry a Professional Applicators license in the state of Idaho.

2014 Seminar/Conference/Training	People Sent	Hours	Total
ATV certification	3	8	24
Forklift Recertification	3	2	6
IMVCA Spring Workshops	12	8	96
Microsoft Program Classes (In House)	1, 2	18, 24	66
AMCA Annual Meeting (Seattle, WA)	1	33	33
NWMVCA Spring Workshop	1	12	12
IMVCA/NWMVCA Fall Conference (Joint- CDA, ID)	1	20	20
Idaho Pest Expo (ECA of ID)	2	12	24
SWIWCA Fall Seminar	2	8	16
Total Hours in Training for 2014:			**297**

Memberships and Affiliations

Ada County Mosquito Abatement District belongs to several associations which increase education opportunities to our staff, keep up to date on new methods, and knowledge of potential legislation that will affect our operations and/or residents. The following are our memberships and affiliations:

- Idaho Mosquito and Vector Control Association (IMVCA)
- Northwest Mosquito and Vector Control Association (NWMVCA)
- American Mosquito Control Association (AMCA)

Integrated Mosquito Management

ACMAD follows an Integrated Mosquito Management (IMM) program which helps to enable a better, more sustainable program where ever necessary which is designed to benefit or to have minimal adverse effects on people, wildlife, domestic animals, and the environment. The following are aspects of an IMM: education, cultural, physical and mechanical controls, biological control, and chemical control. We recognize that not all mosquito populations can be controlled using all of these methods and there is no one way to use these practices due to variations in the mosquito population abundance, species diversity, development habitats and environmental conditions. All controls are carefully considered using the above variables by ACMAD as well as cost versus benefits, efficacy, health effects and ecological impacts.

Public Education

Public Education is a primary objective of any Integrated Mosquito Management program. Through public education and outreach we can better inform our residents within the ACMAD about how to protect themselves against mosquitoes and therein potentially lessen the interaction between mosquitoes and people, which helps to control nuisance mosquito interactions and the spread of potential diseases such as West Nile virus (WNv) and other vector borne diseases.

Some public education and outreach that was conducted in 2014:

- ACMAD website and Online Mosquito Tracker
- At the Western Idaho Fair outside the Agriculture Pavilion for Ada County Weed, Pest, and Mosquito Abatement
- Participated in the Dairy Days, Kuna Days and Eagle Fun Days Parade where thousands of people lined the streets
- ACMAD put up an informational display with brochures and handouts for National Mosquito Awareness week at the Ada County Courthouse and displayed Education Trailer during this week in local Parks for public outreach;
- Put out a coloring contest for different age classes;
- Earth Day Celebration/Boise Watershed
- Presentations to a Boise State University Environmental Health Class, and Touchstone Retirement Community for World Health Week (WHO)
- Provide training and some assistance to BSU graduate student and thesis work; and collecting *Culicoides* samples for USDA APHIS National Wildlife Research Center for research (“by product” of collecting mosquito samples)
- As well as the many face to face interactions of field staff when working on a daily basis during the mosquito season, especially during WNv positive outbreaks

Mosquito Surveillance Operations

Ada County Mosquito Surveillance operations started May 13, 2014 and continued through September 27, 2014 for a total of 20 weeks (week 20-39). There were a total of 76 fixed locations throughout Ada County that were trapped at least weekly to survey the mosquito populations in the county. Surveillance traps that were commonly used were the carbon dioxide (CO^2)-baited EVOS light traps, which on average ran for 10 hours a night (using 3-4 lbs of dry ice a night per trap as bait) for a total of 1664 trap nights in 2014. There was only a 2.6% trap failure (down 1% from last year) due to various reasons such as: batteries died, trap vandalism, the trap was too wet and not on in the morning, or field technician error.

There was a total of 848 adulticide treatment requests based on surveillance data which was determined by thresholds set for vector (5 *Culex* species (*spp*.) count or a positive WNV pool) and nuisance (>25 other species count) mosquito species trapped in a single trap night throughout the county.

In addition to monitoring the mosquito populations within Ada County, ACMAD tests all potential vector mosquitoes for West Nile Virus (WNV) in house through the use of a RAMP reader. This allows for a more immediate response to potential WNV breakouts and control the potential spread of the disease. In 2014, there were **50 WNV positive pools within 34 trap locations found in Ada County Mosquito sampled populations, a decrease of 44.4% of positive pools from 2013 even with an increase in mosquito populations.** The CDC (Center for Disease Control) reported that there were 18 human cases (0 deaths) of West Nile Virus (as of December 17, 2014) in Idaho in 2014 (2 in Ada County) and 2085 cases in the nation with 84 deaths.

Fig. 1: The following chart shows *Culex pipiens* (CXPI) and *Culex tarsalis* (CXTA) trapped populations over time and number of positive pools by each species (CXPW-*Culex pipiens* WNV and CXTW-*Culex tarsalis* WNV).

