



Pest e-alerts



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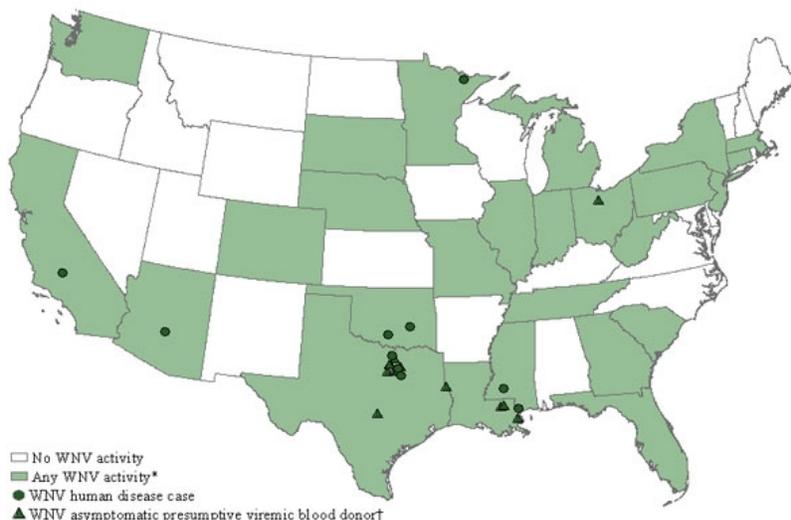
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Mosquitoes in Oklahoma and West Nile Virus (WNV)

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We are starting to receive questions about mosquitoes and how you can control these. With the noticeably hot summers we have had both last year and this year the potential for a mosquito population to build up is always there. The major limiting factor to large populations of mosquitoes is the number of precipitation events. This led to low insect activity overall but this year we are seeing mosquitoes return to noticeable levels especially during late evening hours.

West Nile virus (WNV) activity reported to ArboNET, by state, United States, 2012 (as of July 10, 2012)



Footnote: The map displays white areas that represent no WNV activity reported, light green areas that represent any WNV activity*, dark green circles that represent disease cases, and dark green triangles that represent asymptomatic presumptive viremic blood donors†.

* Includes WNV human disease cases, presumptive viremic blood donors, veterinary disease cases and infections in mosquitoes, birds, and sentinel animals.

† Presumptive viremic blood donors have a positive screening test which has not necessarily been confirmed.

