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Mosquito-borne Diseases and Mosquito IPM

Mosquito-borne diseases impact the health of Americans every year. This year brings additional concerns due to relatively new and re-emerging disease issues.

West Nile virus (WNV) is a mosquito-borne virus found throughout the United States and the cause of West Nile Fever. It was first detected in North America in 1999 and is now the most commonly occurring mosquito-borne virus affecting humans in the United States. West Nile Fever is a preventable disease as the majority of people contract the virus through mosquito bites. *Culex* species mosquitoes are the main carriers of WNV, and these mosquitoes are common throughout Arizona.

Mosquitoes acquire the virus when they feed on birds that are infected with WNV (Fig. 1). After a few days, infected mosquitoes can then transmit WNV to other birds, or less commonly to humans and horses.

The *Culex* mosquitoes responsible for vectoring WNV generally bite at dusk and dawn, in shady areas, or during cloudy days. People of all ages can contract WNV. About 20% of those who become infected with WNV will come down with West Nile fever; the other 80% show no or very mild symptoms. Symptoms of West Nile fever can include: fever, headache, body aches, swollen lymph glands, tiredness and rash on the trunk of the body.

Less than 1% of people who are infected will develop a serious neurologic illness such as encephalitis or meningitis (inflammation of the brain or surrounding tissues). About 10% of people developing serious neurological illnesses will die.

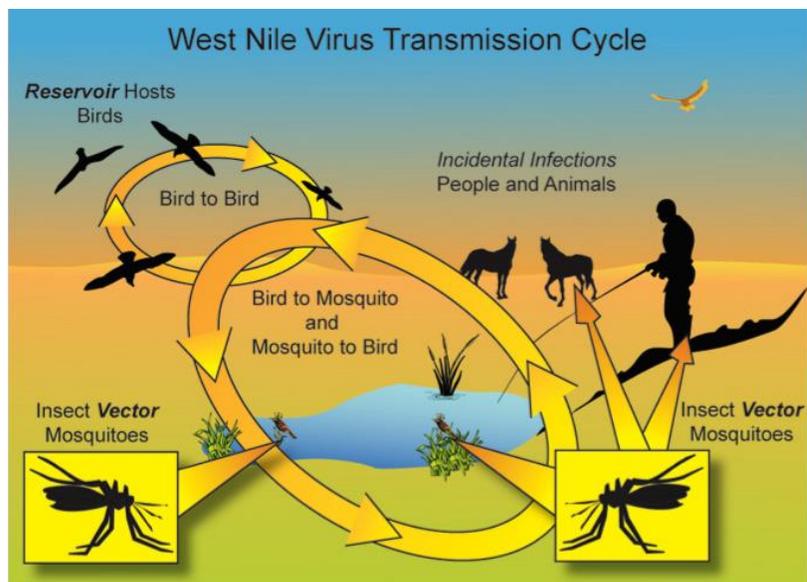


Fig. 1 West Nile virus transmission cycle. Photograph by Deborah Misch - STG Inc. From Global Climate Change Impacts in the United States 2009 Report - US Global Change Research Program.

St. Louis encephalitis (SLE) is a relatively rare viral disease also transmitted by *Culex* species mosquitoes. The virus can cause illness in humans, horses, certain types of birds, and other animals.

Similarly to WNV, the SLE virus is maintained in a mosquito-bird-mosquito cycle. Mosquitoes become infected with the virus when they feed on birds that are infected with SLE (Fig. 2). After a few days, infected mosquitoes can then transmit SLE to other birds, and less often humans and horses. Wild birds are the primary vertebrate hosts. Birds that are abundant in the urban-suburban environment, such as house sparrows, finches, doves and pigeons can be virus reservoirs in the transmission cycle. Although humans and domestic mammals can acquire the SLE virus they are dead-end hosts (meaning that they cannot transmit the disease to a new host).

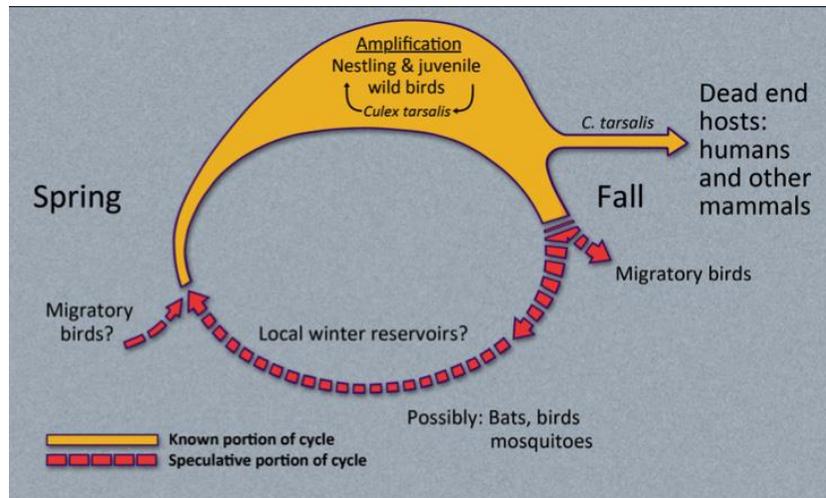


Fig. 2 Transmission cycle of St. Louis encephalitis virus in Western U.S. From CDC.

