



MOSQUITO- BORNE DISEASE RESPONSE PLANS

2024

For eastern equine encephalitis, Saint Louis encephalitis, West Nile virus, Zika, Dengue, Chikungunya, yellow fever, Oropouche fever, and Malaria.

Table of Contents

Mosquito-borne encephalitis viruses	2
Introduction	2
Prevention – Early Detection	3
Sentinel Flock Detection and Response	3
Human & Equine Disease Detection and Response	4
Positive Humans Response	4
Public Outreach	5
Zika/Dengue/Chikungunya/yellow fever	8
Introduction	8
Positive Human Response	8
Surveillance	9
Public Outreach	9
Oropouche fever	12
Introduction	12
Positive Human Response	12
Surveillance	13
Public Outreach	13
Media	14
Malaria	16
Introduction	16
Positive Human Response	16
Surveillance	17
Public Outreach	17
Response Flowcharts	20
Human Disease Response	20
Non-Human Reservoir Response	21
Human Reservoir Response	22
Sentinel Chicken Response	23

Last updated: 8-20-2024



Mosquito-Borne Disease Response Plan

Mosquito-borne encephalitis viruses:

Eastern equine encephalitis virus, West Nile virus, Saint Louis encephalitis virus, and Highlands J virus

Introduction

The mosquito-borne encephalitis viruses found in Florida include eastern equine encephalitis virus (EEEV), West Nile virus (WNV), Saint Louis encephalitis virus (SLEV), and Highlands J virus (HJV). In Florida, these viruses circulate in enzootic transmission foci between vector mosquitoes and wild birds. The EEEV is vectored primarily by *Culiseta melanura* in hardwood swamps and is occasionally to horses, exotic birds (emus), and humans by bridge vectors including *Culex nigripalpus*, *Aedes vexans*, *Coquillettidia perturbans*, and *Mansonia* spp.

The WNV and SLEV are transmitted between vector mosquitoes and wild birds in enzootic transmission cycles throughout Florida. Occasionally amplification between vector mosquitoes and wild birds is so efficient that spillover to humans, and in the case of WNV, equines occur. The primary vectors of WNV and SLEV in Florida are *Culex nigripalpus* and *Cx. quinquefasciatus*.

The HJV is a relatively rare mosquito-borne virus in Florida and is a variant of western equine encephalitis virus. Human and equine infections with HJV are extremely rare in Florida.

*During mosquito control operations, all personal protection equipment (PPE) will be required as listed on the product labels. Do not handle sick animals, especially emus (*Dromaius novaehollandiae*) or sick/dead wild birds, to avoid contracting viruses by contact with these animals. Insect repellent will be utilized to minimize exposure to infected mosquitoes. All efforts will be contingent upon label restrictions, weather conditions, availability of resources, arthropod management plans, and local, state, and federal laws. Locations of interest will be provided by the Florida Department of Health and response efforts will be conducted accordingly.*

Prevention- Early Detection

1. A year-round sentinel chicken arboviral surveillance program is maintained at locations throughout Lee County to monitor virus activity.
 - a. Blood drawn from all sentinel chickens in the field at the beginning of every week.
 - b. One set of blood samples is delivered to the FDOH State Laboratory.
 - c. Second set of blood samples tested in-house.
 - d. Results are used to monitor virus transmission at sites throughout the county.
 - e. Report increased seroconversion rates to FDOH.
2. CDC traps are placed once a week at selected sites throughout the county for an overnight trapping period. Mosquitoes are collected the next morning and identified.
 - a. Vector species are separated from each collection and counted.
 - b. Increases in vector species or virus activity are reported to LCMCD Operations for control efforts.
 - c. Traps verify control effort effectiveness.
3. Monitor dead bird reports through the Florida Fish and Wildlife Conservation Commission.

Sentinel Flock Arboviral Detection and Resulting Vector Control Response

Single Bird Seroconversions

1. Approximate infection windows are calculated for each positive chicken.
2. Ground adulticide ULV truck for two successive nights in all zones within a one-mile radius of the positive flock.
3. Inspect all known larval sites up to a one-mile radius and treat as needed.
4. Repeat as needed – determined by landing rates and trap collection data until baseline levels are obtained.

