



WEST NILE VIRUS PREVENTION

Audubon Texas supports governmental agencies in their commitment to human health and safety, and recognizes that West Nile virus presents a serious threat to the health of humans and wildlife. We support mosquito control tactics that are science-based and cause the least amount of harm to natural systems. These strategies are not only more effective but have fewer negative effects on humans, wildlife, rivers, and streams. We believe that one of the most important strategies in mosquito control is what everyday Texans can do in their yards and neighborhoods to protect against West Nile virus.

Audubon Texas Supports:

Mosquito Control Tactics

Integrated mosquito management by governmental agencies should include the following elements:¹

- Surveillance and monitoring of West Nile virus-carrying mosquitoes and human cases by public agencies and qualified research entities
- Source reduction (i.e. draining shallow standing water) to minimize potential mosquito breeding sites
- Larval control by treating shallow, stagnant bodies of water with minimally impactful larvicide or alternative control methods (see our Pesticide Guide)
- Adult control by responsible, targeted ground spraying only in areas where positive test results are present. Audubon Texas considers this as a last resort measure triggered only by significant threat to human health

Personal Prevention

Do your part to support mosquito control in your community. Practice the “four D’s”² of personal West Nile virus prevention early and often:

- Stay indoors at **dawn and dusk**
- **Dress** in long sleeves and pants when outside
- Wear a **DEET**, lemon oil of eucalyptus, or picaridin repellent whenever outdoors, according to label instructions
- **Drain** any standing water in your yard or neighborhood



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About Audubon Texas

For more than 100 years, Audubon has established itself as a leader in protecting and conserving wildlife and habitat and inspiring people to take action on behalf of the environment. Audubon's success is based on a foundation of science, education, and policy.

Today in Texas, our conservation work includes 70% of the Gulf Coast (or 600 miles), 3 million acres of statewide grasslands, 19 Important Bird Areas, and the Great Trinity Forest. In addition to our conservation programs, Audubon Texas engages communities in civic action, outdoor education initiatives, and citizen science through the Mitchell Lake Audubon Center in San Antonio, the Trinity River Audubon Center in Dallas, and Dogwood Canyon Audubon Center in Cedar Hill.

To learn more, go to **tx.audubon.org**.

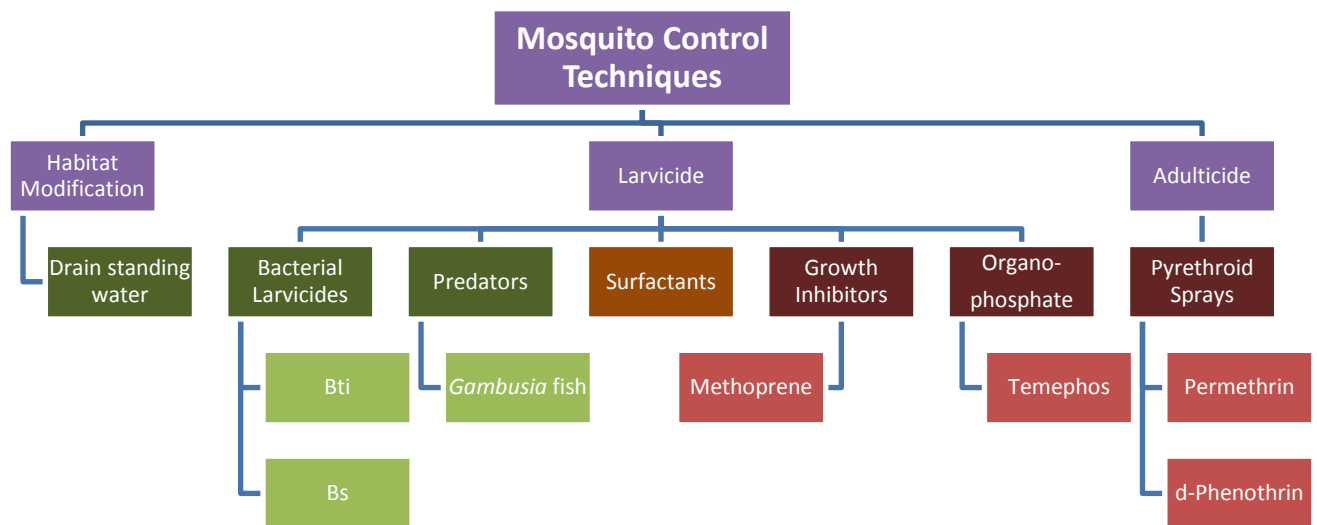
Sources:

¹Grodner, MG et al. 2007. The best way to control mosquitoes: integrated mosquito management explained. Available online at: <http://www-aes.tamu.edu/files/2010/06/The-Best-Way-to-Control-Mosquitos.pdf>

²Fort Worth Code Compliance. Available online at: <http://www.fortworthtexas.gov/westnilevirus>

WEST NILE VIRUS PREVENTION

Pesticide Guide & Mosquito Control Information



Low impact

Moderate impact

High impact



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Pesticide Guide & Mosquito Control Information

Definition of Low, Moderate, and High Impact Mosquito Control Techniques

Low impact

Strategy is effective at controlling mosquitoes but has minimal impact on ecosystem health or non-target organisms, such as aquatic invertebrates, beneficial insects, fish, birds, mammals, pets, or humans.

