Mosquito Surveillance in Southern Nevada

Aedes aegypti - 2017

Southern Nevada Health District

Vector Surveillance Program

Overview

- **SNHD and Program Background**
- ***Aedes aegypti* identification**
- **Response**
- **Genetic Analysis**
- **Future Step**

Clark County, NV - Background

8,060 mi^2

2 million residents:

73% NV population

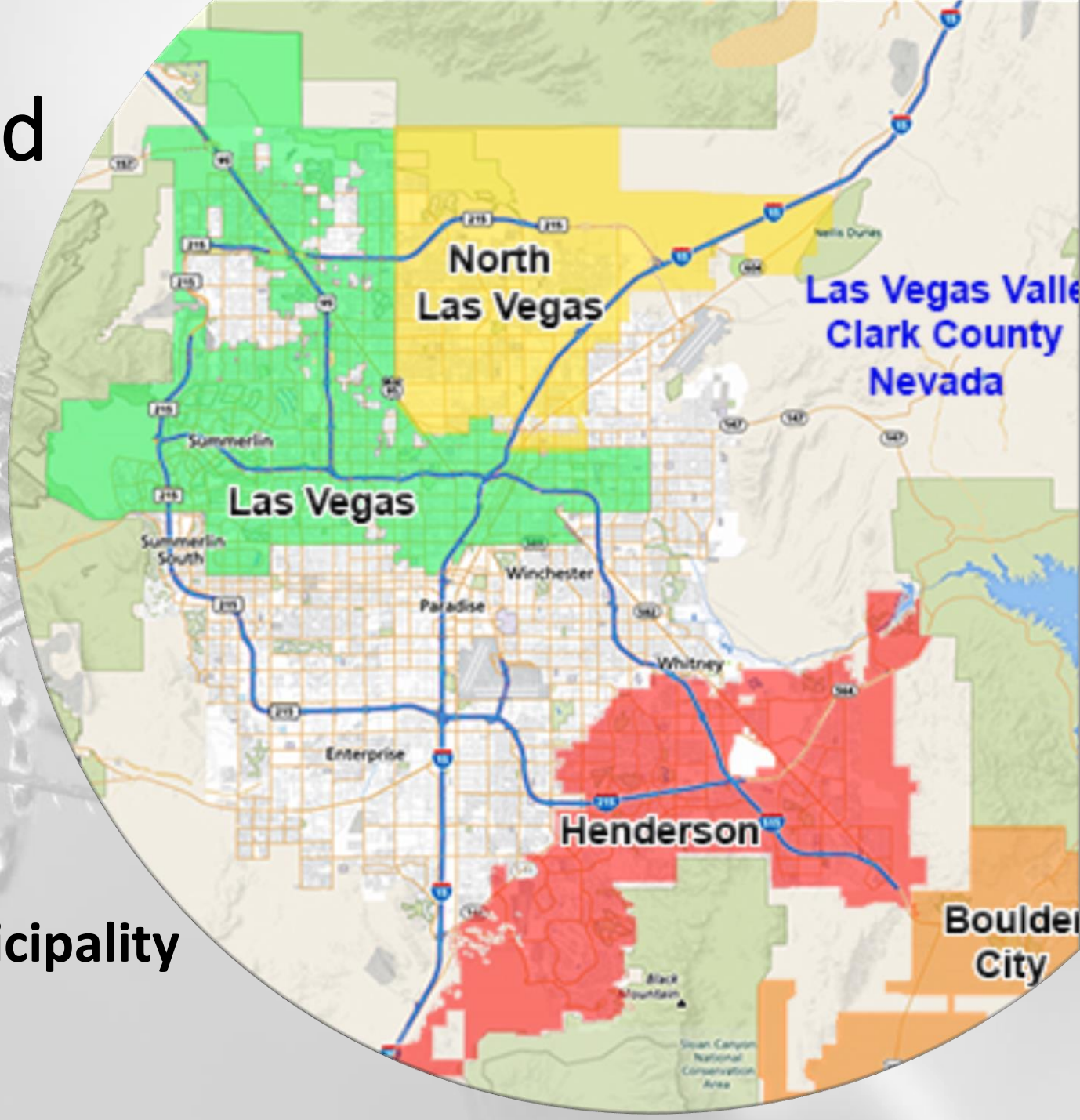
Clark County Background

6 distinct municipalities:

- **Unincorporated Clark County**
- **City of Las Vegas**
- **City of North Las Vegas**
- **City of Henderson**
- **City of Boulder City**
- **City of Mesquite (not shown)**

SNHD Board of Health

- **Elected officials from each municipality**



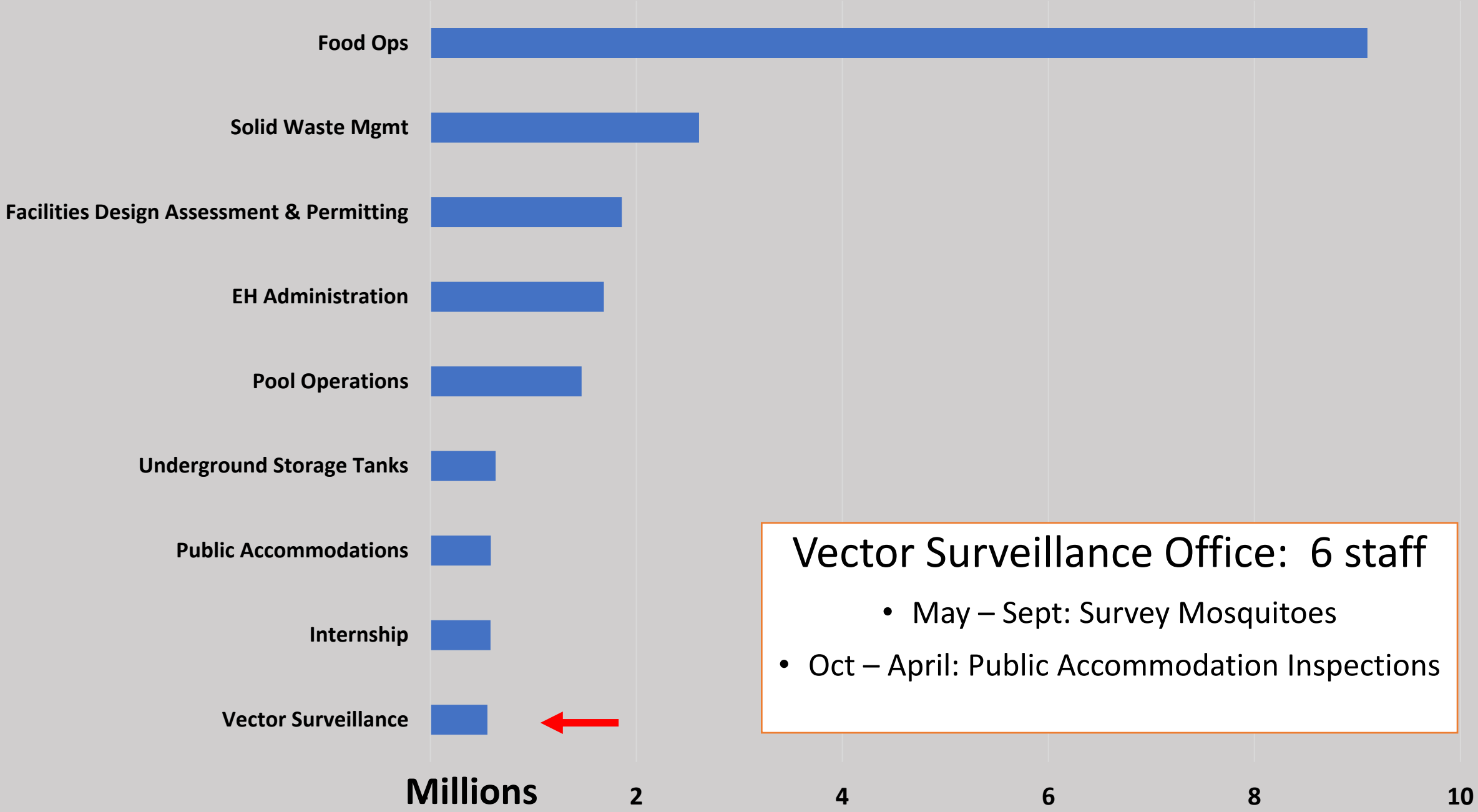
Administration

Clinical Services

Community Health

Environmental Health

Environmental Health Expenses by Activity



Vector Surveillance Office: 6 staff

- May – Sept: Survey Mosquitoes
- Oct – April: Public Accommodation Inspections

Mosquito Surveillance

Primary Goals:

- **Monitor populations and disease**
- **Provide Prevention Information**

Not an Abatement Agency

Integrated Mosquito Management

Conduct spot larval treatments

Jurisdictional referrals for environmental remediation

- **Code Enforcement**
- **Public Works**
- **Parks and Recreation**
- **Streets and Sanitation**

SNHD maintains minimal abatement supplies and equipment for emergencies

Invasive *Aedes* - Preparation

- **2014:**
  - **Purchased surveillance equipment specific for *Ae. aegypti* and *Ae. albopictus***
  - **Targeted areas likely for introduction: nurseries, cemeteries**
  - **Randomly throughout the community**
- **2016:**
  - **Developed invasive *Aedes* response plan and public education material**
  - **Trained other Environmental Health program staff for emergency surveillance capacity**
  - **Trained local jurisdictions on invasive *Aedes* behavior and prevention**


SNHD
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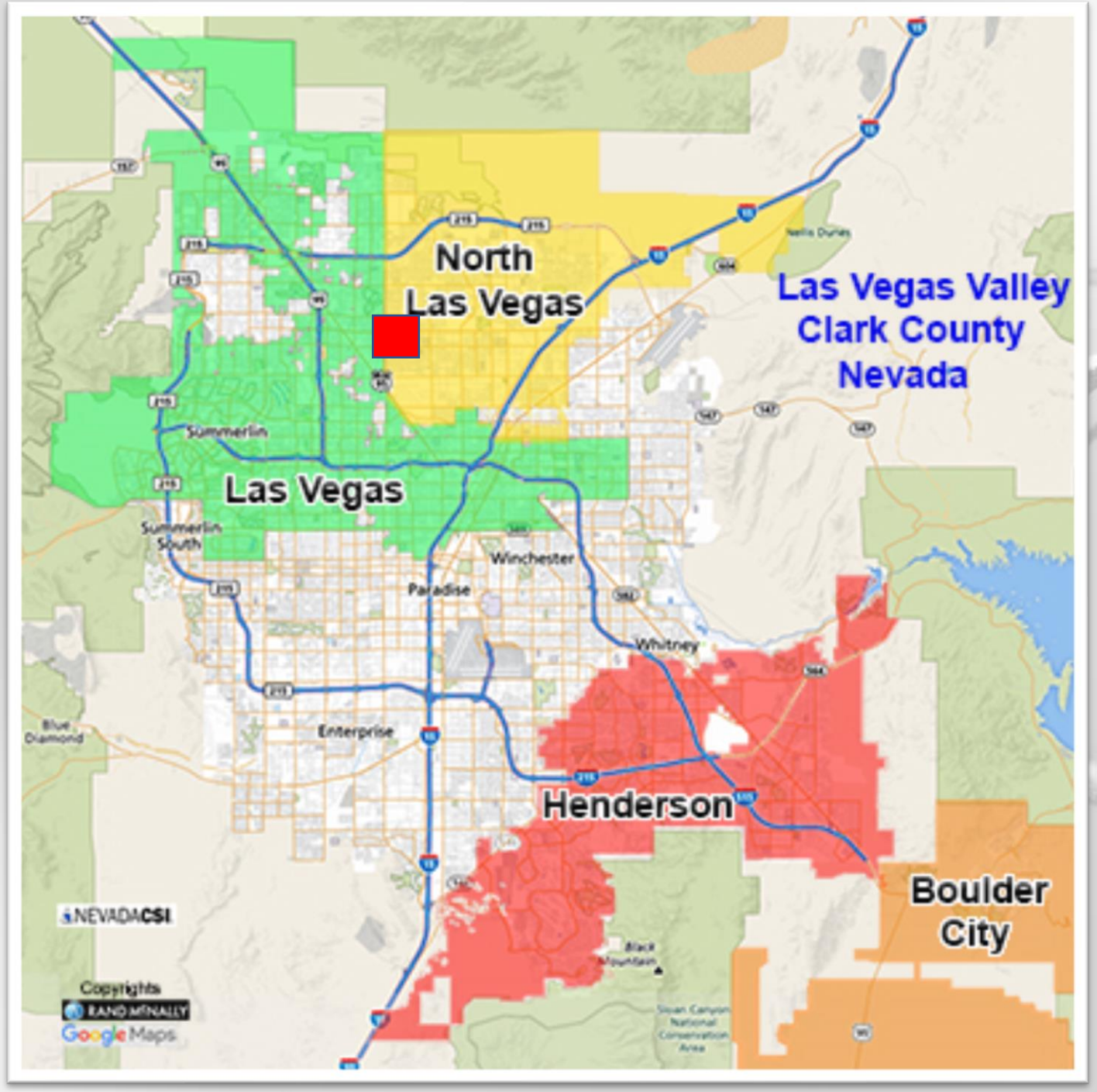


***Ae. aegypti* identified May, 2017**

Ae. aegypti - Identification and Response

May 31, 2017

Initial Identification
Mosquito Activity Complaint

June 1, 2017

Incident Command System
Deployed Emergency Surveillance Team
Public Information Releases

June 1, 2017

ULV of index and adjacent homes

Surveillance Response

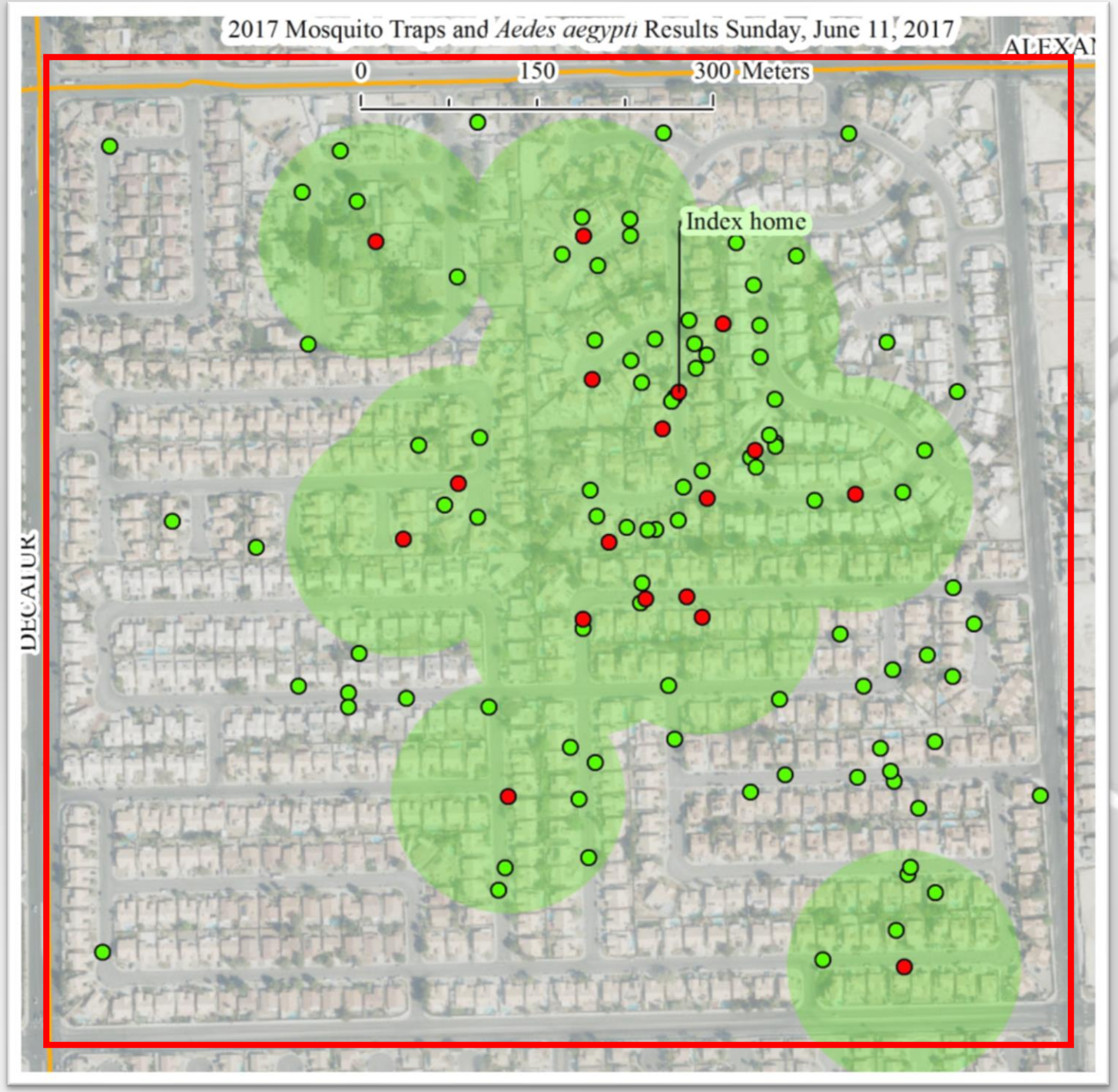
Traps Deployed:

- **BG Sentinel**
- **Gravid**
- **Dry Ice (EVS)**

Initial Surveillance

Index Community:

- Urban residential
- Mix of desert landscaping and lush vegetation
- .25 square miles
- 160 acres



Initial Surveillance

May 31st – June 8th:

184 traps in .25 square miles

108 homes trapped

17 homes w/ *Ae. aegypti*

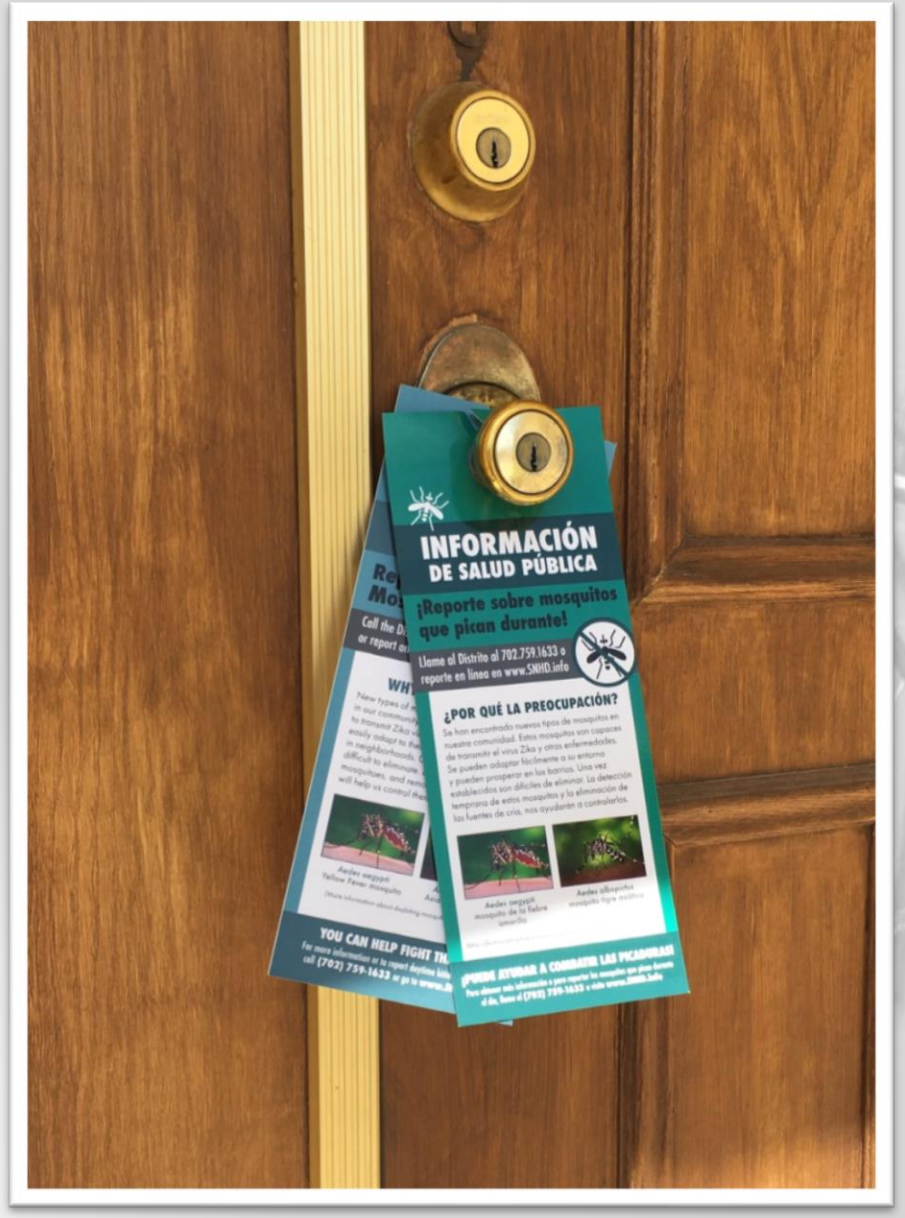
21 female & 3 male

Breeding Sources Identified

Breeding Sources Identified

Larvae emerged into *Ae. aegypti*

Community Education



Adult Control Interventions

Handheld ULV – 23 sites

Homes & adjacent properties w/ *Ae. aegypti*

Anvil 10+10 at label rates

Adult Control Interventions

Truck mounted ULV

- Duet at label rates

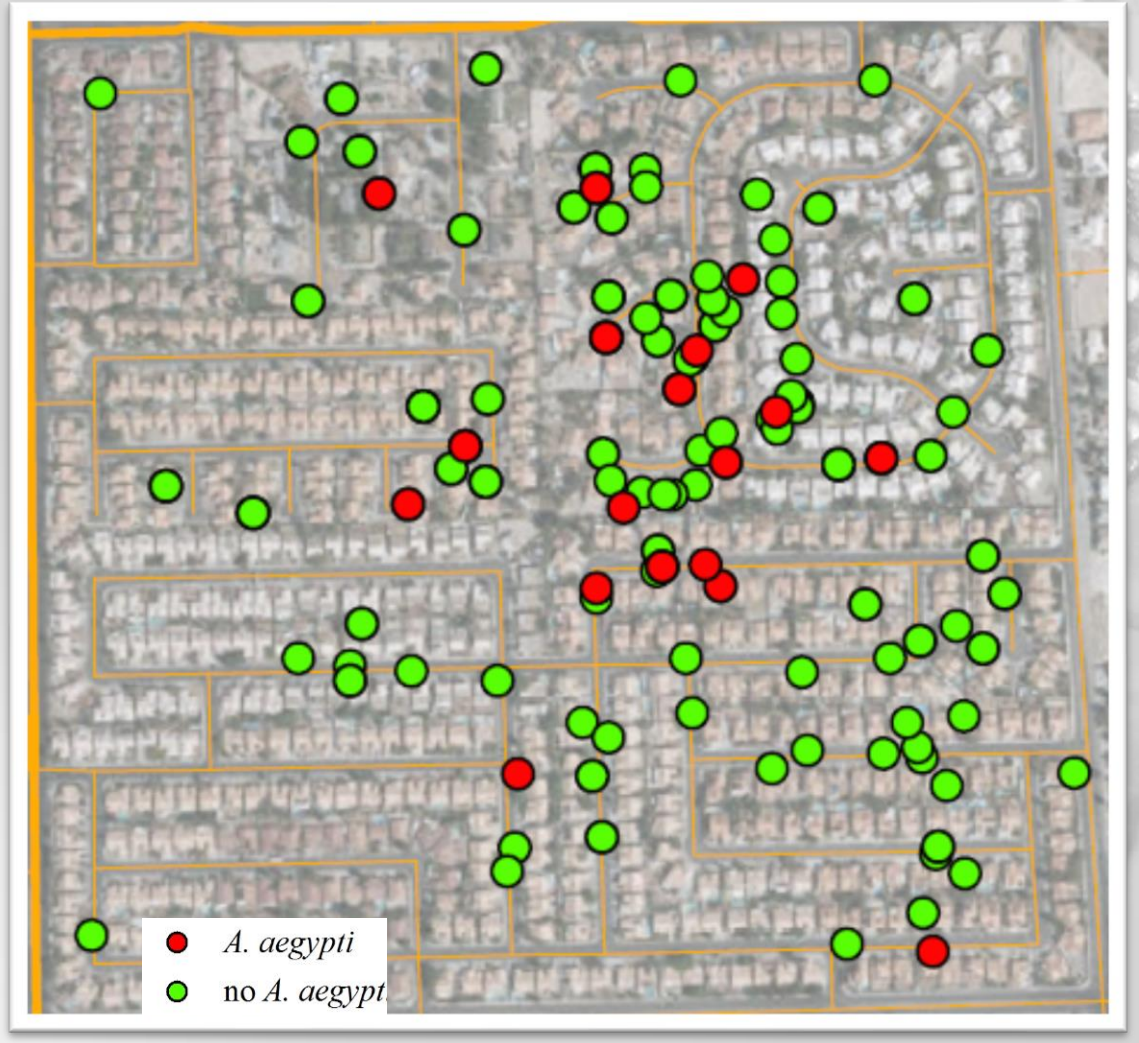
4 truck ULV events

Challenging environment:

- High temperature
- Low humidity
- Low wind (2 mph)
- ‘Night Owl’ activity

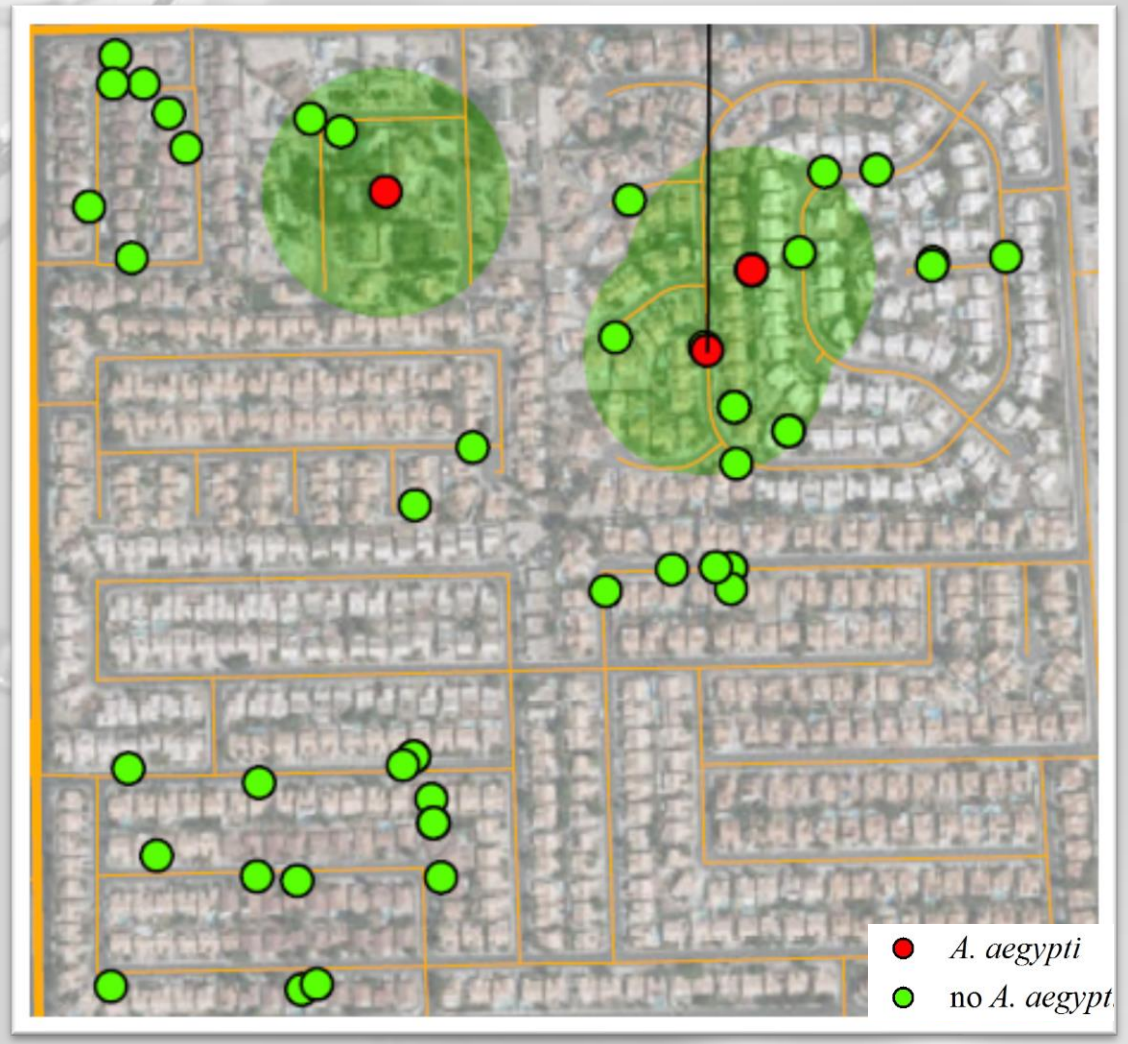
Truck ULV - effectiveness

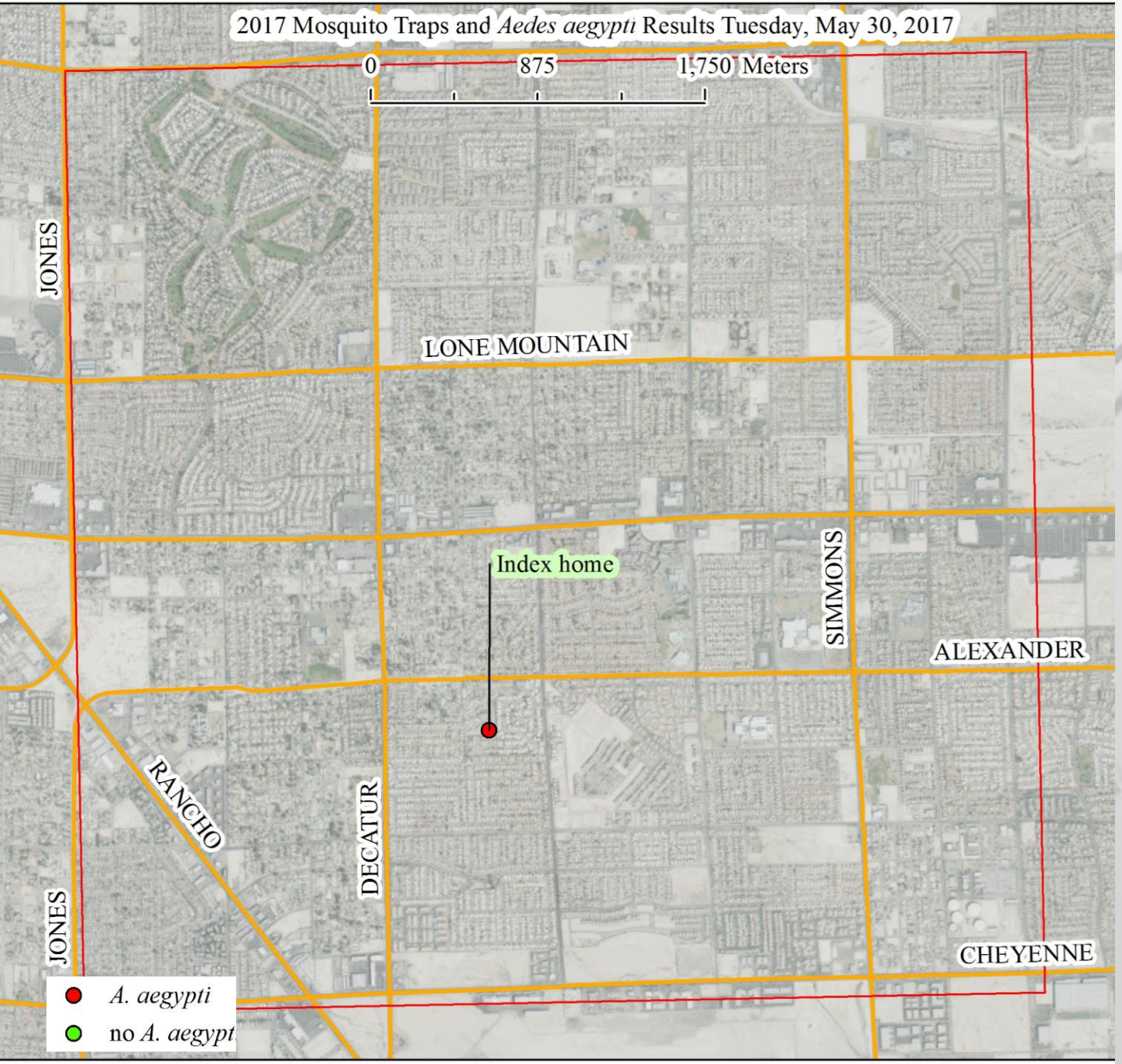
Pre ULV Fog – June 8, 2017



ULV June 9

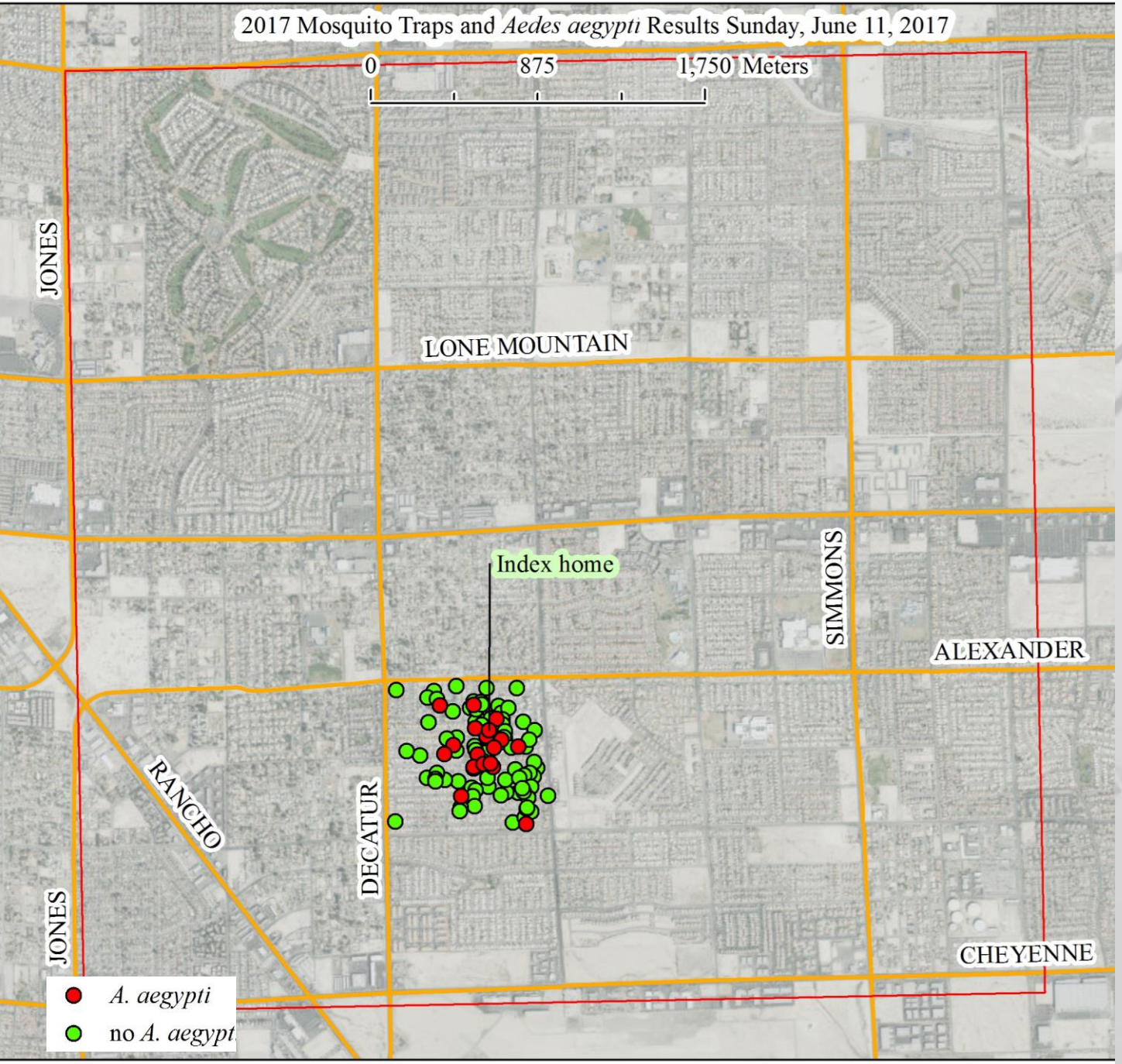
Post ULV Fog – June 12, 2017





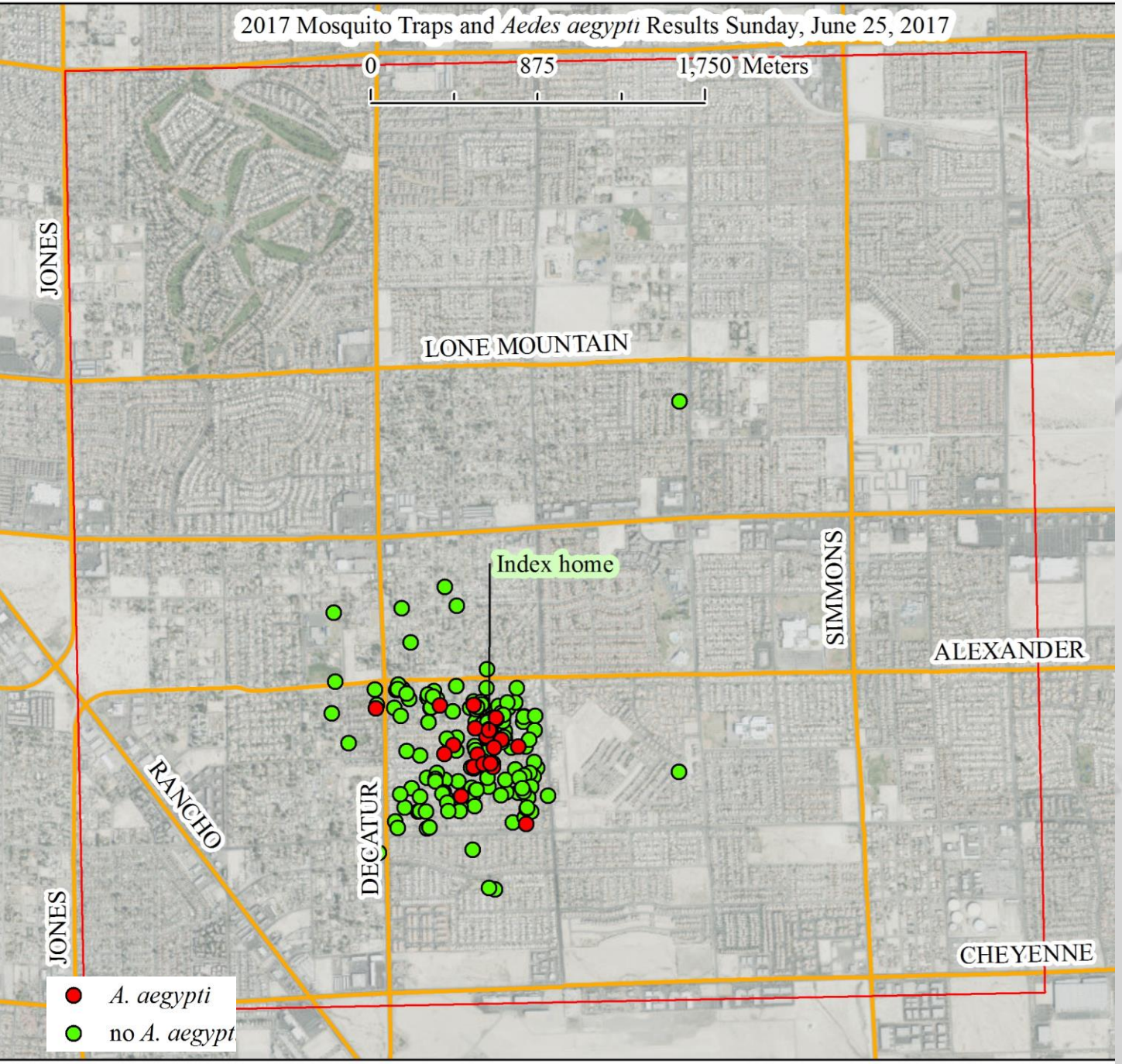
ONGOING SURVEILLANCE

May 31, 2017



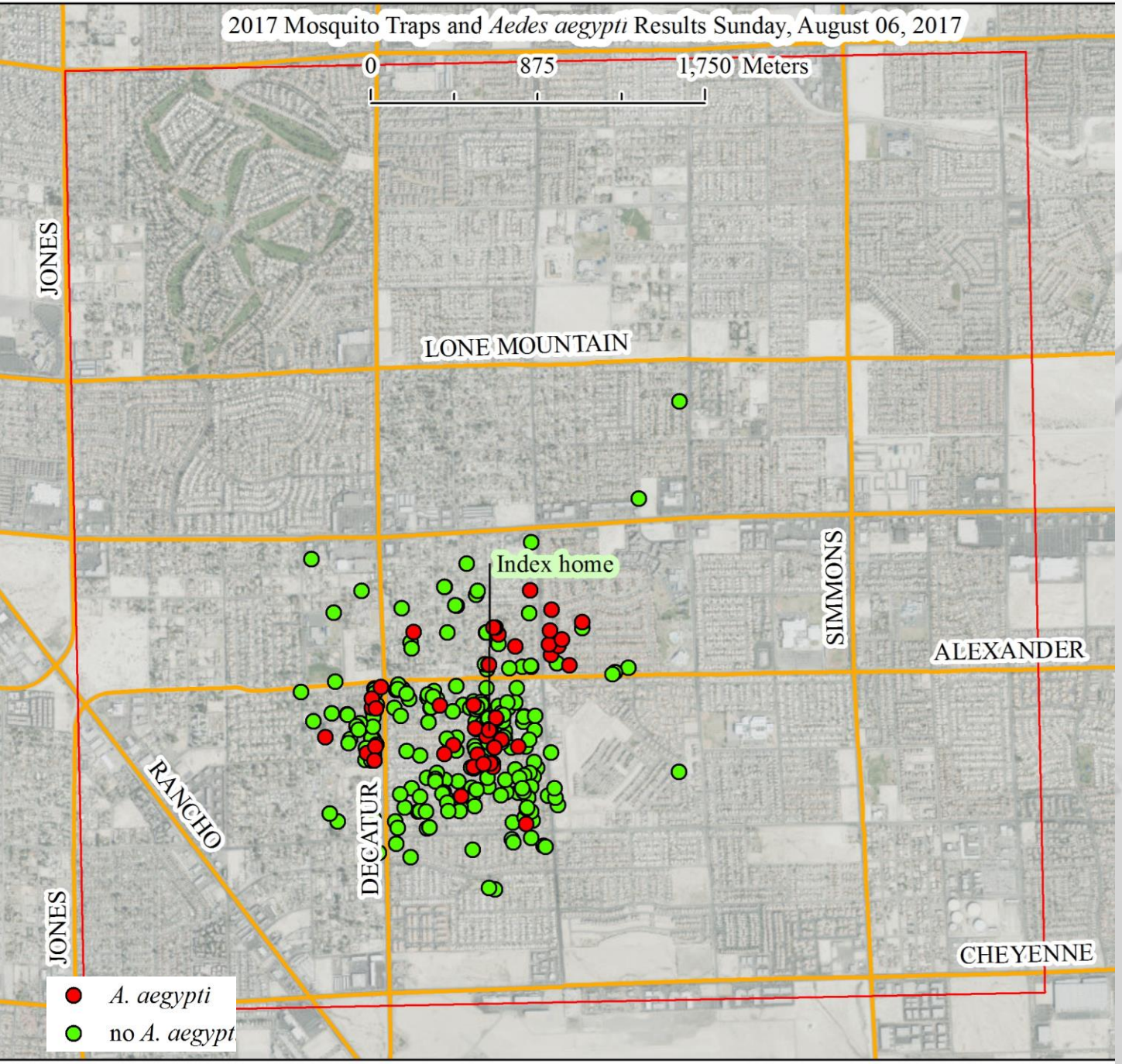
ONGOING SURVEILLANCE

JUNE 11, 2017



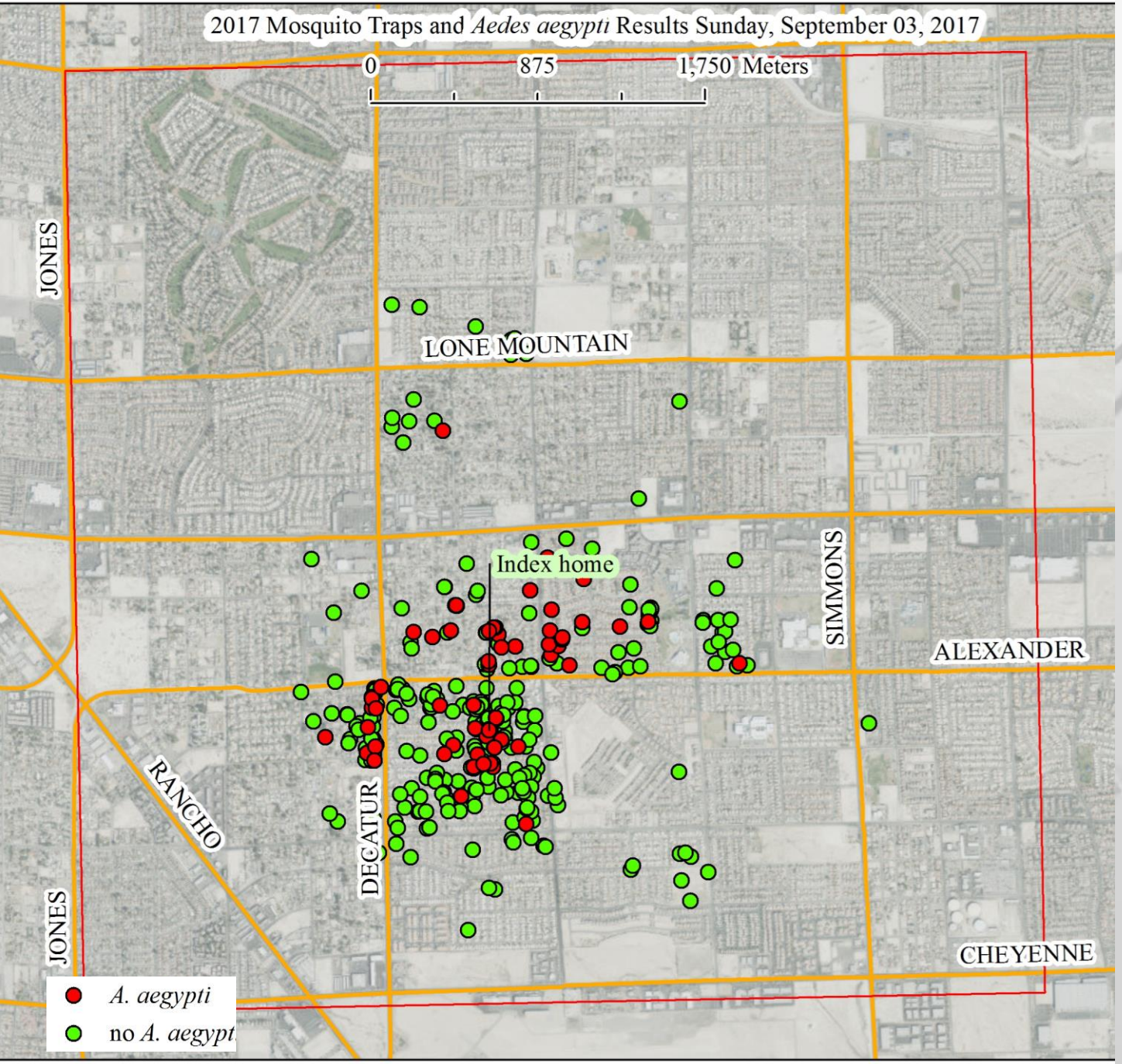
ONGOING SURVEILLANCE

JUNE 25, 2017



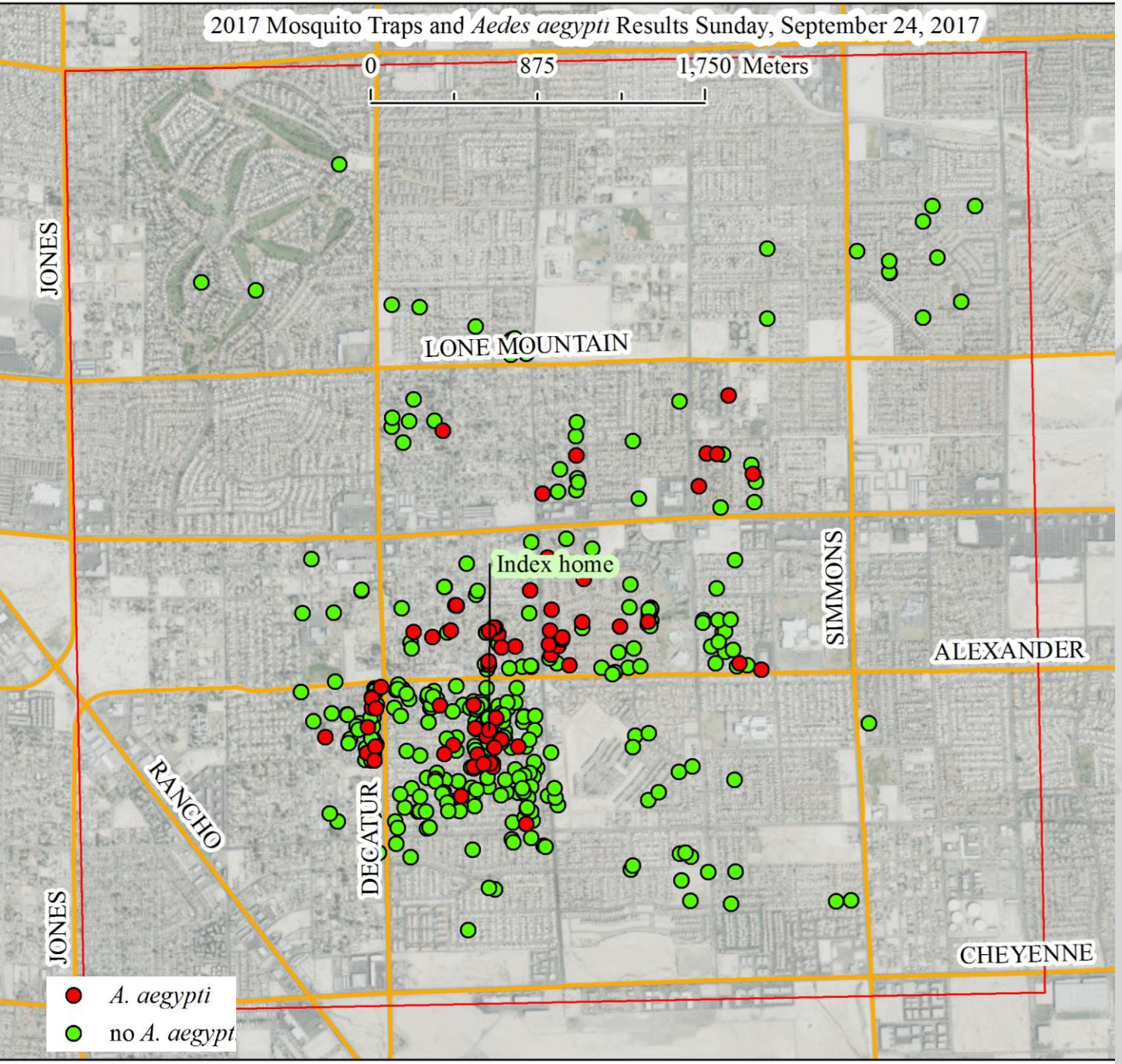
