

Annual Report 2011

North Shore Mosquito Abatement District

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NORTH SHORE MOSQUITO ABATEMENT DISTRICT

2011 ANNUAL REPORT

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PREFACE

Mosquito borne illnesses continue to affect humans worldwide. Malaria, Dengue and West Nile virus are just a few of the many potential diseases that are passed to humans from mosquitoes every year. Mosquitoes are the deadliest animals in the world, which is why the NSMAD continues to do our best to protect the public health of the residents of northern Cook County.

The driving force behind every mosquito season is the weather. Perhaps it sounds a bit redundant at this point but weather is the uncontrollable factor in mosquito abatement. Ultimately, temperature and rainfall will be the determining factors in regards to potential mosquito populations in any given geographic area.

The 2011 season was slightly cooler with more precipitation than 2010. Large flooding rain events in May and July provided ample breeding sources for floodwater type mosquitoes. The population increase in these types of mosquitoes, while large, was actually less than in 2010, due to additional early larval control efforts by the NSMAD.

There were three human incidences of WNV within the NSMAD this year as compared to two confirmed cases in 2010. The Illinois Department of Public Health reported that there were 34 human cases statewide in 2011, with four deaths. There were 22 human cases in all of Cook County with one death occurring in Northbrook. Neuroinvasive illnesses, the more severe of WNV cases, were reported in greater numbers than non-neuroinvasive cases, although it is thought that the majority of milder WNV infections are not reported. There were 22 neuroinvasive cases in Illinois in 2011.

You will find further details of the 2011 mosquito season in this Annual Report, including surveillance and collection data, a discussion of the steps the NSMAD took to control mosquitoes, as well as, general information about mosquitoes in Illinois and what residents can do to help minimize their risk of mosquito borne illness.

Introduction To The North Shore Mosquito Abatement District

The passage of the *Mosquito Abatement District Act* (Chap. 111 ½, Illinois Revised Act) by the Illinois legislature in 1925 prompted a group of citizens to work for the organization of a mosquito abatement program for the North Shore of Cook County. This led to the establishment of the North Shore Mosquito Abatement District (NSMAD), which was officially chartered on December 8, 1927. This year, with support of the citizens of our district, we have successfully completed our 84th year of public health service. We are looking forward to continuing our success into our 85th year of public health service to the communities of the North Shore.

Area Served

The District serves the Townships of Evanston, Niles, New Trier, a part of Northfield (east of Pfingsten Road), and a section of Maine Township (east of Washington Street in Morton Grove). These townships include the municipalities of Evanston, Glencoe, Glenview (east of Pfingsten Road), Golf, Kenilworth, Lincolnwood, Morton Grove, Niles (east of Harlem Avenue), Northbrook (east of Pfingsten Road), Northfield, Skokie, Wilmette, and Winnetka.

The area covered by the NSMAD consists of 79 square miles of Cook County's North Shore. This sprawling and diverse area includes more than 900 miles of streets, 26.9 miles of rivers, 31.8 miles of railroad rights of way, 2.9 miles of ravines, 21.8 miles of bike trails, 17.8 miles of Forest Preserve District horse trails and approximately 3,500 acres of Forest Preserve District land.

Organization

A five person Board of Trustees governs the North Shore Mosquito Abatement District. Trustees are residents of the District and are appointed by the Cook County Board President and serve without compensation. Operation of the District is supported by taxes levied on property located within the boundaries of the member townships.

The NSMAD has nine full-time employees and between 15-20 seasonal employees. The Superintendent, who is responsible for the overall daily operation of all District matters, is accountable to the Board of Trustees and reports to them on a monthly basis. The Shop Supervisor is responsible for maintenance of vehicles and other mechanical equipment while the Communications Manager is responsible for public and media relations, community outreach and educating the public about mosquito borne illness and preventative measures. The staff also includes the Lab Manager, an Ecologist, an Office Manager, a Field Supervisor, a Technology Specialist and a Chief Field Inspector.

The District office, laboratory and maintenance facility is located at 117 Northfield Road, Northfield, Illinois.

Mission Statement

The North Shore Mosquito Abatement District works to reduce and control the regional mosquito population so as to:

1. Reduce the probability of mosquito borne disease and
2. Minimize annoyance from nuisance mosquitoes.

Public Health and Mosquitoes

Mosquitoes are vital links in the transmission cycle of many potentially deadly diseases such as malaria, yellow fever, dengue, filariasis, and many forms of viral encephalitis. These diseases are transmitted through the bite of an infected female mosquito.

In the United States mosquito borne viral encephalitis is the primary health concern of public health agencies like the NSMAD. West Nile Virus (WNV), St. Louis Encephalitis (SLE), Eastern Equine Encephalitis (EEE), Western Encephalitis (WE), and La Crosse Encephalitis, are serious diseases with symptoms ranging from mild or flu-like to severe, including paralysis, coma and death. Recovery from these diseases can be a long and painful process, with some infected persons never fully returning to a healthy status. Unfortunately, there are no vaccines for humans for any of these diseases at this time.

