Brief Summary of Zika Response and Area-Wide Larviciding Program in Miami Dade County

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Miami Dade County Mosquito Control Division

Chronology of Events

- First travel-related case reported --12/23/15
- International Health Emergency --WHO 02/01/16
- Florida State of health emergency -- 02/03/16
- First locally transmitted case -- 6/15/16
- First case in Wynwood -- 6/30/16
- Cluster of cases identified in Wynwood-- 7/21/16
- Miami Beach (South Beach) cluster identified-- 8/16/16
- Miami Beach cluster expanded MB North-- 9/16/16
- Little River cluster identified --10/13/16

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Number of Zika Cases in Florida and Miami Dade County in 2016

- **Florida**
  - Confirmed travel related cases – 1,065
  - Confirmed locally acquired cases – 272
- **Miami-Dade County**
  - Travel related cases – 330
  - Locally acquired cases – 246
  - Wynwood – 33 cases
  - Miami Beach – 75 cases (8 positive mosquito pools)
  - Little River – 9 cases

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Public Education Campaign

- Many County agencies were activated and trained
- All municipalities participated
- EOC was activated

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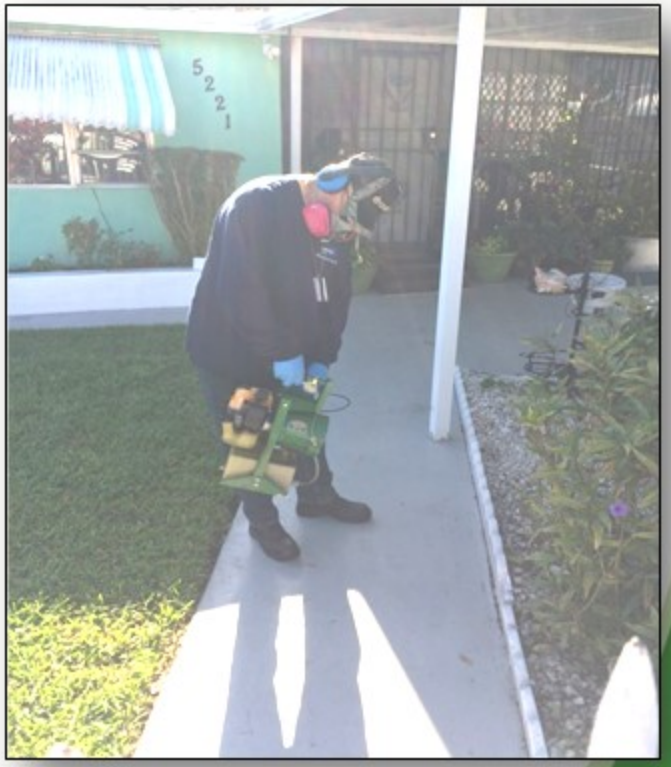
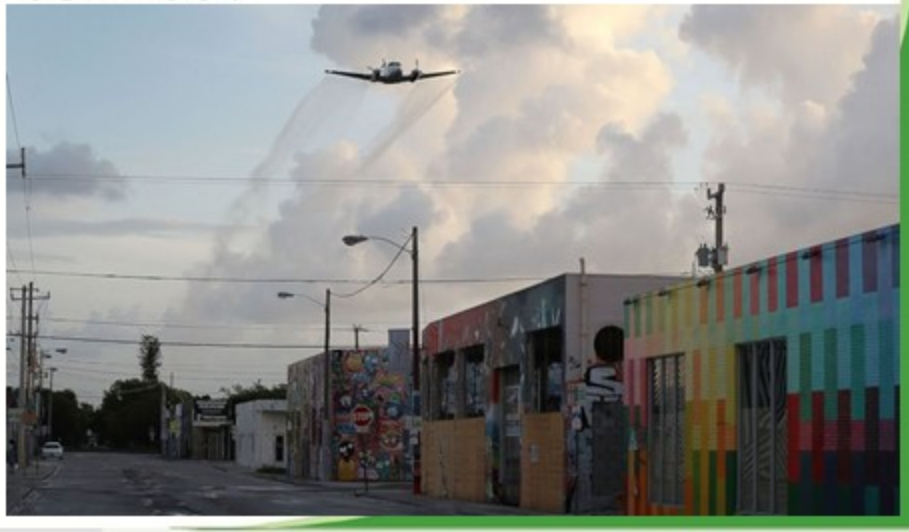
Initial Response

- FDOH referred cases
  - 1/8 of mile radius of the case
  - Source reduction
  - Larviciding manually
  - Barrier treatments
  - Portable sprayers
    - Larviciding and adulticiding
  - Truck ULV adulticiding
  - Door hangers

