

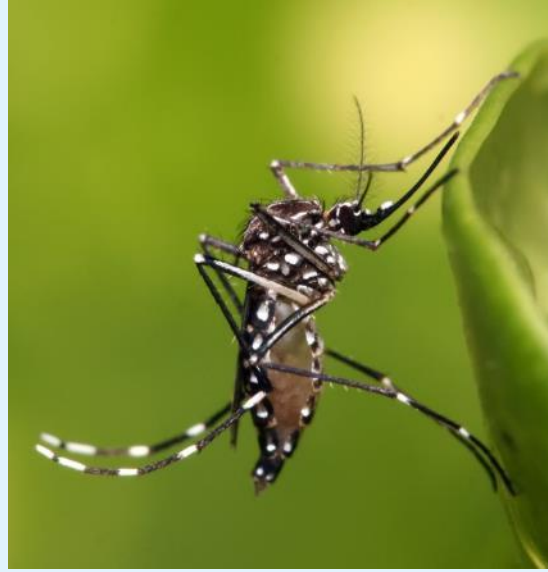
Larviciding Solutions for Urban Environments

Samer Elkashef, Tony Hedley, Tom Price,
Steven Ramos, Ruben Rosas, Marcia
Reed, Ben Weisenberg, Sarah Wheeler

SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

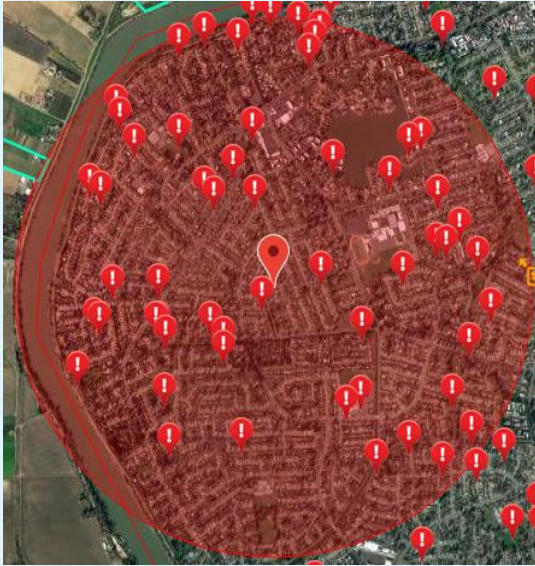


Challenges for Suburban Mosquito Control



How to get everywhere and check everything?

Known Pools



Properties with Pool Permits



Everything Else

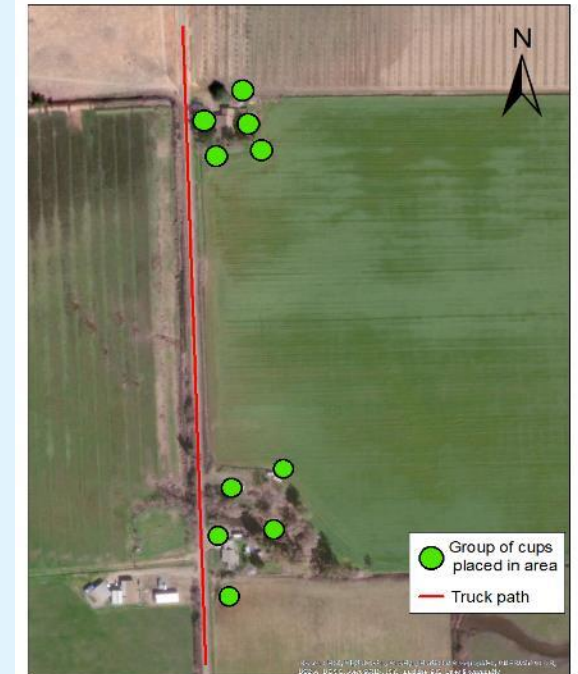
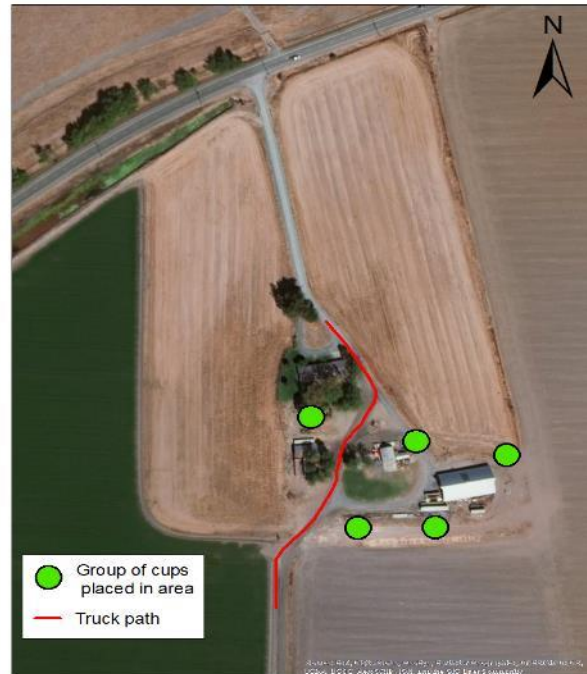
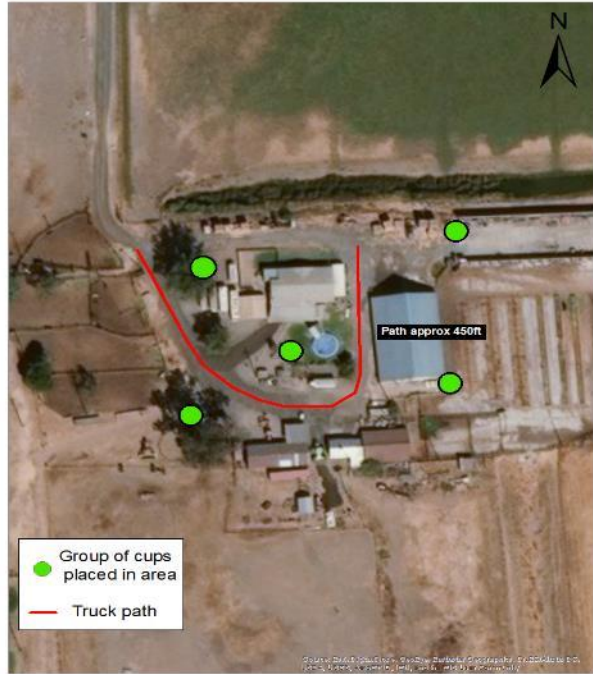


WALS: A low volume larviciding (LVL) technique

- VectoBac WDG suspended in water
- Designed to deliver BTI into hard to reach mosquito breeding sources
- Designed with container breeding *Aedes* in mind
- Can this be used for controlling *Culex pipiens* in suburban environments?



Step 1: Can the material reach cryptic sources?



Agriculture Test Sites



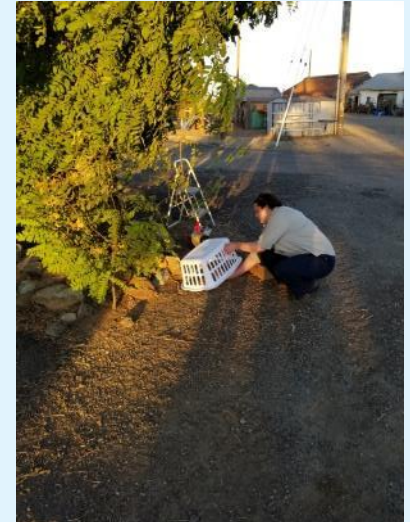
Open



Partially Cover



Full Cover



Under Basket



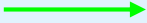
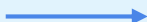
Equipment Evaluated: A1 Super Duty