West Nile Virus

In 1999, New York was affected by the first outbreak of West Nile Virus. The disease then quickly spread across the country. According to the Centers for Disease Control, every state has reported WNV activity with the exception Alaska and Hawaii.

The NSMAD is particularly concerned with West Nile Virus. In 2002, Illinois experienced the worst outbreak of WNV in the country.

There were a total of 884 human cases and 66 deaths that year. Cook County had 634 human cases in 2002 and 41 deaths. Cooler temperatures in 2003 and 2004 are believed to have contributed to fewer human cases in Cook County. In 2003, Cook County had 20 human cases and one death. In 2004, Cook County had 21 human cases reported and two deaths. Unfortunately

the hot, dry summers of 2005 and 2006 brought an increase in human cases of WNV. There were 252 human cases in 2005 and 12 deaths and 215 human cases with 10 deaths in 2006. In 2007, there were 101 human cases with four fatalities. While 2008 and 2009 saw significant reductions in human illness, 2010, once again, saw an increase in human WNV cases. Of the 61 incidents of human infection, two occurred in the NSMAD service area, one in Evanston and one in Northbrook. The Illinois Department of Public Health reported 34 human cases of WNV occurred during 2011, thirteen in Cook County and three within District - Kenilworth, Glenview and Northbrook. The Northbrook case was ruled a fatality due to WNV.

It is very difficult to project human WNV infections from year to year as several variables are unknown, such as temperature, rainfall, and infection rates among birds and mosquitoes. Surveillance by NSMAD helps to determine the risk for contracting WNV during the mosquito season.

Mild cases of West Nile infections may cause a slight fever or headache. More severe infections are marked by a rapid onset of a high fever with head and body aches, disorientation, tremors, convulsions and, in the most severe cases, paralysis or death. Symptoms typically occur within three to 14 days after the bite from an infected mosquito. Persons 50 years of age or older are at the highest risk for serious illness.

The best way to prevent West Nile encephalitis and other mosquito-borne illnesses is to reduce the number of mosquitoes around your home and neighborhood and to take personal protection measures to avoid mosquito bites.

As of January 10, 2012, the CDC reported 690 people were infected with 43 deaths nationwide, a decrease from the previous year. In Illinois, the incidence of WNV decreased as well. At the time of this report, 34 cases of WNV have been reported with three deaths. For the most current information please check the websites of the CDC at www.cdc.gov and the Illinois Department of Public Health at www.idph.state.il.us.

St. Louis Encephalitis

St. Louis Encephalitis, once the most common mosquito borne encephalitis in the United States, is particularly dangerous in the elderly and young. During 1975, the U.S. experienced a major outbreak of SLE. In the past, SLE has been found in all of the United States west of the Mississippi River, as well as, the Ohio River Valley and Florida. Birds are considered the main reservoir of SLE virus and species of *Culex pipiens* and *Culex quinquefasciatus* are the chief urban vectors. *Culex tarsalis* is the chief vector in rural areas in Western States. No mosquitoes found in Illinois tested positive for SLE this year.

Other Arboviral Encephalitides

In addition to SLE and WNV, viruses such as Eastern Equine Encephalitis and Western Encephalitis can cause serious human disease. These diseases are found primarily on the eastern and western coasts of the United States. Normally these viruses are transmitted harmlessly from bird to bird, however sometimes they are transmitted to horses and humans. Eastern Equine Encephalitis is found along the Atlantic and Gulf coasts and inland in the Mississippi River Valley, including Illinois in limited areas. *Culiseta melanura* is the vector in the bird-to-bird cycle. *Aedes sollicitans*, *Aedes vexans*, and *Mansonia perurbans* are vectors in the disease-transmission cycle. Western Encephalitis can be found in all of the states west of the Mississippi River and in Wisconsin and Illinois. The *Culex tarsalis* mosquito is the most important vector of this disease.

La Crosse Encephalitis is found primarily in the Great Lakes region although there has been an increase in the incidence of cases in the Mid-Atlantic States.

Malaria

Malaria - a disease caused when protozoan parasites of the genus *Plasmodium* infect the red-blood cells of humans - continues to devastate many countries both financially and physically throughout the world. The malaria parasites are

transmitted from human to human via the bite of the *Anopheles* mosquito. Although there are approximately fifteen *Anopheles* species in the United States, only two are important in malaria transmission. These are *Anopheles quadrimaculatus* and *Anopheles freeborni*.

Take precautionary steps to avoid being bitten by an infected mosquito:

- **Apply mosquito repellent with DEET when outside**
- **Avoid outdoor activity during peak mosquito activity, particularly dusk and early evening**
- **Wear long sleeves and pants**
- **Eliminate all areas of standing water in and around the home, including birdbaths and ornamental water ponds.**

Dengue Fever

Dengue, also known as break-bone fever, is a serious mosquito-borne virus that has spread throughout the world in a dramatic fashion. Dengue and Dengue Hemorrhagic Fever (first recognized in the 1950's) are currently endemic in more than 100 countries. The sudden and explosive expansion of Dengue can be partly attributed to the geographic expansion of the disease's mosquito vector: the *Aedes aegypti*. Endemic areas include the southeastern U.S., Central and South America, sub-Saharan Africa, India, Australia and Southeast Asia. In the United States, *Aedes sp.* mosquitoes such as *Aedes albopictus* and *Aedes aegypti* are vectors of the disease. Neither *Aedes albopictus* nor *Aedes aegypti* were found in a NSMAD mosquito trap this summer.