Multiple Bird Seroconversions

1. Approximate infection windows are calculated for each positive chicken.
2. Aerial Adulticide treatment up to a one-mile radius of each positive flock.
3. Inspect all known larval sites up to a one-mile radius of each positive flock and treat as needed.
4. Repeat as needed – determined by landing rates and trap collection data until baseline levels are obtained.

Human & Equine Disease Detection and Response

Initial Response

1. Analyze all known information concerning the case report.
2. Evaluate the timeliness of the report and calculate approximate infection dates and infection sites.
3. Map a one-mile radius around the suspected infection site.
4. Increase BG and CDC trapping within the one-mile radius target zone.
5. Monitor collections for vector species and pool vector species for virus isolation attempts.
6. Monitor larval samples collected within target area for vector species.
 - a. Report vector species detection to LCMCD Operations for control efforts
 - b. Maintain increased trap and larval monitoring for up to two weeks after the initial report.

Equine Disease Response (for EEE and WN)

Single Horse Case

1. Analyze all known information concerning the case report.
2. Evaluate the timeliness of the report and calculate approximate infection dates and infection sites.
3. Aerial adulticide or ground adulticide within a one-mile radius of the likely infection site.
4. Inspect all known breeding sites within a one-mile radius of the suspected infection site.
5. Trap area again after 5-7 days and treat if numbers warrant. If warranted, repeat step 3.

Multiple Horse Cases

1. Analyze all known information concerning the case reports.
2. Evaluate the timeliness of the reports and calculate approximate infection dates and infection sites.
3. Aerial adulticide within one mile of the suspected infection site(s).
4. Inspect all known breeding sites up to a one-mile radius of the suspected infection site(s) and treat as needed.
5. Search for larval sites previously unknown for up to a one-mile radius of the suspected infection site(s) and treat as needed.
6. Trap area again after 5-7 days and treat if numbers warrant. If warranted, repeat step 3.

Positive Human Response

Locally Acquired Human Case(s)

1. Analyze all known information concerning the case reports.
2. Evaluate the timeliness of the reports and calculate approximate infection dates and infection sites.
3. Day 1 and 2: Aerial and ground adulticide at least a one square mile polygon around the suspected infection site, alternating one ULV technique each day.

4. Day 3: Adult mosquito trapping with CDC and BG traps within one mile of the suspected infection site. If vectors are collected, conduct a follow-up ground adulticide treatment.
5. Inspect all known larval habitats up to a one-mile radius of the suspected infection site and treat as needed.
6. Search for larval sites previously unknown for up to a one-mile radius of the suspected infection site and treat as needed.
7. Trap area again after 5-7 days and adulticide by ground or air if warranted.
8. Test vectors found in traps for the presence of virus. All positive and equivocal samples will be sent to the FDOH laboratory for additional testing and confirmation.

Public Outreach

Once notified of **Multiple Horse** cases (EEE and WN) within 60 days, the following actions should take place:

1. Post bite prevention information (5 D's) and disease type information on social media and the LCMCD website. (see below for examples)
2. Initiate Public Service Announcement through local media to emphasize the necessity of protecting yourself from mosquitoes (5 D's).
3. Coordinate messaging with County Health Department.

Once notified of locally acquired **Human** case (EEE, HJ, SLE, or WN), the following actions should take place:

1. Post bite prevention information (5 D's) and disease type information on social media and the LCMCD website. (see below for examples)
2. Initiate Public Service Announcement through local media to emphasize the necessity of protecting yourself from mosquitoes (5 D's).
3. Coordinate messaging with County Health Department.

Public Service Announcement (Examples):

Example 1:

"To reduce the exposure to mosquitoes and the diseases they could carry, Lee County Mosquito Control District asks that you practice the 5 D's of mosquito protection. **D**ress in long sleeves and pants if you plan on being outdoors when mosquitoes are active. **D**awn and **D**usk are mosquitoes' most active periods. **D**eet-based mosquito repellent is an effective repellent (always follow label instructions). **D**rain water from containers weekly; don't grow your own mosquitoes. For more information visit LCMCD.org or call 239-694-2174."