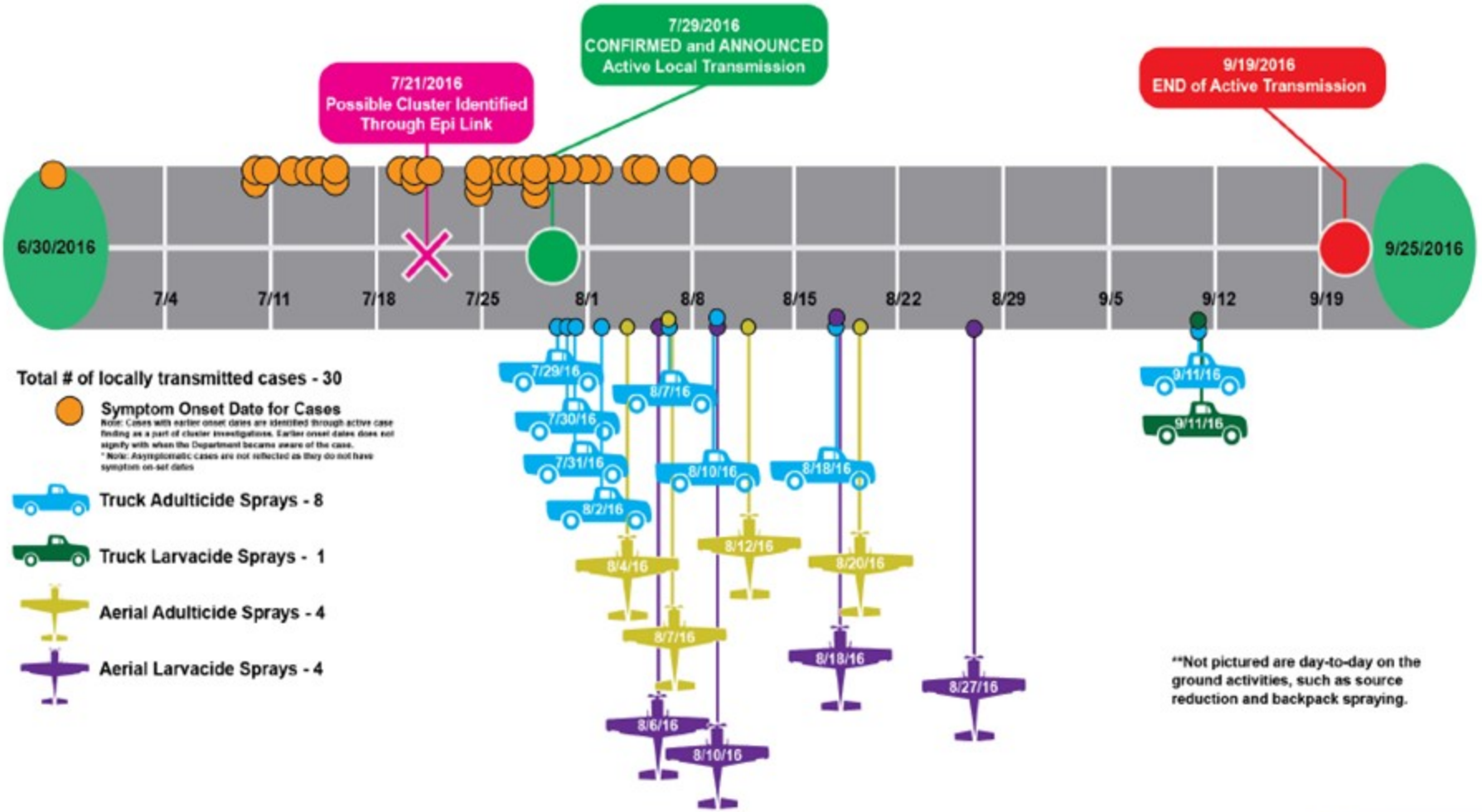


Aerial Applications

- No previous *Ae. aegypti* aerial program
- Floodwater species controlled for almost four decades
- Naled – 0.1 lb./acre (1 oz./acre)
  - Applications before dawn
- Bti – Vectobac WDG – 0.5 lb. per acre
  - Applications made after sunrise.



Wynwood Zika Activities Timeline



**Not pictured are day-to-day on the ground activities, such as source reduction and backpack spraying.

Source: Floridahealth.gov/zika

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OPEN ACCESS Freely available online

PLOS ONE

Area-Wide Ground Applications of *Bacillus thuringiensis* var. *israelensis* for the Control of *Aedes albopictus* in Residential Neighborhoods: From Optimization to Operation

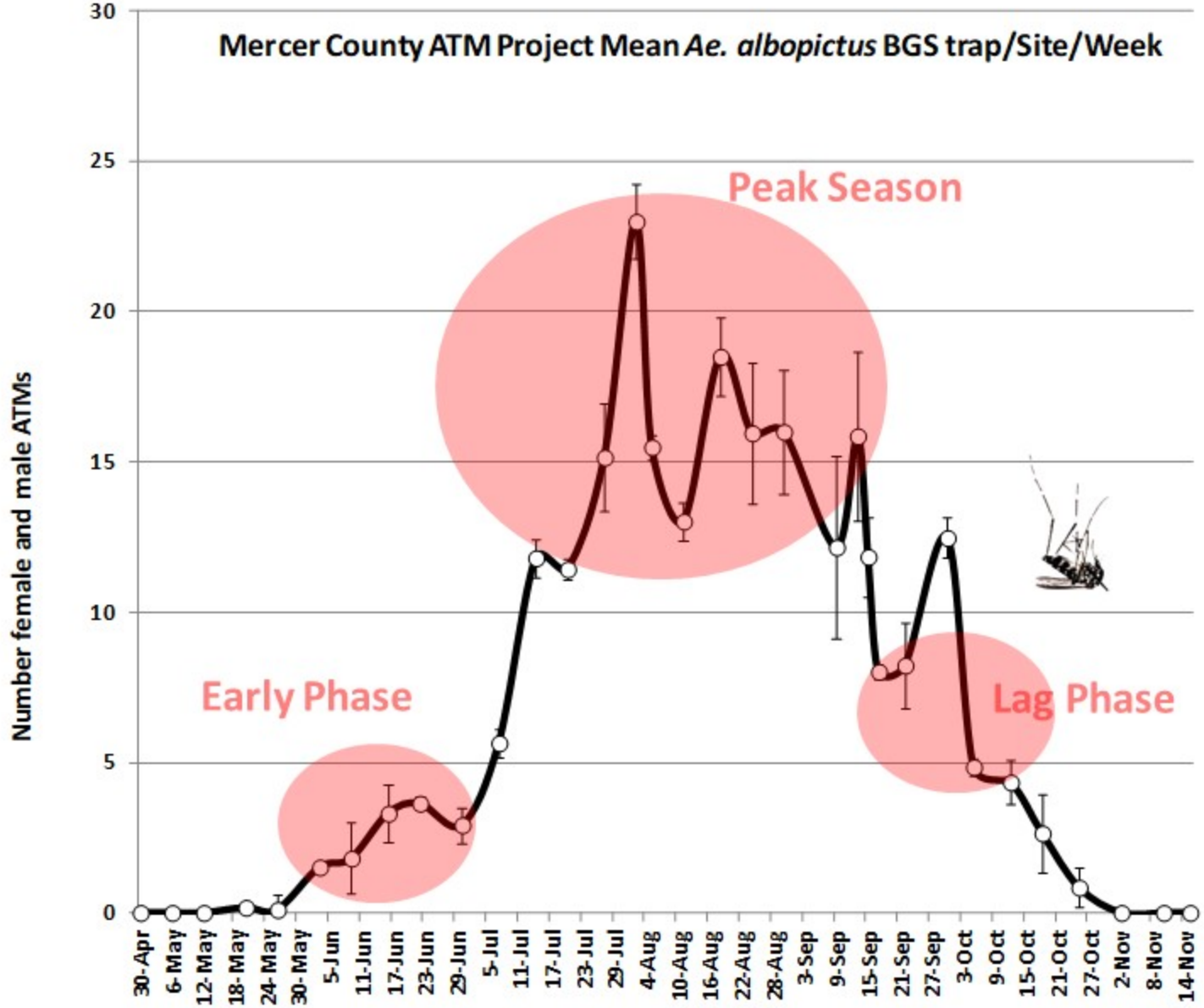
Gregory M. Williams[1,2*], Ary Faraji[2,3], Isik Unlu[2,4], Sean P. Healy[2,5], Muhammad Farooq[6], Randy Gaugler[2], George Hamilton[2], Dina M. Fonseca[2]