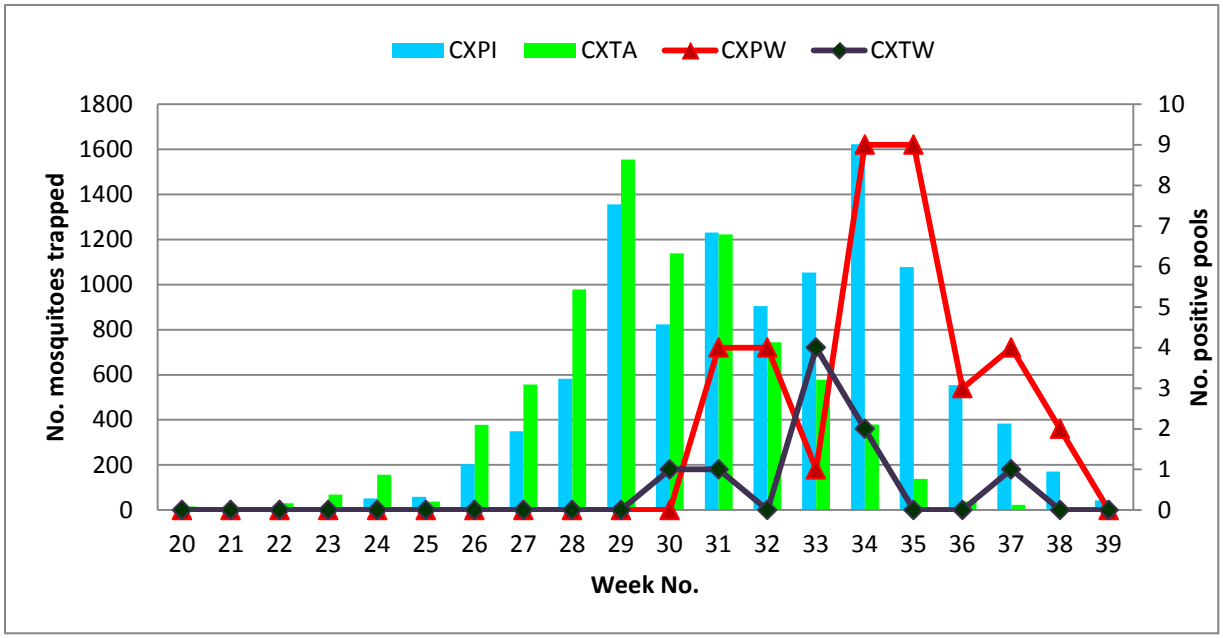
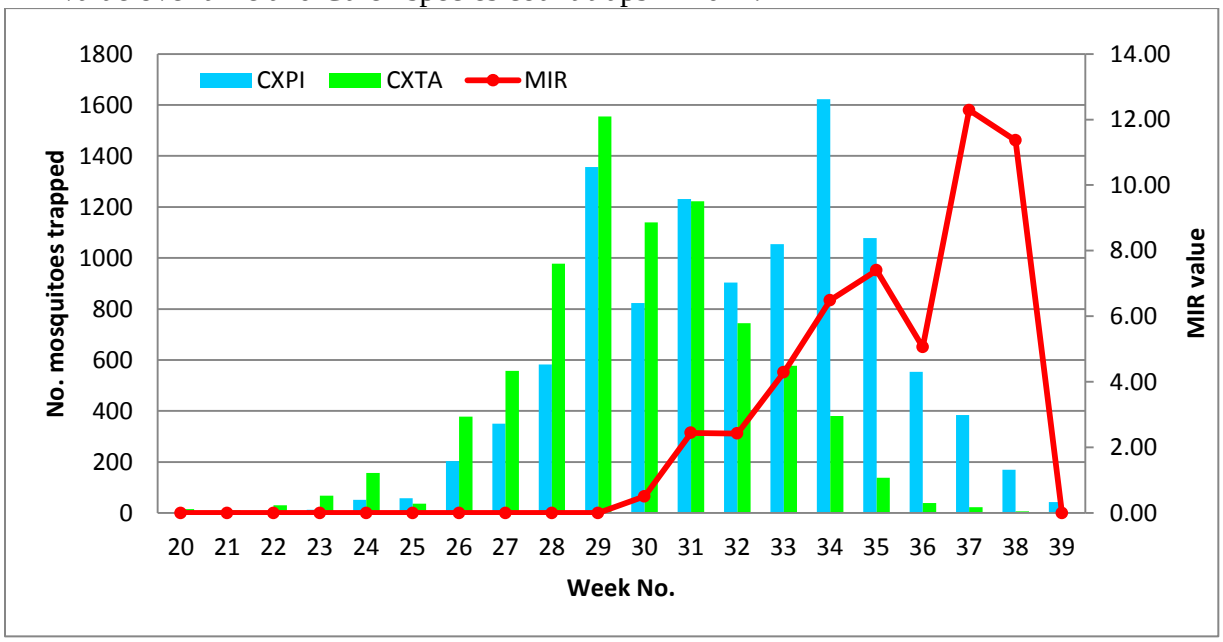


Figure 1 shows the significance of WNV presence in different species populations over time during 2014. Like 2013, this was a change that is not similar in previous WNV positive years where *Culex tarsalis* was the predominant WNV vector species. We are finding more and more of *Culex pipiens* positive WNV pools, some

of this is due to trap placement selection from resident complaints or human population abundance in more urban areas. We have found a significant increase in *Culex pipiens* with 78.8% WNV positive pools primarily occurring within this species. Figure 2 shows the minimum infection rate (MIR) over time in 2014. The MIR is one variable to help set thresholds for ground and/or aerial fogging and make best management decisions to reduce the spread of WNV.

Fig.2: MIR value over time and Culex species count traps in 2014.

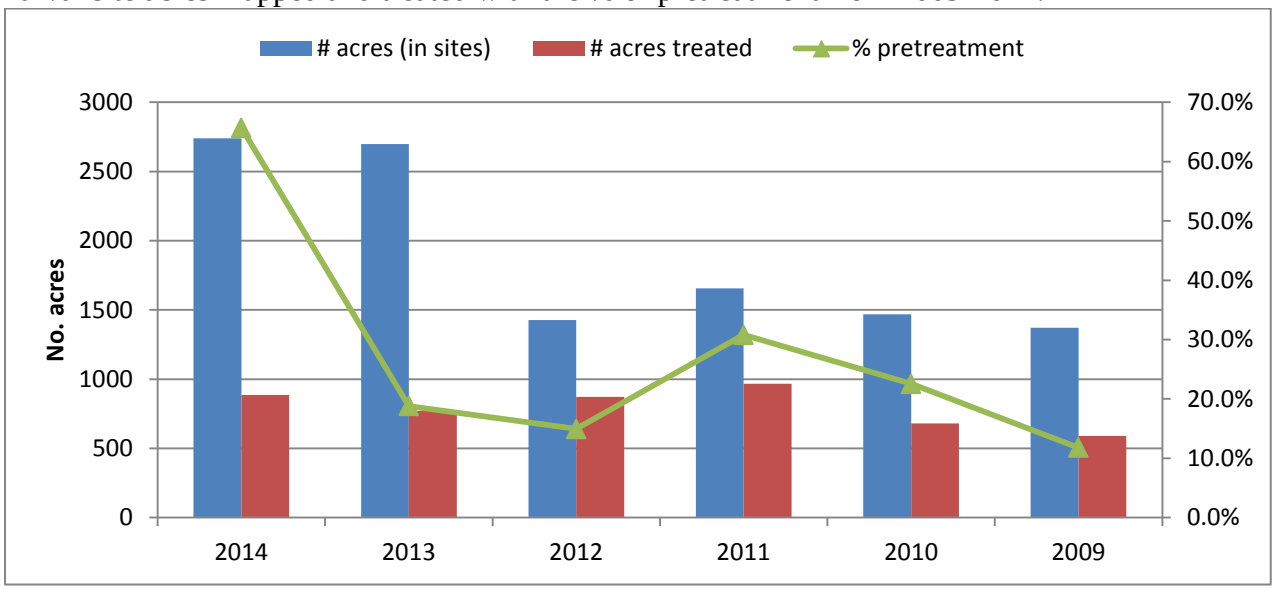


Mosquito Larviciding Control and Operations

Ada County Mosquito Larviciding program started mid-March for hiring of field technicians and in house training, with field training beginning the last week of March and work continued through the last week of September. The larvicide crews coordinated multiple 'Maruyama Fest's' (concentrating all larvicide applicators to treat a specific area using backpack-'Maruyama"- applications) in various areas with a large scale need of survey and treatments. There were a total 11 larviciders this year in 11 different areas.

