

# ***“OTHER” MOSQUITO-BORNE FLAVIVIRUSES***

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*Public Health Services*

*County of San Diego Health and Human Services Agency*

**Binational Symposium – Exploration of Environmental  
and Health Aspects of Zika, Dengue, and Chikungunya**

**27 September 2016**





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**Unlabeled/investigational products and/or services will not be mentioned in this talk.**

# TOPICS

**West Nile Virus**

**St. Louis Encephalitis**

**Yellow Fever**

**Japanese Encephalitis**



**LIVE WELL**  
SAN DIEGO



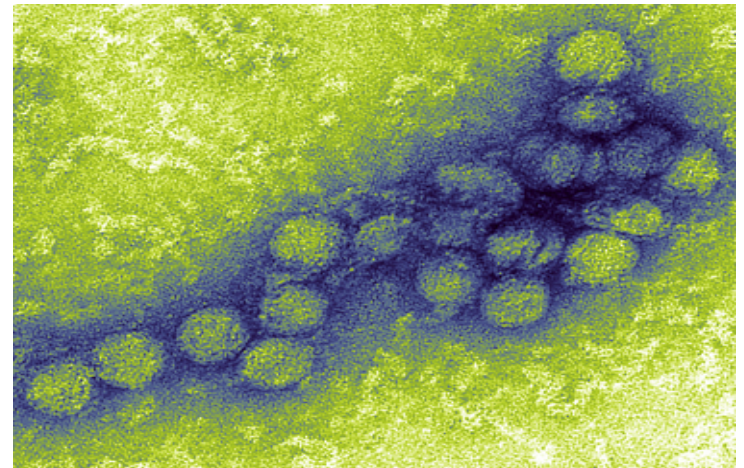
**West Nile virus (WNV) is a single-stranded RNA virus of the family Flaviviridae, genus Flavivirus.**

**First discovered in Uganda in 1937.**

**WNV belongs to the Japanese encephalitis antigenic complex.**

**WNV is closely related to:**

- **Japanese encephalitis**
- **St. Louis encephalitis**
- **Yellow fever**
- **Dengue**



# WEST NILE - DISTRIBUTION



LIVE WELL  
SAN DIEGO

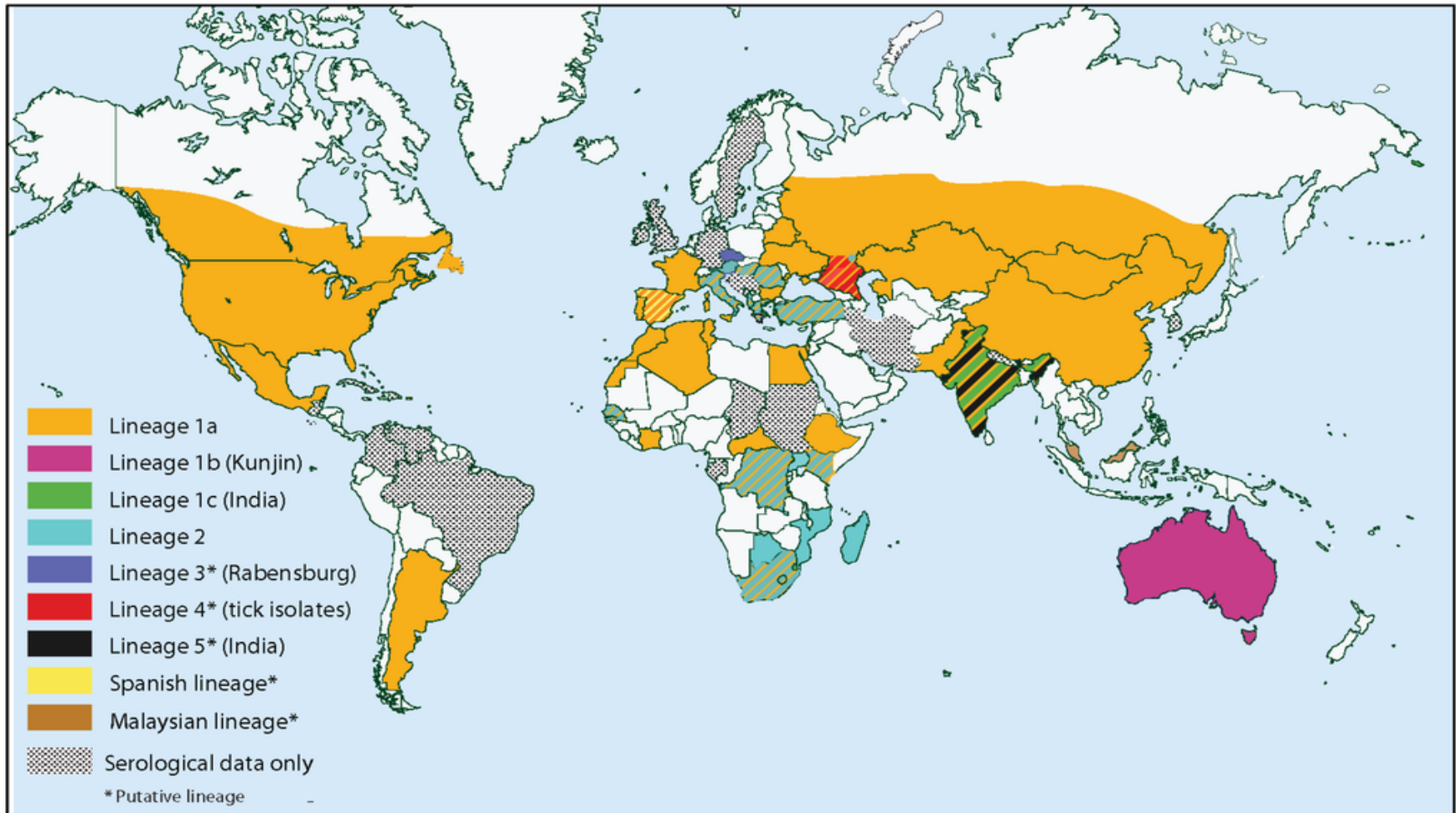


Image from Ciota, A. and Kramer, L. (2013).

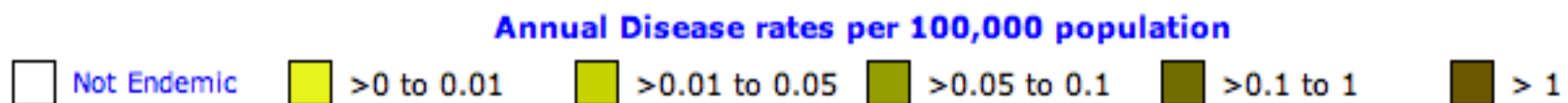
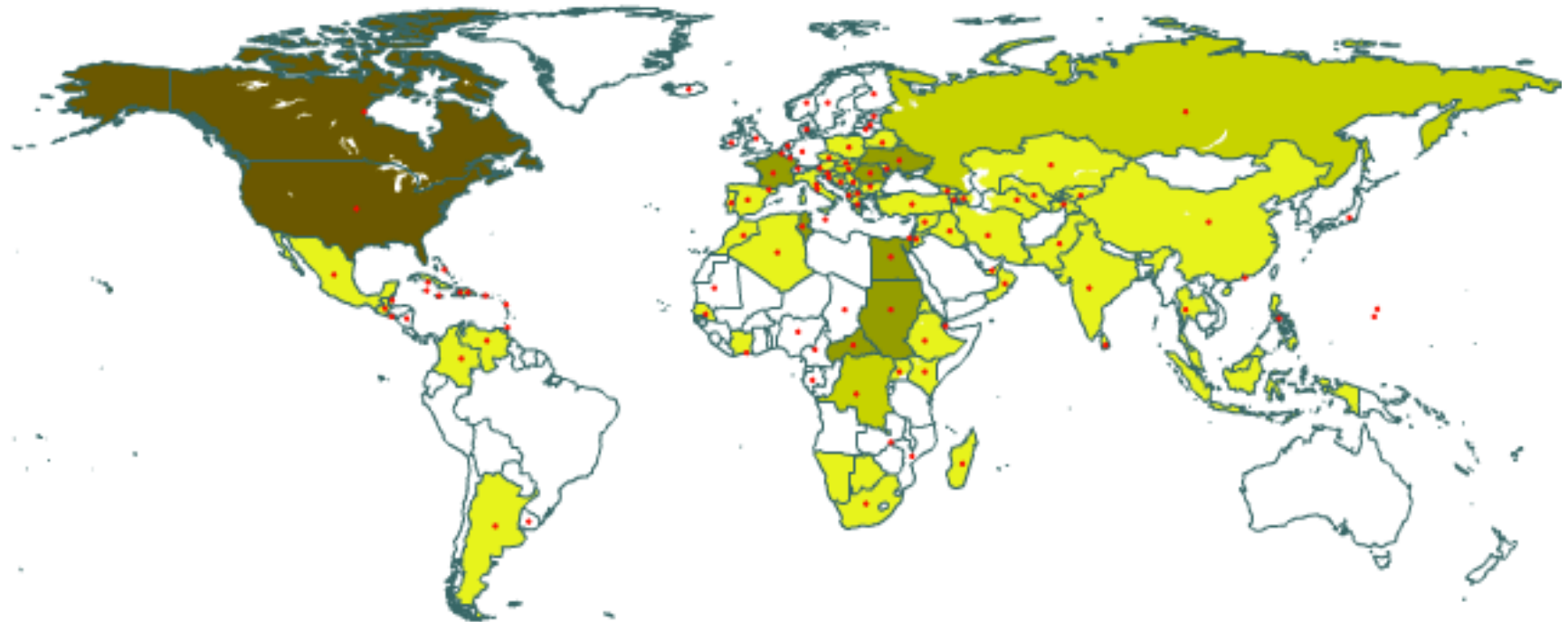
Vector-Virus Interactions and Transmission Dynamics of West Nile Virus. *Viruses*.

Downloaded 9/25/16 from <http://www.mdpi.com/1999-4915/5/12/3021/htm>

# WEST NILE - INCIDENCE



**WNV is endemic to 83 countries.**



**Data source WHO.** Image downloaded 9/25/16 from  
<http://www.gideononline.com/cases/westnilefever/>



- **Most often, WNV is spread by bite of an infected mosquito.**
  - **Mosquitoes become infected when they feed on infected birds (*reservoir for WNV*).**
  - **Infected mosquitoes can then spread the virus to humans and other animals when they bite.**
- **WNV has been spread through:**
  - **Blood transfusions – all blood donations screened in U.S.**
  - **Organ transplants**
  - **Breastfeeding**
  - **During pregnancy from mother to baby**

# VECTOR – CULEX SP.



LIVE WELL  
SAN DIEGO

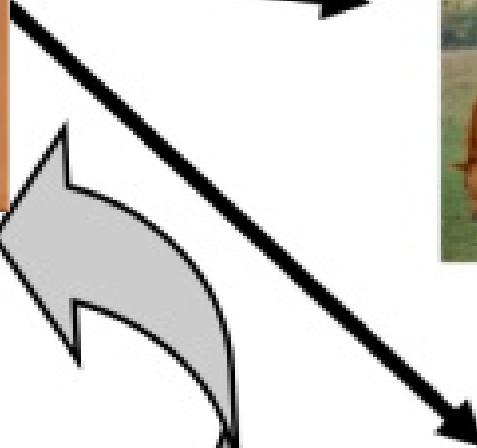
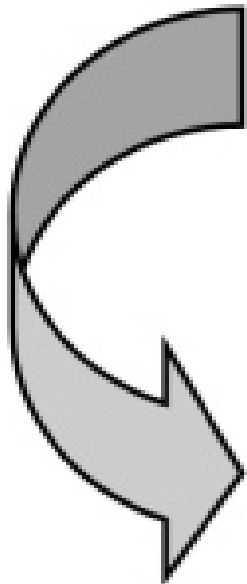
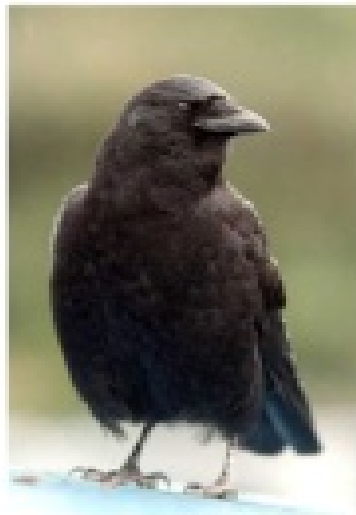


Photo credit: CDC





- **People may develop symptoms 2 to 14 days after they are bitten by infected mosquitoes.**
- **Longer incubation periods have been documented in immunocompromised persons.**
- **WNV is not communicable from person to person, with rare exceptions:**
  - **Blood transfusions**
  - **Organ transplants**
  - **Breastfeeding**
  - **Perinatal transmission**

# WEST NILE VIRUS



LIVE WELL  
SAN DIEGO

Approximately **80%** of those infected with WNV are asymptomatic.

Up to **20%** of those infected with virus may develop West Nile fever (WNF).