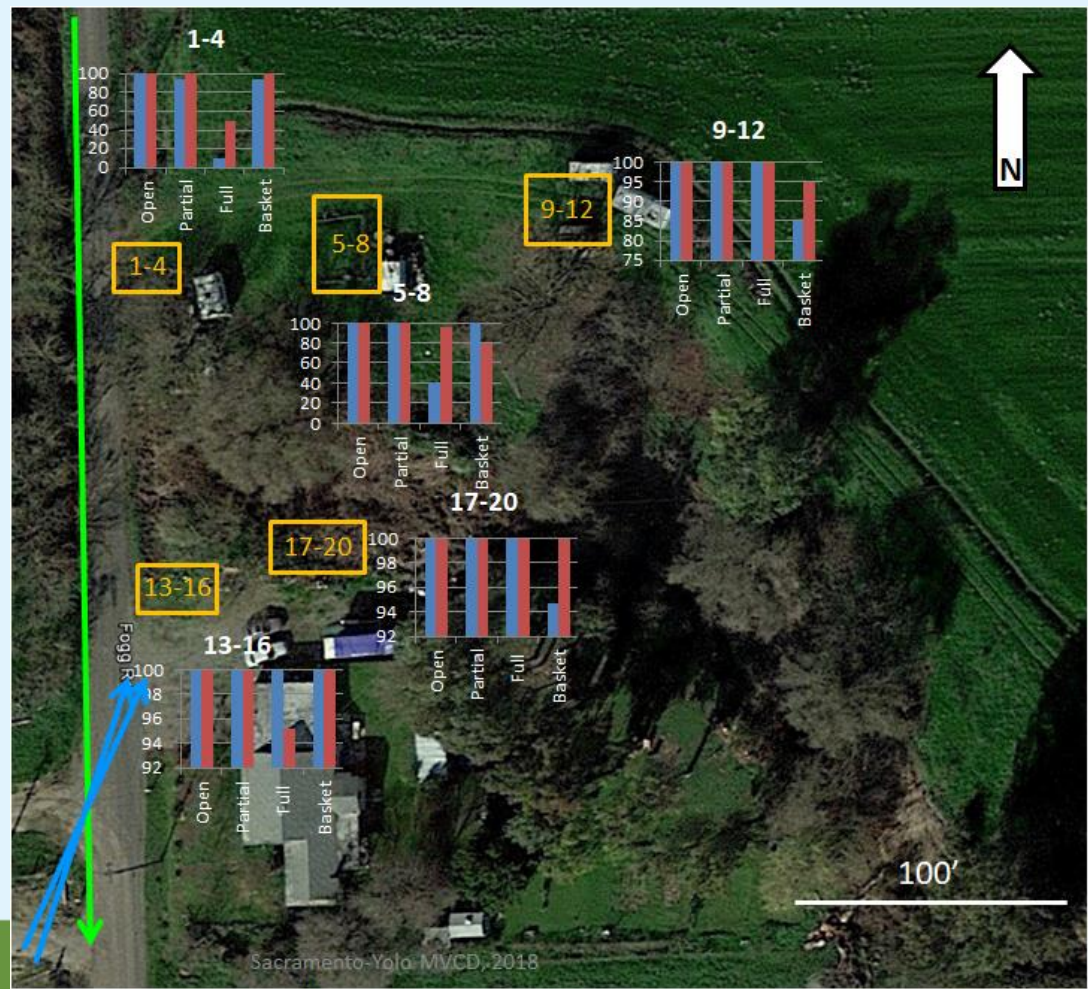
Equipment Evaluated: Guardian 190 G4

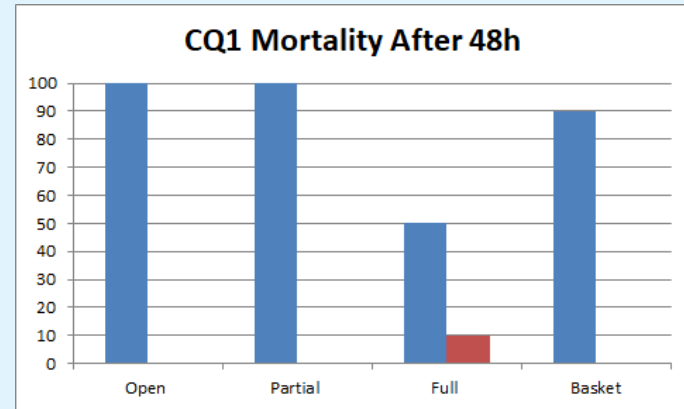
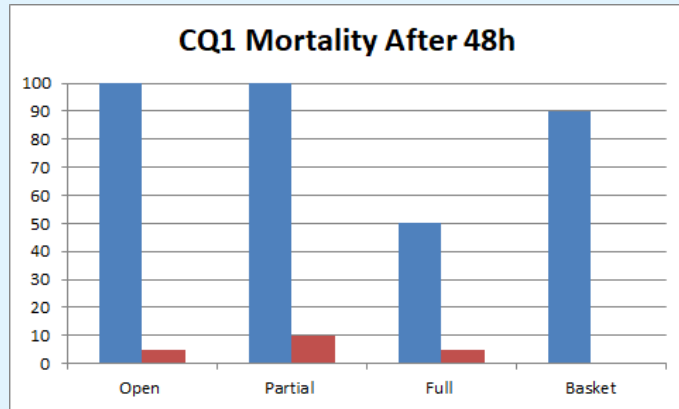
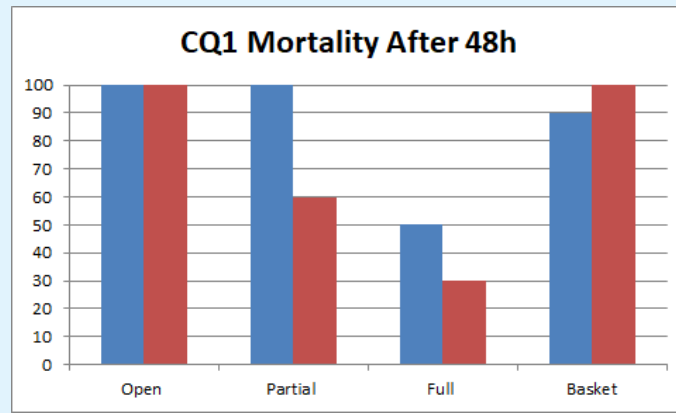
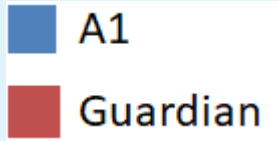


■ A1
■ Guardian

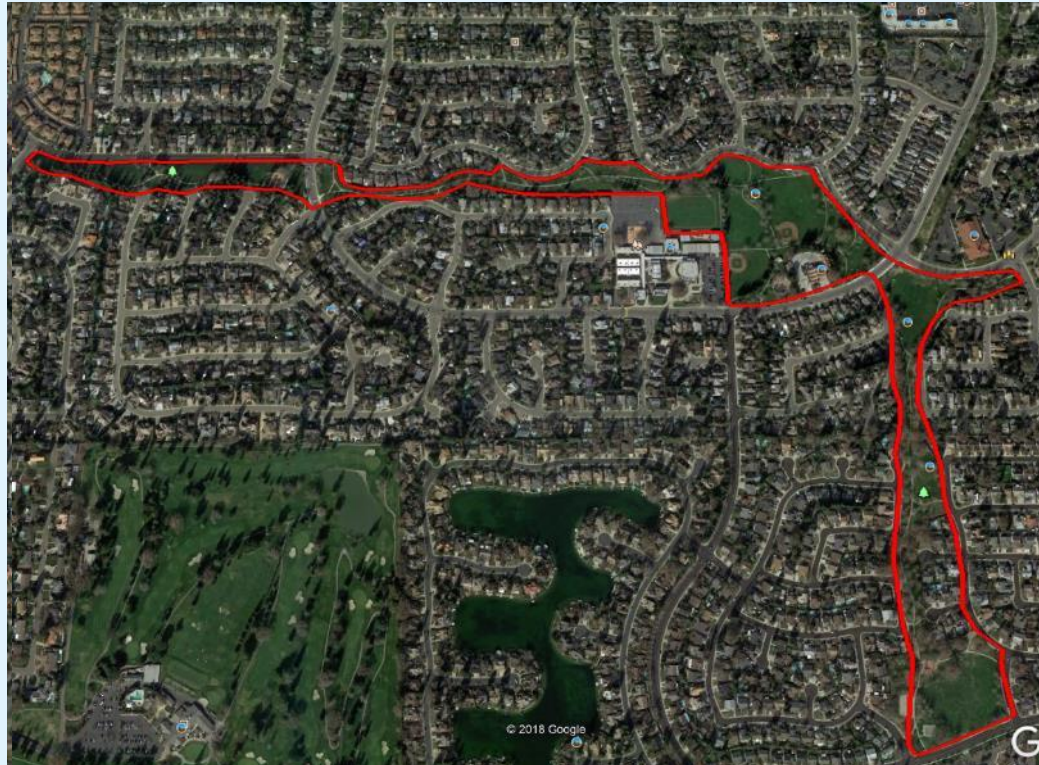
Truck Route: 
 Wind Direction: 

Each bar graph shows the percentage of dead CQ1 mosquito larvae in each sampling cup after 48h of exposure





Step 2: Greenbelt Application



Informing the Public

Door

Hanger

MOSQUITO CONTROL IN YOUR AREA

Starting in August we will be performing periodic mosquito control treatments in your neighborhood between the hours of 2:00 am and 5:00 am to target mosquito breeding sources.