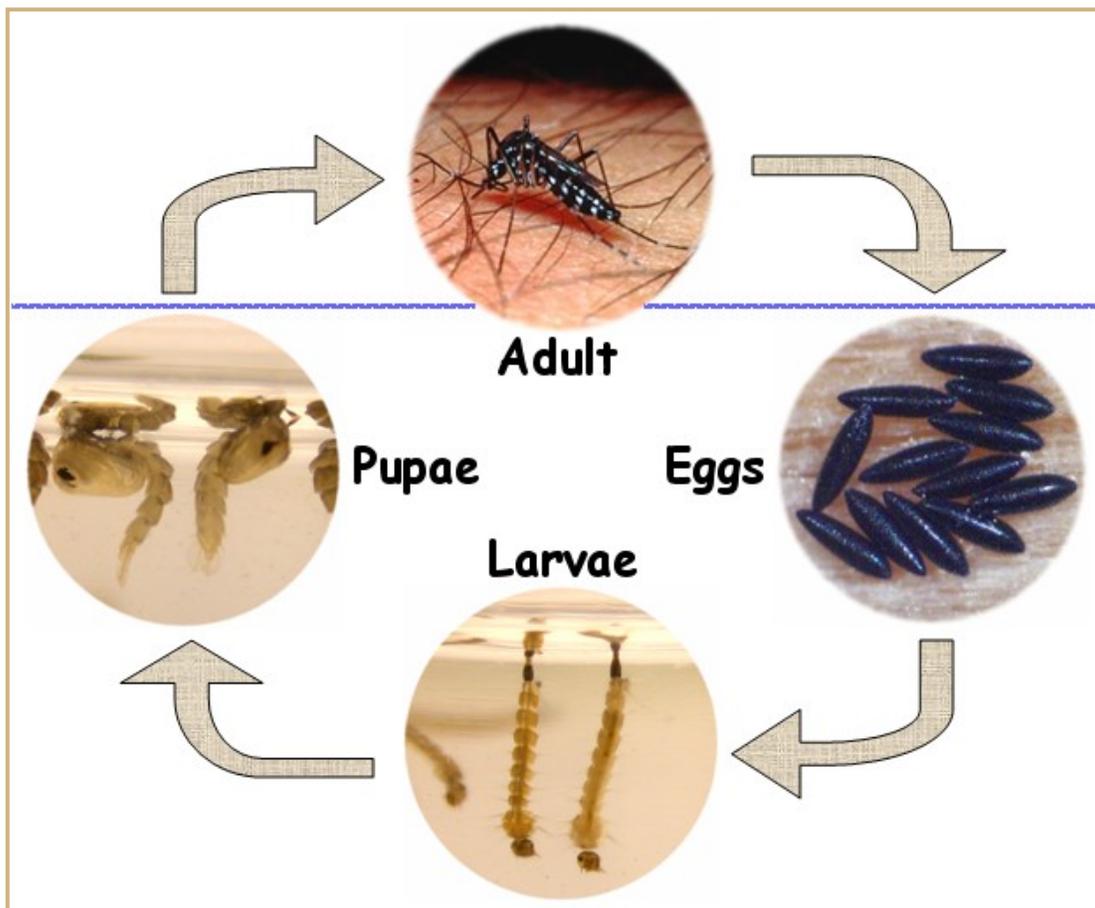
West Nile Virus (WNV) was prevalent at very low levels last year but as of July 10th of this year there have been at least two reported human cases in Oklahoma. Even though the mosquito populations are lower than previous years we need to be diligent in monitoring both mosquito and diseases they may transmit every year. Most people know that the normal infection method for WNV is through a mosquito bite. To understand the cycle of the disease one needs to understand something about the life cycle of the

mosquitoes that transmit the virus. We often call insects that transmit a disease causing agent a vector species.

There are over 60 species of mosquitoes in Oklahoma, but only a few species are capable of picking up, developing, and transmitting WNV. It is important to know a little about mosquito biology, the season when the important biting and transmitting species are abundant, how one can help reduce populations of mosquitoes, and how one can reduce the risk of the transmission of WNV.

Mosquitoes are flies that have four distinct life stages: egg, larva (four stages), pupa, and adult. The larval and pupal stages are found only in water. Eggs are laid on the water or at the edge of the water depending on species. Only adult female mosquitoes bite and feed on blood. They must do so to develop their eggs. Mosquitoes that have become infected with WNV by feeding on an infected bird sometimes transmit WNV to other birds, horses or humans when they take a second or third blood meal. The WNV must develop in the mosquito so transmission does not occur until several days after they have become infected. **Most mosquitoes do not become infected** and most species **cannot** develop and transmit WNV.

Asian tiger mosquito life cycle



One way mosquitoes can be grouped is by the type of water (aquatic habitat) in which the larvae are found. Four such groups are: 1. Flood Water Mosquitoes; 2. Permanent Water Mosquitoes in Permanent Pools; 3. Permanent Water Mosquitoes in Transient Pools; 4. Container Mosquitoes.

1. Flood Water Mosquitoes (*Aedes*, *Ochlerotatus*, and *Psorophora* species)

These mosquitoes are most often found in standing water remaining after heavy rainfalls or flooding. Mosquitoes in this group spend the winter as eggs that have been laid at the edge of standing water the previous year. Some species can have several generations in the same year, but in all cases the eggs hatch only after they have been dried for a time and then are **flooded** in some manner. Flood water pools must remain long enough for larvae and pupae to develop, 7-15 days depending on temperature. Many thousands of eggs are hatched at the same time and huge numbers of mosquitoes develop and emerge as adults within a few days.