Example 2:

"Lee County Mosquito Control District asks that you do your part to protect your family, neighborhood and yourself from mosquito transmitted diseases. You can help by dumping our containers after a rain event. Mosquitoes that spread diseases breed around homes in anything that can hold water for more

than three days, including clogged gutters, plant trays, buckets and bird baths. So do your part and reduce these mosquito breeding habitats. For more information visit LCMCD.com or call 239-694-2174.”

This page is intentionally left blank.



Mosquito-Borne Disease Response Plan

Zika/Dengue/Chikungunya/yellow fever

Introduction

Zika, Dengue, Chikungunya, and yellow fever viruses are primarily spread by *Aedes aegypti* and *Aedes albopictus*. These mosquitoes breed in natural and artificial containers that hold water in residential and urban areas. Flight range for these species on average is 0.06 miles with a typical maximum distance of up to a half mile. These mosquitoes are primarily daytime biters, especially early in the morning and late afternoon.

During mosquito control operations, all personal protection equipment (PPE) will be required as listed on the product labels. Insect repellent will be utilized to minimize exposure to infected mosquitoes. All efforts will be contingent upon label restrictions, weather conditions, availability of resources, arthropod management plans, and local, state, and federal laws. Locations of interest will be provided by the Florida Department of Health and response efforts will be conducted accordingly.

Positive Human Response

Travel-Associated Cases

1. Analyze all known information concerning the case reports.
2. Evaluate the timeliness of the reports and calculate approximate infection zones where vector mosquitoes may become infected and initiate a locally acquired focus of infection.
3. Use BG mosquito traps and CDC light traps to check for the presence of adult vector mosquitoes at the residence and place of employment of the travel-associated case.
4. Ground Adulticide (ULV) area for two consecutive nights, if warranted.
5. Ground Larvicide (LV truck) area if warranted.
6. If mosquito vectors are present, personnel will conduct a door-to-door inspection up to a 0.15-mile radius from the residence and place of employment of the travel-associated case.

Locally Acquired Case(s)

1. Analyze all known information concerning the case reports.
2. Evaluate the timeliness of the reports and calculate approximate infection dates and infection sites.

3. Day 1 and 2: Aerial and ground adulticide (ULV) at least a one square mile polygon around the suspected infection site, alternating one ULV technique each day.
4. Day 2: Ground larvicide (LV Truck) up to a 0.5-mile radius around the suspected site of infection.
5. Day 3-4: Use BG mosquito traps and CDC light traps to check for the presence of adult vector mosquitoes at suspected site of infection. If vectors are collected, conduct a follow-up ground adulticiding treatment.
6. Day 5: Personnel will conduct a door-to-door inspection up to a 0.25-mile radius from the suspected site of infection.
7. Day 5-7: Use BG mosquito traps and CDC light traps to check for presence of adults at the suspected site of infection and adulticide by ground or air if warranted.
8. Test vector found in traps for virus. All positive and equivocal samples will be sent to the FDOH laboratory for additional testing and confirmation.

Surveillance

1. Maintain increased trap and larval monitoring for up to two weeks until the threat is alleviated.
2. Collected vector mosquitoes will be tested in-house with positive samples submitted to the state lab for confirmation.

Public Outreach

Once notified of a **suspected or confirmed** case of Zika, Dengue, Chikungunya or yellow fever, the following actions should take place immediately:

1. Post bite prevention information (5 D's) and disease type information on social media and the LCMCD website. (see below for examples)
2. Initiate Public Service Announcement through local media to emphasize the necessity of protecting yourself from mosquitoes (5 D's).
3. Coordinate messaging with County Health Department.

Public Service Announcement (Examples):

Example 1:

"To reduce the exposure to mosquitoes and the diseases they could carry, Lee County Mosquito Control District asks that you practice the 5 D's of mosquito protection. **D**ress in long sleeves and pants if you plan on being outdoors when mosquitoes are active. **D**awn and **D**usk are mosquitoes most active periods. **D**eet-based mosquito repellent is an effective repellent (always follow label instructions). **D**rain water from containers weekly; don't grow your own mosquitoes. For more information visit LCMCD.com or call 239-694-2174."