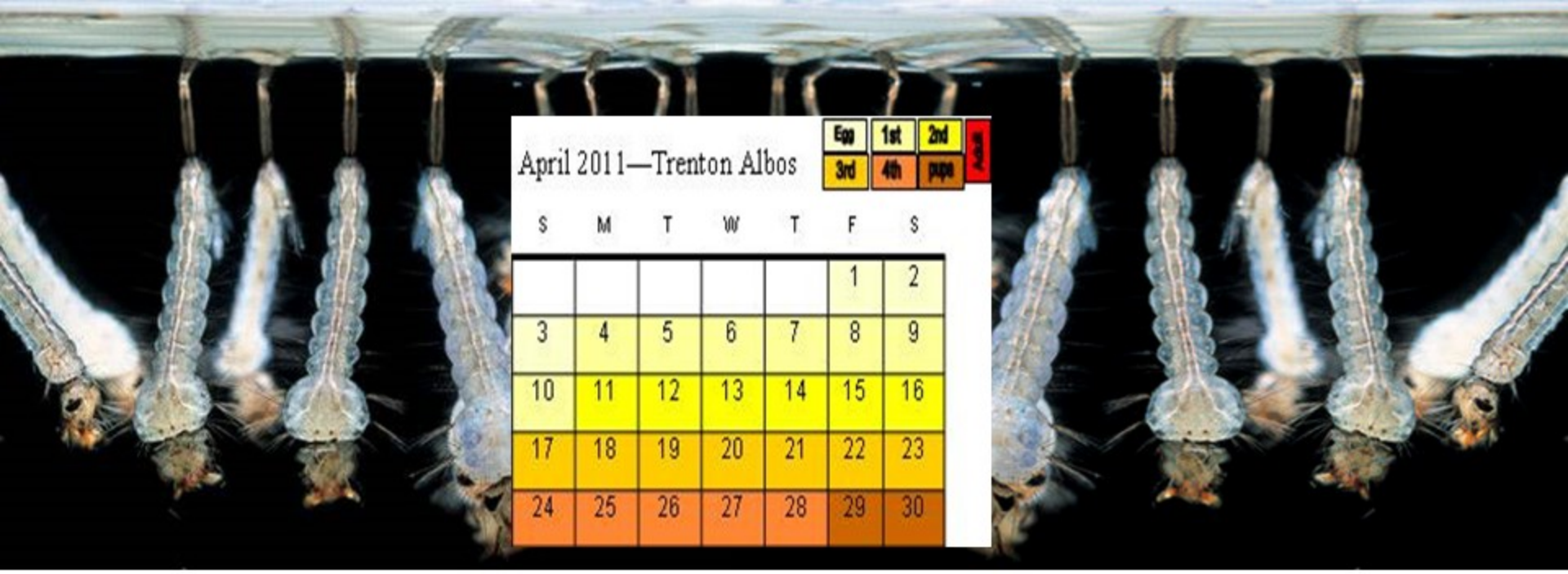
1 Hudson Regional Health Commission, Secaucus, New Jersey, United States of America, **2** Center for Vector Biology, Rutgers University, New Brunswick, New Jersey, United States of America, **3** Salt Lake City Mosquito Abatement District, Salt Lake City, Utah, United States of America, **4** Mercer County Mosquito Control, West Trenton, New Jersey, United States of America, **5** Department of Pathobiological Sciences, Louisiana State University School of Veterinary Medicine, Baton Rouge, Louisiana, United States of America, **6** Navy Entomology Center of Excellence, Jacksonville, Florida, United States of America

Abstract

The increasing range of *Aedes albopictus*, the Asian tiger mosquito, in the USA and the threat of chikungunya and dengue outbreaks vectored by this species have necessitated novel approaches to control this peridomestic mosquito. Conventional methods such as adulticiding provide temporary relief, but fail to manage this pest on a sustained basis. We explored the use of cold aerosol foggers and misting machines for area-wide applications of *Bacillus thuringiensis* var. *israelensis* (VectoBac WDG) as a larvicide targeting *Aedes albopictus*. During 2010–2013 we performed initially open field

2008-2011 Combined

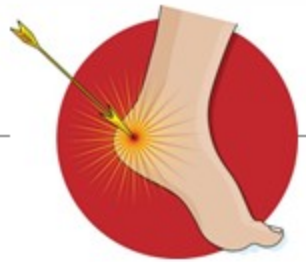



April 2011—Trenton Albos
Egg
1st
2nd
3rd
4th
pupa
Adult
S M T W T F S
1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30


11 April 2011 (2nd instars)


14 April 2011 (2nd instars)

BGS Trap Data 2008-2011



Mean # *Ae. albopictus* (male+female)