You may see a slow moving vehicle on your street conducting the application.

To sign up for spraying notifications by email visit www.FIGHTtheBITE.net
For more information call 1-800-429-1022

Email Notification

View this email in your browser

SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

Controlling mosquitoes to protect you and your health.

Ground Spraying Notice

The Sacramento-Yolo Mosquito and Vector Control District plans to treat areas of Sacramento and Yolo Counties for mosquitoes that may carry the potentially fatal [West Nile virus](#).


Visit our [Spraying Update](#) page for a complete list of scheduled treatment locations by zip code. Treatments may be cancelled due to weather conditions or other issues. For additional treatment questions and answers please visit [Spraying Frequently Asked Questions](#).


Areas highlighted on the map are scheduled for treatment **Thursday AM September 20th between 3:00am and 5:00am.**
NOTE - This will be a larval control treatment.
For more information: [Larval Spraying Frequently Asked Questions](#).

[Click to view an interactive map on our website.](#)





Park Spray Results


Truck Route: 

Wind Direction: 


Cup placement

In open: 


Partially covered: 


Completely covered: 


Above ground larval mortality

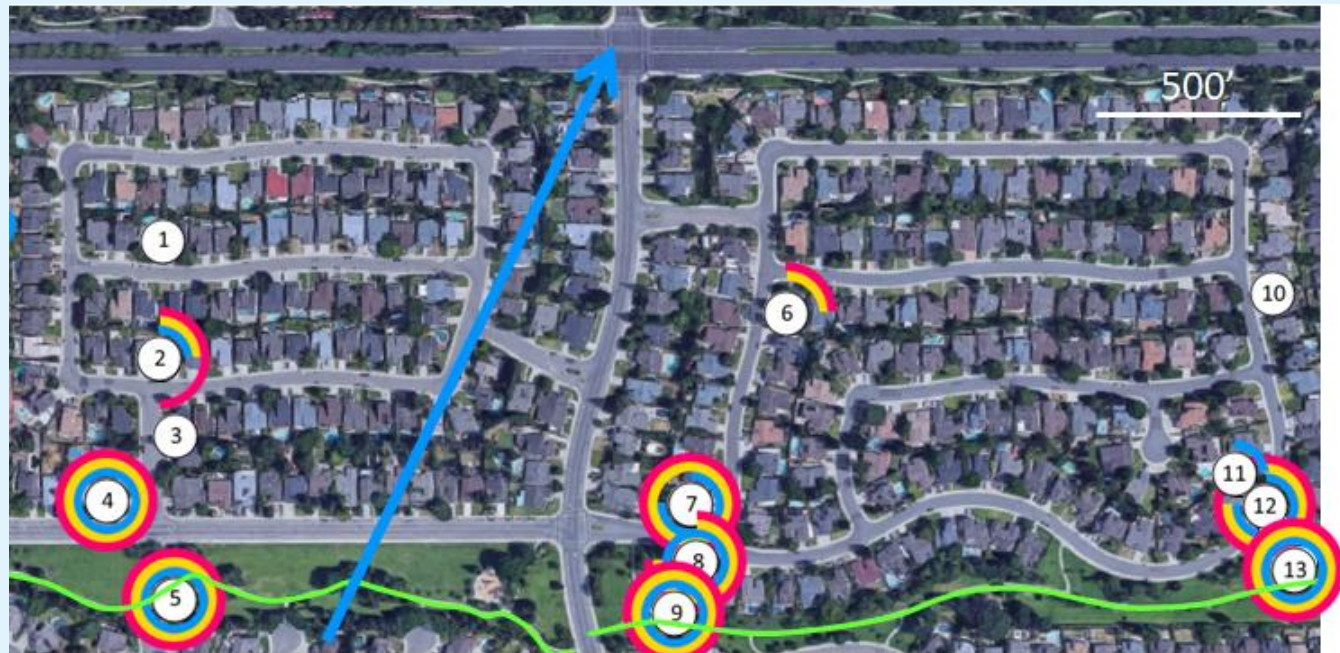
0%: 

25% - <50%: 

50% - <75%: 

75% - <100%: 

100%: 



Step 3: Suburban Applications

Evaluated Catch Basins


















3 Types of Cup Coverage



Orangevale Results

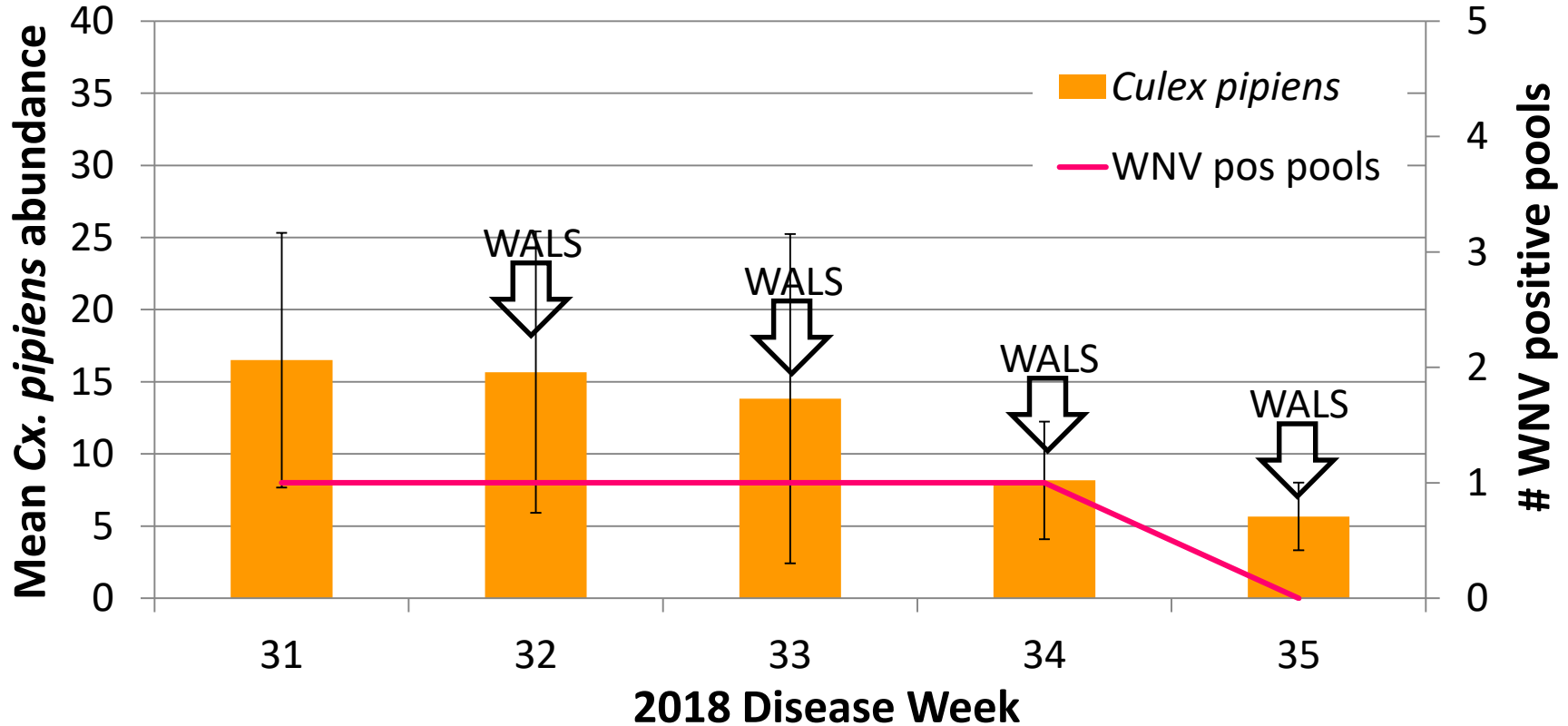
Wind @1.5-2 mph

Wind @0.2-1.1 mph

- Truck Route: 
- Wind Direction: 
- Cup placement**
- In open: 
- Partially covered: 
- Completely covered: 
- Above ground larval mortality**
- 0%: 
- 25% - <50%: 
- 50% - <75%: 
- 75% - <100%: 
- 100%: 
- Below ground larval mortality**
- 0%: 
- 25% - <50%: 
- 50% - <75%: 
- 75% - <100%: 
- 100%: 