Example 2:

“Lee County Mosquito Control District asks that you do your part to protect your family, neighborhood and yourself from mosquito transmitted diseases. You can help by dumping our containers after a rain event. Mosquitoes that spread diseases breed around homes in anything that can hold water for more than three days, including clogged gutters, plant trays, buckets and bird baths. So do your part and reduce these mosquito breeding habitats. For more information visit LCMCD.com or call 239-694-2174.”

This page is intentionally left blank.



Disease Response Plan

Oropouche fever

Introduction

Oropouche fever is an emerging zoonotic disease caused by Oropouche virus (OROV) and is historically vectored by biting midges, specifically *C. paraensis*. It was first isolated in Trinidad and Tobago in 1955 having two transmission cycles, sylvatic and urban. More recently, increasing cases of OROV infection in humans have been reported in South and Central America, Cuba, and Haiti. In 2024, the state of Florida reported travel related cases that originated from Cuba and are the first recorded cases in the US. With the recent geographic expansion of OROV, experts are uncertain as to what vector is involved in this transmission. Some concerns are that the virus may have evolved to one transmission cycle (urban) and that mosquitoes may be the primary vector. Studies report that *Aedes* and *Culex* mosquitoes have been infected with OROV, but their vector competence is still in question. In Florida, *Aedes* and *Culex* habitats are well described, and proper treatments have been established. However, *C. paraensis* is not a vector that is understood as well by control experts resulting in “no known control strategies”.

During control operations, all personal protection equipment (PPE) will be required as listed on the product labels. Insect repellent will be utilized to minimize exposure to infected mosquitoes and biting midges. All efforts will be contingent upon label restrictions, weather conditions, availability of resources, arthropod management plans, and local, state, and federal laws. Locations of interest will be provided by the Florida Department of Health and response efforts will be conducted accordingly.

Positive Human Response

Travel-Associated Cases

1. Analyze all known information concerning the case reports.
2. Evaluate the timeliness of the reports and calculate approximate infection zones where biting midges and mosquitoes may become infected and initiate a locally acquired focus of infection.
3. Set adult biting fly traps (BGS, GAT or CDC) with biting midge nets to check for the presence of adult biting midges and mosquitoes at the residence and place of employment of the travel-associated case.
4. Ground Adulticide (ULV) area for two consecutive nights, if warranted.
5. Ground Larvicide (LV truck) area if warranted.

6. Conduct LV residual insecticide barrier treatments, if warranted.
7. If potential vectors are present, personnel will conduct a door-to-door inspection to at least a 0.15-mile radius from the residence and place of employment of the travel-associated case.
8. All potential vectors captured in adult biting fly traps will be preserved in an -80 freezer.

Locally Acquired Case(s)

1. Analyze all known information concerning the case reports.
2. Evaluate the timeliness of the reports and calculate approximate infection dates and infection sites.
3. Day 1 and 2: Aerial and ground adulticide (ULV) at least a one square mile polygon around the suspected infection site, alternating one ULV technique each day.
4. Day 2: Ground Larvicide (LV truck) up to a 0.5-mile radius around the suspected site of infection.
5. Day 3: Personnel will conduct a door-to-door inspection up to a 0.25-mile radius from the suspected site of infection. Conduct barrier treatments on foliage, tree holes, fences, and other potential biting midge resting areas around suspected site of infection out to 1 acre, if warranted. Treat with residual insecticide with LV backpack sprayer or pump sprayer. Reapply as needed according to label (approx. 4-6 weeks).
6. Day 5-7: Ground adulticide (ULV) at least a two-mile radius around the suspected infection site with a rotating product spray schedule.
7. Day 8: Set adult biting fly traps (BGS, GAT or CDC) with biting midge nets to check for the presence of adult biting midges and mosquitoes at the residence and place of employment at suspected site of infection.
8. Day 9: Adulticide by ground or air if warranted.
9. All potential vectors captured in adult biting fly traps will be preserved in an -80 freezer.