These species tend to have **population peaks in the spring and early summer**, April through June, and are the primary nuisance pests that we experience this time of year. Sometimes locally heavy thunderstorms in the summer and early fall cause localized flooding resulting in large mosquito populations in those areas. Species in this group bite during the evening hours or when disturbed in shaded wooded areas. Most species feed readily on humans and a wide range of animal hosts, but do not prefer birds. Most of these mosquitoes live two to three weeks, but die sooner when the weather gets very hot. If there are no heavy rains and flooding we do not have summer populations of this group. Generally these species are **not the ones that transmit WNV**. However, they often can be severe nuisance pests and often warrant some type of control measure.



Ochlerotatus sp.

2. Permanent Water Mosquitoes (Permanent Pool Group) (*Anopheles* sp., *Culex salinarius*)

Mosquitoes do not live in large open bodies of water such as lakes, rivers and ponds. However, some species live in the quiet water at the edges of such water if the edge has a lot of vegetation. Normally mosquito larvae do not last long in the typical farm pond or lake that has abundant fish or other aquatic predators. Mosquitoes from these habitats occur from mid-spring to fall, but are **not the species that are involved in the transmission of WNV** and usually are not a nuisance problem.

3. Permanent Water Mosquitoes Transient Pool Group (*Culex* sp., *Culiseta* sp.)

There are several species of mosquitoes that prefer water which has been standing three weeks or longer. This type of water can range from very small fresh water pools to large bodies of very polluted stagnant water. A range of this type of water would include large pools of water left three to four weeks after heavy flooding, water accumulations from poor drainage in irrigation systems, water catch basins in storm sewer systems, large tanks or containers of water, polluted sewage lagoons, seepage water from livestock holding facilities, or stagnant water in marshy or swampy area. Essentially these sites include almost any standing stagnant water that has been present for three or more weeks during the spring through the fall.



The mosquitoes that use this type of water lay their eggs in **rafts on the water's surface**. Eggs hatch in 24-48 hours and larval and pupal development takes from 6-10 days. These mosquito species spend the winter as mated females resting in burrows, caves, culverts, sewers, unheated outbuildings, garages, and similar places. A low number of these females survive the winter. When they emerge from over-wintering sites they must find a blood meal (usually birds), and find suitable water to lay eggs on the surface. Because relatively few females start the new population, it takes a long time before populations of these mosquitoes increase. Large populations of these species **appear by late summer and throughout the fall**. Most of these species prefer to **feed on birds** and feed primarily at night. Some feed on birds infected with WNV and the virus is easily transmitted to other birds. Several of these species transmit WNV between birds until many birds are infected.

It appears the **best vectors or transmitters of WNV among birds are *Culex pipiens quinquefasciatus*, *Culex tarsalis*, and *Culex restuans***. These species prefer to feed on birds, but when very abundant will feed on human or horse hosts. They most often feed at night and are not noticed as much as other species. The species *Culex tarsalis* occurs in the western half of Oklahoma and may more readily feed on horses. **The peak number of human and horse WNV**

cases occurs in late summer and fall when these mosquitoes are abundant and the most birds infected are present. Other mosquito species that may be plentiful in the late summer and fall can become infected when feeding on infected birds and may be good vectors to humans or horses.



4. Container mosquitoes

Several species of mosquitoes lay their eggs on or at the edge of water in containers of all types ranging from small cans, buckets, bird baths, flower pot bases, plugged rain gutters, poorly maintained water gardens to old tires. Most of these species develop from egg to adult in 7-10 days and can have continuously emerging adults all summer. The Asian Tiger Mosquito, *Aedes albopictus*, an introduced species, occurs in almost any kind of container and has become the **most important pest species** in most urban areas of Oklahoma from **early June through the fall**. It readily bites humans and feeds during mid-afternoon to early evening. Although scientists are not certain yet, they suspect this species may be good intermediate vectors that can become infected with WNV from birds and later transmit it to humans or horses.