Orangevale mosquito abundance and WNV activity



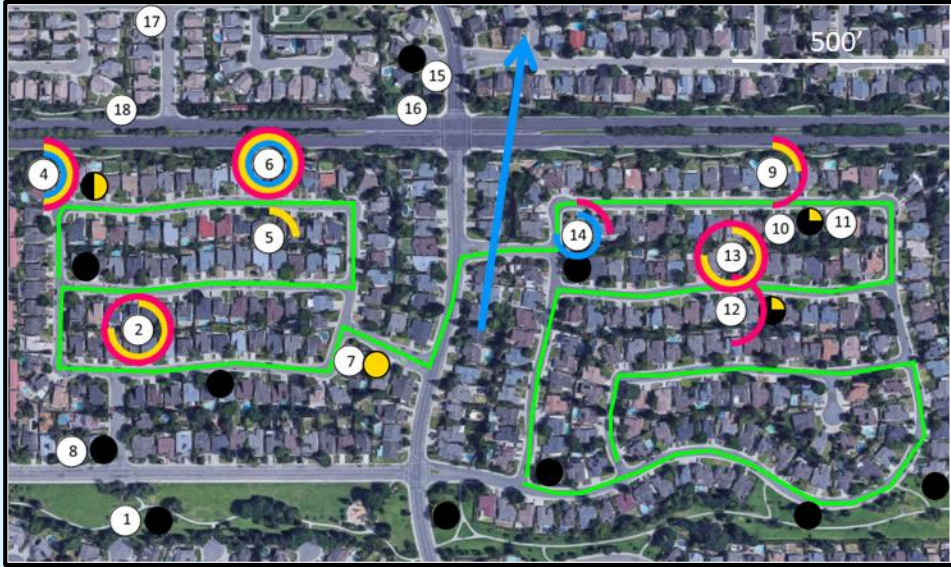
CO₂ and gravid trap data for *Culex pipiens* were combined for each site and mean abundance was calculated across all trapping locations, standard deviation shown





Elk Grove Results

Wind @ less than 1 mph

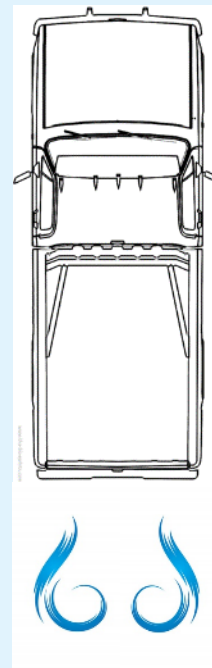
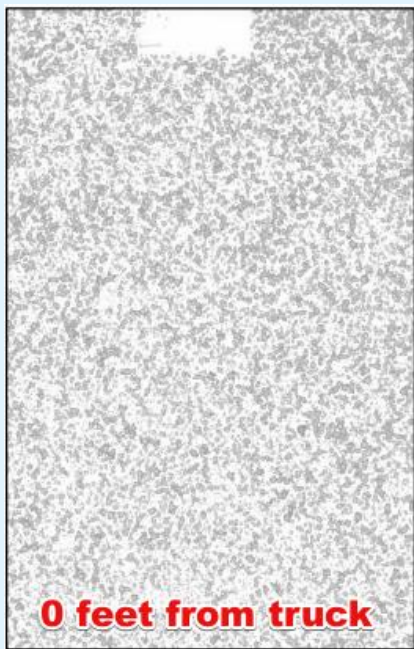


Wind @ 2.5 mph

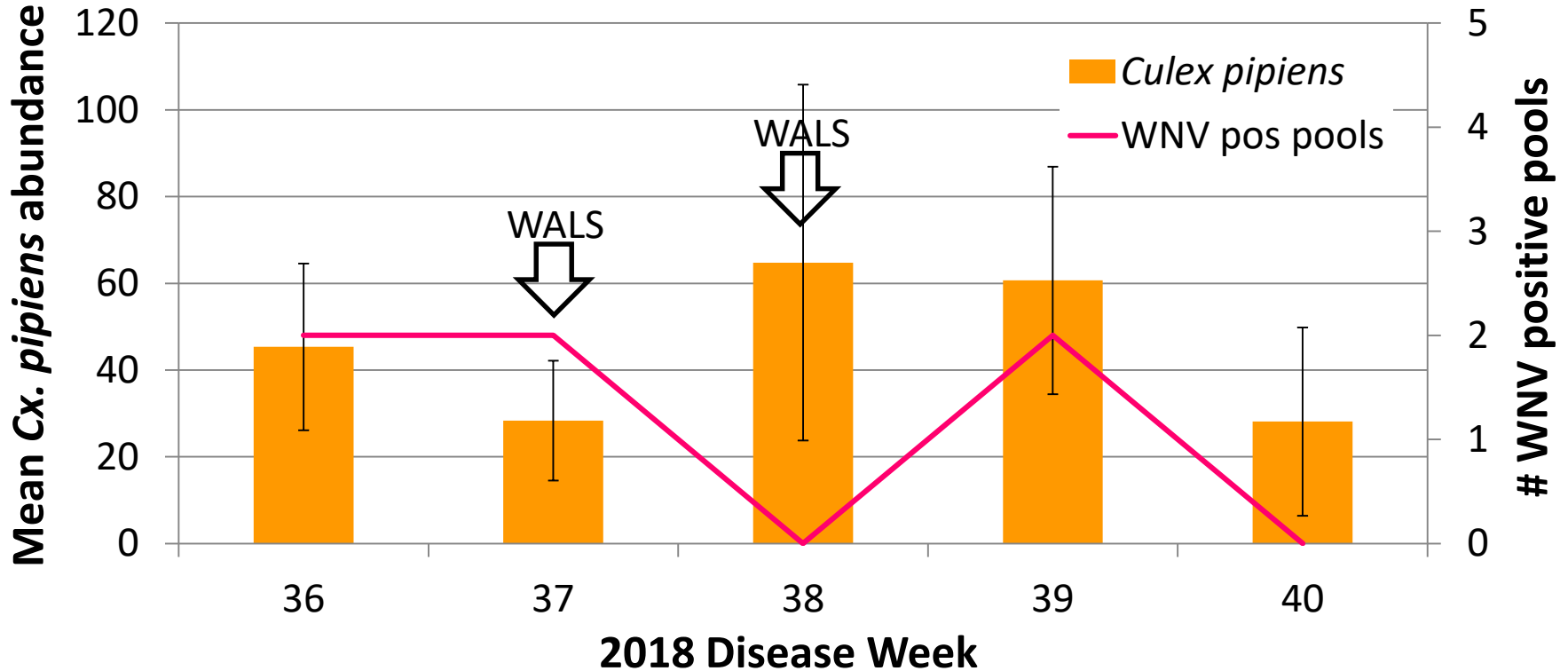


The Need for Wind

No wind
leaves
material
deposits
on the
road



Elk Grove mosquito abundance and WNV activity



Summary of Initial Investigation

- Applications generally resulted in product drifting approximately 300' downwind of the spray path
- Good wind was essential to spread the product
- Product readily drifted into cryptic sites and catch basins.



How do you operationalize

1. What
2. What
3. How

FORMATTED DATE_TIME	Wind Speed
9/12/2018 3:00	2.1
9/12/2018 3:10	1.7
9/12/2018 3:20	1.2
9/12/2018 3:30	0.8
9/12/2018 3:40	3.9
9/12/2018 3:50	3
9/12/2018 4:00	3.4
9/12/2018 4:10	0
9/12/2018 4:20	2.7
9/12/2018 4:30	3.3