Larval Site Inspections and Treatment Summary:
In 2014, the larvicide crews did a total of 59,830 inspections (an increase of 44%) at 15,639 site locations (increase of 241%) recorded within ACMAD and treatments occurred with a frequency of 45% after an inspection. Looking at the total number of inspections, 58% of the time a site was wet when visited; for the season, 5% of sites mapped were dry all year which is significantly different than in 2013 where 20% of sites were dry all year. There were 21,289 treatments made throughout the year; 65% of these were pretreated and these were mostly storm drains. The total acres treated within ACMAD for 2014 season was 886.2 acres (see Fig. 3).

Fig. 3: Larval site acres mapped and treated with the % of pretreatment from 2009-2014.

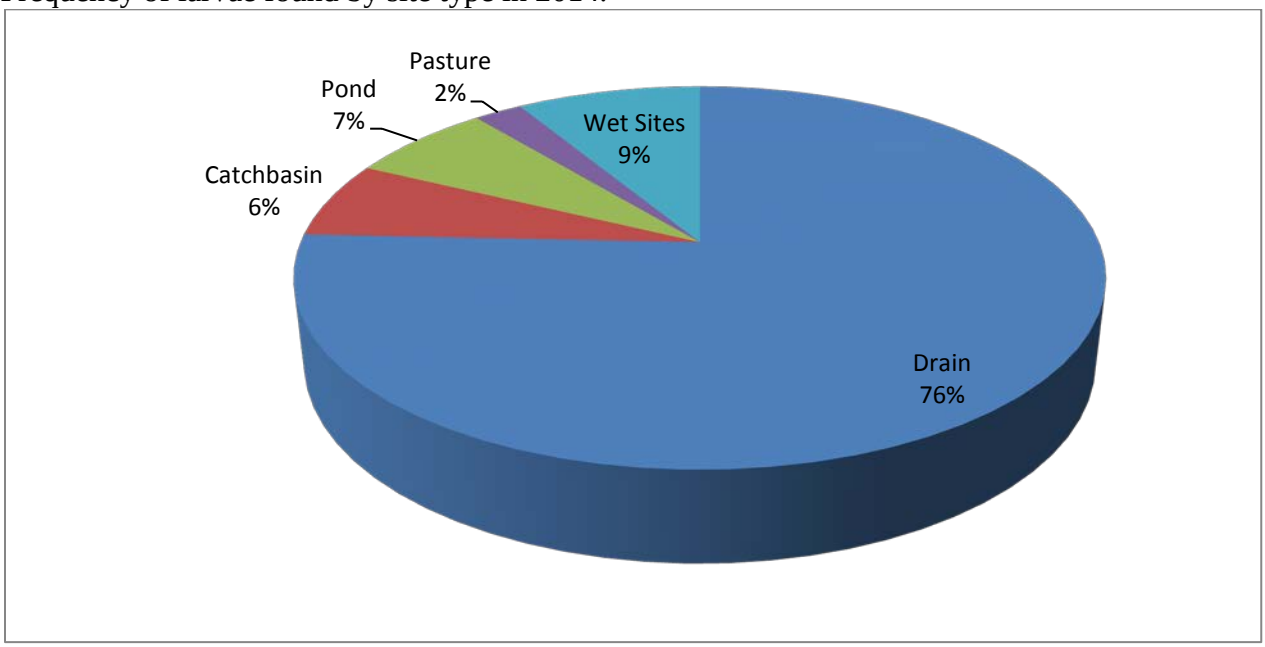


Larvae Development Habitat Summary:

This year with the presence of WNV, larviciders were actively in the field thoroughly sweeping areas around positive site locations locating mosquito development sources specifically for *Culex spp*. Many new storm drains were mapped (n=11,953), and when treated, there was a direct drop in the adult populations trapped near these problematic development sources. The storm drain locations also resulted in more *Culex* larvae found (this is typical of storm drains, with the species predominately *Culex pipiens*). Between the categories of larval sites, 76% of larvae were found in storm drains (drains and drop inlets (DI)) which is an increase from last year by 16%; 6% were found in catch basins (-6%), 7% in Ponds (-4%), 9% of larvae were found in other wet sites (-5%) (i.e. roadside ditches, swimming pools, yards, etc.), and 2% in pasture sites (see Fig. 4). **There was a significant increase of drains/DIs mapped (8646 new DIs mapped this year), which is one of the main development sites for *Culex pipiens*. These mapped sources and treated larval sites are significant to mosquito control as we see more WNV in *Culex pipiens* over time so to continue making DIs/storm drain monitoring and treatment a priority in the future is important to reduce the primary vector populations now in Ada County.**

There were a total of 996 documented remediated sites; which will continue to be a priority in the future in order to show mechanical controls using an IMM practice. See Appendix C for larvae frequency and distribution map.

Fig. 4: Frequency of larvae found by site type in 2014.



This is significant because it shows us the most common development sources where larvae were found in 2014 which contributes significantly to the mosquito populations.

Larvicide Public Service Requests:
The public service requests for a larval inspection (243 work orders) were increased from last year (n_{2013}=136). The increase may be attributed to the wet year and more surface water visible.

Larvicide Product Summary:
Products used in larviciding are predominately biological control products of *Bacillus thuringiensis israelensis* (Bti) or *Bacillus sphaericus* (Bs), naturally occurring bacteria, and methoprene, an insect growth regulator, with less than 1% of other chemical controls used. These products are specific to mosquito larvae and black fly larvae without impacting non-target beneficial species.

Mosquito Adulticiding Control and Operations

The Mosquito Adulticiding Program started late May. There were 3001 work orders requested in 2014 and 28% of these were requested from the surveillance lab. Many of the public complaints this year were verified through surveillance trapping. Some of the lab requests were due to the 50 WNV positive pools locations, the rest were based on mosquito population thresholds. See Appendix A for Adulticiding applications distribution map along with WNV positive surveillance site locations.

Fig. 5: Adulticide requests by general location throughout Ada County in 2013 & 2014.