Clinical features of WNF may include:

- Fever, headache, fatigue
- Skin rash on trunk of the body
- Swollen lymph glands
- Eye pain



Photo credits: CDC



**Of those infected with WNV, 1 in 150 or  $<1\%$  may develop severe illness called WN neuroinvasive disease (WNND) because it affects a person's nervous system.**

**Specific types of WNND may include:**

- **Encephalitis**
- **Aseptic meningitis**
- **Acute flaccid paralysis (AFP)**
- **Atypical Guillain-Barré Syndrome (GBS)**
- **Transverse myelitis**



## Clinical features of WNND may include:

- **Fever, gastrointestinal symptoms, ataxia**  
*(failure of muscular coordination; irregularity of muscular action)*
- **Extrapyramidal signs** *(e.g., extreme restlessness, involuntary movements, and uncontrollable speech)*
- **Optic neuritis** *(inflammation of the optic nerve)*
- **Seizure, altered mental status**
- **Weakness, flaccid paralysis**  
*(weakness or loss of muscle tone)*
- **Myelitis** *(inflammation of the spinal cord)*
- **Polyradiculitis** *(inflammation of the nerve roots)*
- **Maculopapular or morbilliform rash involving neck, trunk, arms, or legs**

# WEST NILE VIRUS



**LIVE WELL  
SAN DIEGO**

**There is currently no specific treatment for WNV infection.**

More information at: <http://www.cdc.gov/ncidod/dvbid/westnile/clinicians/>

## Key prevention messages:

- Stay indoors at dawn and dusk
- Avoid mosquito bites; wear long sleeves, long pants, and socks when outdoors
- Use mosquito repellent\*
- Keep screens on windows and doors in good repair
- Identify and eliminate standing water sources that can be mosquito-breeding areas around the home

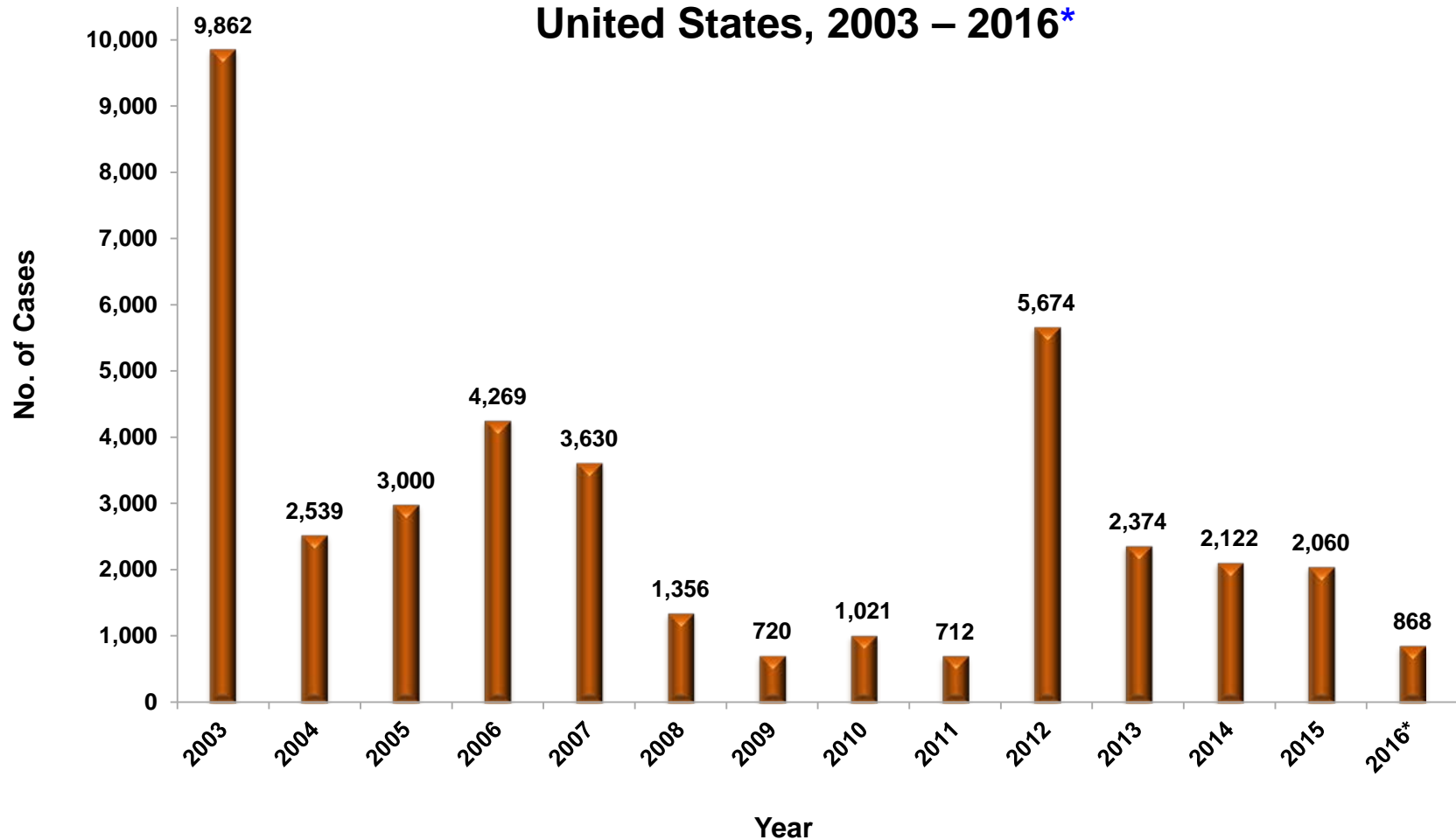
\* Information on repellents can be found at:  
<http://www.cdc.gov/ncidod/dvbid/westnile/RepellentUpdates.htm>



Photo:  
SDCVCP



## WNV Disease Cases† by Year United States, 2003 – 2016\*



† Includes confirmed and probable cases. Does not include asymptomatic blood donors found positive for WNV.

\* As of September 22, 2016.

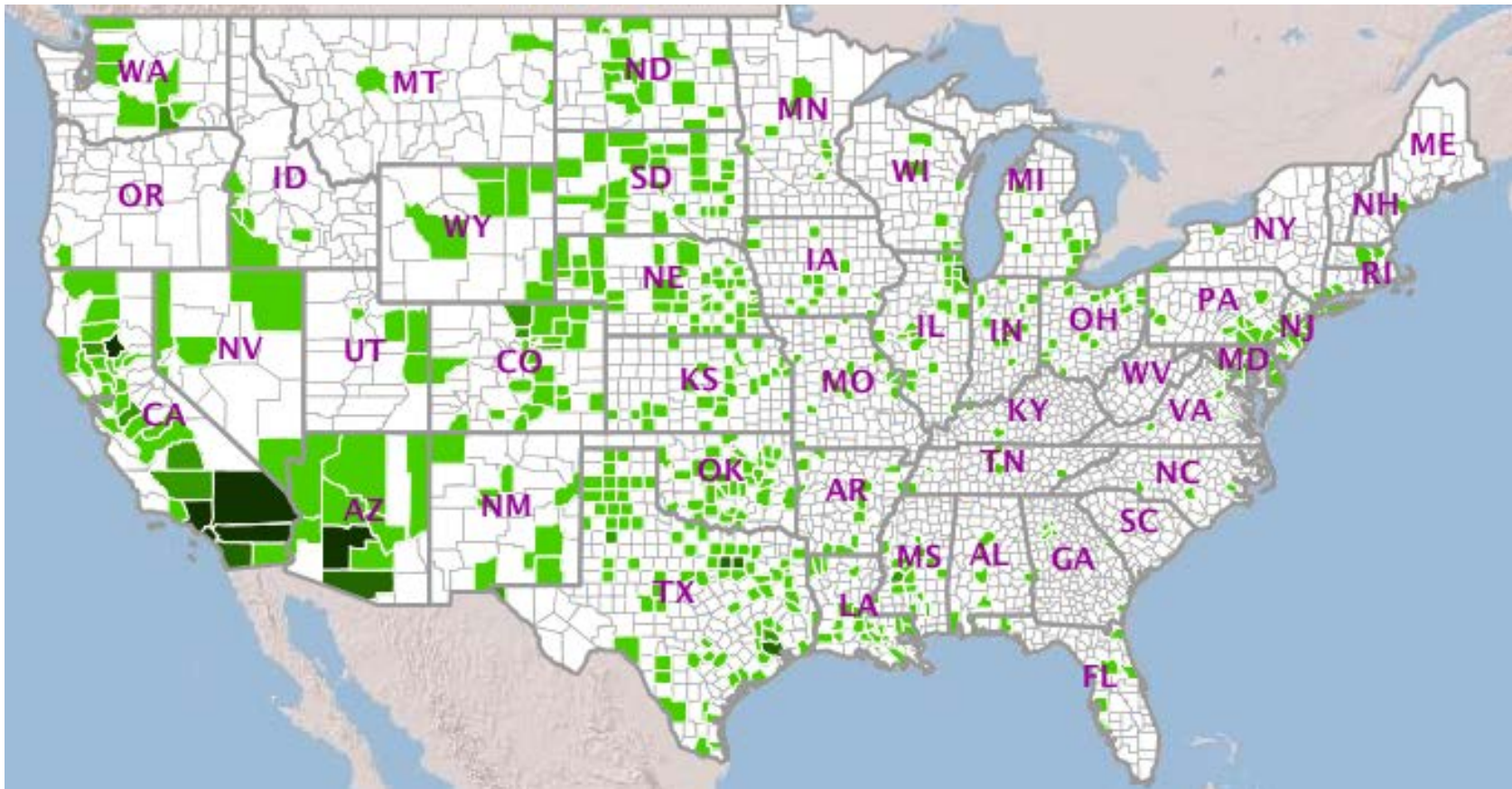
# WEST NILE VIRUS – US 2015



LIVE WELL  
SAN DIEGO

● Overall, **2,175** cases of WNV disease in people were reported to CDC.

● **1,455 (67%)** were classified as WNND and **720 (33%)** were non-WNND.

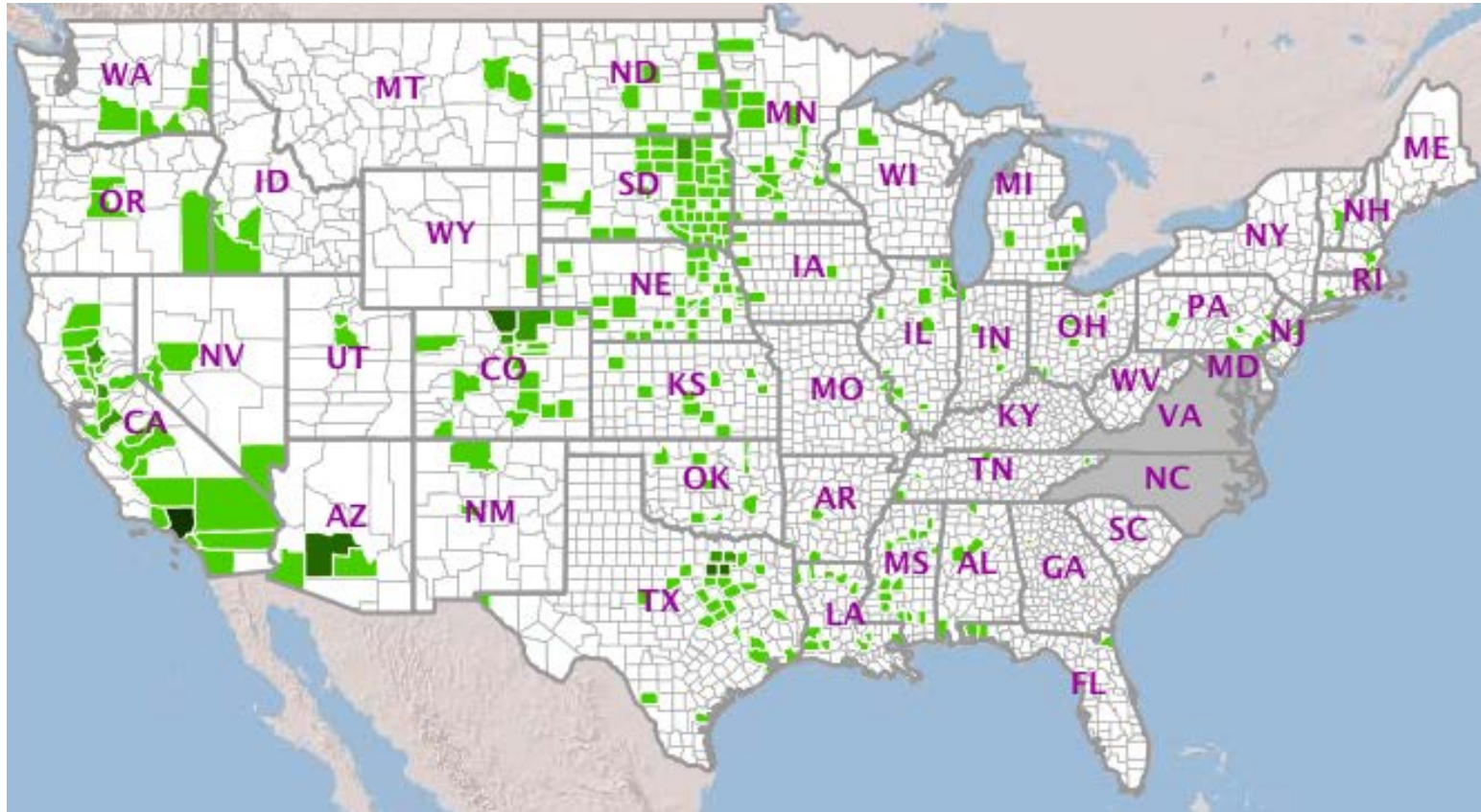


# WEST NILE VIRUS – US 2016



● Overall, **868** cases of WNV disease in people have been reported to CDC.

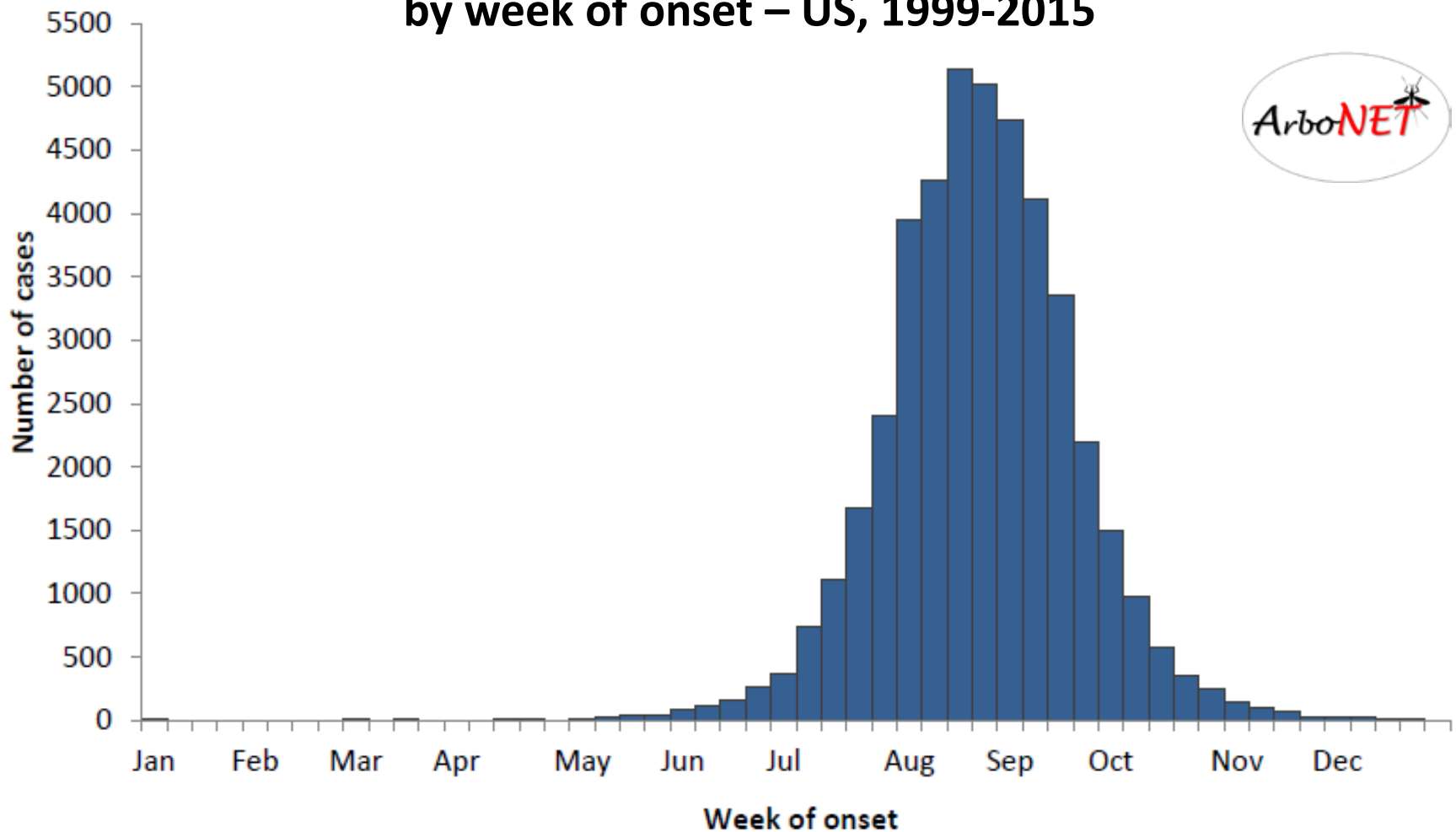
● **448 (52%)** were classified as WNND and **420 (48%)** were non-WNND.