80
70
60
50
40
30
20
10
0

Date	30-Apr	5-May	14-May	21-May	26-May	3-Jun	8-Jun	19-Jun	26-Jun	1-Jul	8-Jul	16-Jul	23-Jul	27-Jul	4-Aug	8-Aug	11-Aug	18-Aug	21-Aug	27-Aug	2-Sep	9-Sep	16-Sep	22-Sep	30-Sep	8-Oct	13-Oct	21-Oct	27-Oct	6-Nov	14-Nov
Week	17	18	19	20	21	22	21	22	23	24	25	26	27	28	29	30	31	32	32	33	33	34	35	37	38	39	39	40	41	42	43

Research Article

Received: 30 April 2018 Revised: 20 August 2018 Accepted article published: 2 October 2018 Published online in Wiley Online Library:

(wileyonlinelibrary.com) DOI 10.1002/ps.5227

Truck-mounted area-wide applications of larvicides and adulticides for extended suppression of adult *Aedes albopictus*

Isik Unlu,[a,b*] Ary Faraji,[a,c] Gregory M Williams,[a,d] Sebastien Marcombe,[a,e] Dina M Fonseca[a] and Randy Gaugler[a]

Abstract

BACKGROUND: Given the lack of vaccines for most vector-borne diseases, vector control is often the primary option for disease control. *Aedes albopictus* are difficult to control because the immatures primarily develop in containers ubiquitous in residential properties. Conventional adulticide campaigns often result in brief, rebounding population declines, so incorporating new techniques into an integrated pest management program is imperative. We performed combined area-wide applications of the larvicides *Bacillus thuringiensis* var. *israelensis* and pyriproxyfen with the adulticide sumithrin and prallethrin to achieve extended suppression of *Ae. albopictus* populations in Trenton, NJ, USA. We deployed bioassay cups to assess the spatial penetration and efficacy of the applications.

RESULTS: Inhibition of adult emergence was significantly higher in the treatment bioassay cups than in laboratory controls ($z = 4.65$, $P < 0.0001$) and field control bioassay cups ($z = 8.93$, $P < 0.0001$). We observed a lower trend in adult numbers following season-long combined application of pyriproxyfen and adulticide, with numbers of adult *Ae. albopictus* at the treatment site up to five times lower than at the control site.

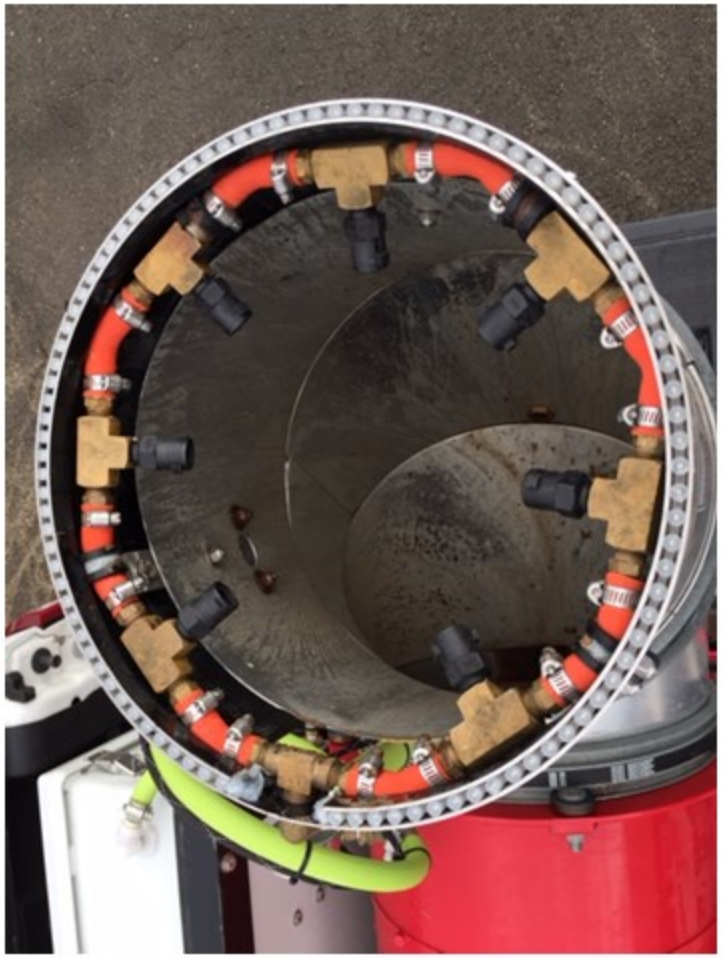
CONCLUSION: Pyriproxyfen is a powerful mosquito larvicide and pupacide with low mammalian toxicity that shows promise