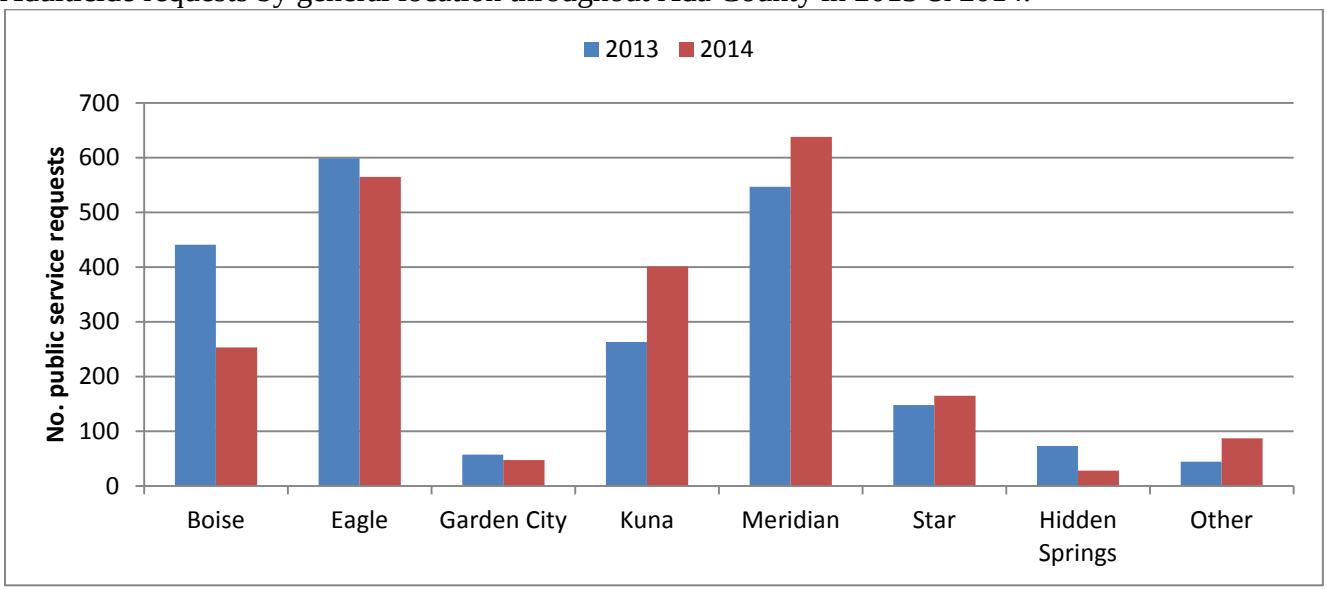
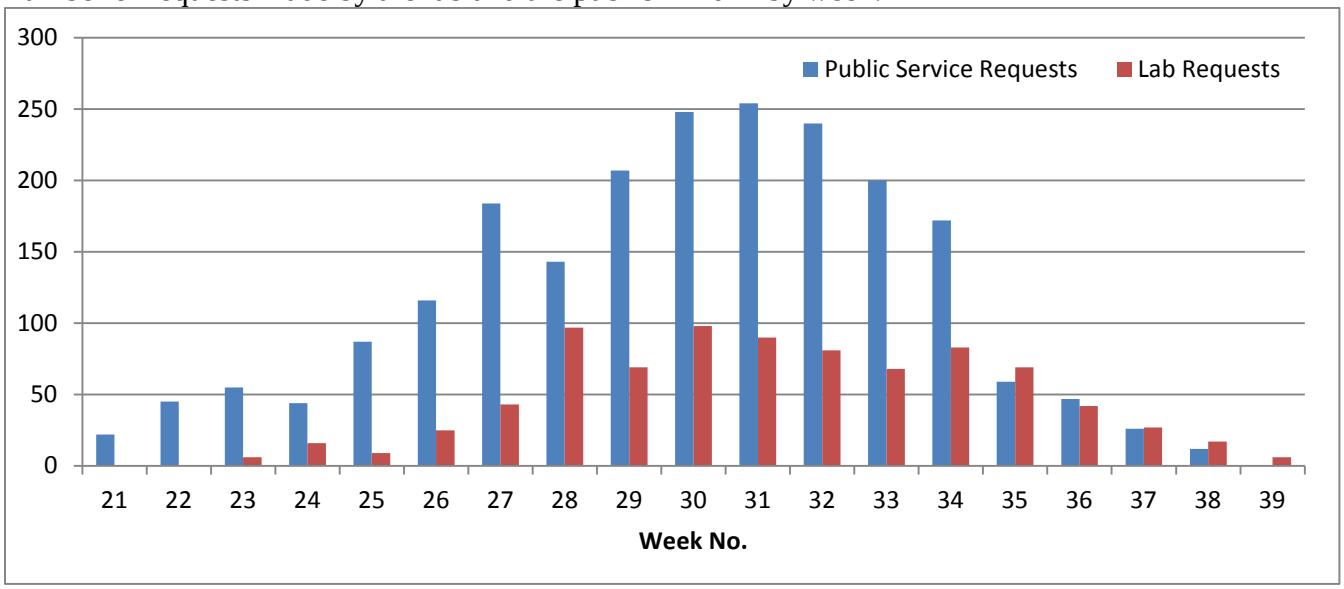


Fig. 6: Number of requests made by the lab and the public in 2014 by week.



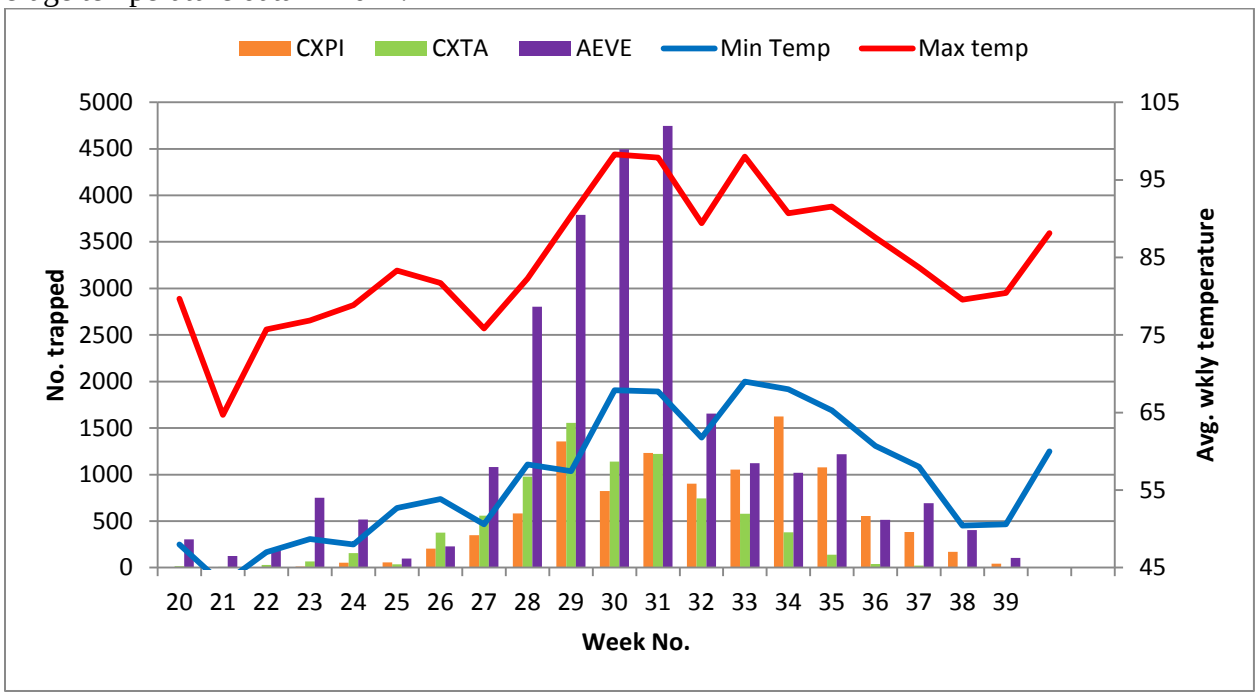
Adulticide Treatment Summary:

Total road miles treated for the 2014 field season was 2139.2, which is approximately 100 miles less than in 2013. The adulticide product used was a water-based permethrin product which is target specific to kill adult flying mosquitoes and black flies by using ultralow volume micron-size droplet technology. Overall, we did complete more public service requests than in 2013, but we also treated less area as there was less WNV present in 2014 than in 2013 (see Appendix A and B).

Mosquito Population Dynamics

Mosquito Surveillance and Climate Data:
Figure 7 shows the distribution of *Culex* species and *Aedes vexans* (most common nuisance species in Ada County) in the 2014 surveillance field season. Peak *Culex* activity occurs when average nightly temperatures are averaging 60-70+ ° F, and then slows down when nightly average temperatures reach 52-54 ° F.

Fig. 7: Weekly summary of both fixed and flex sites of *Culex pipiens*, *Culex tarsalis*, and *Aedes vexans* counts with average temperature data in 2014.



In the 2014 field season, the precipitation level was high without any major flooding and with regular rain and snowmelt having a light drought season if at all in some areas. The weather was warm in the spring and summer with only one week of a heat wave but average maximum weekly temperatures were slightly lower than in 2013. We can see from Figure 8 that rainfall was seen throughout the summer and there was nuisance species peak in three weeks (wks 29-31) which is different from 2013 where *Aedes vexans* peaked early in the season during week 23 and again in weeks 25 and 26. *Culex spp.* never peaked in 2014 like *Aedes vexans* and with a drop in minimum weekly temperature during week 32 (Fig. 8 & 9).

Fig. 8: Weekly summary of both fixed and flex sites of *Culex pipiens*, *Culex tarsalis*, and *Aedes vexans* counts with total weekly precipitation data in 2014.

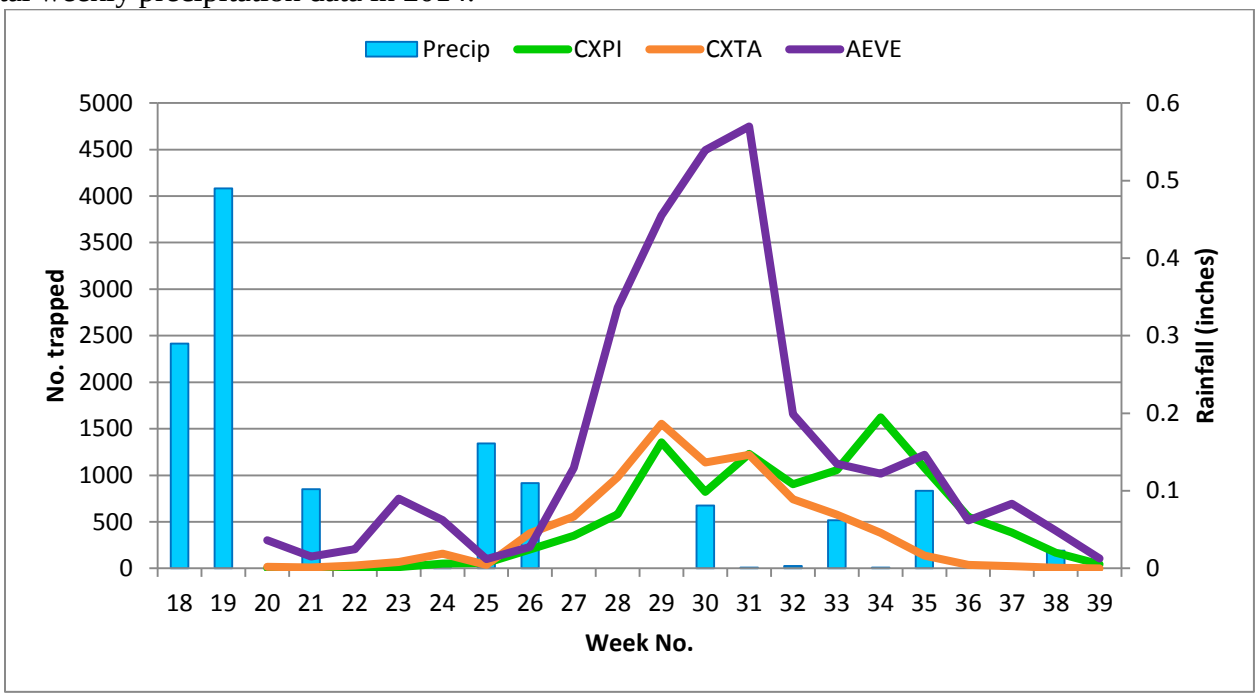
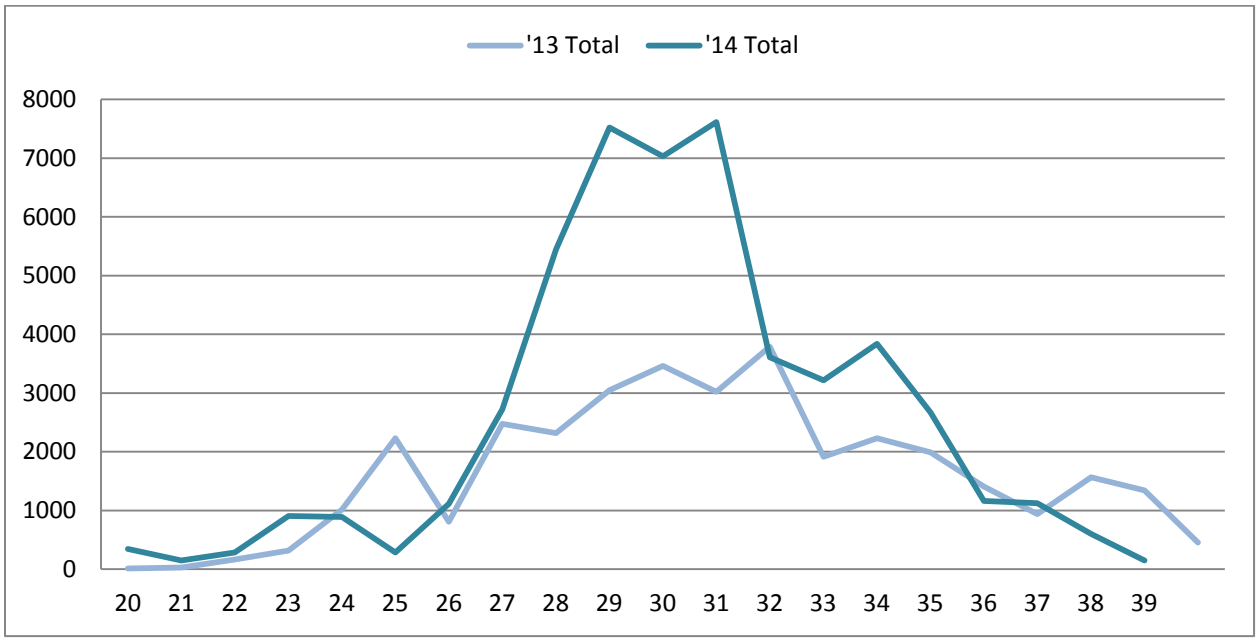