## WNV disease cases reported to ArboNET by week of onset – US, 1999-2015

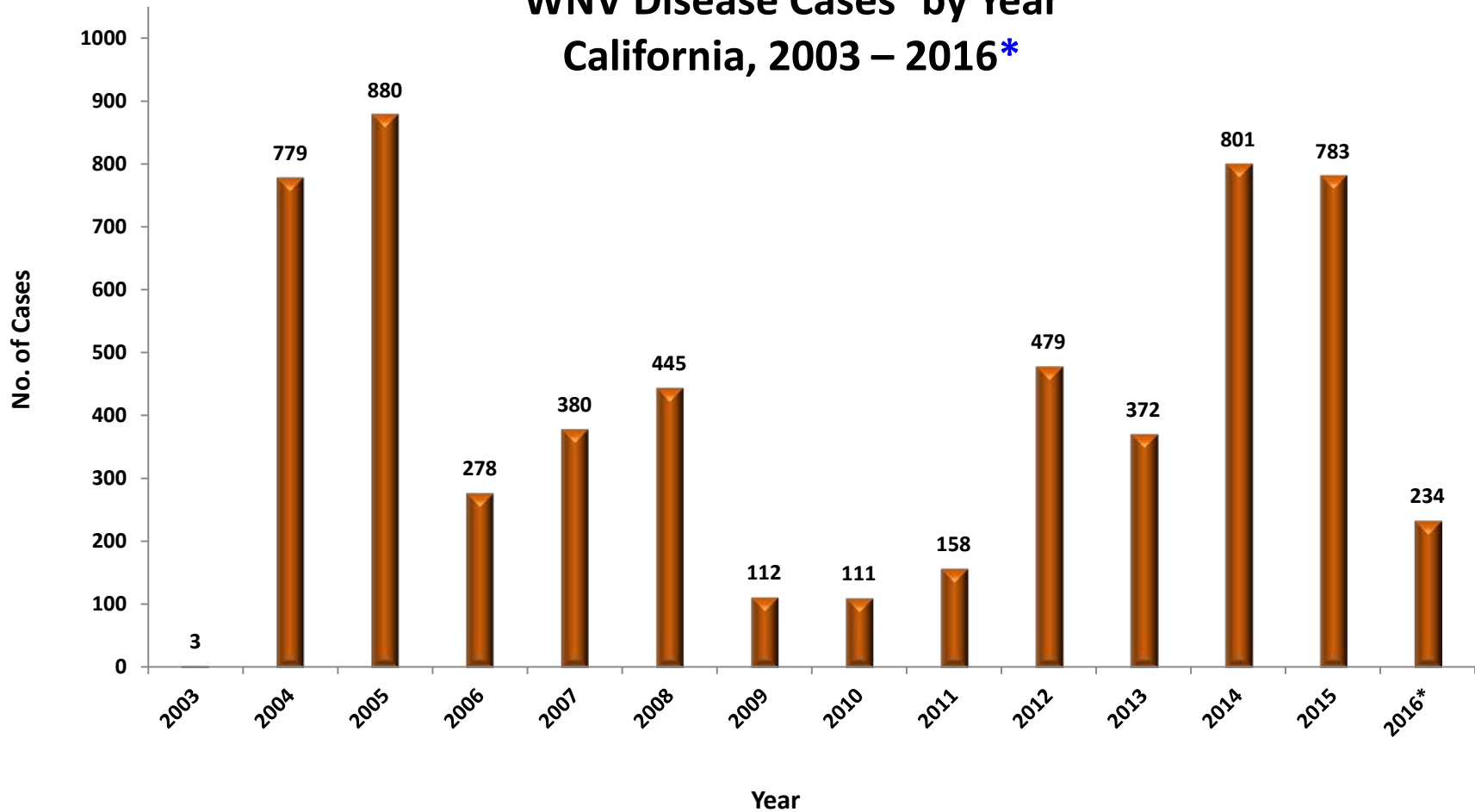


Source: CDC. Downloaded 9/11/16 from

[http://www.cdc.gov/westnile/resources/pdfs/data/4-wnv-week-onset\\_for-pdf\\_1999-2015\\_07072016.pdf](http://www.cdc.gov/westnile/resources/pdfs/data/4-wnv-week-onset_for-pdf_1999-2015_07072016.pdf)



## WNV Disease Cases<sup>†</sup> by Year California, 2003 – 2016\*



† Includes confirmed and probable cases. Does not include asymptomatic blood donors found positive for WNV.

\* As of September 23, 2016.

# WEST NILE VIRUS – CA 2016



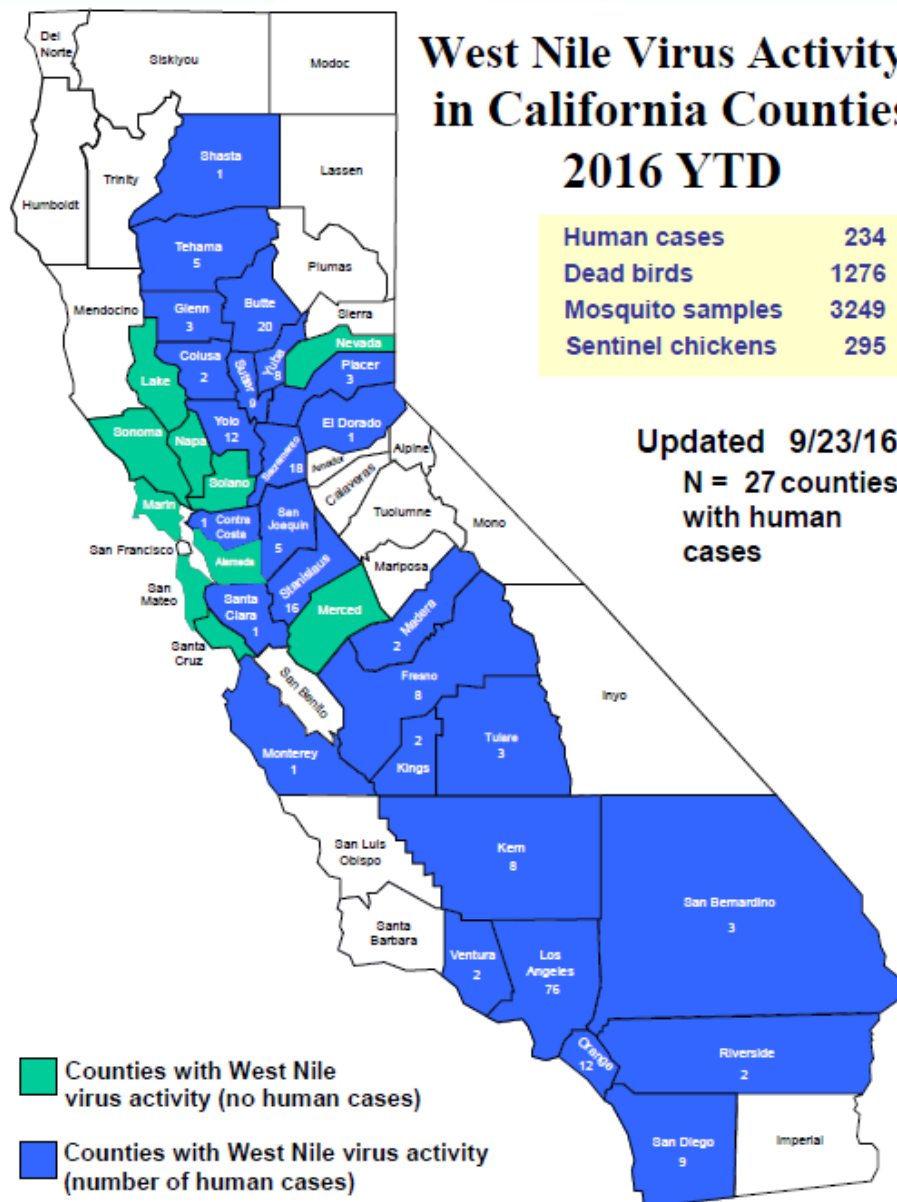
LIVE WELL  
SAN DIEGO

- **234** human cases from **27** counties have tested positive for WNV in 2016.
- **5** WNV-related fatalities have been reported
- **9** confirmed WNV cases in San Diego this year, **1** deaths, **7** cases pending confirmation by CDPH lab

## West Nile Virus Activity in California Counties 2016 YTD

Human cases	234
Dead birds	1276
Mosquito samples	3249
Sentinel chickens	295

Updated 9/23/16  
N = 27 counties  
with human  
cases

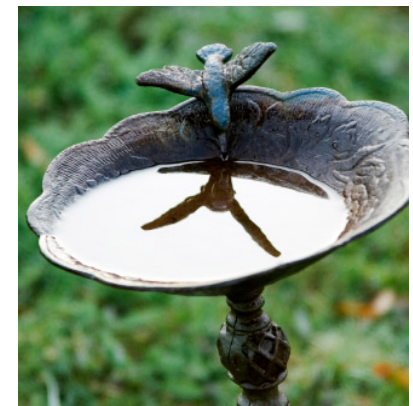
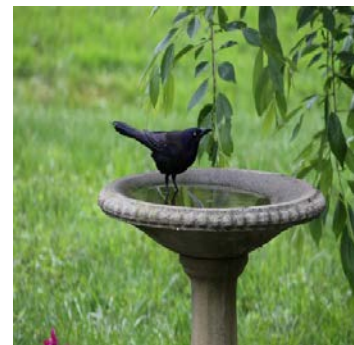


Source: CDPH. Downloaded 9/25/16  
from <http://www.westnile.ca.gov/>



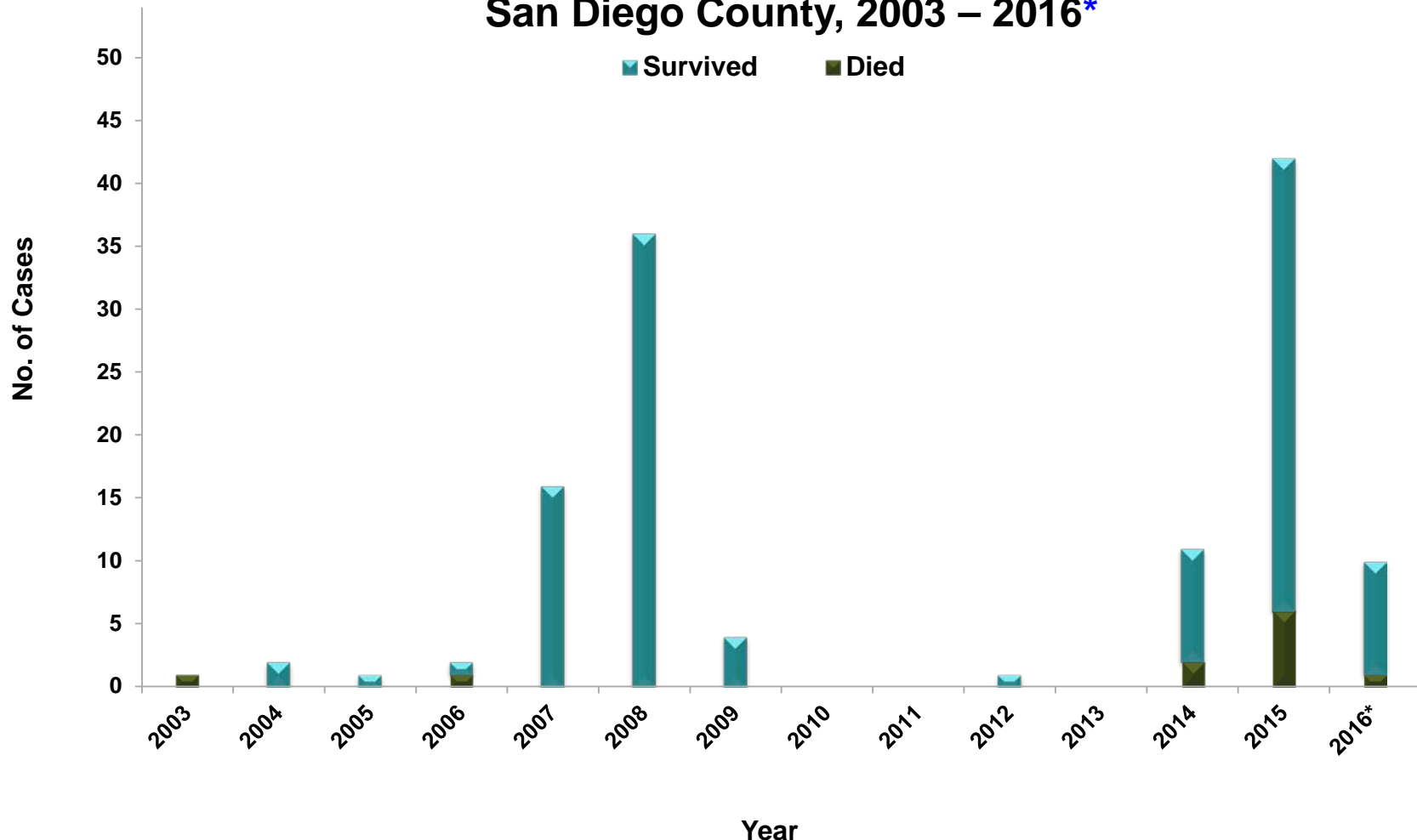
It is possible that the ongoing drought contributed to increased WNV activity by creating more **limited sources of water** for birds and mosquitoes.