Buffalo Turbine – Larvicide Machine

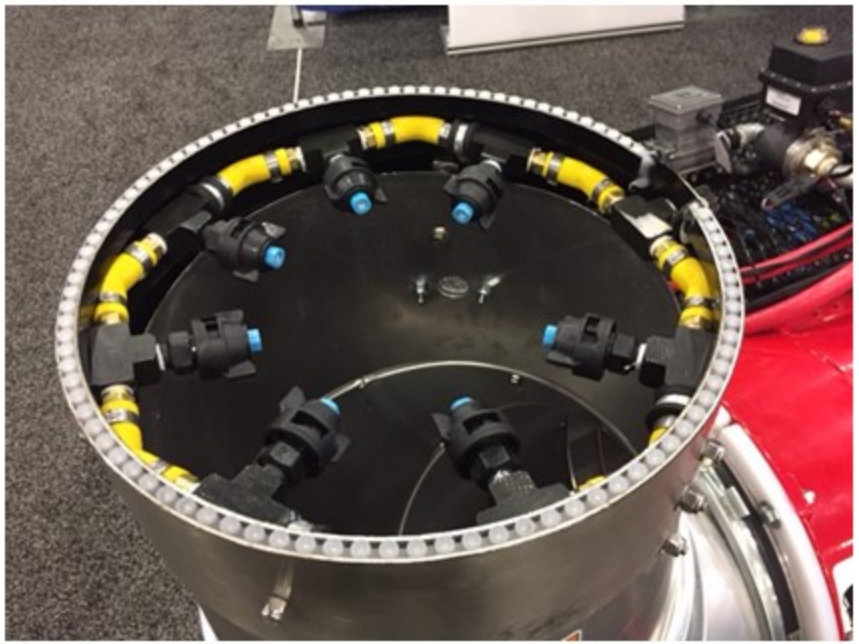
Original Turbine Field Test

Stock Nozzle Configuration

Buffalo Turbine – Larvicide Machine

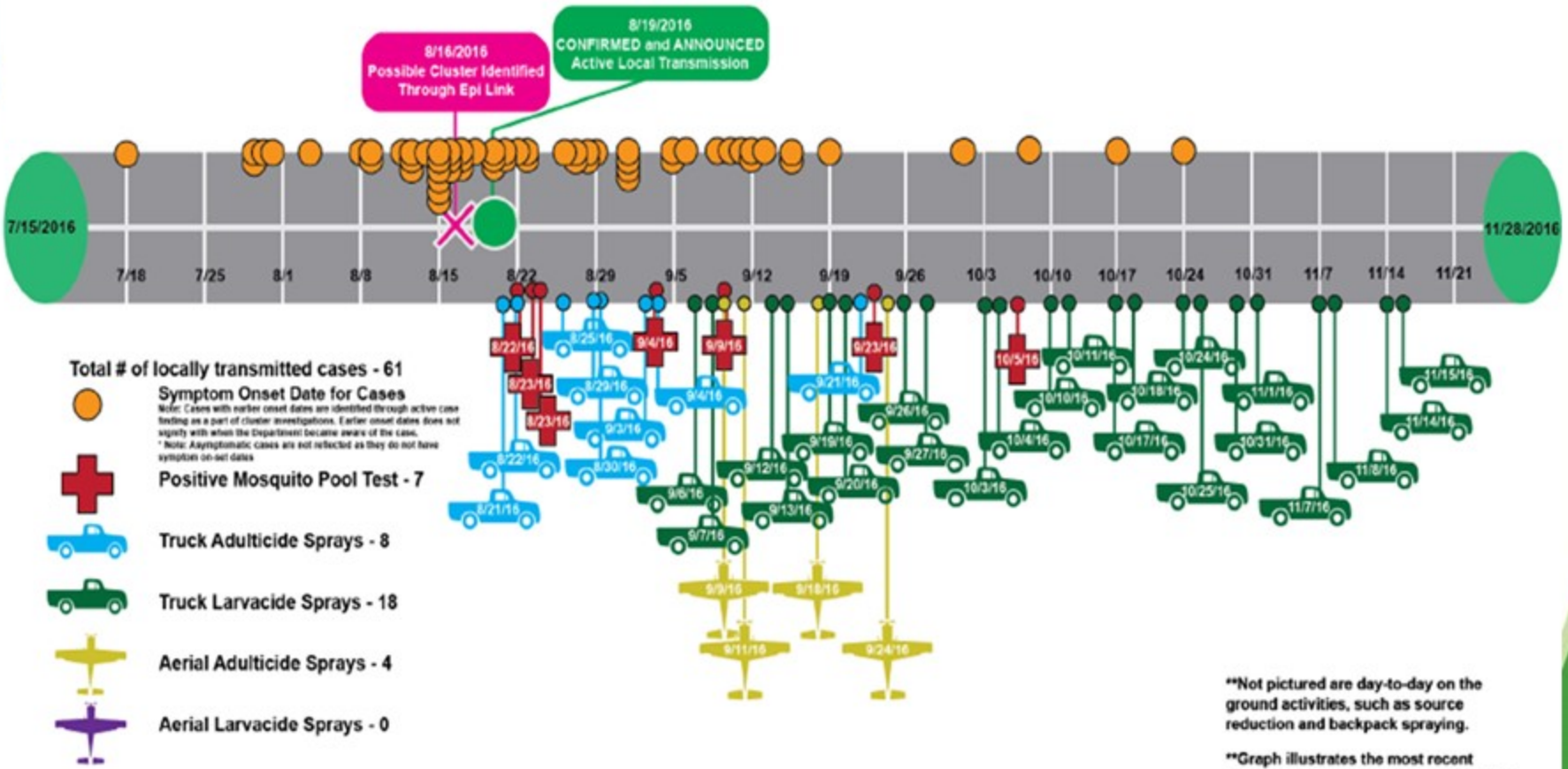


Prototype Nozzle Configuration



Commercial Nozzle Configuration

South Miami Beach Zika Activities Timeline as of November 23, 2016