Moderate impact

Strategy is effective at controlling mosquitoes but may have some negative impact on ecosystem health or non-target organisms, such as aquatic invertebrates, beneficial insects, fish, birds, mammals, pets, or humans.

High impact

Strategy is effective at controlling mosquitoes but has a high potential for negative impacts to ecosystem health or non-target organisms, such as aquatic invertebrates, beneficial insects, fish, birds, mammals, pets, or humans.



Bti

Low impact

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Pesticide Information

Name:

Bti dunks/donuts, Sustain, Aquabac

Active Ingredient:

Bacillus thuringiensis israelensis

Type:

Bacteria

Larvicide

Mode of Action:

Mosquito larvae ingest the Bti spores that contain toxins. These toxins affect the cells of the larvae's midgut, disrupting its ability to digest food. Larvae die from starvation or septicemia.

Risks to Humans:

Very low risk. The bacterial toxins are highly specific to mosquito and blackfly larvae. As with any other pest treatment, use caution in handling the material to avoid skin or eye irritation.

Risks to Ecosystems:

Very low risk. The toxins produced by the *israelensis* strain of the Bt bacteria target the digestive system of mosquitoes and blackflies. While other Bt strains may impact other insects, *israelensis* is highly specific to mosquitoes and blackfly larvae. Bti is non-toxic to bees, aquatic invertebrates, fish, birds, and mammals. It does not impact plants.

Sources:

National Pesticide Information Center. 2000. *Bacillus thuringiensis* technical fact sheet. Available online at: <http://npic.orst.edu/>



Bs

Low impact

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Pesticide Information

Name:

Vectolex (Bs)

Active Ingredient:

Bacillus sphaericus

Type:

Bacteria

Larvicide

Mode of Action:

Bacillus sphaericus (Bs) acts much like related bacteria Bti. Bs spores produce a toxin that, when ingested by mosquito larvae, paralyzes their digestive system and causes them to starve.

Risks to Humans:

Low risk. Can cause eye or lung irritation or mild skin irritation, so use caution when handling and dispensing material.

Risks to Ecosystems:

Very low risk. The toxins produced by the Bs bacteria target the digestive system of mosquitoes. Bs is non-toxic to bees, aquatic invertebrates, fish, birds, and mammals. It does not impact plants.

Sources:

Environmental Protection Agency, Office of Pesticide Programs. *Bacillus sphaericus* serotype H5a5b strain fact sheet. Available online at:

http://www.epa.gov/pesticides/chem_search/reg_actions/registration/fs_PC-119801_01-Nov-99.pdf



Surfactants

Moderate impact

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Pesticide Information

Name:

Agnique MMF, Arosurf MSF

Active Ingredient:

Ethoxylated alcohol [Poly (oxy-1,2-ethanediyl), α -(C16-20 branched and linear alkyl)- ω -hydroxy]

Type:

Monomolecular surface film

Larvicide

Mode of Action:

The monomolecular film in this product coats the surface of the water and disrupts its surface tension, preventing mosquito larvae from successfully attaching to the water's surface, a behavior necessary for development and emergence.

Risks to Humans:

Can irritate skin and eyes. Use caution when handling or applying this material.

Risks to Ecosystems:

Described as acutely toxic to fish and aquatic invertebrates. Studies in the field report varying levels of toxicity to non-target aquatic invertebrates, crustaceans, fish, and aquatic plants. Generally, these studies appear to indicate low risk to non-target organisms in the field (see Nayar and Ali 2003 for review).

Sources:

BASF. 2011. MSDS for Agnique MMF Mosquito Larvicide. Available online at:

http://www.myadapco.com/res/pdf/msds/Agnique_MMF_MSDS.pdf

Nayar, JK and A Ali. 2003. A review of monomolecular surface films as larvicides and pupicides of mosquitos. Journal of Vector Ecology 28 (2): 190-199. Available online at:

http://www.sove.org/Society_for_Vector_Ecology/Journal/Entries/2003/12/1_Volume_28,_Number_2_files/Nayar%20and%20Ali%2003-12.pdf



Methoprene

High impact

WEST NILE VIRUS PREVENTION

Pesticide Information

Name:

Methoprene

Active Ingredient:

S-Methoprene

Type:

Insect growth disruptor
Larvicide

Mode of Action:

Methoprene is an insect growth disruptor that mimics an important developmental hormone in insects. It prevents insects from passing through the normal stages of development and growth and can prevent reproduction.