- The lack of water could have caused some sources of **water to stagnate**, making the water sources attractive for mosquitoes to lay eggs.
- As birds and mosquitoes sought water, they came into closer contact and amplified the virus.





## WNV Disease Cases<sup>†</sup> by Year and Outcome San Diego County, 2003 – 2016\*

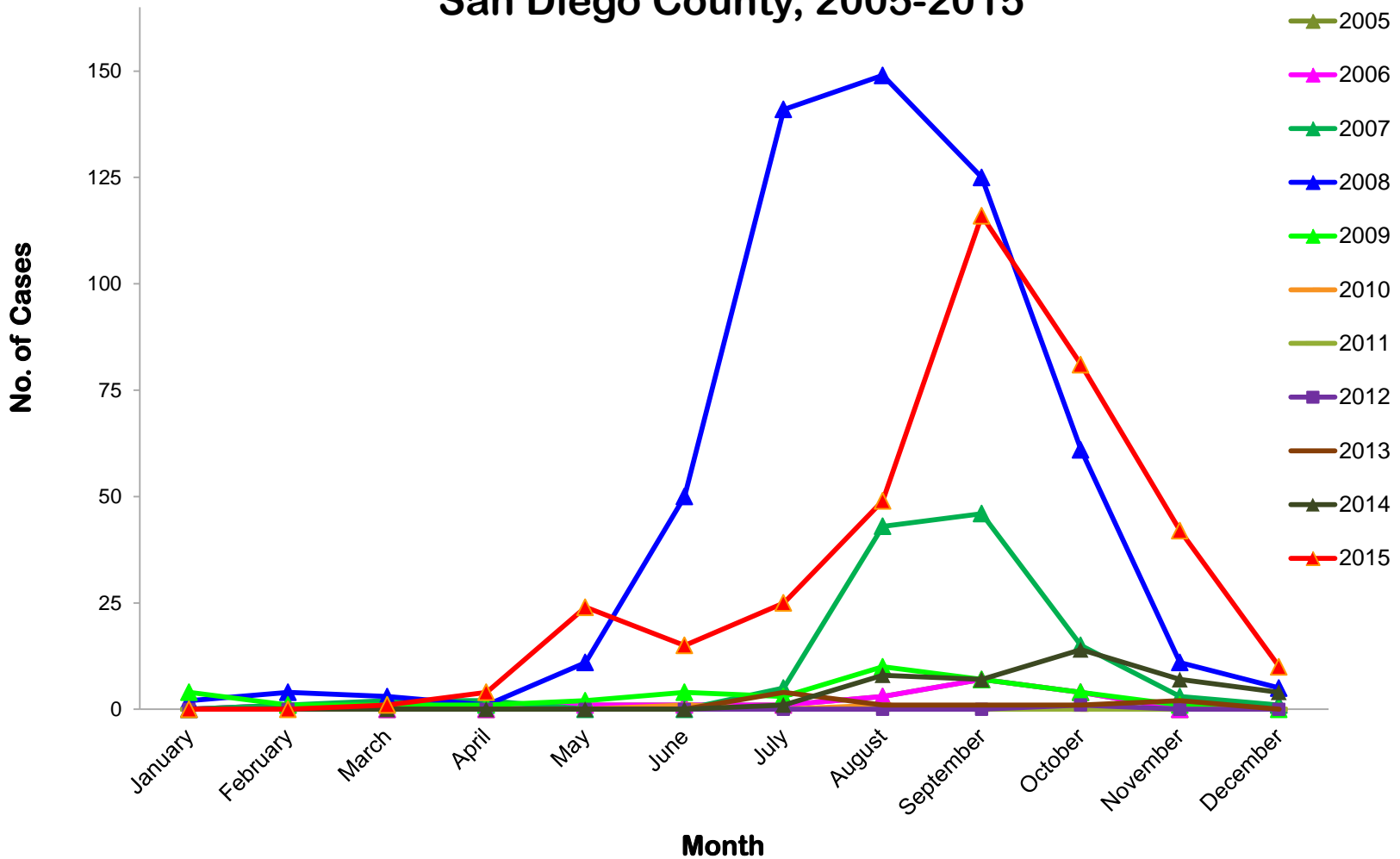


<sup>†</sup> Includes confirmed and probable cases. Does not include asymptomatic blood donors found positive for WNV.

\* As of September 23, 2016.

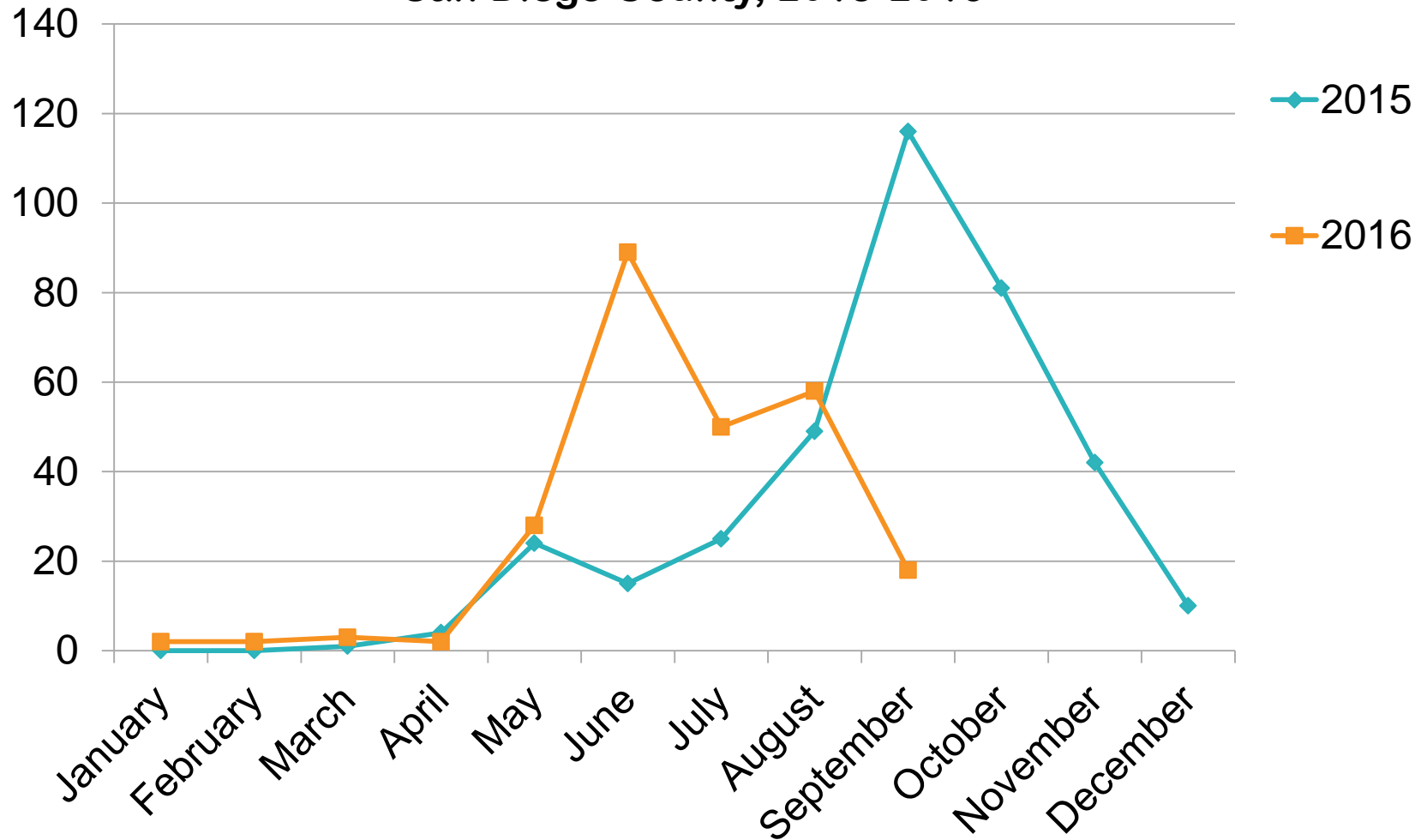


## Dead Bird Detections WNV by Month and Year of Report San Diego County, 2005-2015





## Dead Bird Detections WNV by Month and Year of Report San Diego County, 2015-2016

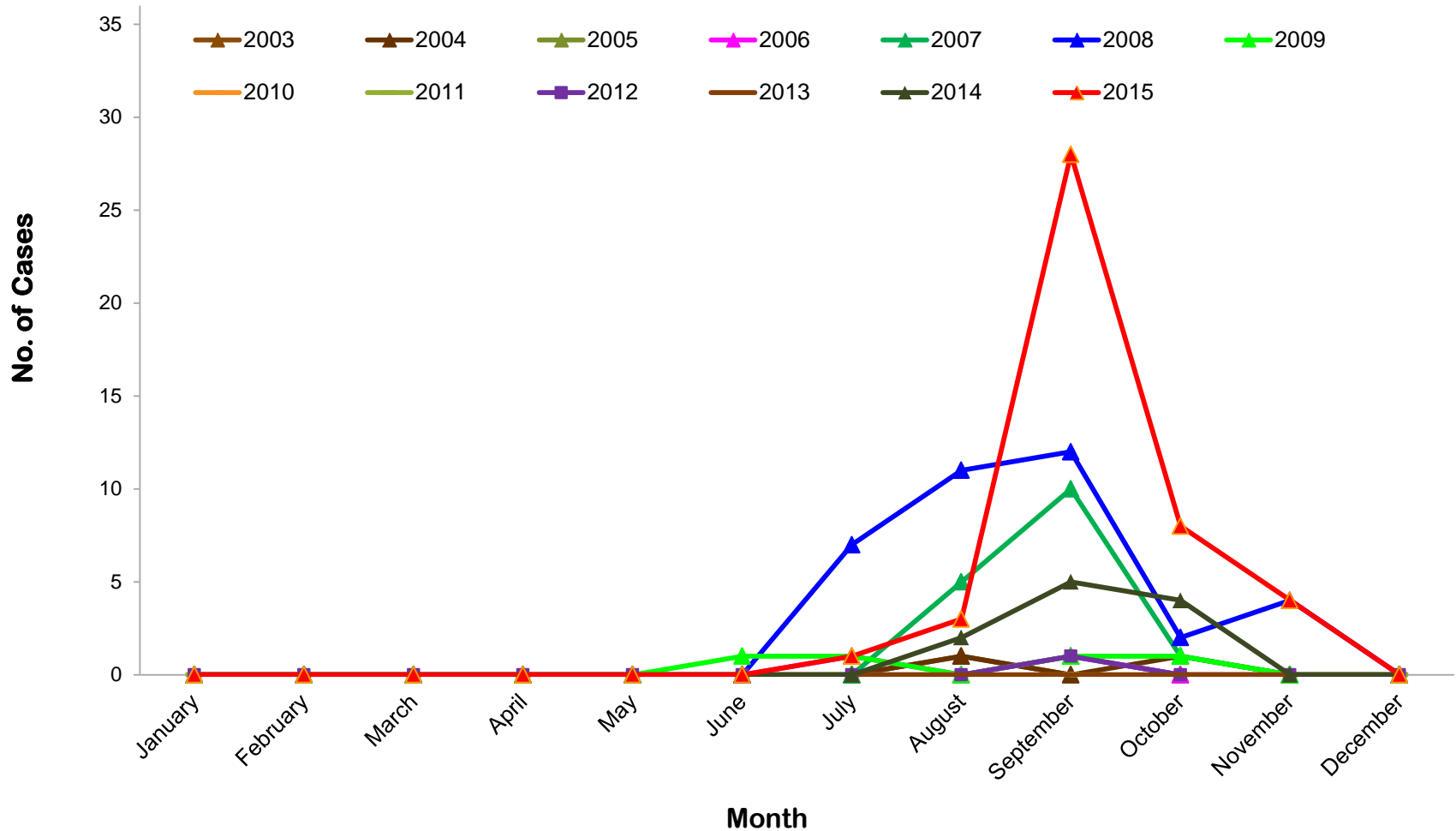


# WEST NILE VIRUS- SAN DIEGO



LIVE WELL  
SAN DIEGO

## Human WNV Disease Cases by Month and Year of Report San Diego County, 2003-2015





## Mosquito Control Spraying Set For Areas of North Torrey Pines, South Del Mar



May 16, 2016 | 3:31pm



The County of San Diego's Vector Control Program is scheduled to conduct pesticide spraying in several neighborhoods around the Los Peñasquitos Lagoon after finding increasing numbers of adult mosquitoes carrying West Nile virus in the area.



## West Nile Virus in San Diego County



Vector Control Program staff monitor WNV by trapping, pooling, and testing mosquitoes and by testing sentinel chickens and dead birds.

Current 2016 WNV activity is given below. Information for prior years is available [here](#), and additional information on WNV can be found [here](#).