Surveillance

1. Maintain increased trap and larval monitoring until notified by DOH that the threat is alleviated.
2. Collected biting midges and mosquitoes will be preserved and submitted to the state lab for virus confirmation.

Public Outreach

Once notified of a **local** case of Oropouche, the following actions should take place immediately:

1. Post bite prevention information (5 D's) and disease type information on social media and the LCMCD website. (see below for examples)
2. Initiate Public Service Announcement through local media to emphasize the necessity of protecting yourself from mosquitoes (5 D's).
3. Coordinate messaging with County Health Department.

Public Service Announcement (Examples):

Example 1:

“To reduce the exposure to biting midges or mosquitoes and the diseases they could carry, Lee County Mosquito Control District asks that you practice the 5 D’s of mosquito protection. **D**ress in long sleeves and pants if you plan on being outdoors when mosquitoes are active. **D**awn and **D**usk are the most active periods. **D**eet-based mosquito repellent is an effective repellent (always follow label instructions). **D**rain water from containers weekly; don’t grow your own mosquitoes. For more information visit LCMCD.com or call 239-694-2174.”

Media

Long Version

Oropouche

Lee County Mosquito Control District (LCMCD), Florida Department of Agriculture & Consumer Services (FDACS) and the Health Department routinely communicate updates to the relatively new Oropouche virus. We work closely with these government agencies to regularly monitor vector borne viruses and have an immediate response plan in place, if necessary.

In the last 25 years, cases of Oropouche virus have been identified in mostly the South Americas. This changed in June of 2024 with Cuba having its first confirmed case. As with all relatively new viruses, more research needs to be done to expand our knowledge and understanding of this virus.

Oropouche Symptoms

Oropouche virus is spread to people primarily by biting midges that are already infected by the virus. Some evidence suggests that certain mosquitoes can also spread the virus. Symptoms may include pain behind the eyes, nausea, vomiting, dizziness, sensitivity to light, and rash. Symptoms last less than a week and can often reoccur a few days or even weeks later. Most people recover within several days to one month. In very rare cases, the virus can progress to a more serious form.

Oropouche: How to Prevent It

The best way to protect yourself and your family is to prevent bites from biting midges and mosquitoes. This includes using EPA approved insect repellent, wearing long pants and sleeves while outside, and avoiding outdoor activities at dusk and dawn, which are peak biting times.

If you have traveled out of the country recently, and have the above symptoms, seeing a physician is highly recommended.

Where to Find More Information

For more information about Oropouche visit <https://www.cdc.gov/oropouche/about/index.html>

Shortened version:

Lee County Mosquito Control District (LCMCD), Florida Department of Agriculture & Consumer Services (FDACS) and the Florida Department of Health (FDOH) routinely communicate updates to the relatively new Oropouche virus. We work closely with these government agencies to regularly monitor vector borne viruses and have an immediate response plan in place, if necessary. Oropouche virus is spread to people primarily by biting midges that are already infected by the virus. Some evidence suggests that certain mosquitoes can also spread the virus. Symptoms can include pain behind the eyes, nausea, vomiting, dizziness, sensitivity to light, and rash.

The best way to protect yourself and your family is to prevent bites from biting midges and mosquitoes. This includes wearing EPA approved insect repellent, wearing long pants and sleeves while outside, and avoiding outdoor activities at dusk and dawn which are peak biting times. If you have traveled out of the country recently, and have the above symptoms, seeing a physician is highly recommended.

For more information about Oropouche visit <https://www.cdc.gov/oropouche/about/index.html>



Mosquito-Borne Disease Response Plan

Malaria

Introduction

In Florida, malaria is primarily spread by *Anopheles quadrimaculatus* and *Anopheles crucians*. These mosquitoes breed in woodland pool areas, freshwater marshes, canals, ponds and seepage areas. Flight range for these species is typically up to one mile. These mosquitoes rest in dark shelters during the day with biting activity peaking shortly after dark continuing into the evening hours.