ONGOING SURVEILLANCE

AUG 6, 2017



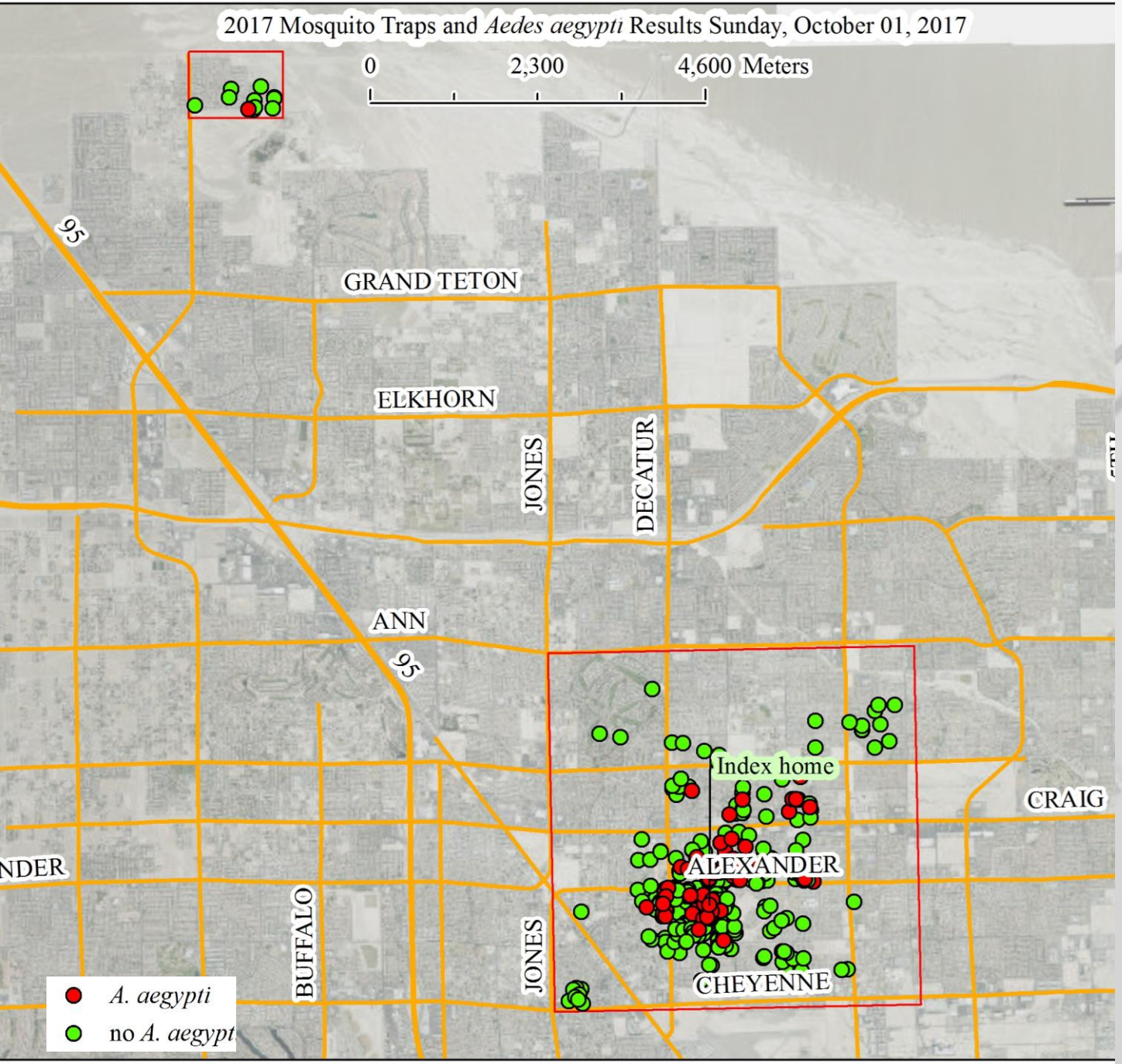
ONGOING SURVEILLANCE

SEPT 3, 2017



ONGOING SURVEILLANCE

SEPT 24, 2017



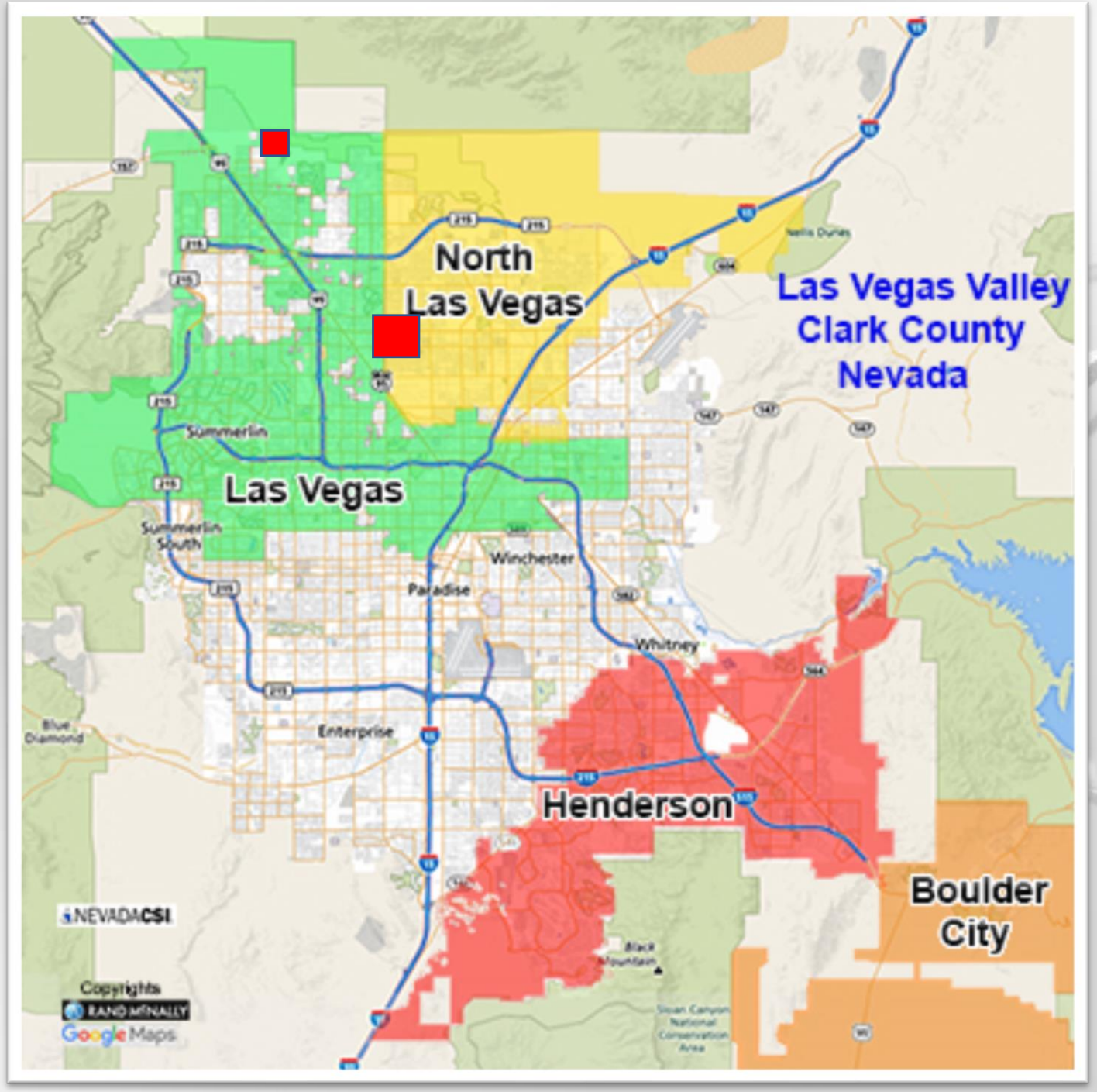
MAY 31 - OCT 1

611 traps

183 *Ae. aegypti*

37 homes w/ *Ae. aegypti*

BG Sentinel most effective



Ae. aegypti - 2 Jurisdictions:

City of North Las Vegas

City of Las Vegas

No consistent abatement agency across jurisdictions

Ae. aegypti Survival

Abundant breeding sources and suitable microclimates

- Pools, spas, cryptic breeding sources