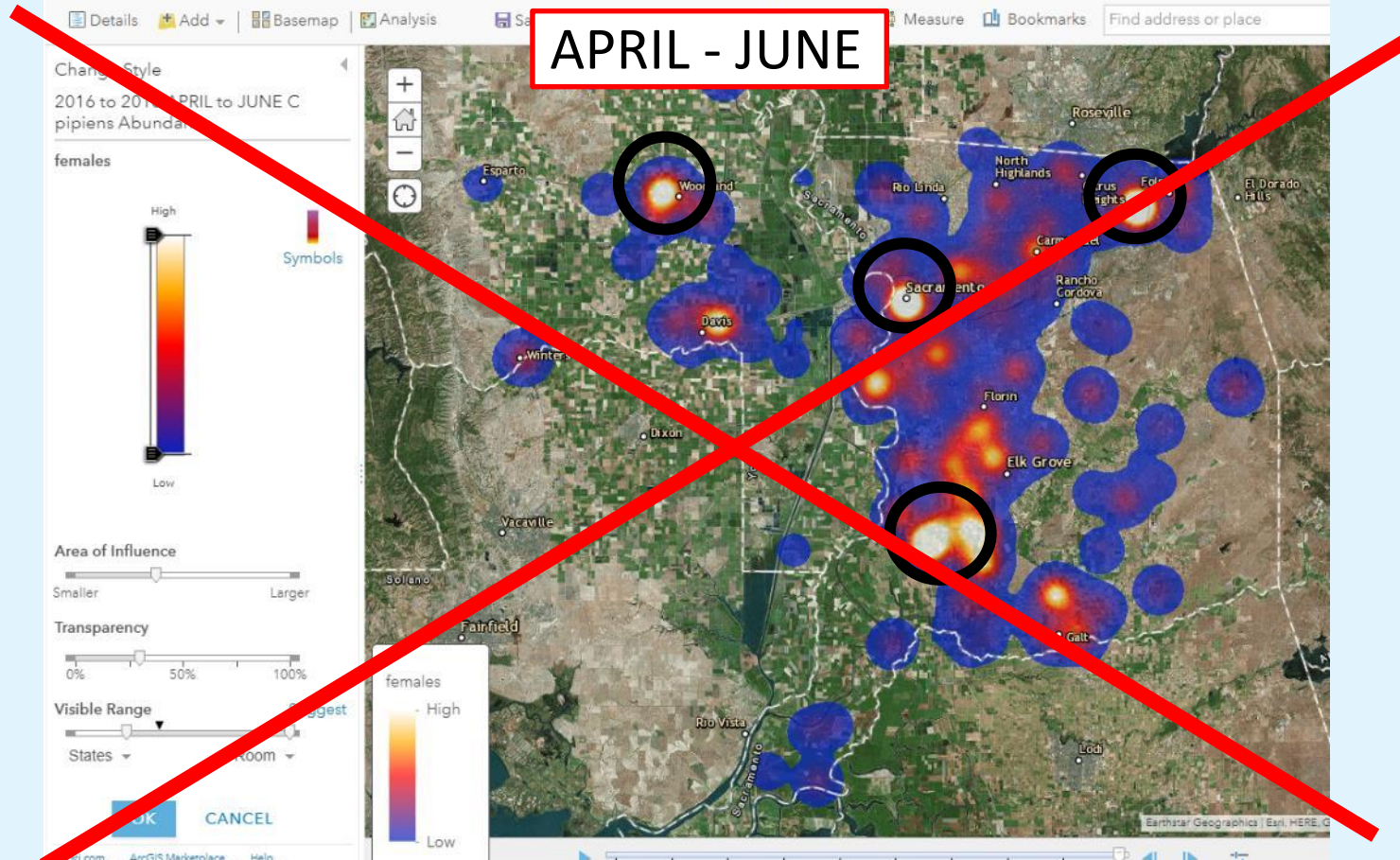


How do you operationalize LVL?

Hard to justify LVL has a response to high WNV prevalence, it just doesn't act fast enough to lower vector index

Can these applications be done proactively to reduce the risk of infection?





APRIL - JUNE



August 28th, 2019 3:15pm



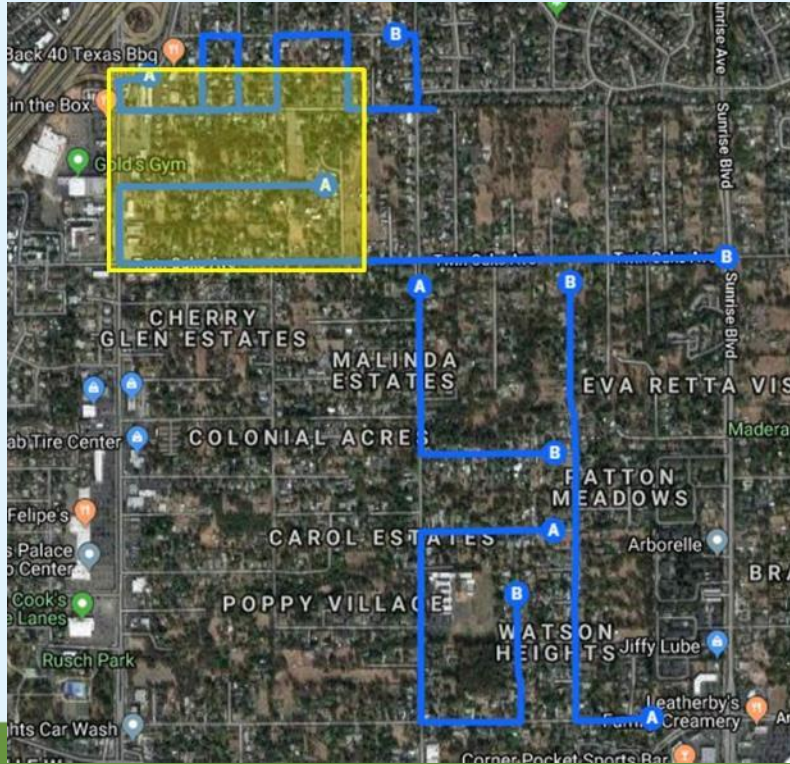
SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