During mosquito control operations, all personal protection equipment (PPE) will be required as listed on the product labels. Insect repellent will be utilized to minimize exposure to infected mosquitoes. All efforts will be contingent upon label restrictions, weather conditions, availability of resources, arthropod management plans, and local, state, and federal laws. Locations of interest will be provided by the Florida Department of Health and response efforts will be conducted accordingly.

Positive Human Response

Travel-Associated Cases

1. Analyze all known information concerning the case reports.
2. Evaluate the timeliness of the reports and calculate approximate infection zones where vector mosquitoes may become infected and initiate a locally acquired focus of infection.
3. Use CDC and BG mosquito traps within one mile of the suspected infection site.
4. Ground Adulticide (ULV) area for two consecutive nights, if warranted.
5. Ground Larvicide (LV truck) area if warranted.
6. Personnel to conduct area habitat inspections up to 0.50 miles from the residence and place of employment of the travel-associated case. Identify any homeless camps or long term to permanent outside gatherings of people.

Locally Acquired Case(s)

1. Analyze all known information concerning the case reports.
2. Evaluate the timeliness of the reports and calculate approximate infection dates and infection sites.

3. Day 1 and 2: Aerial and ground adulticide within a one-mile radius of the suspected infection site, alternating one ULV technique each day.
4. Day 2: Conduct a ground larviciding mission with a Low Volume larviciding truck within one mile of the suspected infection site.
5. Day 3: Adult mosquito trapping with CDC and BG traps within one mile of the suspected infection site. Vectors from traps are sent to state laboratory for testing.
6. Inspect all known breeding sites up to a one-mile radius of the suspected infection site and treat as needed.
7. Search for larval breeding sites previously unknown for up to a one-mile radius of the suspected infection site and treat as needed.
8. Trap area again after 5-7 days and treat if vectors are present. All vectors collected in traps are to be sent to the state laboratory for testing. If warranted, repeat steps 3 and 4.

Surveillance

1. Maintain increased traps and larval monitoring for up to two weeks until the threat is alleviated. Identify and monitor any homeless camps or long term to permanent outside gatherings of people.
2. Collected vector mosquitoes will be submitted to the state lab for testing.

Public Outreach

Once notified of a **suspected or confirmed** case of Malaria, the following actions should take place immediately:

1. Post bite prevention information (5 D's) and disease type information on social media and the LCMCD website. (see below for examples)
2. Initiate Public Service Announcement through local media to emphasize the necessity of protecting yourself from mosquitoes (5 D's).
3. Coordinate messaging with County Health Department.

Public Service Announcement (Examples):

Example 1:

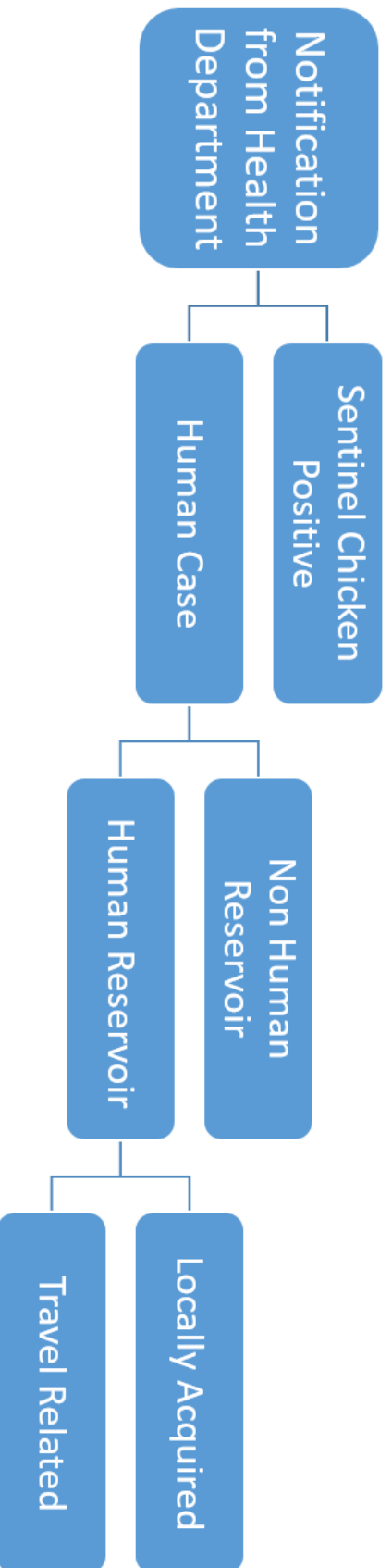
"To reduce the exposure to mosquitoes and the diseases they carry, Lee County Mosquito Control District asks that you practice the 5 D's of mosquito protection. **D**ress in long sleeves and pants if you plan on being outdoors when mosquitoes are active. **D**awn and **D**usk are mosquitoes most active periods. **D**eet-based mosquito repellent is an effective repellent (always follow label instructions). **D**rain water from containers weekly; don't grow your own mosquitoes. For more information visit LCMCD.com or call 239-694-2174."