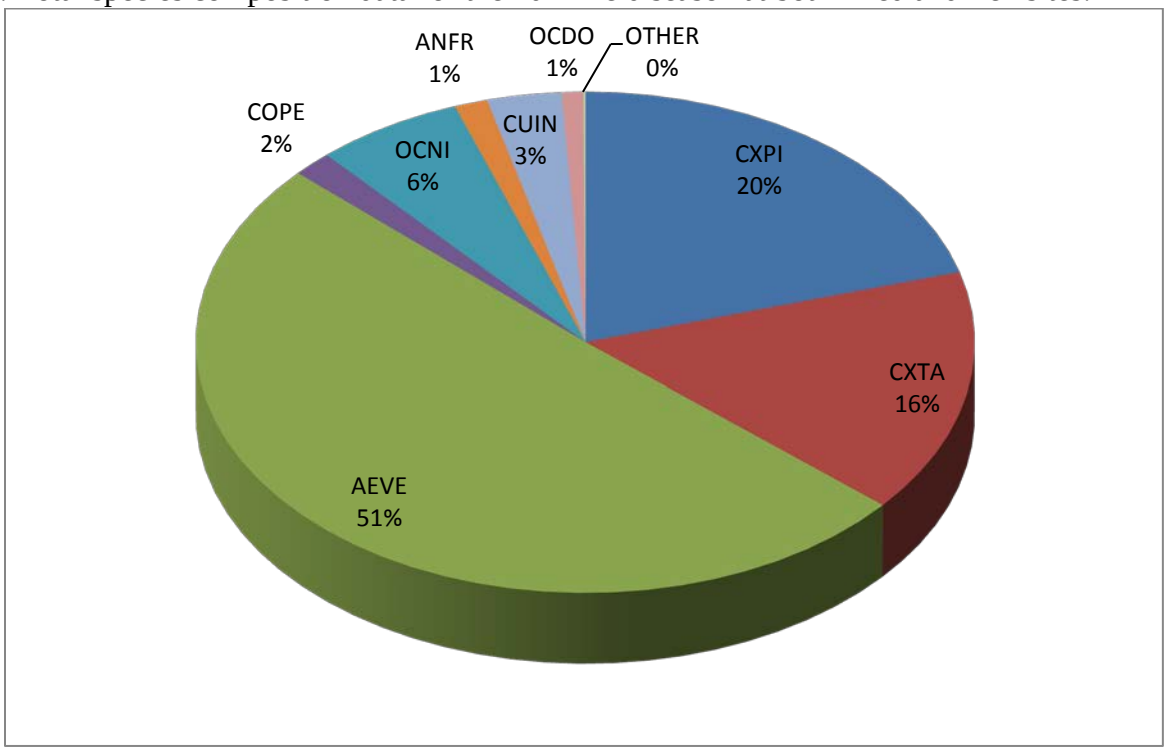
Fig. 9: Weekly summary of total trapped mosquito counts comparison in 2013 and 2014.



Mosquito Species Composition Data:
No new species were recorded in 2014, but most other species were trapped as consistent with previous years' data (*Aedes vexans, Culex pipiens, Culex tarsalis, Ochlerotatus nigromaculis, Ochlerotatus dorsalis, Ochlerotatus increpitus, Ochlerotatus melanimon, Anopheles freeborni, Culiseta incidens, Culiseta inornata,* and *Coquillettidia pertrubans).* This year we saw more nuisance floodwater species overall probably due to a wet spring and summer and there was no real water shortage in the valley for landowners unlike in 2013.

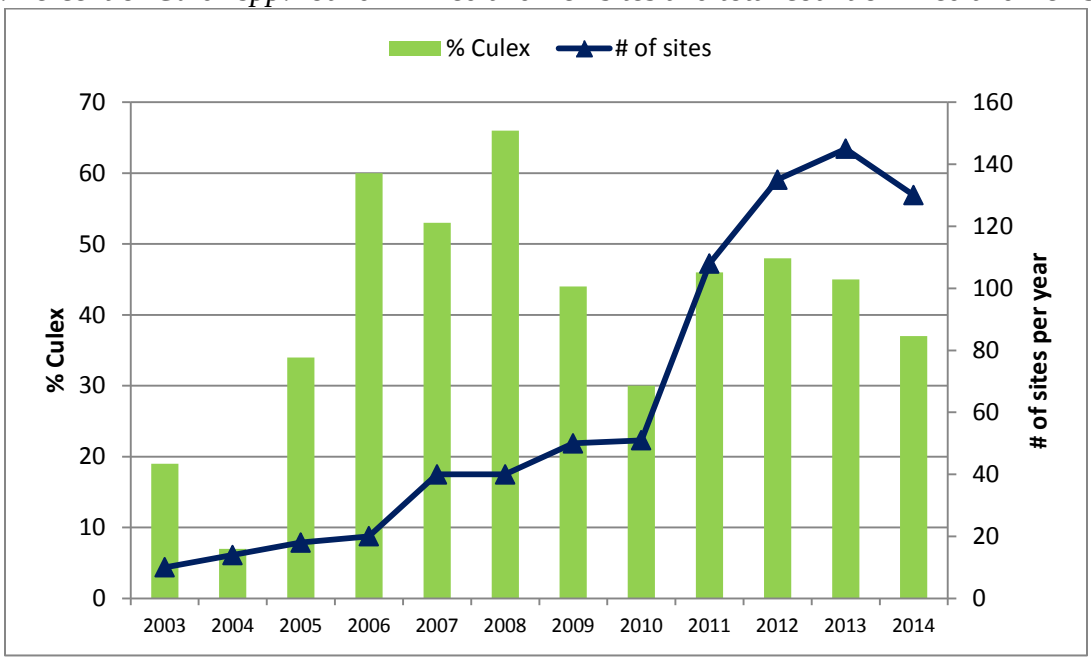
With the continuation of more flex sites within the mosquito surveillance program, there was an increase of mosquitoes sampled, for a total of 51,183 mosquitoes, of that 18,538 were *Culex spp.* (36.22%). On an average trap night, there was an average of 30.5 total mosquitoes trapped (increased from 2013 avg. of 17.7) and respectively 11.1 *Culex spp*. trapped (up from 2013's avg. 7.9 per night). Looking at fixed and flex data, the predominant species trapped were *Aedes vexans* (51%) early on in the season, *Culex pipiens* (20%), and *Culex tarsalis* (16%) (See Fig. 10). While *Aedes vexans* increased 10% this year from 2013, both *Culex pipiens* dropped by 7% and *Culex tarsalis* by 2%. This can be attributed to an increase in *Culex spp.* larvicide development sources (primarily drop inlets and storm drains) being mapped and treated in urban areas this year and monitored more closely.