- Constant over irrigation, lush tropical vegetation
- Monsoonal rains – typically August

Develop quickly in high temperatures

- Produces tiny adults
- 10 year avg. temperature Jan - December:

  Low: 39ºF – 81ºF High: 58ºF – 104ºF

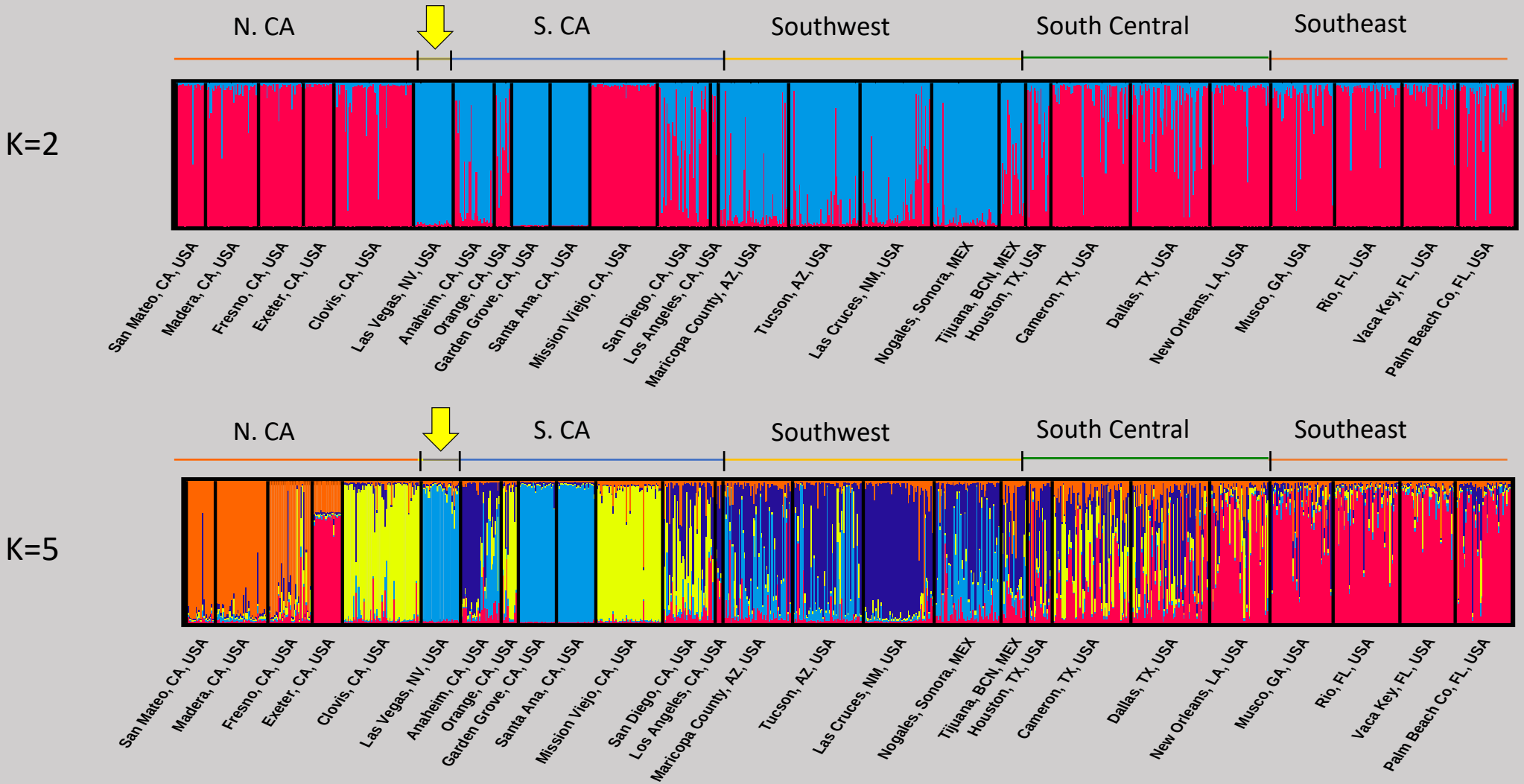
Ae. aegypti – Genetic Analysis

31 male *Ae. aegypti* to Yale University's Powell Laboratory for Genetic Analysis

Closest genetic match - Garden Grove, CA

Overall low genetic diversity - possible 'founder effect'

STRUCTURE: North America



E. Pless and J. Powell, Yale University

Genetic Analysis