Example 2:

“Lee County Mosquito Control District asks that you do your part to protect your family, neighborhood and yourself from mosquito transmitted diseases. You can help by dumping our containers after a rain event. Mosquitoes that spread diseases breed around homes in anything that can hold water for more than three days, including clogged gutters, plant trays, buckets and bird baths. So do your part and reduce these mosquito breeding habitats. For more information visit LCMCD.com or call 239-694-2174.”

This page is intentionally left blank.

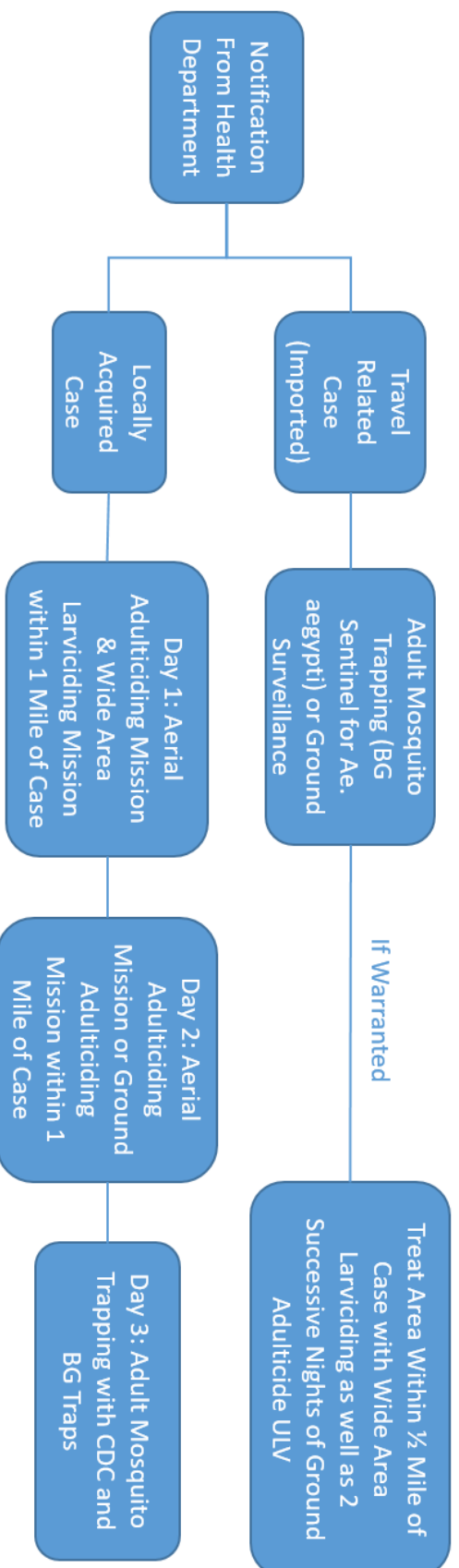
Human Disease Response



Non-Human Reservoir Response



Human Reservoir Response



Sentinel Chicken Response

Pro-Active Sentinel Chicken Arbovirus Surveillance Result Response Flowchart