Although human disease cases are very rare in the United States, public health professionals are constantly monitoring for the virus. An increase in both detections and human cases has been reported in 2015 in some areas.

Dengue fever is an infectious disease caused by the dengue virus serotypes DEN-1, DEN-2, DEN-3 and DEN-4. It is essentially a human disease, transmitted between humans by *Aedes* mosquitoes. It is primarily transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitoes (Fig. 4), which can also vector chikungunya virus. These mosquitoes are found throughout the tropics and subtropics, and their abundance has aided in the geographic expansion of the virus. Dengue is expanding rapidly, and there has been a 30-fold increase in incidence between 2000 and 2010. This includes increased disease incidence in endemic countries as well as encroachment into new countries and regions.

Currently, there have been confirmed locally-acquired cases of dengue identified in some of the southern states (Florida and Texas). However, many more cases are brought into the United States every year by travelers who contract the virus while abroad. Any state with *Aedes aegypti* or *A. albopictus* (Fig. 3) is at risk for local transmission of dengue virus.



Fig. 3 Map of the U.S. showing the areas at risk of dengue and chikungunya outbreaks.

How does locally acquired virus transmission occur? First a person becomes infected through a bite from a vectoring mosquito while traveling outside the United States in a country with endemic (regularly found in people in an area) Dengue. Upon their return home they become sick and high levels of the virus circulate in their blood system. They are then fed on by a local *A. aegypti* or *A. albopictus* mosquito which acquires the virus from the blood meal. This mosquito can then transfer the virus to other people it feeds on. These unfortunate individuals would then be considered locally-acquired cases.

Chikungunya fever is another mosquito-borne disease, relatively new to the United States, and the virus is primarily transmitted by *Aedes aegypti* and *Aedes albopictus* (Fig. 4).

Since 2004 the chikungunya virus has caused large outbreaks in Africa, Asia, Indian Ocean islands, and Italy. Contrary to certain misconceptions, chikungunya does not affect chickens, and the term refers to the 'bent over' posture of severely affected people when in pain.

In December 2013 the first cases of locally-acquired chikungunya in the western hemisphere were reported among residents of St. Martin in the Caribbean. The virus quickly began to spread across the Caribbean region, and locally-acquired cases have been reported from North, Central, and South America.



Fig. 4 The yellow fever mosquito *Aedes aegypti* (left) and Asian tiger mosquito *Aedes albopictus* (right).

Chikungunya fever is now a nationally notifiable condition. The introduction of chikungunya virus to the Caribbean and Central America increases the incidence of importation into the United States. As with dengue fever, states that have one or both of the *Aedes* vectors are at risk of subsequent local transmission of chikungunya virus. However, infected mosquitoes may also simply travel across national borders.

Although chikungunya and dengue are essentially human diseases, neither can be passed on from person to person during normal contact.

Few mosquito-borne diseases have a vaccine, so the best method of avoiding illness is to protect yourself and your home from mosquitoes. Here are some tips on **Integrated Pest Management (IPM)** methods for mosquitoes.

1. Check standing water in plant pots, bird-baths, fountains, tires, depressions in tarpaulins, and backyard trampolines. Drain the water regularly (twice a week is ideal).
2. Remove unnecessary clutter. Keep rain gutters free of leaves and other debris that prevent water from draining. Store boats, canoes and other objects so they do not collect rainwater.

3. Repair water leaks (leaky pipes, sprinkler systems, and outside faucets). Correct drainage problems in yards and playing fields. Report drainage problems in ditches, etc. Fill holes or depressions in trees with sand.
4. Empty water containers for pets and check livestock watering troughs and tanks, or add *Gambusia* (mosquito eating fish).
5. Larvacides such as the bacteria based products containing *Bacillus thuringiensis israelensis* (Bti) or *Bacillus sphaericus* (Bs) are specifically targeted against the larval life stage, while harmless to humans, pets and the environment. Mosquito larvacides can be used to kill mosquito “wrigglers” in a non-consumptive water source.
6. Report mosquito “hot-spots” to vector control specialists in your region. Call in, or log an environmental complaint on-line.