**Not pictured are day-to-day on the ground activities, such as source reduction and backpack spraying.

**Graph illustrates the most recent information received detailing mosquito control efforts in Miami Beach.

Source: Floridahealth.gov/zika

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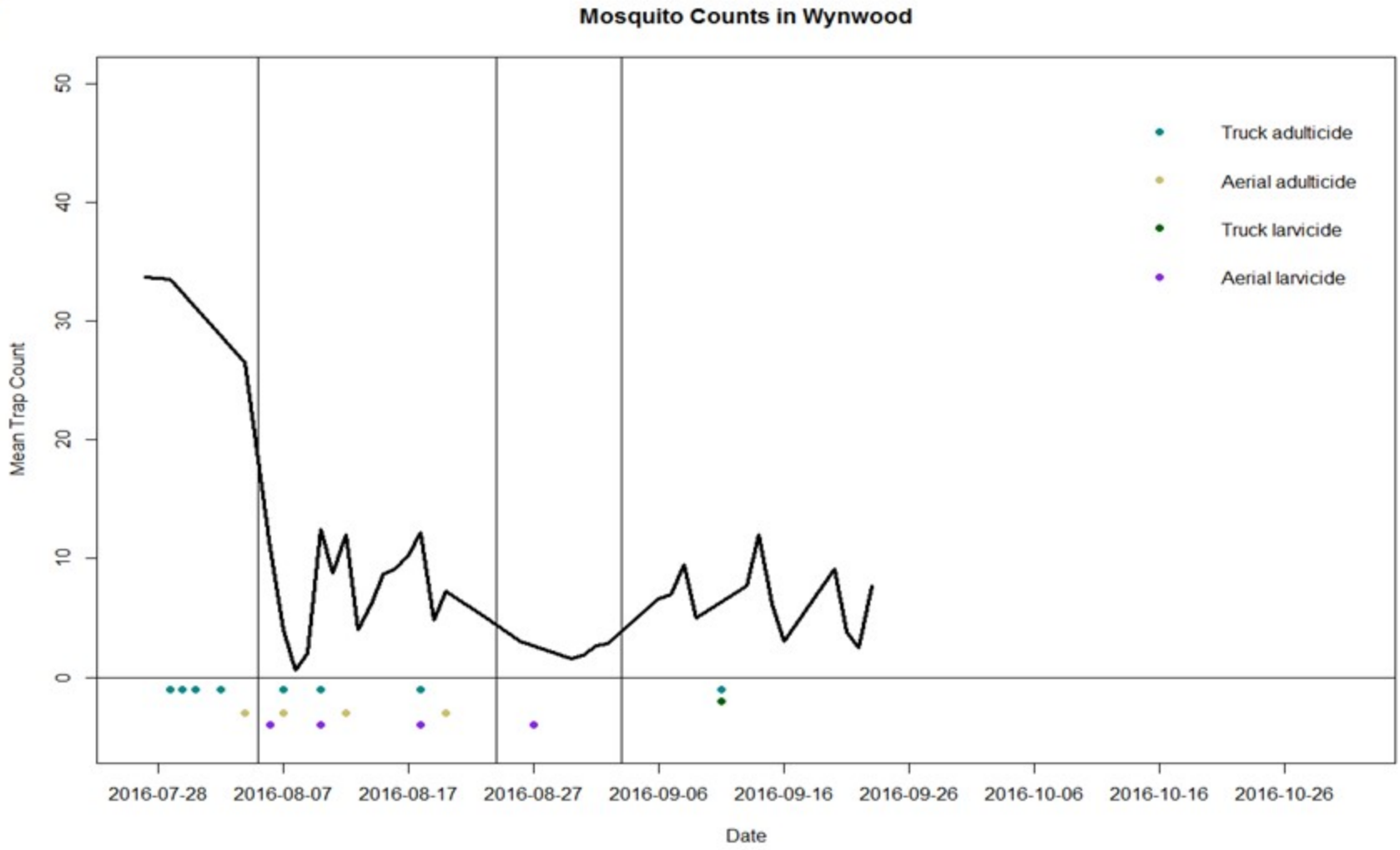
Timeline for control measures and mean Ae. aegypti populations in Wynwood