Region	Expected Heterozygosity ± SD	Observed Heterozygosity ± SD	Allelic Richness (N=30) ± SD
Northern California	0.51 ± 0.028	0.48 ± 0.029	3.4 ± 0.65
Southern California	0.42 ± 0.089	0.44 ± 0.10	2.6 ± 0.42
Southwest	0.55 ± 0.016	0.57 ± 0.038	3.6 ± 0.36
South Central	0.52 ± 0.087	0.51 ± 0.060	3.9 ± 0.61
Southeast	0.59 ± 0.020	0.59 ± 0.055	4.3 ± 0.093
Las Vegas	0.38	0.35	2.6

E. Pless and J. Powell, Yale University


Garden Grove to Las Vegas
271 miles
#1
4 hr 23 min
Fresno
Visalia
Bakersfield
Maria
Lancaster
Palmdale
Victorville
Santa Barbara
Oxnard
Los Angeles
Anaheim
Irvine
Indio
Oceanside
PHOENIX
Las Vega
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Future Steps - 2018

- **Monitor mosquito populations and disease status**
- **Identify breeding sources and recommend control measures based on surveillance**
  - **Municipalities will have to pay for abatement services.**
- **Provide the community ongoing mosquito breeding and bite prevention education**
- **Engage with local jurisdictions and provide regular activity updates.**

Acknowledgements

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