### Adult Mosquito Treatment Information

#### 2016 WNV Activity Map

For more information on a specific source click on the source name (hyperlink) below

Source	Number of Positives to Date
<a href="#">Dead Birds</a>	255
<a href="#">Sentinel Chickens</a>	9
<a href="#">Mosquito Pools</a>	99
<a href="#">Horses</a>	1
<a href="#">Humans</a>	11
<b>Total Source Positives</b>	<b>375</b>

[SD Fight the Bite Homepage](#)

For More Information On  
WNV Or Other Vectors Contact:  
(858) 694-2888  
[vector@sdcounty.ca.gov](mailto:vector@sdcounty.ca.gov)



### Popular Services

[Report a Dead Bird](#)

[Report a Green Pool](#)

[Report Mosquito Activity](#)

[Find Free Mosquito Fish](#)

[Request a Rat Inspection](#)

[Sign Up for Email Notifications](#)

### COUNTYNEWSCENTER

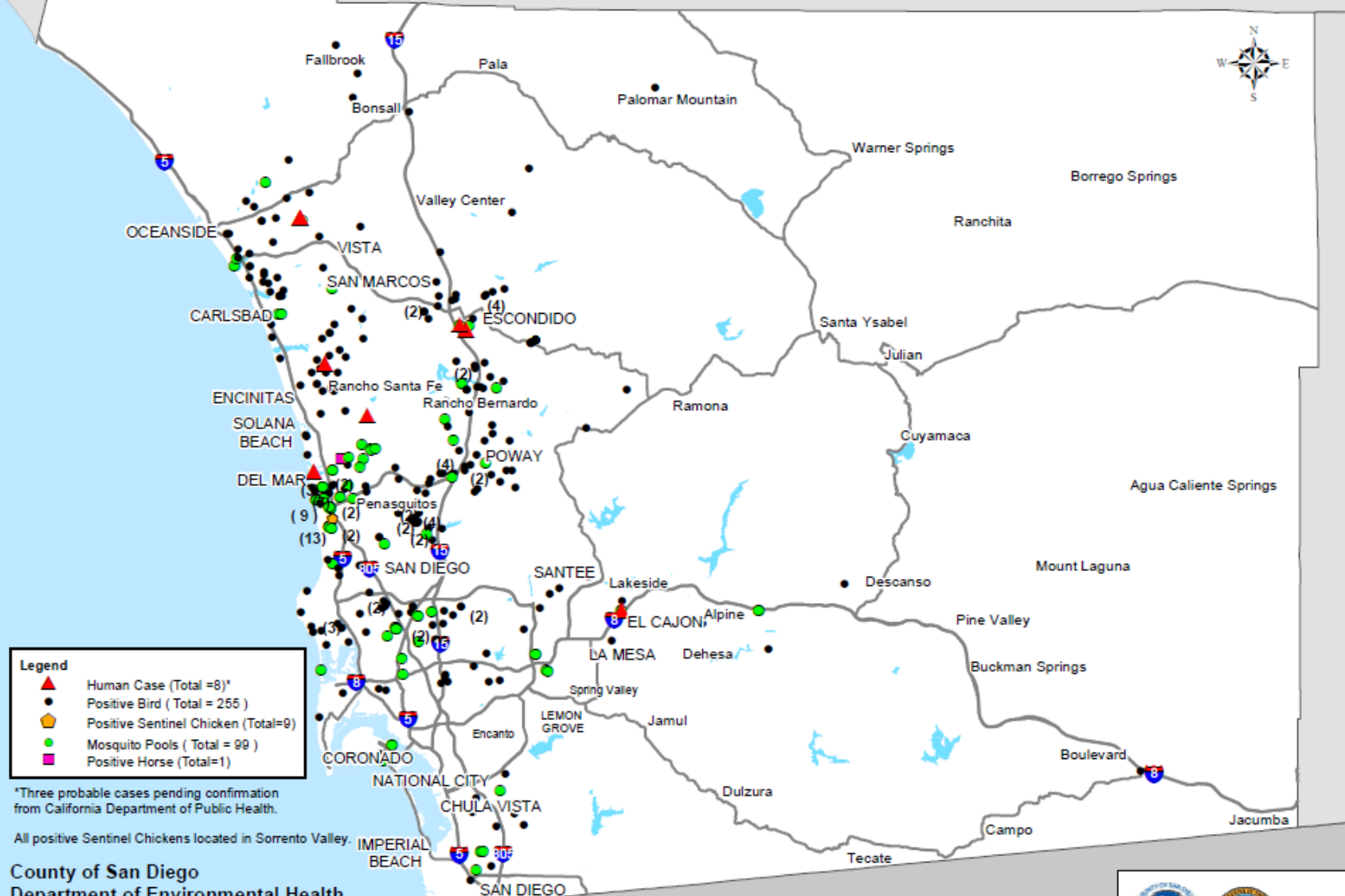


VIDEO: Rally in Balboa Park Calls for Peace



Local Infant Dies from Pertussis

# Total Number of Positive West Nile Virus (WNV) Test Results in San Diego County in 2016 Year to Date



**Legend**

- ▲ Human Case (Total =8)\*
- Positive Bird ( Total = 255 )
- Positive Sentinel Chicken (Total=9)
- Mosquito Pools ( Total = 99 )
- Positive Horse (Total=1)

\*Three probable cases pending confirmation from California Department of Public Health.

All positive Sentinel Chickens located in Sorrento Valley.

County of San Diego  
Department of Environmental Health  
Vector Control Program

January 1, 2016 - September 22, 2016

DISCLAIMER: THIS MAP/DATA IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Note: This product may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG. This product may contain information reproduced with permission granted by RAND McNALLY & COMPANY to SanGIS. This map is copyrighted by RAND McNALLY & COMPANY. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without the prior, written permission of RAND McNALLY & COMPANY. Copyright SanGIS 2009 - All Rights Reserved. Full text of this legal notice can be found at: [http://www.sangis.org/egal\\_Notice.htm](http://www.sangis.org/egal_Notice.htm)



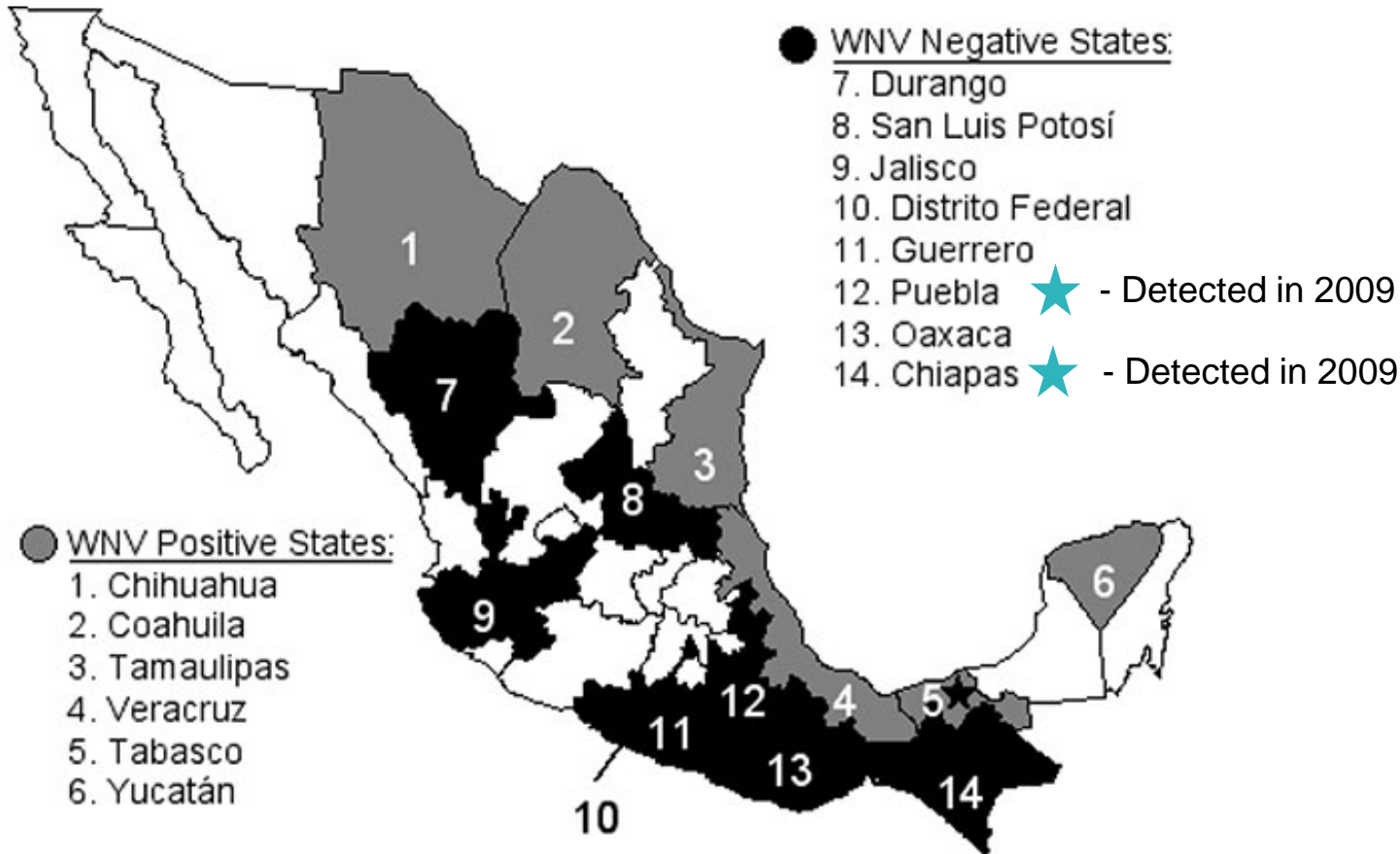
Source: San Diego County DEH VCP. Downloaded 9/25/16 from:

[http://www.sandiegocounty.gov/content/dam/sdc/deh/Vector/pdf/2016Maps/wnv\\_positives\\_WEB\\_SEP\\_22\\_2016.pdf](http://www.sandiegocounty.gov/content/dam/sdc/deh/Vector/pdf/2016Maps/wnv_positives_WEB_SEP_22_2016.pdf)

# WEST NILE VIRUS- MEXICO



LIVE WELL  
SAN DIEGO



**Figure 1.** Map showing the Mexican states sampled for antibodies to West Nile virus and Venezuelan equine encephalitis virus in equines. Unshaded states were not sampled. The location of the West Nile virus isolation from a dead Common Raven is shown by a star.

**Source: Estrada-Franco, et al. (2003)**

Downloaded 9/26/16 from [http://wwwnc.cdc.gov/eid/article/9/12/03-0564\\_article](http://wwwnc.cdc.gov/eid/article/9/12/03-0564_article)

See also: <http://www.ncbi.nlm.nih.gov/pubmed/23141421>



- **Most efficient diagnostic method is detection of antibodies to WNV in serum and/or CSF collected within 7 days of illness onset.**
- **Routine testing for WNV includes tests by enzyme immunoassay (EIA) and/or immunofluorescent assay (IFA).**
- **CDPH Viral and Rickettsial Disease Laboratory (VRDL) continues to accept serum and CSF samples for WNV testing.**



## WNV Testing capacities at CDPH VRDL include:

- IgM and IgG EIA testing
  - IgM and IgG IFA testing
  - Plaque Reduction Neutralization Test (PRNT)
  - Reverse Transcriptase – Polymerase Chain Reaction (RT-PCR)
- \* Immunocompromised patients may not mount a demonstrable antibody response in sera. CSF from these patients may be sent to VRDL for virus detection by PCR.*

## Required specimens are:

- CSF: 1-2 cc (if lumbar puncture was performed)
  - Acute Serum:  $\geq 2$  cc serum collected  $\leq 7$  days after onset †
- † *If WNV infection is highly suspected and acute serum is negative or inconclusive, testing of a 2<sup>nd</sup> or convalescent serum collected 3-5 days after acute serum may be considered.*

# SAINT LOUIS ENCEPHALITIS



- **Discovered in 1933 after outbreak in St. Louis, Missouri.**
- **23 strains, with geographic range from Canada to Argentina, but human cases have almost exclusively occurred in U.S.**
- **SLEV disease cases occur primarily in the late summer/early fall, but can occur year round in southern U.S.**
- **Majority of cases have occurred in eastern and central U.S., where episodic urban-centered outbreaks have recurred since the 1930's.**
- **In western U.S., transmission has followed a more endemic pattern. Found historically in many regions of CA (Central Valley and southern CA), but, since the introduction of WNV into CA in 2003, SLEV detected rarely.**



- **Largest epidemic of SLEV neuroinvasive disease ever recognized occurred in the U.S. in 1975, with nearly 2,000 cases reported, primarily from the central states in the Ohio-Mississippi River Basin.**
- **Since 2004, between 1 and 12 cases per year reported.**
- **Four cases reported so far in 2016, one in Los Angeles County**
- **Mosquitoes positive for SLEV in Los Angeles, Riverside, Orange and Kern Counties in 2016.**

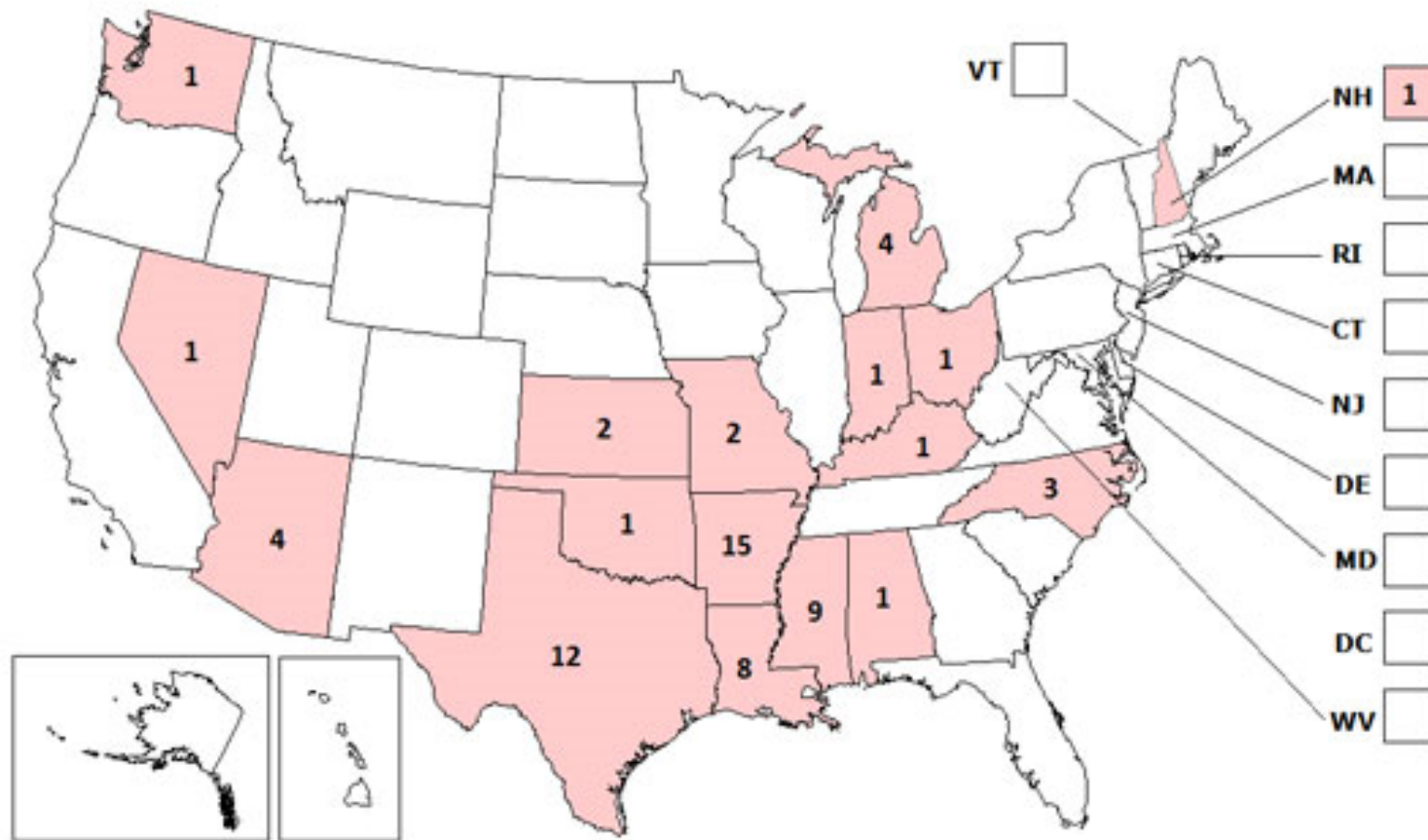


# SAINT LOUIS ENCEPHALITIS



LIVE WELL  
SAN DIEGO

St. Louis encephalitis virus neuroinvasive disease cases reported by state, 2004-2013