Additionally, when outdoors, consider the following safety tips:

1. Wear light colored clothing with loose fitting long-sleeves, long pants and socks. Use protective clothing when exposure to mosquitoes cannot be avoided.
2. If possible, avoid outdoor activity before dawn and after dusk when mosquitoes are most active and avoid being bitten by mosquitoes at any time.
3. Properly apply insect repellent even if you are outside for just a short period of time, and share your insect repellent with those around you. For additional help selecting which repellent is right for you, go to the EPA search page:
<http://cfpub.epa.gov/oppref/insect/#searchform>

Consider the following tips for relieving the itch of mosquito bites: The first step is to clean the bite area with soap and water. Topical corticosteroids can reduce the itching and discomfort. Topical diphenhydramine and caine-containing derivatives should be used with caution because of concerns about inducing allergic contact sensitivity. Oral antihistamines can be effective in reducing the symptoms of mosquito bites, but may cause drowsiness. Use of a cold compress can be helpful, but do not apply ice directly to the skin.

With education and awareness, we can limit the health threat posed by these pests.

This information is based on the Center for Disease Control and the Arizona Department of Health Services <http://www.azdhs.gov/preparedness/epidemiology-disease-control/mosquito-borne/index.php>.

If you would like to learn more about mosquitoes and their management, please view:
<http://cals.arizona.edu/apmc/public-health-IPM#mosquitoes>
<http://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az1221-2013.pdf>

Know more about “Prevent Mosquito Bites”, view: <http://www.cdc.gov/features/stopmosquitoes/>

Article featuring mosquitoes and West Nile Virus:
<http://cals.arizona.edu/apmc/westernschoolIPM.html#schoolspstpress>

Mosquito general information:

<http://www.maricopa.gov/EnvSvc/VectorControl/Mosquitos/MosqInfo.aspx>

West Nile Virus in Maricopa County: <http://www.maricopa.gov/wnv>

Bed Bug Battle – We Want to Hear From You

The University of Arizona and several partnering research institutions are working to battle the bed bug resurgence in the United States. Researchers hope to determine the real impact and social cost of bed bugs, the risks to individuals and society, as well as the significant causes of infestations.

We hope you will complete an online bed bug survey. This voluntary survey should take about ten minutes. The survey is available in English and Spanish. There is no compensation available for your participation. Your answers are anonymous and confidential while you contribute information that will help us battle the pesky parasites.

Who should take this survey? Everyone!

English version of Bed Bug survey: <http://www.surveymonkey.com/s/DGLQS52>

Spanish version of Bed Bug survey: <https://es.surveymonkey.com/s/F5NZXJK>

Indoor Air Quality (IAQ) Master Class Webinar Series Continues

As part of EPA's ongoing effort to continue the momentum to create healthy school indoor environments in all our nation's schools, they are pleased to announce the launching of a new [IAQ Master Class Webinar Series](#).

At the June 2014, the School Health and Indoor Environments Leadership Development (SHIELD) Network began work on designing ten 1-hour technical core-competency web-based trainings intended to build the capacity of school district staff across the country to start, improve, or sustain an IAQ management program.

The webinars will feature technical experts, industry leaders and model school districts from the SHIELD Network. CEU's are pending and certificates of completion will be provided to all who complete the post-training evaluation.

Mark your calendar to join the Master Class Technical Webinar Series. Schedule below.

Webinar Topic	Webinar Date
Source Control	9/17/15

Upcoming Webinars and Events

Attend Free Sessions of the [Green Strides Webinar Series](#). View archived webinars [here](#).

The [Green Strides Webinar Series](#) provides school communities the tools to reduce their schools' environmental impact and costs; improve health and wellness; and teach effective environmental literacy, including STEM, green careers, and civic engagement.

August 27, 2015, Annual Short Course “[Utility of new insecticide modes of action in crops and turf & ornamentals: Preserving them for the long term](#)”, Maricopa County Cooperative Extension Office, Phoenix, AZ.

Common insecticide chemistries are used across various commodities and landscapes that are in close proximity or adjacent and insect pests in crops or landscapes are susceptible to these products. The presentations will describe strategies to ensure continued efficacy and prevent development of insecticide resistance as well as maintaining pollinator safety. 5 CEUs have been granted by the AZ Dept of Ag and OPM.

For more details of the agenda, see attachment or go to: <http://turf.arizona.edu>.

For more information about the EPA Schools program, visit:
<http://www.epa.gov/schools/>

For more information about the Community IPM, visit:
<http://www.extension.org/pages/23359/urban-integrated-pest-management-community-page>



For more information about School IPM in Arizona, visit:
<http://cals.arizona.edu/apmc/westernschoolIPM.html>

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Acknowledgements

This material is based upon work that is supported in part by the National Institute of Food and Agriculture, U.S. Department of Agriculture (USDA NIFA). Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the U.S. Department of Agriculture. Additional support is provided by the U.S. Environmental Protection Agency (EPA) and the University of Arizona – Arizona Pest Management Center (APMC).



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