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 mi²
- 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
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
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

Post ULV Fog – June 12, 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: 39°F – 81°F  High: 58°F – 104°F
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

K=2

K=5

E. Pless and J. Powell, Yale University
## Genetic Analysis

<table>
<thead>
<tr>
<th>Region</th>
<th>Expected Heterozygosity ± SD</th>
<th>Observed Heterozygosity ± SD</th>
<th>Allelic Richness (N=30) ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern California</td>
<td>0.51 ± 0.028</td>
<td>0.48 ± 0.029</td>
<td>3.4 ± 0.65</td>
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<tr>
<td>Southern California</td>
<td><strong>0.42 ± 0.089</strong></td>
<td>0.44 ± 0.10</td>
<td><strong>2.6 ± 0.42</strong></td>
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<tr>
<td>Southwest</td>
<td>0.55 ± 0.016</td>
<td>0.57 ± 0.038</td>
<td>3.6 ± 0.36</td>
</tr>
<tr>
<td>South Central</td>
<td>0.52 ± 0.087</td>
<td>0.51 ± 0.060</td>
<td>3.9 ± 0.61</td>
</tr>
<tr>
<td>Southeast</td>
<td>0.59 ± 0.020</td>
<td>0.59 ± 0.055</td>
<td>4.3 ± 0.093</td>
</tr>
<tr>
<td>Las Vegas</td>
<td><strong>0.38</strong></td>
<td>0.35</td>
<td><strong>2.6</strong></td>
</tr>
</tbody>
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E. Pless and J. Powell, Yale University
Garden Grove to Las Vegas
271 miles
4 hr 23 min
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.
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