Data source: ArboNet. Image: CDC. Downloaded 9/25/16 from <http://www.cdc.gov/sle/technical/epi.html#moremapschartstables>

# SLEV - TRANSMISSION



LIVE WELL  
SAN DIEGO

## Transmission cycle of SLEV

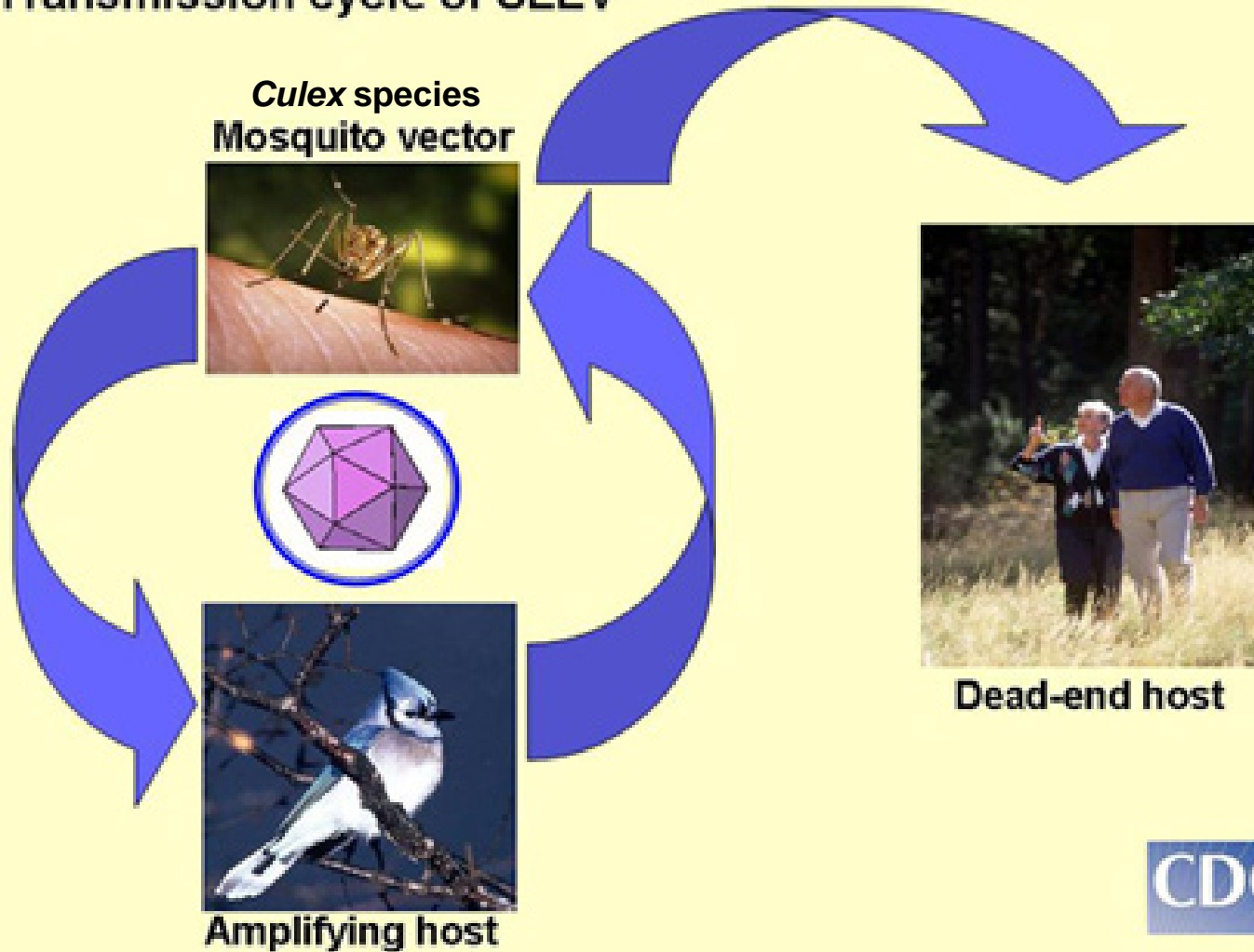


Photo credit: CDC



- **Less than 1% of St. Louis encephalitis virus (SLEV) infections are clinically apparent and the vast majority of infections remain undiagnosed.**
- **The incubation period for SLEV disease (the time from infected mosquito bite to onset of illness) ranges from 5 to 15 days.**
- **Onset of illness is usually abrupt, with fever, headache, dizziness, nausea, and malaise.**
- **Signs and symptoms intensify over a period of several days to a week.**



- **Some patients spontaneously recover after this period; others develop signs of central nervous system infections, including stiff neck, confusion, disorientation, dizziness, tremors and unsteadiness. Coma can develop in severe cases.**
- **Disease is generally milder in children than in older adults.**
- **About 40% of children and young adults with SLEV disease develop only fever and headache or aseptic meningitis; almost 90% of elderly persons with SLEV disease develop encephalitis.**
- **Overall case-fatality ratio is 5 to 15% - increases with age.**

## 5 FORMAS FÁCILES DE LUCHAR CONTRA LA PICADURA

- 1 Use repelente contra zancudos antes de salir de la casa - especialmente al amanecer y al atardecer
- 2 Reporte pájaros recientemente muertos (como cuervos y halcones) al Programa de Control de Vectores
- 3 Revise semanalmente que no haya agua estancada alrededor de su casa
- 4 Cuando esté afuera durante el amanecer y el atardecer, use mangas largas y pantalones largos
- 5 Llame al Programa de Control de Vectores para un tratamiento contra zancudos sin costo alguno (es seguro para personas y mascotas) (858) 694-2888



Para recibir alertas de salud de la comunidad, háganos like en Facebook (SD Fight the Bite) o síguenos en Twitter (@sdfightthebite).



*CUIDESE A SU MISMO, A SU FAMILIA Y A SU VECINDARIO*



**¡Prevenga!**



**¡Protéjase!**



**¡Reporte!**



Programa de Control de Vectores del Condado de San Diego  
5570 Overland Ave., Suite 102 | San Diego, Ca 92123  
TELÉFONO (858) 694-2888 | CORREO ELECTRÓNICO [vector@sdcounty.ca.gov](mailto:vector@sdcounty.ca.gov)

# SAINT LOUIS ENCEPHALITIS

No current specific treatment or vaccine for SLEV infection.

Photo: SDCVCP

# YELLOW FEVER



- **YF has had an important role in the history of Africa, the Americas, Europe, and the Caribbean.**
- **In the 1600's, YF was imported into the Western Hemisphere on slave ships from West Africa.**
- **In 1648, the first definitive evidence of YF in the Americas was in Mayan manuscripts describing an outbreak of the disease in the Yucatan and Guadeloupe.**
- **Outbreaks were reported in the U.S., including in New York (1668), Boston (1691), and Charleston (1699). Spread to Europe in the 1700's.**
- **The Reed Yellow Fever Commission proved that YF infection is transmitted to humans by the *Aedes aegypti*.**
- **Last U.S. outbreak occurred in New Orleans in 1905.**

# YELLOW FEVER



- **Following the demonstration that *Ae. aegypti* mosquitoes are responsible for transmission of the YF virus to humans, intense sanitation programs began in Panama and Havana, Cuba, eradicating the disease in these areas.**
- **In 1930, two YF vaccines were developed, the 17D vaccine and the French neurotropic vaccine. Mass campaigns conducted in the 1940's.**
- **In 1950's doctors became concerned with the high rate of postvaccinal encephalitis following administration of the YF vaccine to infants.**
- **The range of YF virus transmission in the Americas expanded, and cases were reported in Panama for the first time in 43 years. Before the end of 1950's, the disease had spread throughout Central America, finally stopping near the border of Guatemala and Mexico.**

# YELLOW FEVER – SOUTH AMERICA



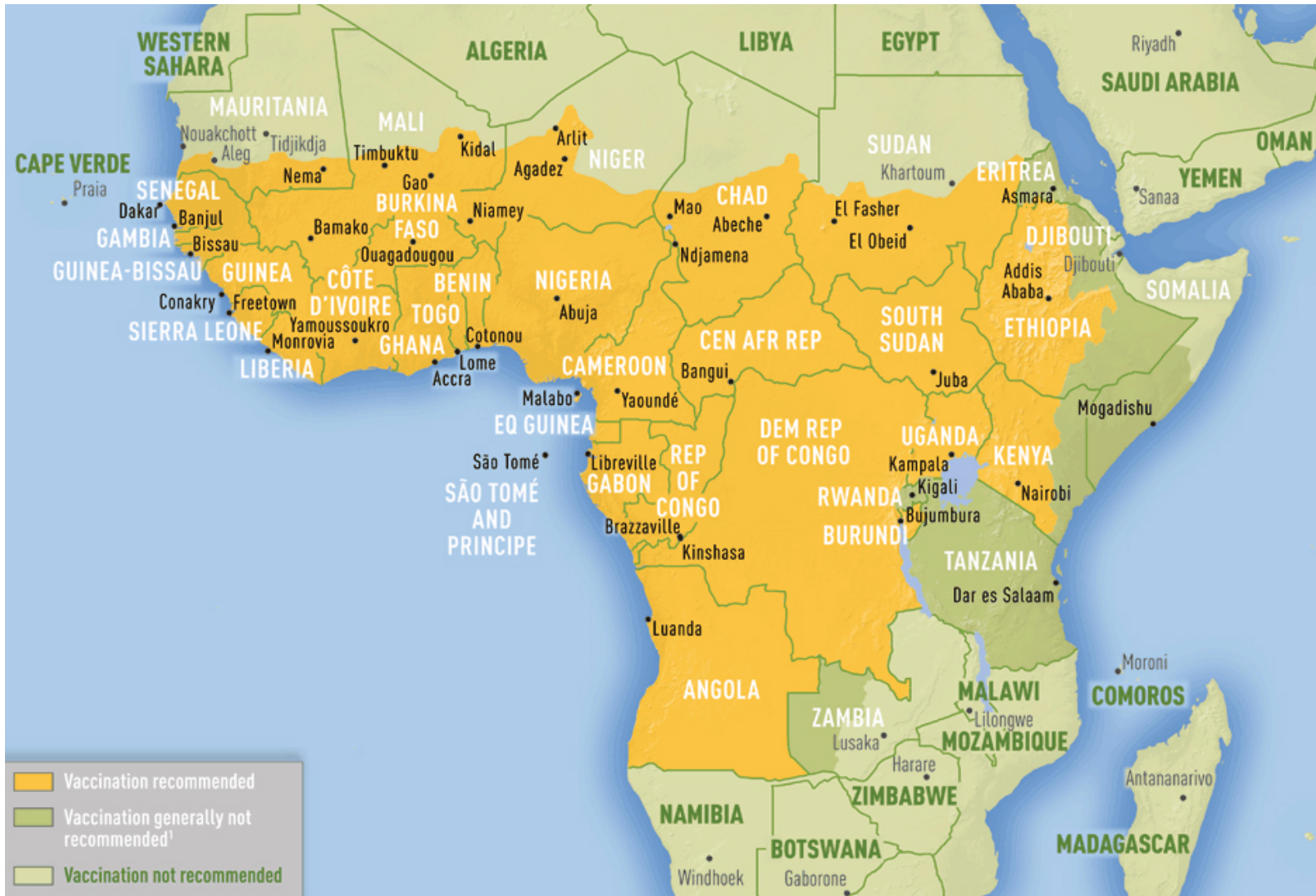
**Source CDC.**  
Downloaded 9/25/16 from  
<http://www.cdc.gov/yellowfever/maps/southamerica.html>