Enter *Aedes aegypti*

www.FIGHTtheBITE.net



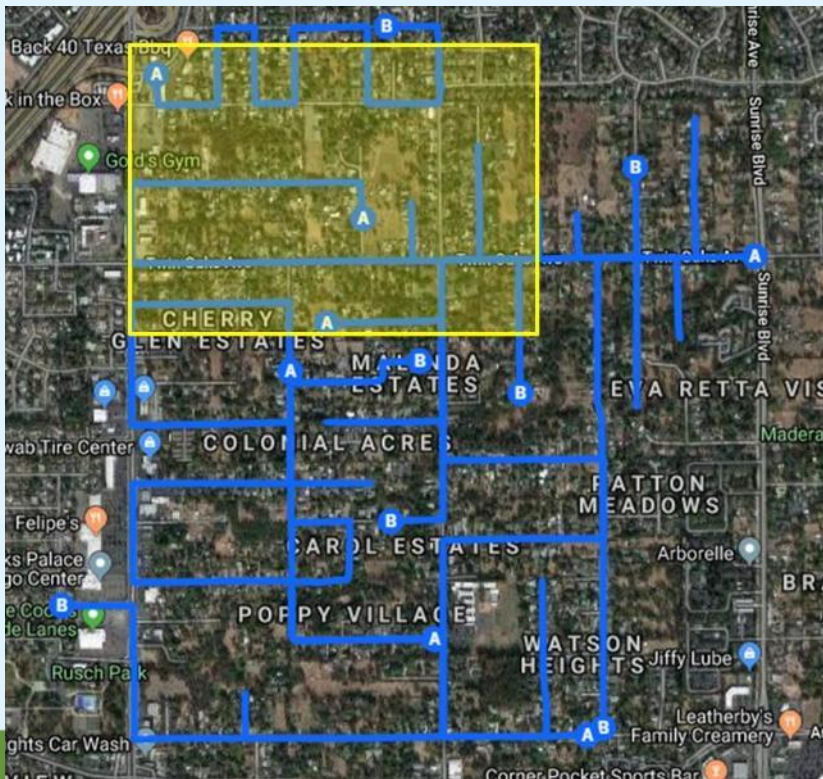
Inspection and Treatment Strategy



- Day 2 LVL with WDG
- 260 acres Treated



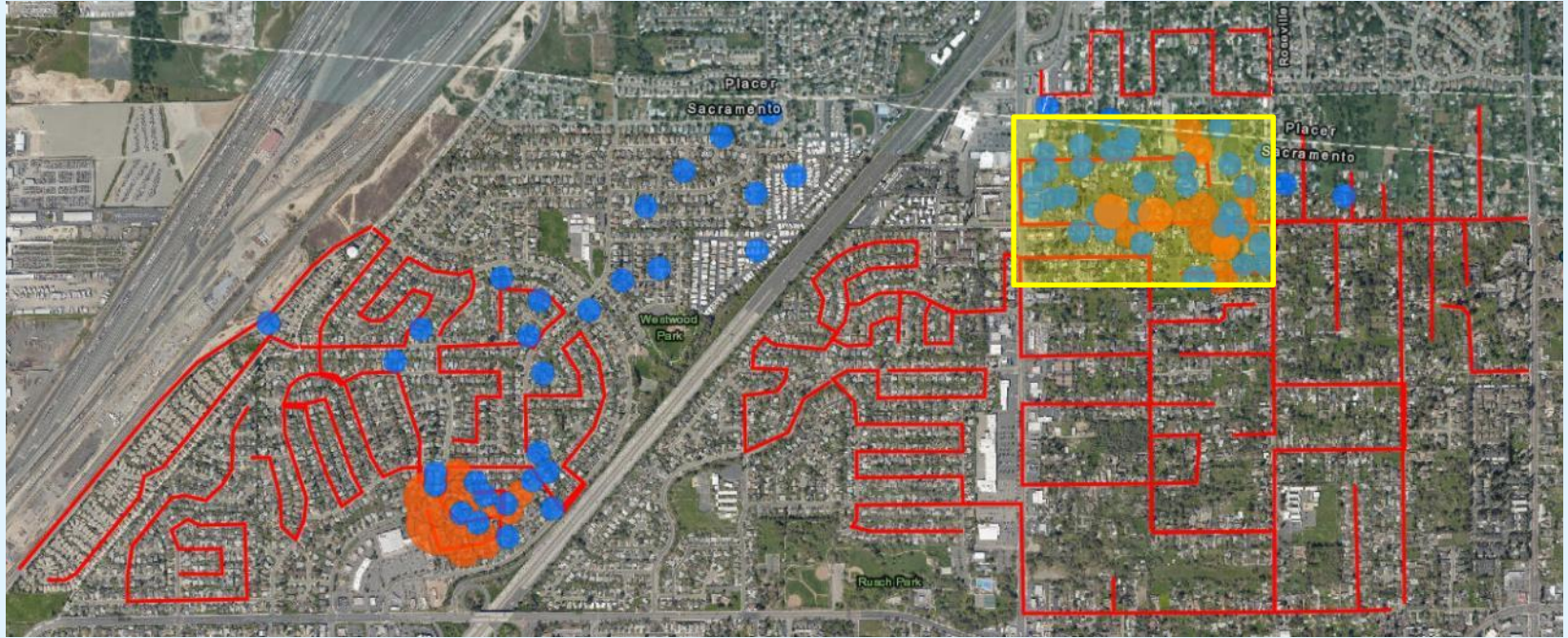
Inspection and Treatment Strategy



- Day 6 LVL and ULV
- Expanded treatment area
- 333 acres Treated



Expanded LVL Routes



How do you make this efficient?



How do you make this efficient?

- Streamlining the refill process
- Better routing features
- Improvements to the A1
- Material Cost



Refilling in the field



15 minutes to refill



Routing and Weather



App Store Preview

This app is available only on the App Store for iPhone and iPad.



inRoute Route Planner 4+

Routing & Road Trip Planning

Carob Apps, LLC

#116 in Navigation

★★★★★ 4.6, 3.3K Ratings

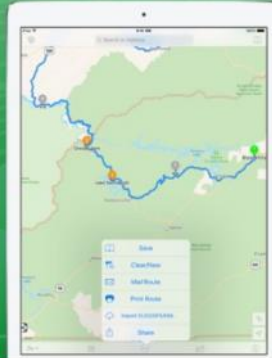
Free · Offers In-App Purchases

Screenshots iPhone iPad

PLAN & NAVIGATE
Handsfree navigation of
optimized or custom routes



SAVE, SHARE, IMPORT
iCloud sync, import XLSX/GPX,
export to GPX and apps



VOICE NAVIGATION with severe
weather alerts for safe travels
(US, CAN, EU alerts)