Consider Your Best Option

Larvicide Truck

VS

Aerial Application

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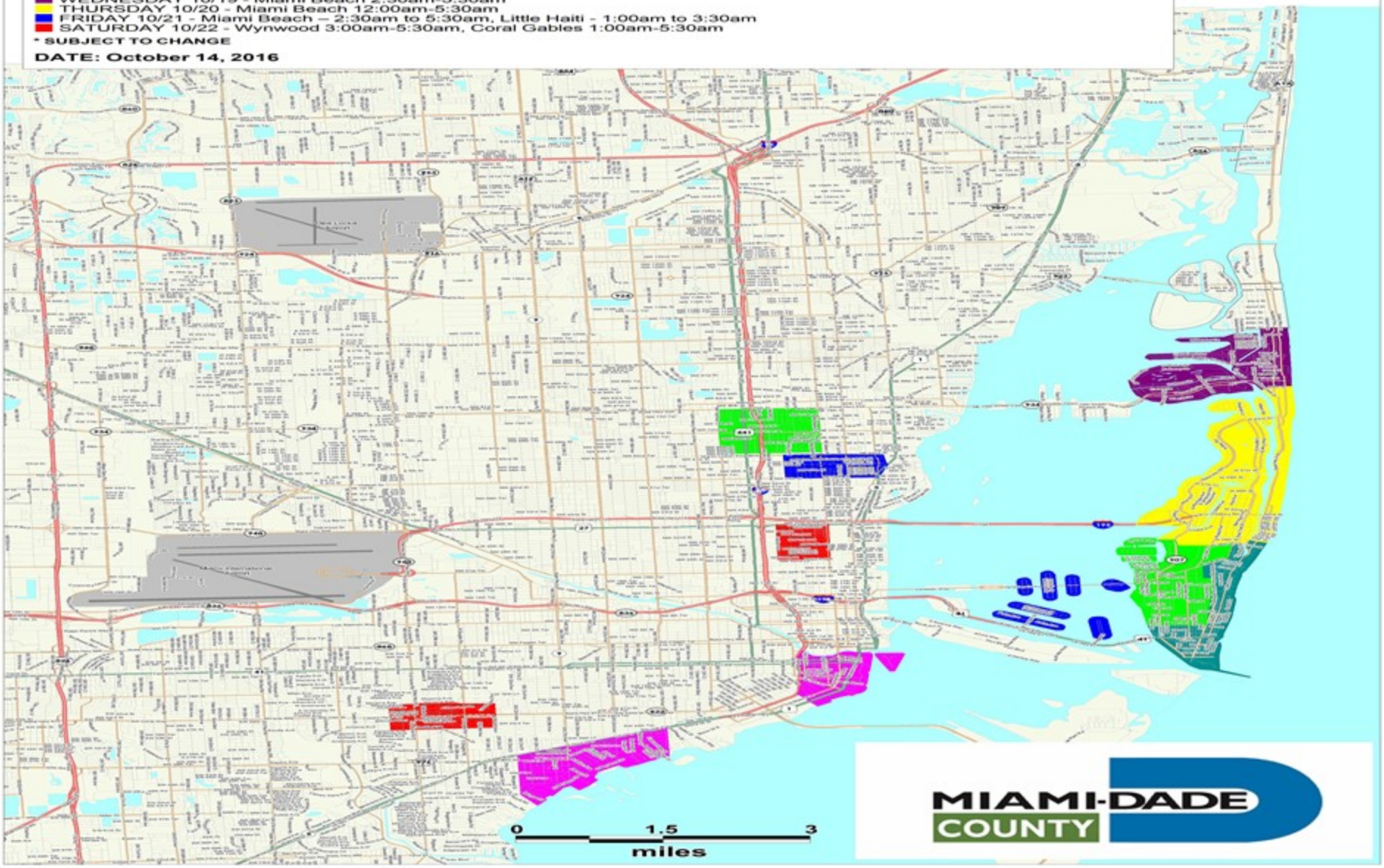
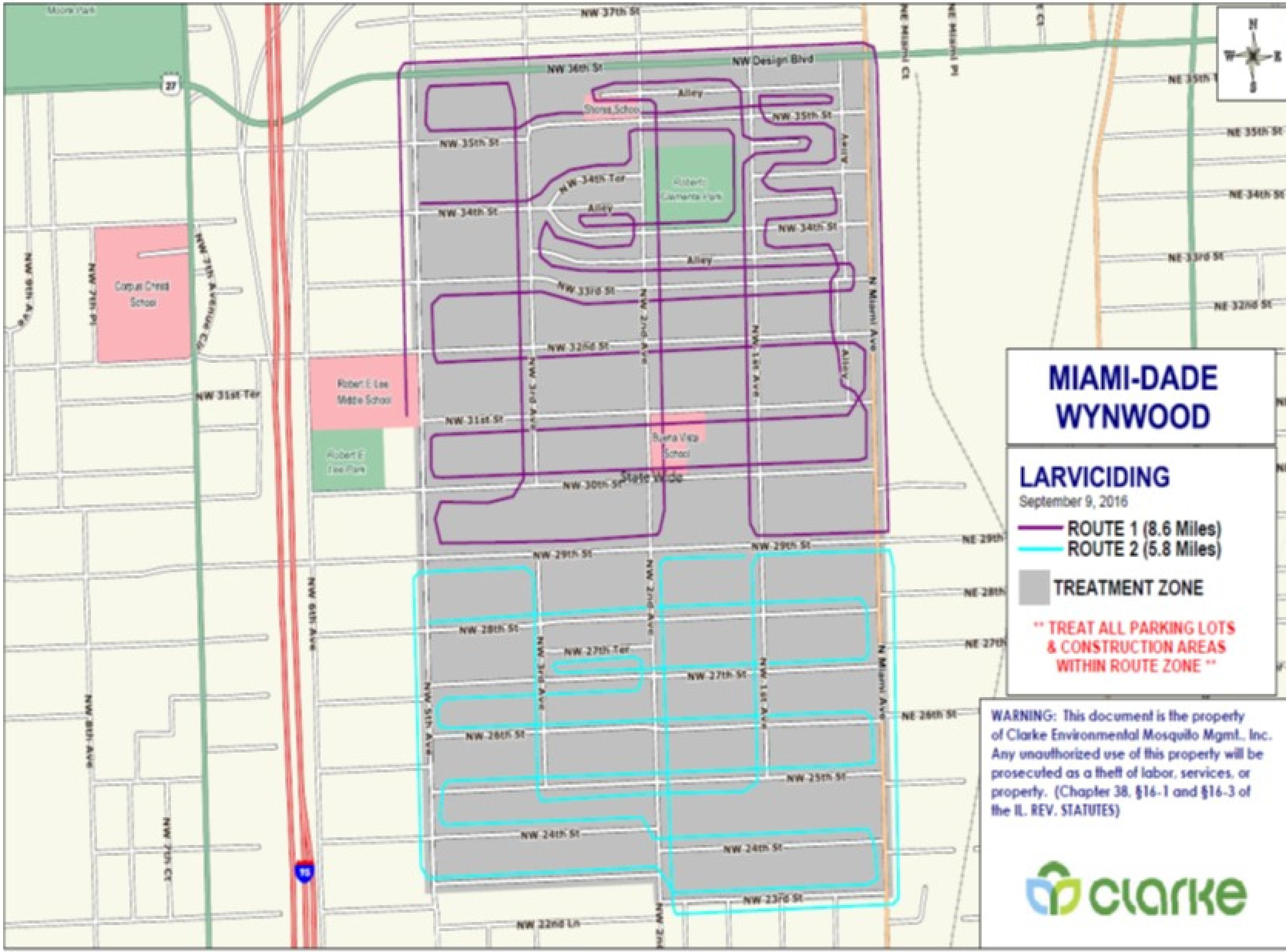
BUFFALO TURBINE TREATMENT SCHEDULE FOR THE WEEK OF 10/16 - 10/22 *

- SUNDAY 10/16 -Downtown & Brickell Island 3am to 5:30am, Coconut Grove 1am-5:30am
- MONDAY 10/17 - Miami Beach 2:00am to 5:30am, Little River 3:00am to 5:30am
- TUESDAY 10/18 - Miami Beach 3:00am to 6:00am
- WEDNESDAY 10/19 - Miami Beach 2:30am-5:30am
- THURSDAY 10/20 - Miami Beach 12:00am-5:30am
- FRIDAY 10/21 - Miami Beach – 2:30am to 5:30am, Little Haiti - 1:00am to 3:30am
- SATURDAY 10/22 - Wynwood 3:00am-5:30am, Coral Gables 1:00am-5:30am