# YELLOW FEVER - AFRICA

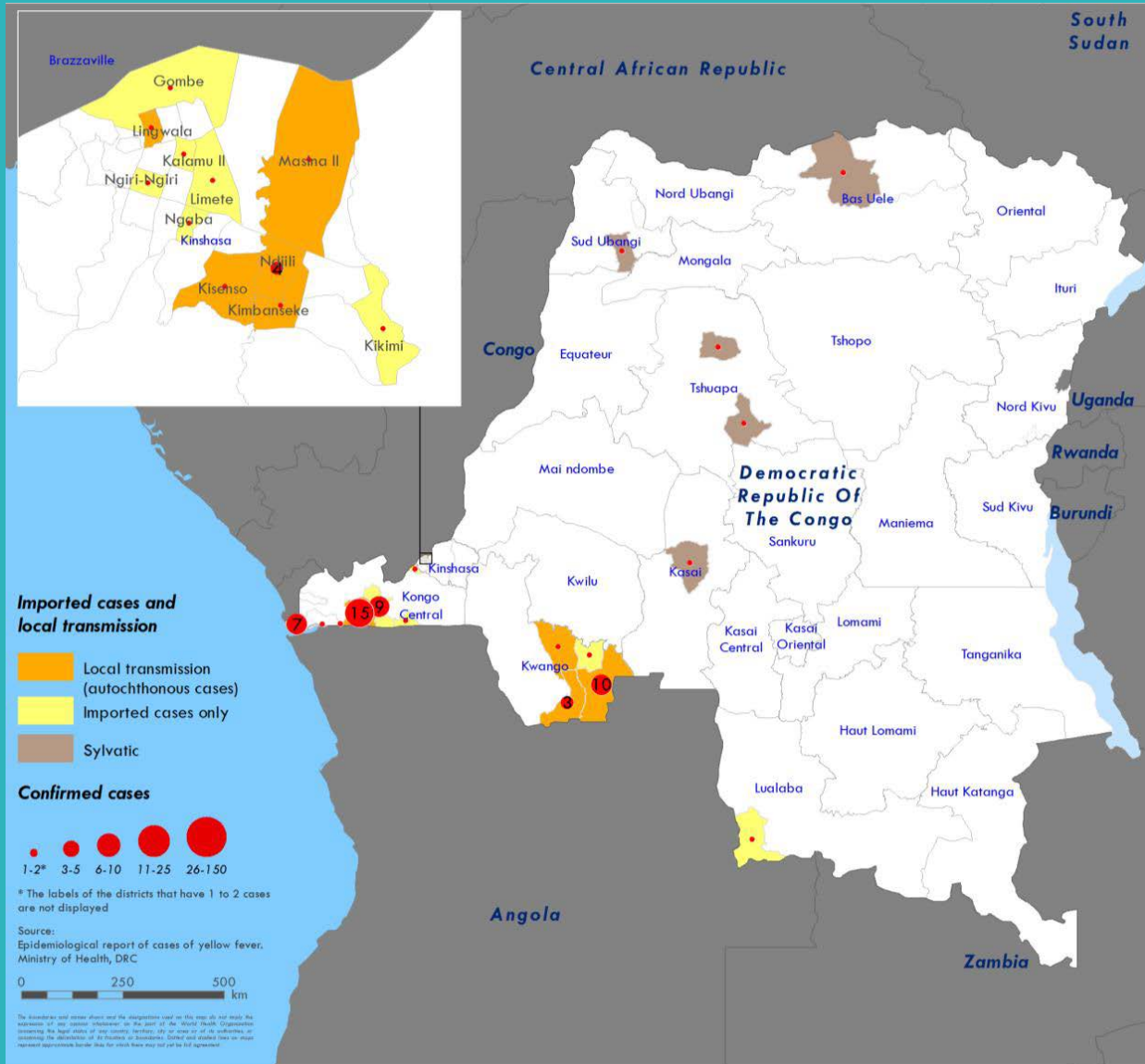


LIVE WELL  
SAN DIEGO



Source CDC. Downloaded 9/25/16 from <http://www.cdc.gov/yellowfever/maps/africa.html>

# Distribution of confirmed yellow fever cases in Democratic Republic of The Congo as of 18 September 2016



Outbreak began 1/1/16

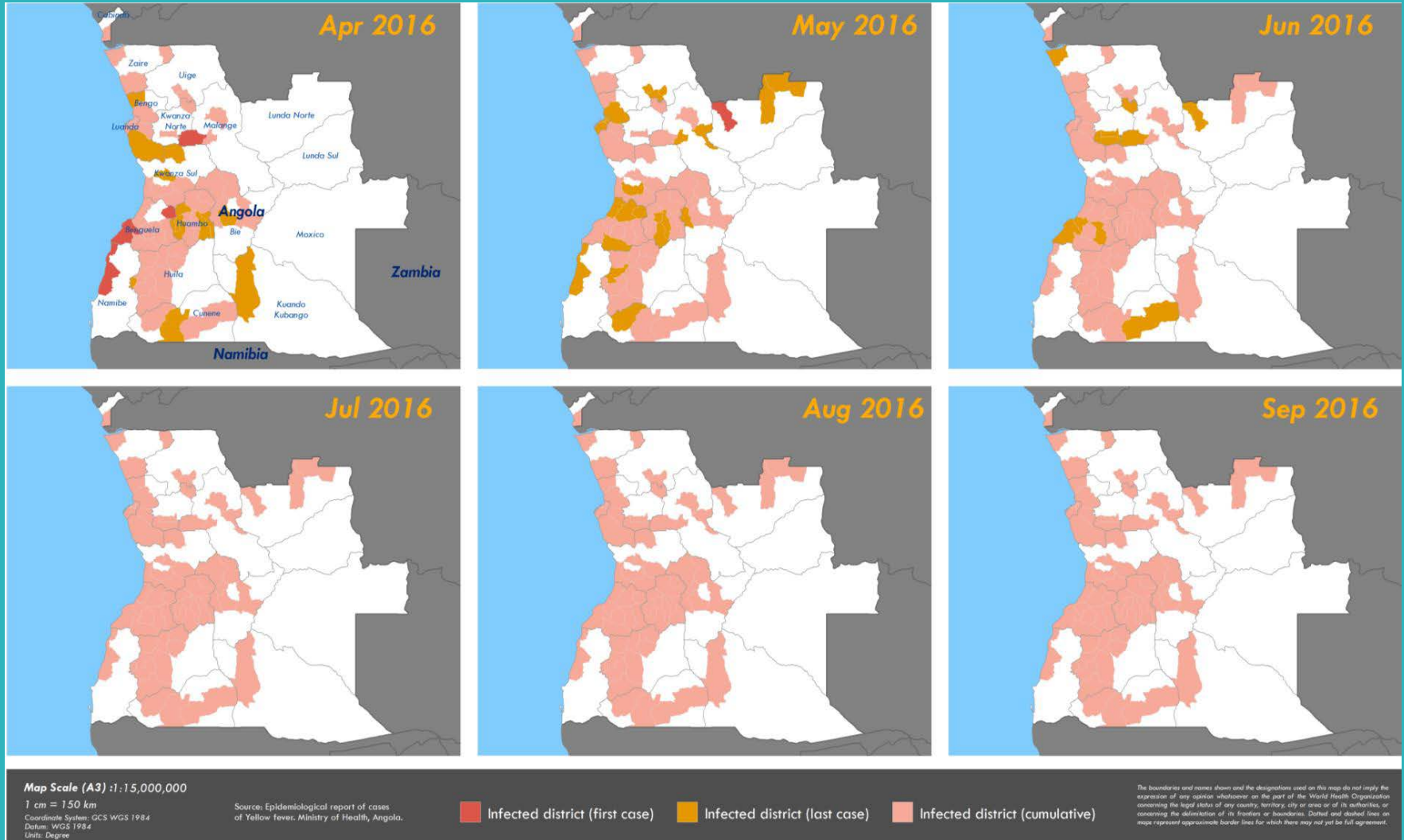
2,770 reported cases  
116 reported deaths

76 confirmed cases  
16 confirmed deaths

Data source WHO.

Downloaded 9/26/16 from:  
<http://apps.who.int/iris/bitstream/10665/250147/1/yellow-feversitrep23Sep16-eng.pdf?ua=1>

# Geographical distribution of confirmed cases in Angola by district through time, March 2016 to 1 September 2016

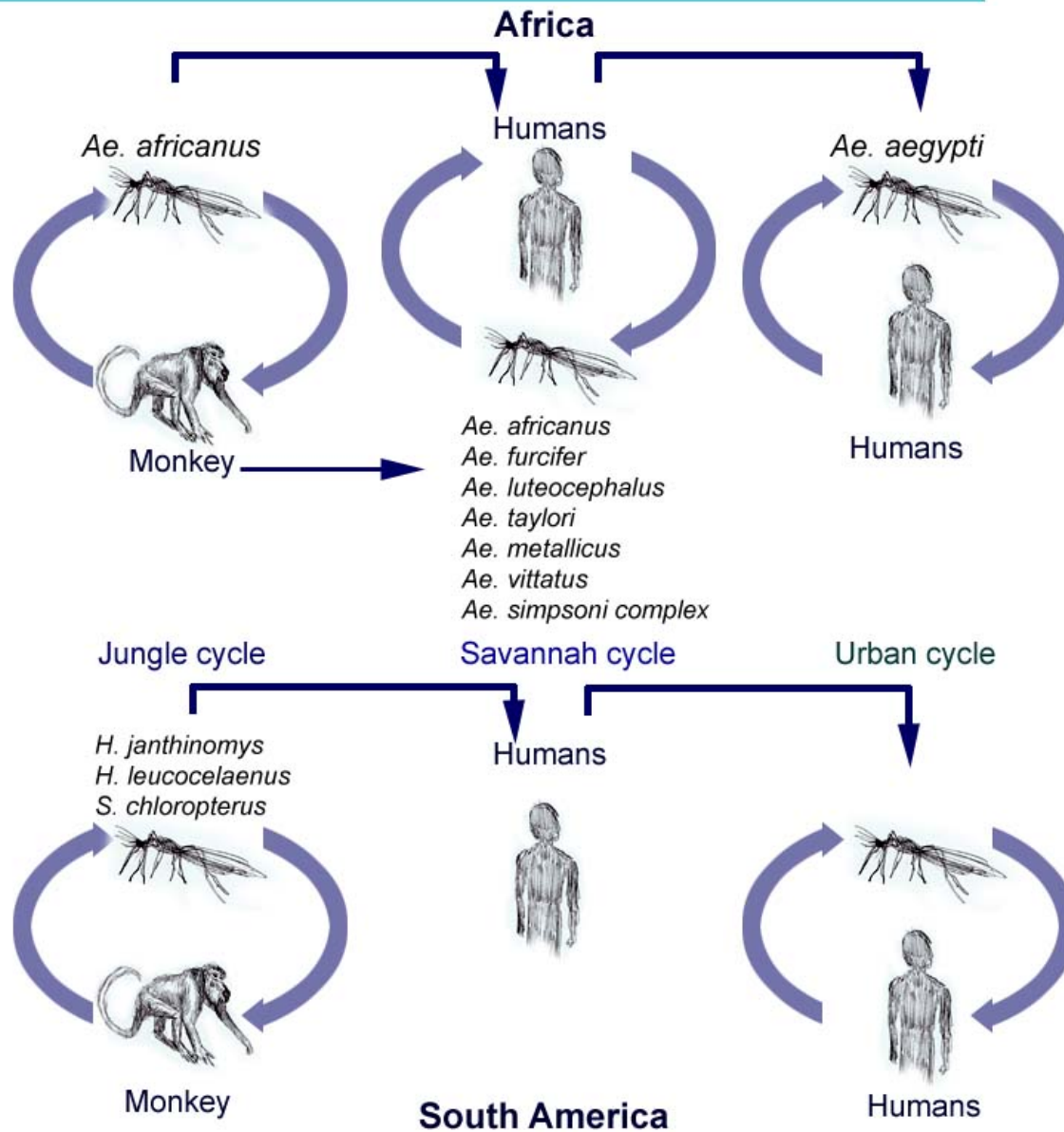


**Outbreak began 12/5/15 4,065 reported cases 371 reported deaths  
 884 confirmed cases 121 confirmed deaths**

**Data source WHO. Downloaded 9/26/16 from**

**<http://apps.who.int/iris/bitstream/10665/250077/1/yellowfeversitrep9Sep16-eng.pdf?ua=1>**

# YELLOW FEVER



**Source: Infection Landscapes.**  
 Downloaded 9/25/16 from  
<http://www.infectionlandscapes.org/2011/07/yellow-fever.html>

# YELLOW FEVER - SYMPTOMS



- **Majority of persons infected with YF have no illness or only mild illness.**
- **In persons who develop symptoms, the incubation period is typically 3 to 6 days.**
- **Initial symptoms include sudden onset of fever, chills, severe headache, back pain, general body aches, nausea, and vomiting, fatigue, and weakness. Most persons improve after the initial presentation.**
- **After a brief remission of hours to a day, 15% of cases progress to develop a more severe form of the disease, characterized by high fever, jaundice, bleeding, and eventually shock and multiple organ failure.**





- **No specific treatments have been found to benefit patients with YF. Whenever possible, YF patients should be hospitalized for supportive care and close observation.**
- **Treatment is symptomatic. Rest, fluids, and use of pain relievers and medication to reduce fever may relieve symptoms of aching and fever.**
- **Avoid certain medications, such as aspirin or other nonsteroidal anti-inflammatory drugs (e.g. ibuprofen, naproxen), which may increase the risk of bleeding.**
- **YF patients should be protected from further mosquito exposure (staying indoors and/or under a mosquito net) for up to 5 days after fever onset.**



- **Majority of infected persons will be asymptomatic or have mild disease with complete recovery.**
- **In persons who become symptomatic but recover, weakness and fatigue may last several months.**
- **Among those who develop severe disease, 20–50% may die.**
- **Those who recover from YF generally have lasting immunity against subsequent infection.**



**There IS a vaccine for yellow fever, but no specific treatment.**

## **Key prevention messages:**

- Stay indoors at dawn and dusk
- Avoid mosquito bites; wear long sleeves, long pants, and socks when outdoors
- Use mosquito repellent\*
- Keep screens on windows and doors in good repair
- Identify and eliminate standing water sources that can be mosquito-breeding areas around the home

\* Information on repellents can be found at:  
<http://www.cdc.gov/ncidod/dvbid/westnile/RepellentUpdates.htm>



# YF VACCINE - RECOMMENDATION



- **YF vaccine is recommended for persons aged  $\geq 9$  months who are traveling to or living in areas at risk for YF virus transmission in South America or Africa.**
- **YF vaccine may be required for entry into certain countries. YF vaccination requirements and recommendations for specific countries are available on the [CDC Travelers' Health page](#).**
- **Serious adverse events can occur following YF vaccination. Persons should only be vaccinated if they are at risk of exposure to YF virus or require proof of vaccination for country entry.**
- **To minimize the risk, providers should carefully observe the contraindications and consider the precautions prior to vaccine administration.**

# YF VACCINE - RECOMMENDATION



- A medical waiver can be given for persons with a precaution about or contraindication to vaccination. More information about medical waivers is available on the [CDC Travelers' Health website](#).
- For more information about the use of YF vaccine in travelers or laboratory workers, see the [Advisory Committee on Immunization Practice \(ACIP\) recommendations](#).
- This vaccine is administered only at designated vaccination centers. Locations at [CDC Travelers' Health Yellow Fever website](#).