Routing and Weather



Create Waypoints
Within InRoute App



Start



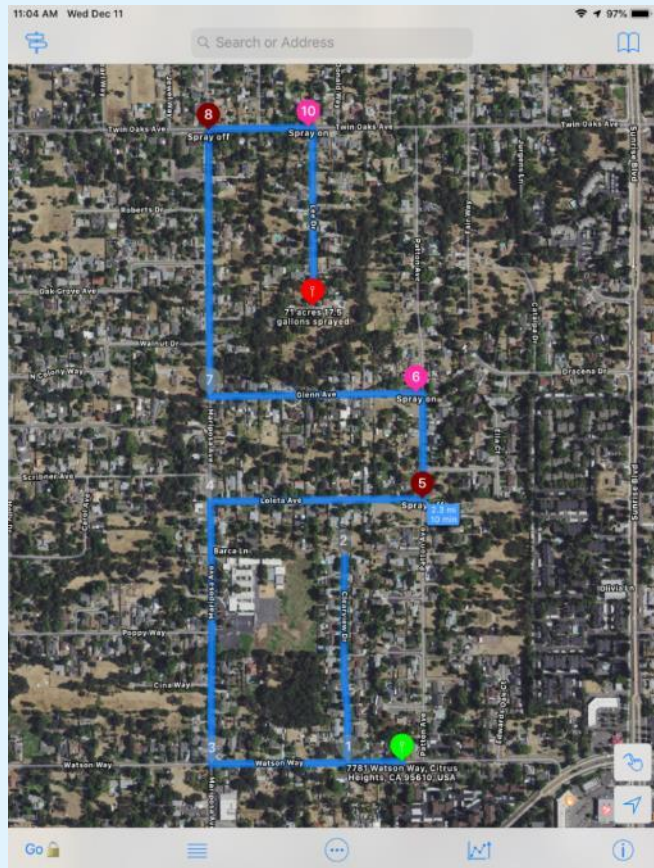
End



Spray off

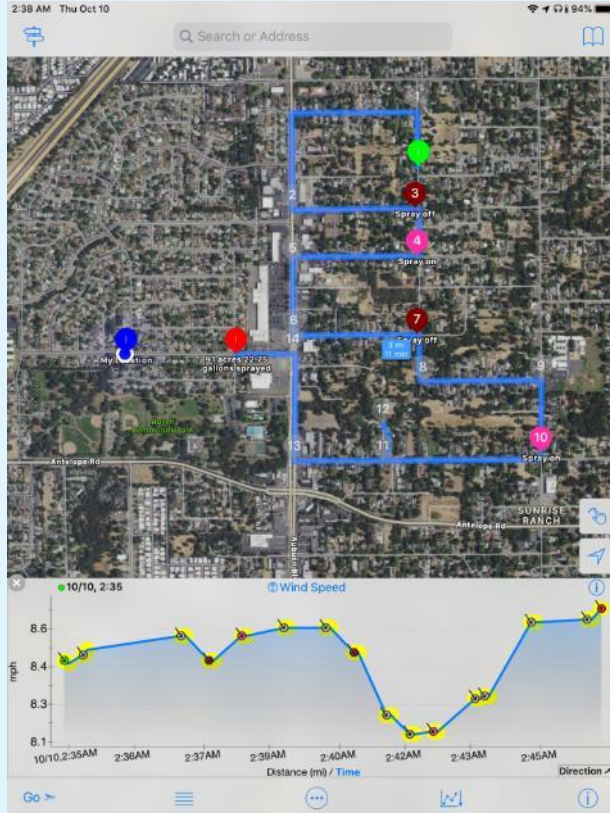


Spray on

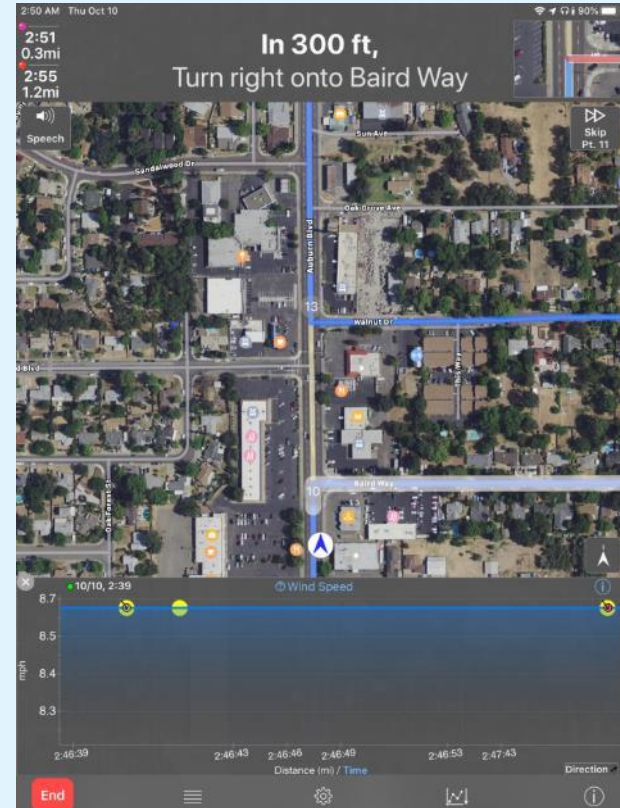


Routing and Weather

Before Application



During Application



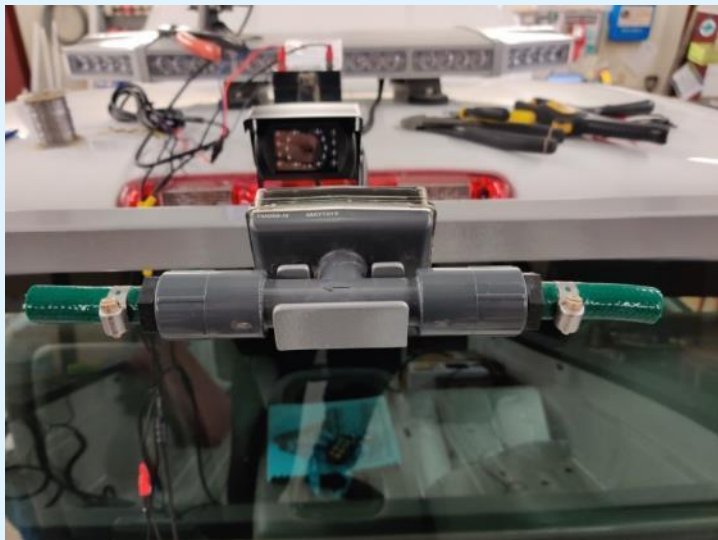
A1 Improvements

Original
calibration
point

New
calibration
point



A1 Improvements



A1 Improvements



Pressure Regulator



Motorized Bypass Valve

Flowrate Adjustments



A1 Improvements



A1 Improvements



Citrus Heights WALS Routes and Study Sites

A – Grand Oaks
Neighborhood

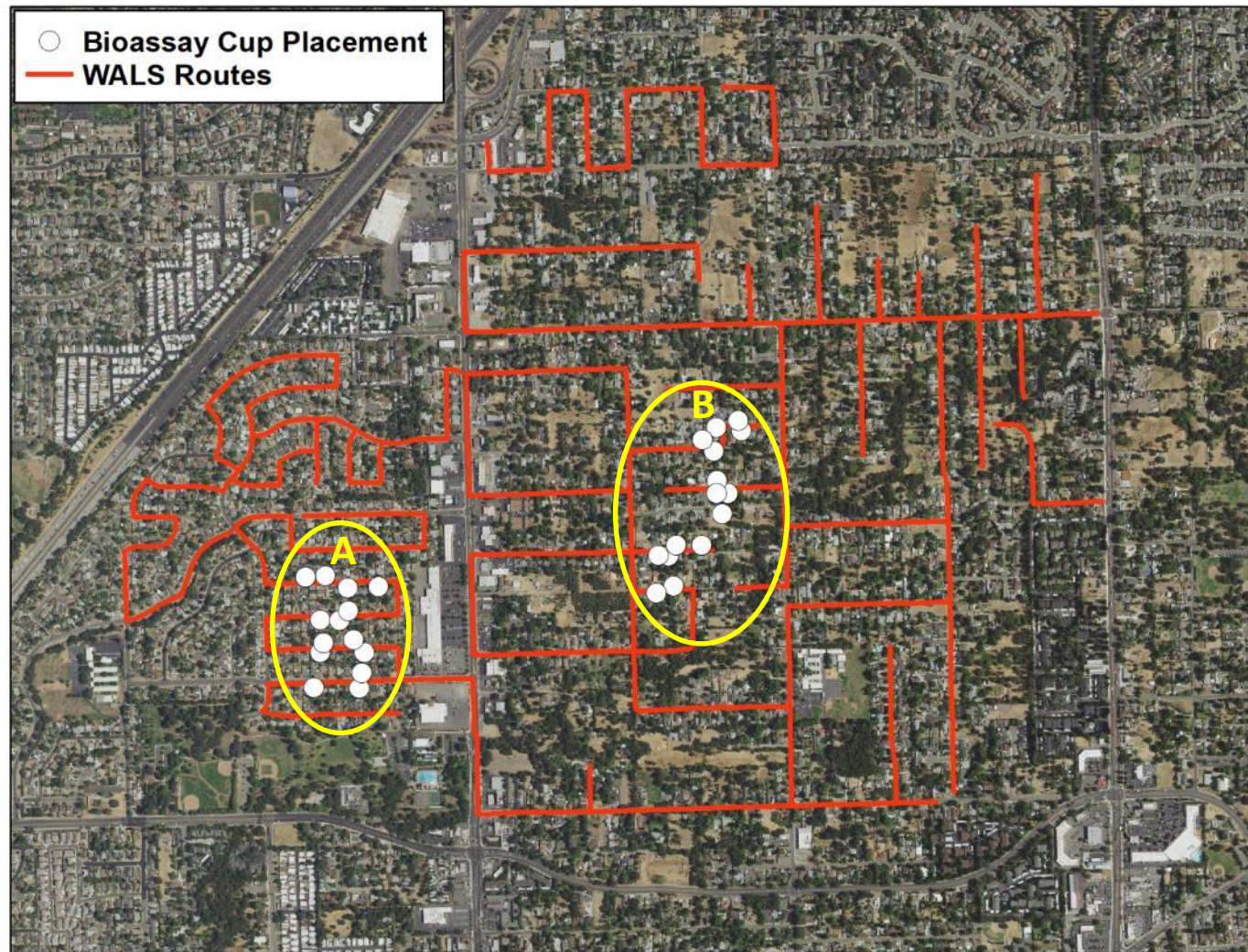
0.25 lb/acre - 9/24/2019

0.50 lb/acre - 9/27/19

B- Colonial Acres
Neighborhood

0.50 lb/acre - 9/24/2019

0.25 lb/acre - 9/27/19




Grand Oaks, Citrus Heights, CA

Aedes aegypti 


Culex pipiens 

Truck Route: 

Wind Direction: 


Bioassay larval mortality

0%: 

25% - <50%: 

50% - <75%: 

75% - <100%: 

100%: 