Fig. 10: Total species composition data for the 2014 field season at both fixed and flex sites.



In 2014, there was almost a 10% decrease in *Culex spp.* found in comparison to other years (see Fig. 11). W***hile we are trapping a lot of other species, our Culex controls on larvae are working due to the increase in larvae sites found this year, not in flood larval sites, but Culex preferred larval sites and the adult Culex spp. percent are still lower than total mosquitoes trapped.*** The factors that also must be considered are site placement (rural vs. urban/suburban), why a site was placed in a location (most flex sites were in response to public service requests for adulticiding which typically are a response to nuisance mosquitoes), average minimum temperatures, precipitation, degree days, and % of larvicide pretreatments and treatments at *Culex spp*. development sites.

Fig. 11: Percent of *Culex spp*. found in fixed and flex sites and total count of fixed and flex sites per year.



Projects and Field trial summaries

Elevated Traps versus ground level traps
This year the surveillance coordinator set 4 elevated traps that were up in trees or at canopy level near traps that were previously set at ground level. All were succesful and the first occurance of WNV in 2014 was in an elevated trap. Additionally the only WNV positive pool that came out of Hidden Springs Community this year was in an elevated trap as well. *Conclusion: continue future integration for more WNV surveillance or to use as an early indicator.*

Gravid Traps
Gravid traps are used to catch mosquitoes that have already feed on a blood meal to develop eggs and the trap itself catches them before they area able to lay the eggs on the surface. This was used for the first time this year in our district in a few locations in a few trap nights. No WNV was found out of these tested females, but they were mostly gravid Culex pipiens. *Conclusion: it can be used as another method for Culex pipiens surviellance and potentially to verifiy suspected areas of potential WNV.*

Oviposit Traps
We are still in the process and planning of using OVIposit traps. Oviposit traps are looking for specific species of mosquitoes present in Ada County that may not normally or typically caught in the standard CDC or EVOS light traps. This is a simple process of presence or absense of species of concern, like *Aedes aegypti* or *albopictus. Conclusion: continue the final phase of the project and field implementation in 2015.*

Conclusion

In summary, the year was a warm, not extremely hot, and wet year. It was not considered a drought-like year and this was confirmed through our monitoring of wet sites throughout the year, an increase in mapped sites and inspections completed as well as larvae found. Sites that we found a significant increase in frequency of larvae were treated or pretreated and these sites which would normally produce vector species of mosquitoes were effectively controlled via larvicide treatments thus the % trapped *Culex* species was reduced this year compared to the last three years (figure 11). We also saw more floodwater species in surveillance and this is also confirmed through public complaints coming a week after surveillance data showing total population abundance (Figure 8 & 9).

We did see the presence of WNV this year again, but it was reduced from previous high WNV years that correlated with drought-like conditions (i.e. 2013 and 2009). Additionally, larvicide crews focused many efforts on long-term treatments in storm drains and DIs this year right from the beginning of the season which helped reduce historically known high *Culex* trap locations. After rain events we saw an increase in floodwater species with 2 weeks as well (Figure 8).

Overall, the larvicide crews increased inspections and treatments significantly this year which is needed for monitoring storm drains and DIs, however as development continues within ACMAD and rural areas become more urban, we will need continue to develop the program and increase staff in order to cover the volume of these mosquito development sources and the number of residents within ACMAD as it also continues to increase.

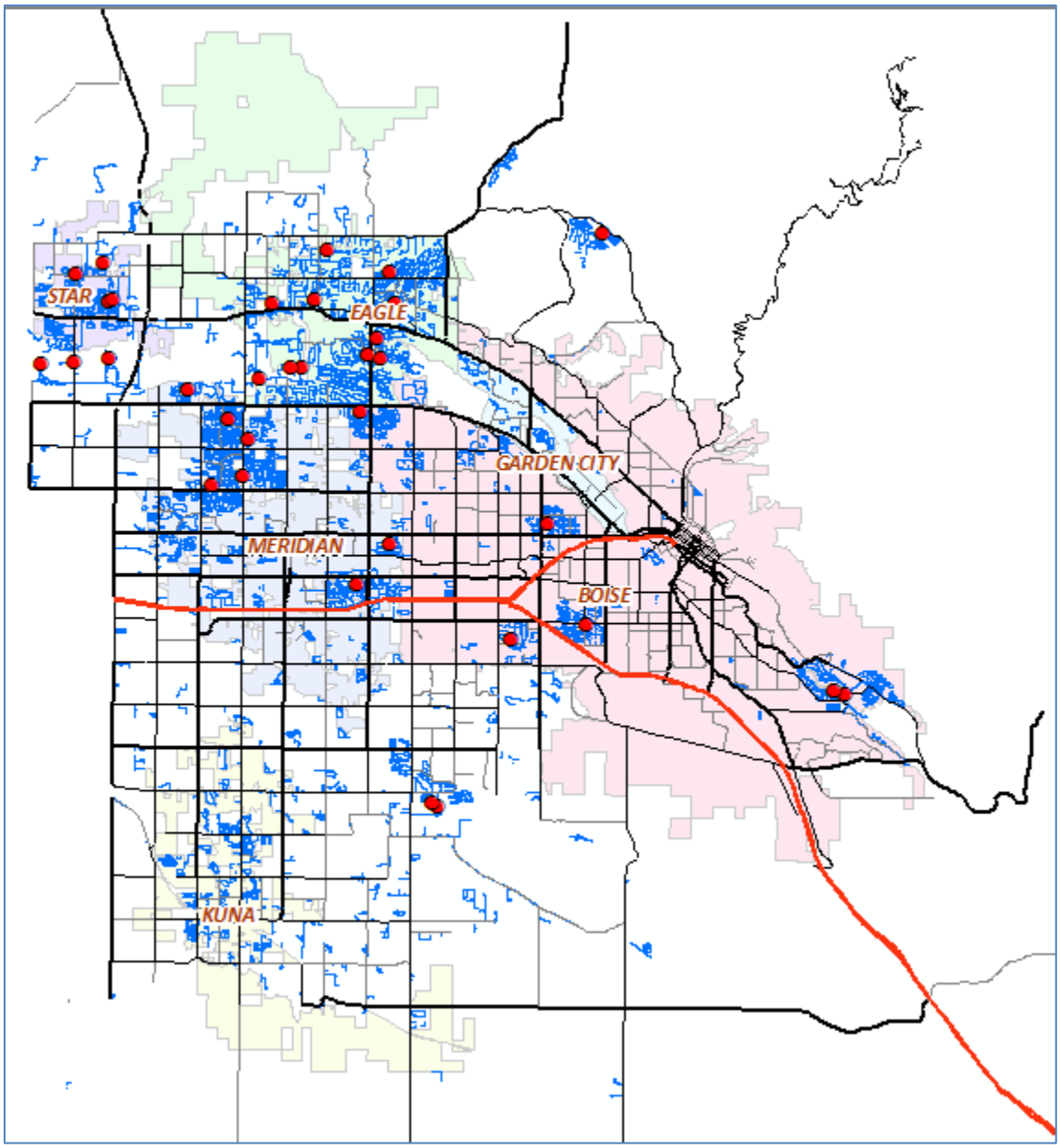
Adulticide treatment requests are continuing to shift to be based more on surveillance trap numbers in areas of concern or areas where public complaints are frequent. We can see from the adulticide number of requests that external public adulticide service complaints tend to follow a week behind the surveillance requested adulticide service complaints. This is probably due to normal routine by the public and when they observe mosquito populations and when they actually complain on them to the ACMAD. For example if someone has a barbeque on a Thursday or Friday and they experience a large mosquito hatch, they may call Monday or Tuesday and depending on the area, a treatment may occur that same night or within the week of the original time they saw the mosquito issue. We saw on average time of completion ranging within the same day up to treatment within 2 days after a public complaint came in. Many times the 2 day completion date was because the area had just been treated the night before the call came in, and due to label restrictions and best management practices we complete the call appropriately. Ideally we really want adulticide fog treatment based primarily off of surveillance data and less off of public complaints, though these external complaints will highly unlikely ever be completely removed from the program as they help us monitor potential mosquito areas of concern.