- **In February 2015, the CDC Advisory Committee on Immunization Practices (ACIP) approved a new recommendation that a single dose of yellow fever vaccine provides long-lasting protection and is adequate for most travelers.**
- **The updated recommendations also identify specific groups of travelers who should receive additional doses and others for whom additional doses may be considered including:**
  - **Woman who were pregnant when first vaccinated**
  - **Persons who received a hematopoietic stem cell transplant following their last dose of YF vaccine**
  - **Persons who are HIV-infected**
  - **Travelers who received YF vaccine at least 10 years previously and who will be in a higher-risk setting based on season, location, activities, and duration of their travel**
  - **Laboratory workers who routinely handle wild-type YF virus**

# YF VACCINE - BOOSTER



- **Although ACIP no longer recommends booster doses of YF vaccine for most travelers, clinicians and travelers should review the entry requirements for destination countries because changes to the International Health Regulations (IHR) have not yet been fully implemented.**
- **In 2014, WHO adopted the recommendation to remove the 10-year booster dose requirement from the IHR as of June 2016. Once this change is instituted, a completed International Certificate of Vaccination or Prophylaxis will be valid for the lifetime of the vaccine. Some countries have already adopted this change, however, it is uncertain when and if all countries with YF vaccination requirements will adopt this change.**

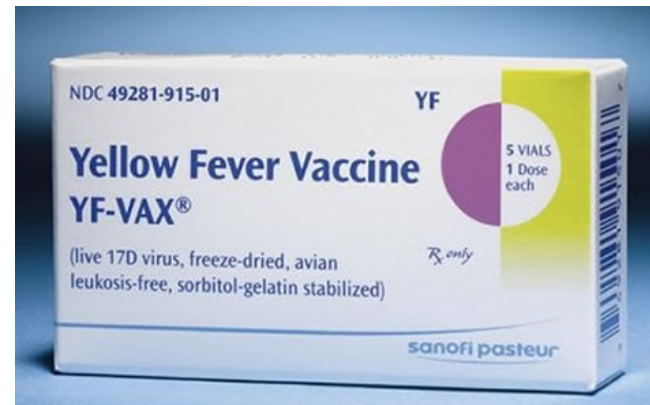


## Contraindications

- Allergy to a vaccine component
- Age <6 months
- Thymus disorder associated with abnormal immune function
- Primary immunodeficiencies
- Malignant neoplasms
- Transplantation
- Immunosuppressive and immunomodulatory therapies
- Symptomatic HIV infection or CD4+ T-lymphocytes <200/mm<sup>3</sup> (<15% of total in children aged <6 years)

## Precautions

- Age 6 to 8 months
- Age ≥60 years
- Asymptomatic HIV infection and CD4+ T-lymphocytes 200 to 499/mm<sup>3</sup> (15-24% of total in children aged <6 years)
- Pregnancy
- Breastfeeding



# YF VACCINE - REACTIONS



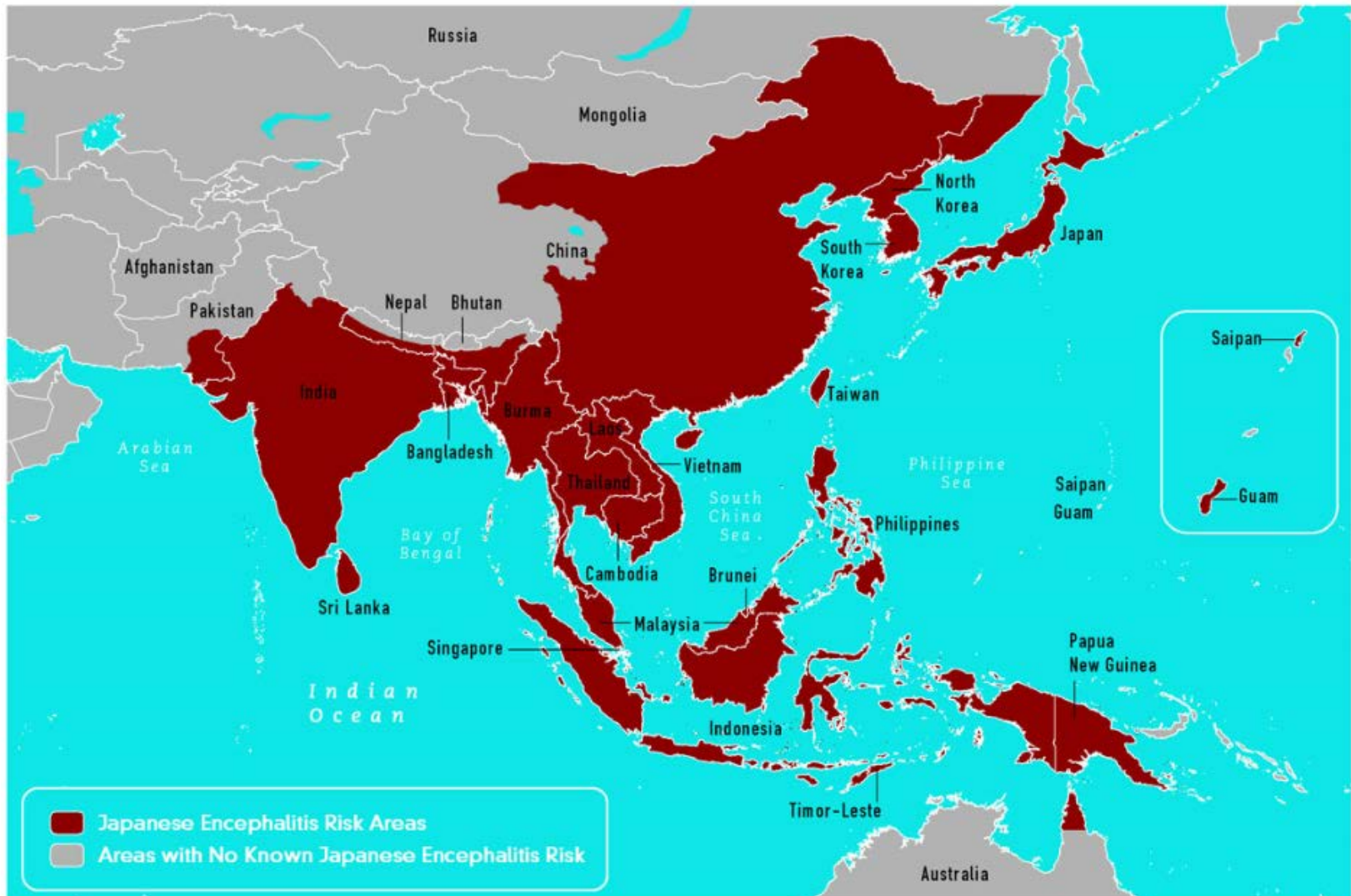
- Reactions to YF vaccine are generally mild and include headaches, myalgias, and low-grade pyrexia.
- Rare reports of serious events following YF vaccination, including:
  - Anaphylaxis
  - YF vaccine-associated viscerotropic disease (YEL-AVD)
  - YF vaccine-associated neurologic disease (YEL-AND)
- CDC can provide lab testing support for suspected YEL-AVD and YEL-AND.
- Healthcare providers are encouraged to report all adverse events that might be caused by vaccination to the [CDC/FDA Vaccine Adverse Events Reporting System \(VAERS\)](#)

# JAPANESE ENCEPHALITIS



- **Approximately 67,900 JE cases typically occur annually (overall incidence: 1.8 per 100,000), of which only about 10% are reported to WHO. (Campbell, et al. 2011)**
- **Approximately 33,900 (50%) of cases occur in China (excluding Taiwan) and approximately 51,000 (75%) occur in children aged 0-14 years (incidence: 5.4 per 100,000).**
- **Approximately 55,000 (81%) cases occur in areas with well established or developing JE vaccination programs, while approximately 12,900 (19%) occur in areas with minimal or no JE vaccination programs.**

# JAPANESE ENCEPHALITIS



Source CDC. Downloaded 9/25/16 from <http://www.cdc.gov/japaneseencephalitis/maps/index.html>

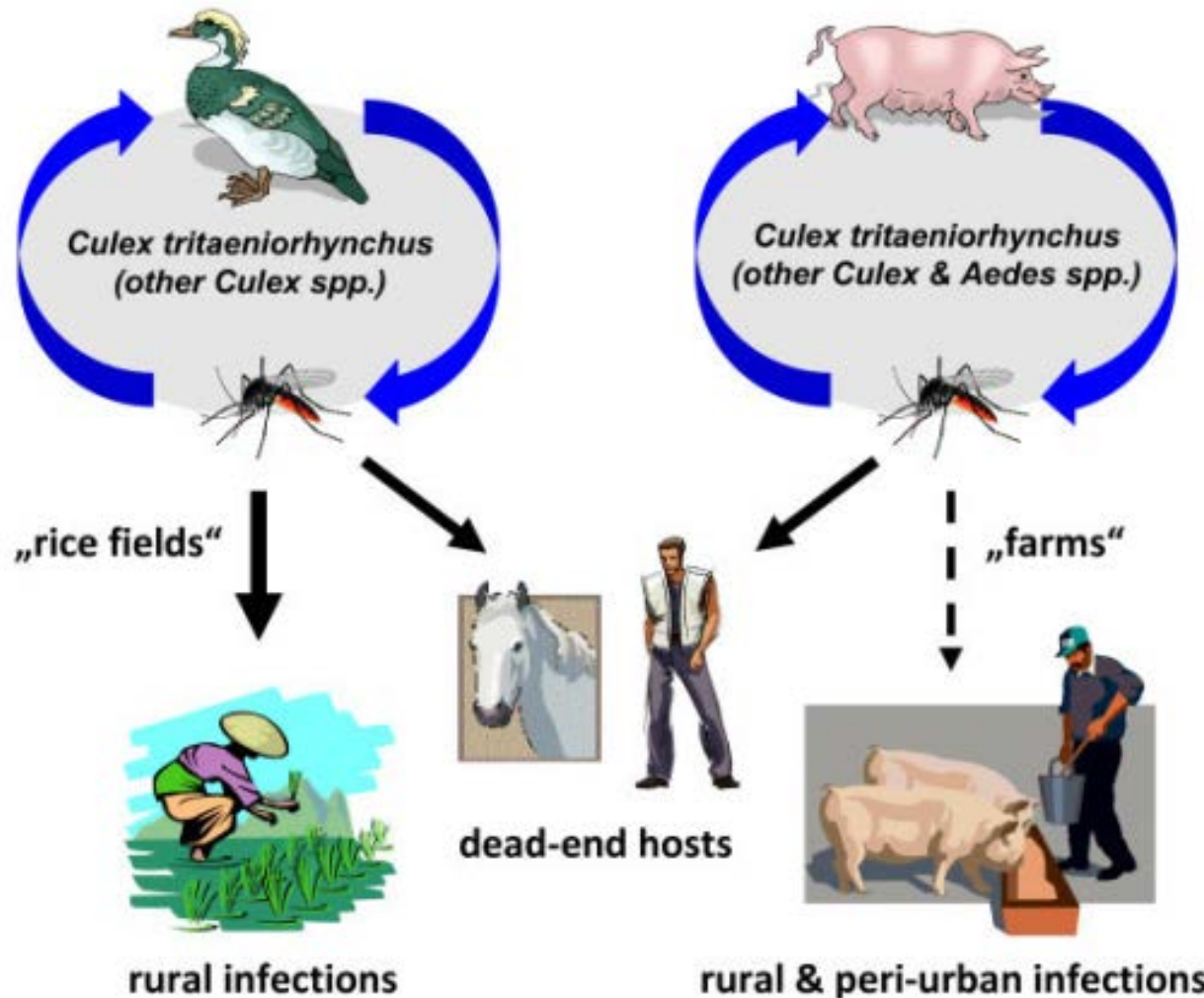


# JAPANESE ENCEPHALITIS



Endemic / natural cycle

Amplification cycle



Source: Pfeffer & Dobler (2010). Downloaded 9/25/16 from

[https://openi.nlm.nih.gov/detailedresult.php?img=PMC2868497\\_1756-3305-3-35-3&req=4](https://openi.nlm.nih.gov/detailedresult.php?img=PMC2868497_1756-3305-3-35-3&req=4)

# JE - SYMPTOMS



- **Less than 1% of people infected with Japanese encephalitis (JE) virus develop clinical illness.**
- **In persons who develop symptoms, the incubation period (time from infection until illness) is typically 5 to 15 days.**
- **Initial symptoms often include fever, headache, and vomiting.**
- **Mental status changes, neurologic symptoms, weakness, and movement disorders might develop over the next few days.**
- **Seizures are common, especially among children.**



- **No specific treatments have been found to benefit patients with JE, but hospitalization for supportive care and close observation is generally required.**
- **Treatment is symptomatic. Rest, fluids, and use of pain relievers and medication to reduce fever may relieve some symptoms.**
- **Among patients who develop encephalitis, 20% - 30% die.**
- **Although some symptoms improve after the acute illness, 30%-50% of survivors continue to have neurologic, cognitive, or psychiatric symptoms**



**There IS a vaccine for JE, but no specific treatment.**

## **Key prevention messages:**

- Stay indoors at dawn and dusk
- Avoid mosquito bites; wear long sleeves, long pants, and socks when outdoors
- Use mosquito repellent\*
- Keep screens on windows and doors in good repair
- Identify and eliminate standing water sources that can be mosquito-breeding areas around the home

\* Information on repellents can be found at:  
<http://www.cdc.gov/ncidod/dvbid/westnile/RepellentUpdates.htm>



- JE vaccine is **recommended** for travelers who plan to spend 1 month or more in endemic areas during the JE virus transmission season. This includes long-term travelers, recurrent travelers, or expatriates who will be based in urban areas but are likely to visit endemic rural or agricultural areas during a high-risk period of JE virus transmission.
- JE vaccine is **not recommended** for short-term travelers whose visits will be restricted to urban areas or times outside a well-defined JE virus transmission season.



- Vaccine should also be **considered** for the following:
  - Short-term (<1 month) travelers to endemic areas during the transmission season, if they plan to travel outside an urban area and their activities will increase the risk of JE virus exposure. Examples of higher-risk activities or itineraries include:
    - spending substantial time outdoors in rural or agricultural areas, especially during the evening or night;
    - participating in extensive outdoor activities (such as camping, hiking, trekking, biking, fishing, hunting, or farming); and
    - staying in accommodations without air conditioning, screens, or bed nets.
  - Travelers to an area with an ongoing JE outbreak.
  - Travelers to endemic areas who are uncertain of specific destinations, activities, or duration of travel.

# JE VACCINE - IXIARO



- Inactivated Vero cell culture-derived Japanese encephalitis (JE) vaccine is the only JE vaccine licensed and available in the U.S.
- Vaccine was approved in March 2009 for use in people aged 17 years and older and in May 2013 for use in children 2 months through 16 years of age. Other JE vaccines are manufactured and used in other countries but are not licensed for use in the U.S.
- IXIARO is given as a two-dose series, with the doses spaced 28 days apart. The last dose should be given at least 1 week before travel.
- For persons aged 17 years and older, a booster dose may be given if a person has received the two-dose primary vaccination series one year or more previously and there is a continued risk for JE virus infection or potential for re-exposure.
- Although studies are being conducted on the need for a booster dose for children, data are not yet available.







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