This species is difficult to control in the larval stage because it occurs in many small containers that hold water. The usual mosquito adult sprays do not work well because these sprays must be applied around sunset or later when the thermal currents are not rising and when most mosquitoes are active. Since the Asian Tiger mosquito is **most active in mid-to-late afternoon**, the usual mosquito adult spray programs are not applied when the mosquito is active and the spray droplets do not contact the adults.



Mosquito Control

Mosquito control can be divided into two areas: larval control and adult control. Most often the more successful control programs combine both of these two to reduce mosquito populations. These combined programs are known as an Integrated Pest Management (IPM) program, which take into account ecological, social, and economic criteria when implementing control strategies. An IPM program includes both non-chemical and chemical strategies to reduce mosquito populations. Some non-chemical methods include source reduction (eliminating standing water where mosquito larvae can develop), utilizing biological control

agents such as *Gambusia* fish that feed on mosquito larvae, and invertebrate predators, parasites, or pathogens that also target mosquito larvae.

The first step to implementing any control program for mosquitoes is a surveillance program that identifies and quantifies mosquito development areas. These programs are usually deployed by a local mosquito control district but Oklahoma is lacking in these districts except for the larger metropolitan areas such as Oklahoma City and Tulsa. Some local city governments will implement these on merely a complaint basis but is usually dependent on city budget funds that are available for this specific purpose. Some pest control operators will also provide this service before they implement any control methods.

Larval Control

Probably the most efficient means to reduce a mosquito population is by eliminating any larval development sites on your property. As mentioned earlier reducing mosquito larvae can be accomplished either in a non-chemical (reducing standing water) manner or a chemical (larvicides) manner. Larvicides are chemicals that can be applied to mosquito development areas such as bodies of water and are classified as either stomach toxins (*Bacillus thuringiensis*), contact larvicides (pyrethroids), surface agents (oils or soaps), natural agents, and insect growth regulators (IGR; methoprene, diflubenzuron). When applying larvicides efforts should be made to concentrate application to the edges of the water near shorelines of ponds since mosquito larvae are not present in the entire water body. Listed below are some recommendations from the American Mosquito Control Association:

1. Irrigate lawns and gardens carefully to prevent water from standing for several days.
2. Clean debris from rain gutters and remove any standing water under or around structures, or on flat roofs. Check around faucets and air conditioner units and repair leaks or eliminate puddles that remain for several days.
3. Destroy or dispose of tin cans, old tires, buckets, unused plastic swimming pools or other containers that collect and hold water. Do not allow water to accumulate in the saucers of flowerpots, cemetery urns or in pet dishes for more than 2 days.

Adult Control

When dealing with an adult population of mosquitoes homeowners should consider several factors when choosing a control technique. The first is to understand the specific goal for eliminating the mosquito population for example, controlling a mosquito problem around outdoor entertainment areas versus reducing the impact mosquitoes have on everyday activities. Adult mosquito control options can depend on which goal you are targeting and the quickest and easiest manner to reduce a population is to utilize insecticides that are applied through either a fogger or ultra-low volume applicator. For more control options go to the following website at Oklahoma State University in the Department of Entomology and Plant Pathology: <http://entopl.okstate.edu/mosquito/mosquito.html>

Personal Protection

Everyone should exercise good judgment in preventing mosquito bites. If mosquito populations are high one should avoid being in areas where they are abundant, wear long sleeves and long pants, and/or use a repellent. All the most effective brand name repellents contain the same repellent, DEET. Many formulations will not say DEET on the label, but all must list the active ingredient name, N,N-diethyl-meta-toluamide on the label. Look for this chemical name and its percentage concentration before buying a product. Concentrations can range from 7% to 100% with most being in the range of 10 to 18%. All concentrations are effective except that the higher concentrations last longer. Even the lowest concentration, which is preferred for small children, gives one to two hours of protection if it is not washed or rubbed off. Use according to label instructions. Also remember that **WNV has a greater impact on people age 50 years and up**, than on children, so it is very important to protect adults.

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