* SUBJECT TO CHANGE

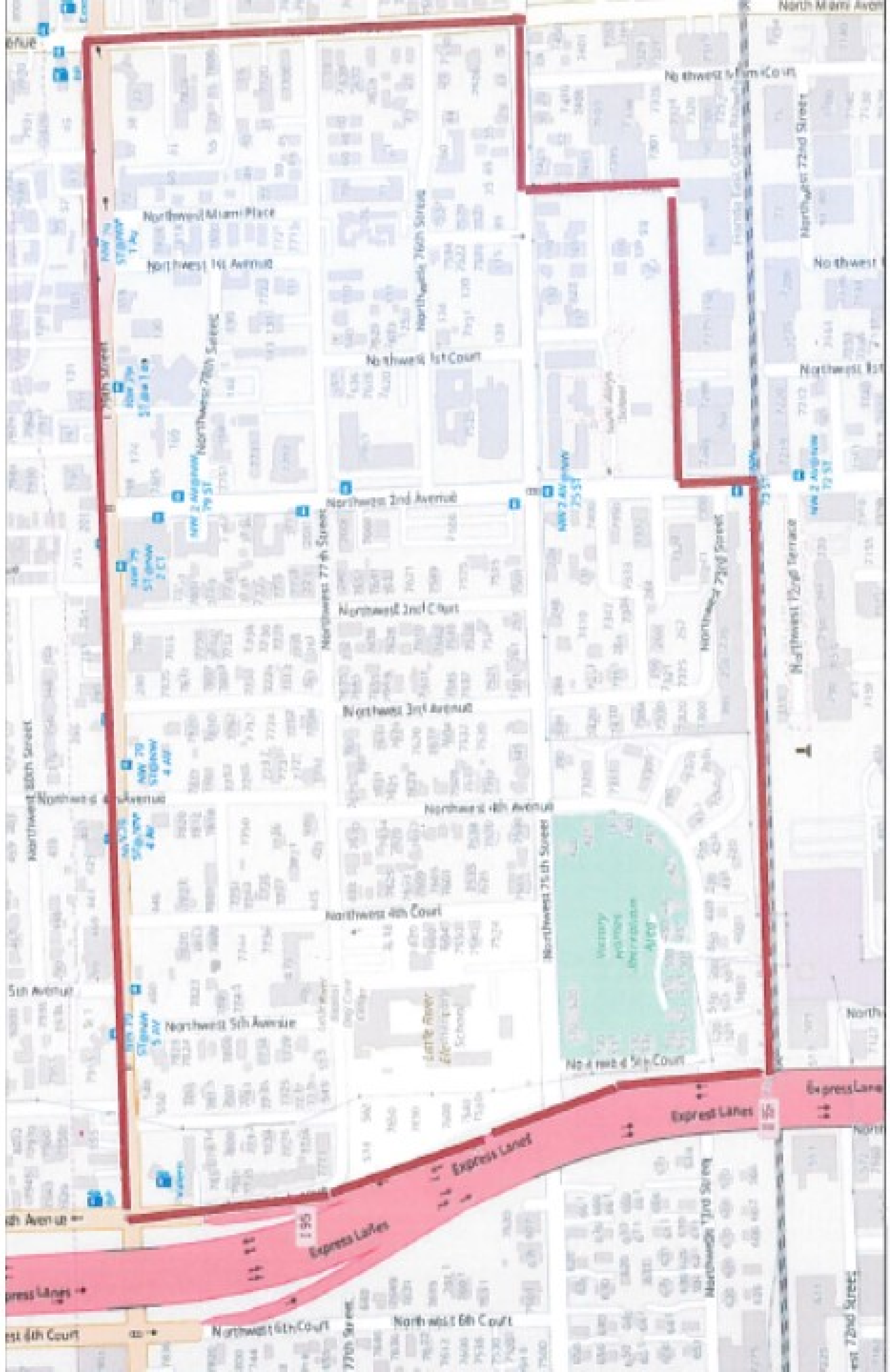
DATE: October 14, 2016





MIAMI-DADE
WYNWOOD
LARVICIDING
September 9, 2016
ROUTE 1 (8.6 Miles)
ROUTE 2 (5.8 Miles)
TREATMENT ZONE
** TREAT ALL PARKING LOTS & CONSTRUCTION AREAS WITHIN ROUTE ZONE **
WARNING: This document is the property of Clarke Environmental Mosquito Mgmt., Inc. Any unauthorized use of this property will be prosecuted as a theft of labor, services, or property. (Chapter 38, §16-1 and §16-3 of the IL. REV. STATUTES)
clarke


FL 907A
Alton Road
I 195
FL 112
FL A1A
Miami Beach Convention Center
17th Street
Dade Boulevard
Collins Avenue


North Miami Avenue
Northwest Miami Court
Northwest Miami Place
Northwest 1st Avenue
Northwest 1st Court
Northwest 2nd Avenue
Northwest 2nd Court
Northwest 3rd Avenue
Northwest 4th Avenue
Northwest 4th Court
Northwest 5th Avenue
Northwest 6th Court
Northwest 72nd Street
Northwest 72nd Terrace
Northwest 73rd Street
Northwest 75th Street
Northwest 76th Street
Northwest 77th Street
Northwest 78th Street
79th Street
Northwest 80th Street
Express Lanes
I 95
Victory Homes Recreation Area
Little River Elementary School

Status of Resistance

Active ingredient/Commercial Product	Bottle results (FMEL)	Field results / half application rate (CDC)	Field results / full application rate(CDC)
Naled/Dibrom Concentrate	100%		
Malathion/Fyfanon	92-95%		
Deltamethrin/DeltaGard	29%	80%	93%
Etofenprox/Zenivex E4 RTU	7%	19%	57%
Permethrin/Biomist 30+30	0%	33%	
Sumithrin/Duet	0%	44%	

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Program Adjustments

- Operation is still being revamped
- Infrastructure of surveillance program enhanced
- Aerial adulticiding and area-wide truck mounted larviciding added to program to maintain container-inhabiting mosquito species
- In house arbovirus testing
- Insecticide resistance monitoring

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Lessons Learned

- Aerial or Ground Larviciding is essential to keep populations low
- Surveillance is the backbone of the operations critical
- Insecticide resistance is crucial

MIAMI-DADE COUNTY

Recognition to Our Partners

- Centers for Disease Control and Prevention
- Florida Department of Health
- Florida Department of Agriculture and Consumer Services
- Florida Medical Entomology Laboratory
- Manatee County Mosquito Control District
- Contractors
- City of Miami
- City of Miami Beach
- Greater Miami Convention & Visitors Bureau
- The Great Mosquito Control Staff

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