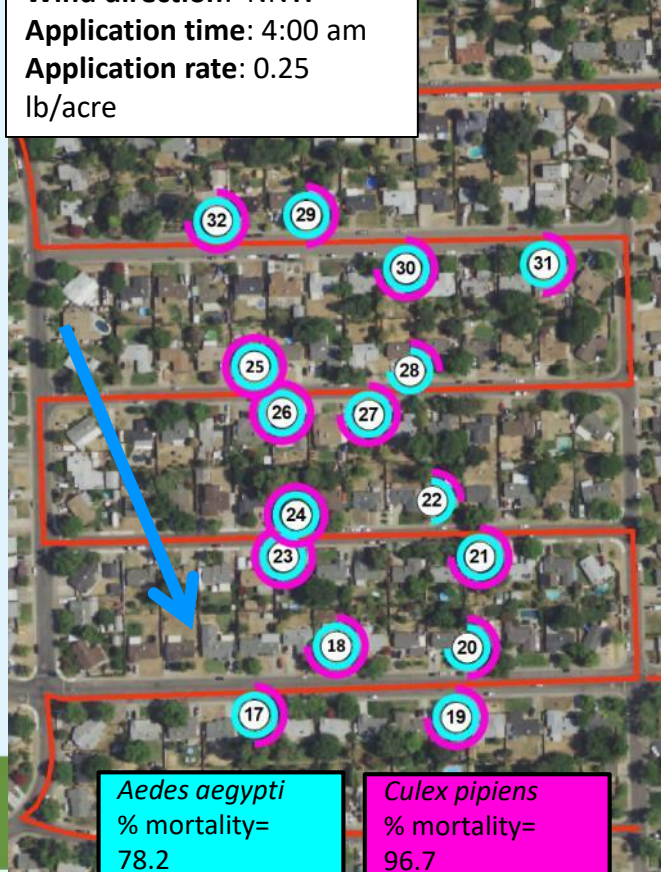
September 24, 2019

Wind speed: 10-12 mph

Wind direction: NNW

Application time: 4:00 am

Application rate: 0.25
lb/acre



Aedes aegypti
% mortality=
78.2

Culex pipiens
% mortality=
96.7

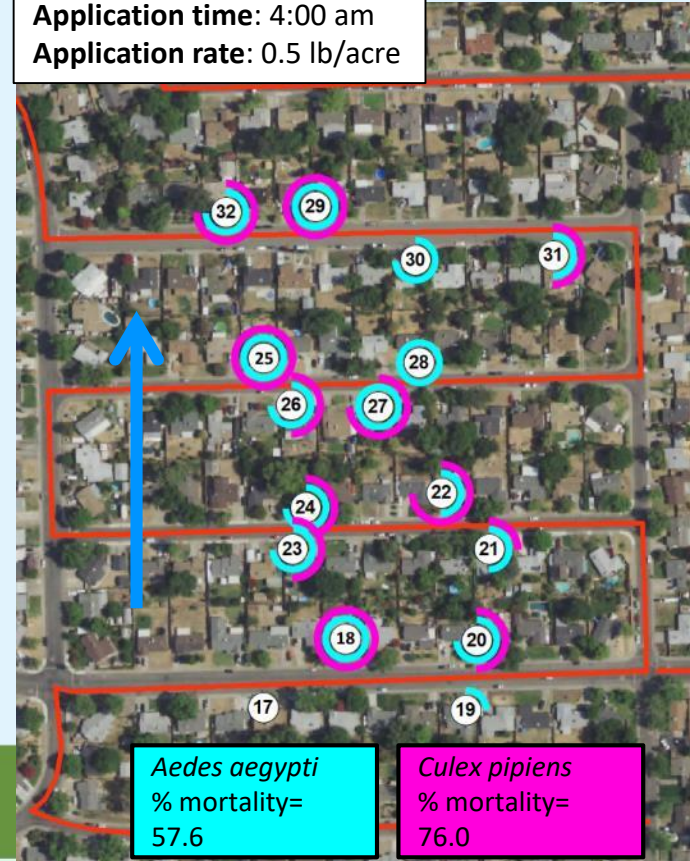
September 27, 2019

Wind speed: 10-15 mph

Wind direction: S

Application time: 4:00 am

Application rate: 0.5 lb/acre

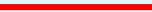








Aedes aegypti
% mortality=
57.6

Culex pipiens
% mortality=
76.0

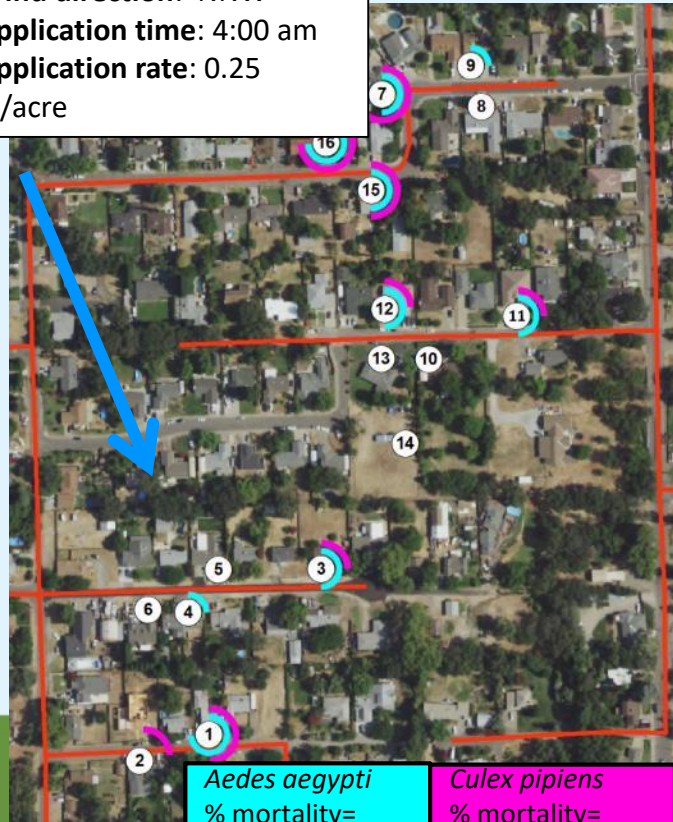
Colonial Acres, Citrus Heights, CA

Aedes aegypti 
Culex pipiens 

Truck Route: 
 Wind Direction: 

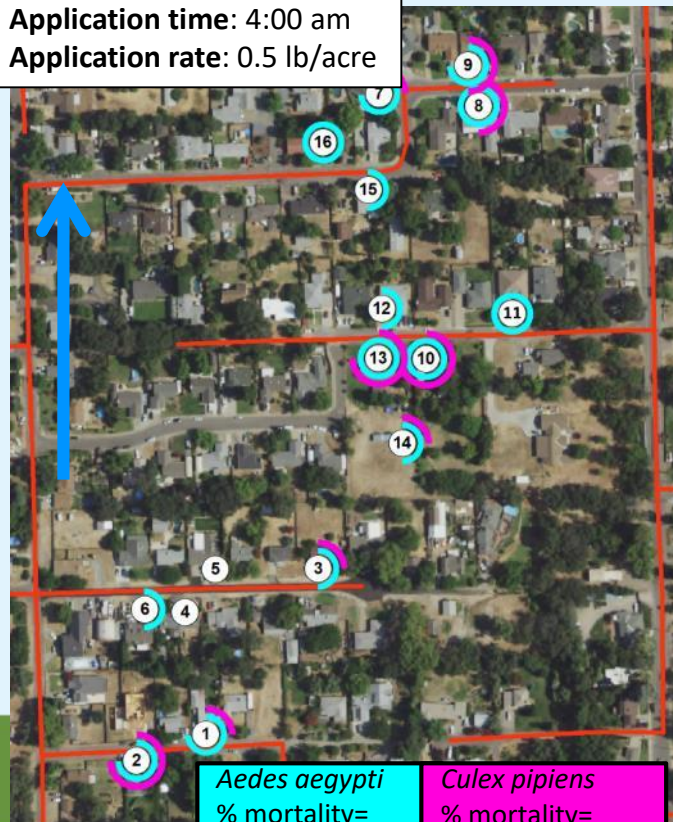
Bioassay larval mortality
 0%: 
 25% - <50%: 
 50% - <75%: 
 75% - <100%: 
 100%: 

September 27, 2019
 Wind speed: 10-12 mph
 Wind direction: NNW
 Application time: 4:00 am
 Application rate: 0.25
 lb/acre



<i>Aedes aegypti</i> % mortality= 30.0	<i>Culex pipiens</i> % mortality= 43.0
--	--

September 24, 2019
 Wind speed: 10-15 mph
 Wind direction: S
 Application time: 4:00 am
 Application rate: 0.5 lb/acre



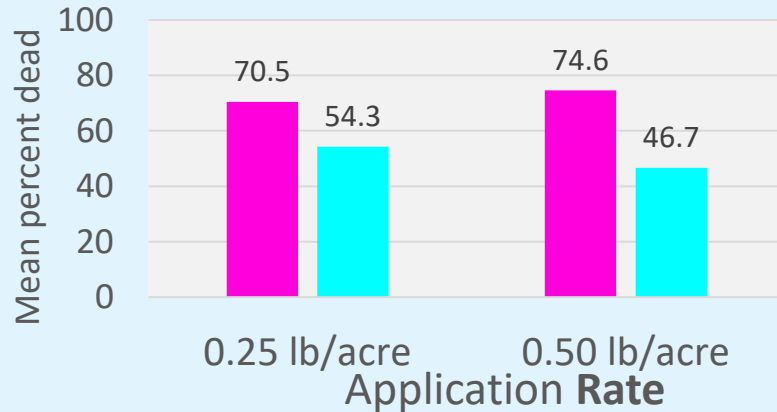
<i>Aedes aegypti</i> % mortality= 36.0	<i>Culex pipiens</i> % mortality= 76.0
--	--

Dose Optimization

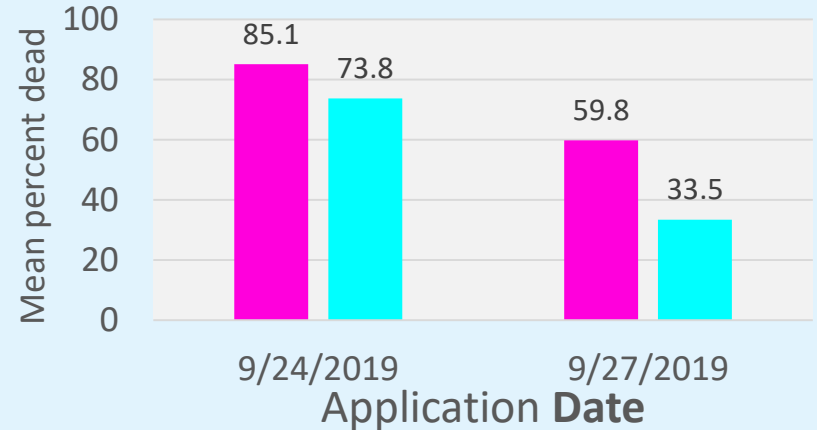
Aedes aegypti 

Culex pipiens 

Mean larval mortality by application rate



Mean larval mortality by application date



Larval bioassay data was combined across placement types, application date, and location and was compared by application rate

Larval bioassay data was combined across placement types, application rates, and locations and compared by application date



Conclusion

- With the proper wind, the use of VectoBac WDG is a good tool to get to backyard sources
- The A1 Super Duty was found to slightly outcompete the Guardian
- The District is optimizing the use of the A1 to meet operational realities
- Dose matters, not as much as wind
- Based on work done at other agencies, we are looking at doing similar applications with different products