Goals for 2015

1. Increase control and monitoring of storm drains using effective and efficient means through larviciding practices
2. Increase the number of remediated sites and tracking through mobile computer devices and GIS.
3. Increase education and public outreach for mosquito control and the ACMAD within the residents and track it through mobile computers and GIS and programs and events.
4. Projects to continue to implement and work on in 2015: oviposit traps and barrier application planning.

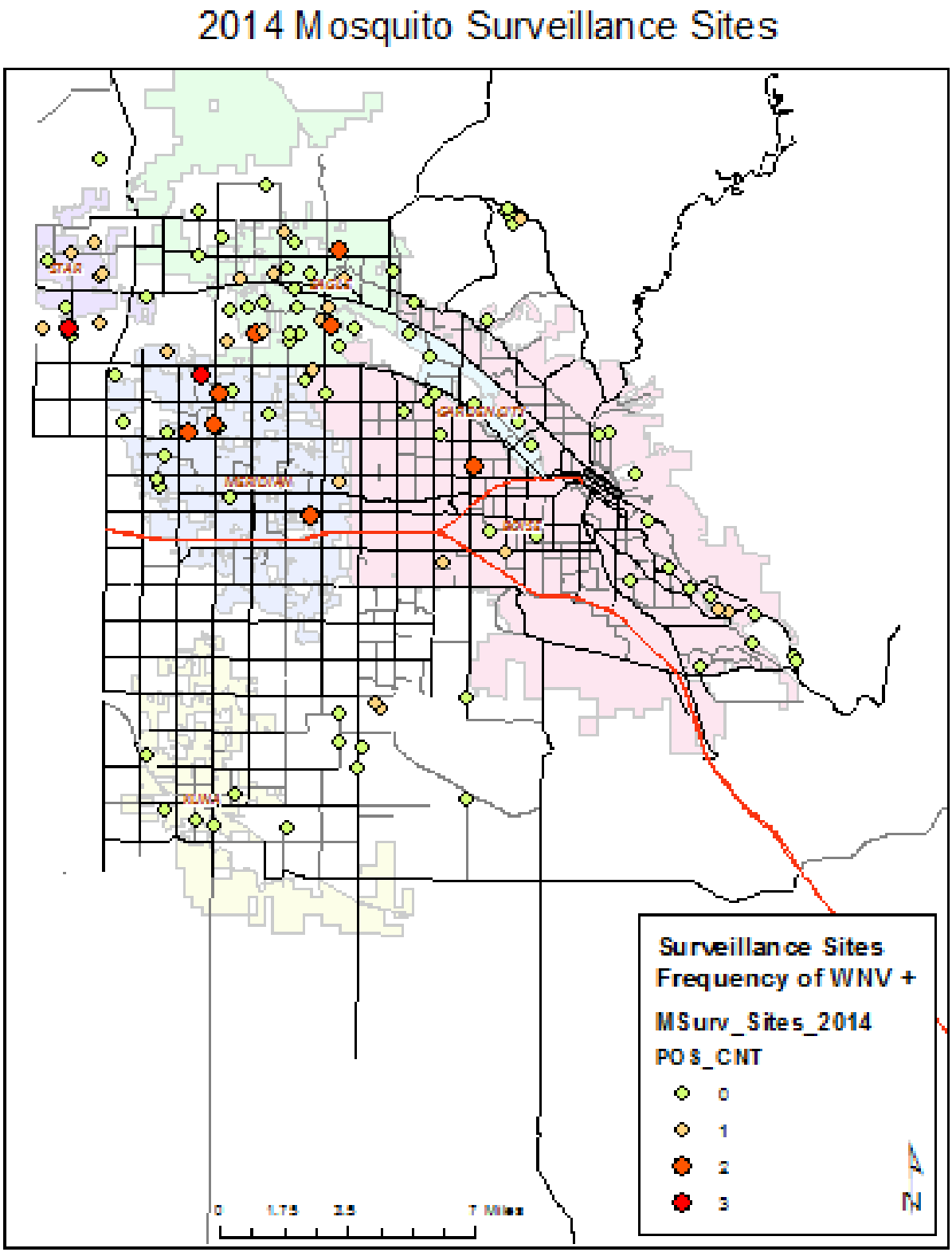
Appendix A

Map of surveillance locations with WNV and adulticide treatments in blue 2014.



Appendix B

Frequency of WNV in surveillance trap locations in 2014.



Appendix C

Map of larvicide site locations and frequency of larvae found throughout ACMAD in 2014.