Risks to Humans:

Low risk. Can cause eye or lung irritation or mild skin irritation. Use caution when handling and dispensing material.

There have not been any studies on endocrine disruption effects of methoprene in humans.

Risks to Ecosystems:

Moderate to high. Methoprene is moderately to highly toxic to fish and freshwater invertebrates. It is moderately toxic to crabs, shrimp, lobsters, and crayfish. It has low toxicity to birds, but can be moderately toxic to bee larvae.

Sources:

National Pesticide Information Center. 2000. Methoprene general fact sheet. Available online at: <http://npic.orst.edu/>



Temephos

High impact

WEST NILE VIRUS PREVENTION

Pesticide Information

Name:

Skeeter Abate pellets

Active Ingredient:

Temephos

Type:

Organophosphate

Larvicide

Mode of Action:

Temephos interferes with the normal functioning of insect nervous systems.

Risks to Humans:

Use caution when handling and dispensing material; avoid contact.

“Temephos can cause cholinesterase inhibition in humans; that is, it can overstimulate the nervous system causing nausea, dizziness, confusion, and at very high exposures (e.g., accidents or major spills), respiratory paralysis and death.” – Environmental Protection Agency

Risks to Ecosystems:

This product should only be applied to non-potable water that is high-risk for mosquito breeding activity (high organic content, stagnant, and/or temporary). Temephos is categorized as slightly to moderately toxic to freshwater fish, and highly toxic to "very highly toxic" to freshwater and marine/estuarine aquatic invertebrates.

Sources:

Environmental Protection Agency. 2001. Temephos Facts. Available online at:
<http://www.epa.gov/oppsrrd1/REDs/factsheets/temephosfactsheet.pdf>

Environmental Protection Agency. Temephos RED. Available online at:
http://www.epa.gov/oppsrrd1/REDs/temephos_red.htm#IIIB



Permethrin

High impact

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Pesticide Information

Name:

Aqualuer 20-20

Duet

Biomist 4+4 ULV

Kontrol 4x4

Active Ingredient:

Permethrin + piperonyl butoxide

Type:

Synthetic Pyrethroid Insecticide and Synergist

Mode of Action:

Permethrin disrupts the nervous system of insects by interfering with sodium channels in neurons, causing muscle spasms, paralysis, and death. Piperonyl butoxide is a synergist that amplifies the effect of the permethrin in insects.

Risks to Humans:

The EPA has classified permethrin as “likely to be carcinogenic to humans” if ingested. Otherwise, it is considered to be low toxicity by contact.

Risks to Ecosystems:

Permethrin is a non-specific insecticide, and is highly toxic to honeybees and other beneficial insects. Avoid contamination of aquatic environments. Permethrin is highly toxic to fish and aquatic invertebrates, with marine species often more sensitive than the freshwater species. Bacteria, algae, mollusks, and amphibians show somewhat higher tolerance to the compound. Permethrin is slightly toxic to birds, but does not appear to impact reproduction. Piperonyl butoxide is acutely toxic to fish and highly toxic to aquatic invertebrates. It has a low to very low toxicity to birds and mammals.

Sources:

National Pesticide Information Center. 2000. Permethrin technical fact sheet. Available online at: <http://npic.orst.edu/>

Environmental Protection Agency. 2009. Permethrin Facts. Available online at: <http://www.epa.gov/oppsrrd1/REDs/factsheets/permethrin-facts-2009.pdf>



d-Phenothrin

High impact

WEST NILE VIRUS PREVENTION

Pesticide Information

Name:

Anvil 2+2

Active Ingredient:

d-Phenothrin + piperonyl butoxide

Type:

Synthetic Pyrethroid Insecticide and Synergist

Mode of Action:

d-Phenothrin disrupts the nervous system of insects by interfering with sodium channels in neurons, causing muscle spasms, paralysis, and death. Piperonyl butoxide is a synergist that amplifies the effect of the permethrin in insects.

Risks to Humans:

d-Phenothrin is low toxicity to humans but can cause mild skin and eye irritation upon contact.

Risks to Ecosystems:

d-Phenothrin is a non-specific insecticide, and is highly toxic to honeybees and other beneficial insects.

Avoid contamination of aquatic environments. D-Phenothrin is highly toxic to both freshwater and marine fish and aquatic invertebrates. D-Phenothrin has very low toxicity to birds.

Piperonyl butoxide is acutely toxic to fish and highly toxic to aquatic invertebrates. It has a low to very low toxicity to birds and mammals.

Sources:

National Pesticide Information Center. 2000. d-Phenothrin fact sheet. Available online at:
<http://npic.orst.edu/>

National Pesticide Information Center. 2000. d-Phenothrin technical fact sheet. Available online at:
<http://npic.orst.edu/>