There were two major outbreaks of Dengue fever in the US and its territories in 2010. Southern Florida experienced 53 human cases across three counties while Puerto Rico had 9,987. These incidents were considered locally acquired. Additionally, there were 436 imported human incidences across 32 states nationally. Florida, Hawaii and Puerto Rico reported locally acquired human cases of Dengue in 2011 with 30 states and territories reporting 178 cases of imported human cases. There were three cases of imported Dengue in Illinois this year.

Dog Heartworm

Dog heartworm is another mosquito-transmitted disease that concerns the NSMAD. The causative agent, *Dirofilaria immitis*, is a nematode whose microfilariae (the immature but infective stage of the worm) are picked up and transmitted from dog to dog by mosquitoes. The transmission cycle first begins when a hungry female mosquito feeds on an infected dog and picks up the infective microfilariae. When the mosquito takes another blood meal, she transmits the microfilariae via her proboscis from the infected dog to the skin of another dog. Once on the surface of the dog's skin, the worm penetrates the dog's dermis and enters its bloodstream. Then, once in the dog's body, the worms begin to grow and mature. Mature worms, which can sometimes grow to lengths of 8-13 inches, can infect a dog's heart and cause life threatening pathology. A veterinarian can prescribe medications for your pet to prevent infection.

A Final Note Regarding Mosquito Borne Illness

It is important to understand that the United States is not immune to diseases that are historically found in other countries and /or other continents. The endemic presence of these diseases coupled with (1) the tremendous growth of urban populations, and (2) the expansion of pesticide resistant mosquitoes and drug resistant parasites into these areas, has contributed to the continued expansion of mosquito-borne diseases. Additionally, as the climate continues to change, species of mosquitoes that would normally not be found in the area are beginning to appear. If these species are able to become established in northern latitudes there could be further spreading of mosquito borne illnesses.

Diseases like West Nile Virus, St. Louis Encephalitis, as well as other viral encephalitides, may be named after their unique geographical place of discovery, but they are not limited to them. The diseases and their carriers do not know nor respect political borders. They are not local phenomenon threatening only the original areas of endemicity. WNV existed outside the U.S. for at least 60 years before infections occurred in New York during 1999. Mosquitoes and the diseases they may carry can pose a potentially serious threat to the people and pets of any town or city where the conditions and environment are suitable. Therefore, we at The North Shore Mosquito Abatement District will continue to maintain our pro-active, preventative approach to the control of mosquitoes found in our neighborhoods, parks and forest preserves.

Illinois Mosquito Biology

Two different kinds of mosquitoes plague Illinois - the floodwater mosquito and the vector mosquito.

Floodwater or temporary pool mosquitoes lay their eggs singly in low-lying areas that will be flooded later. Under normal summer temperatures, large numbers of these biting mosquitoes will emerge about two weeks after heavy rain and can remain a major nuisance problem for several weeks. The most common of these in Illinois is the inland floodwater mosquito or *Aedes vexans*. Viscous bitters, these medium sized, brown mosquitoes have narrow rings of white scales on the hind tarsi. They are also further distinguished by a distinct V-shaped notch in the middle of each band of white scales on the upper surface of their abdomen. These mosquitoes breed in rain pools, floodwater sites, roadside puddles, and practically all other temporary pools of water. They lay their eggs on the ground and hatching occurs when flooding waters cover them. *Aedes vexans* produce several broods each year and adults will travel long distances, sometimes up to 10 miles from their breeding places. These biters and are found to be most annoying after dark and at dusk. During the day, they tend to rest in tall grass and other vegetation but will become extremely aggressive when disturbed.

Vector mosquitoes carry diseases and lay their eggs in anything that will hold water. This includes stagnant ditches, sewage treatment ponds, tree holes, old tires, clogged gutters, old tin cans and even bottle caps. Eggs are laid on or just above the water surface, where they usually hatch within two to three days. Two of the more common vector mosquitoes in Illinois are the house mosquito and the tree-hole mosquito.

The northern house mosquito is the *Culex pipiens*. They are brown mosquitoes of medium size with cross bands of white scales on the abdominal segments but without other prominent markings. They breed primarily in rain barrels, tanks, gutters, birdbaths, fishponds, and other types of artificial containers. These mosquitoes lay their eggs in rafts of 40 to 400 eggs. The rafts float on the water surface and hatching occurs within a day or two in warm weather. This species does not migrate far from its breeding habitat and is predominately active at night. During the day they may be found in houses, around chicken coops and various other shelters near their breeding places. They are very attracted to both carbon monoxide and light traps. This mosquito is of particular public health importance since it is able to transmit various mosquito borne diseases, such as St. Louis Encephalitis and West Nile Virus.

Aedes triseriatus, another important public health vector, is known as the "tree-hole" mosquito. This mosquito is blue-black in appearance with silvery white scales at the sides of the thorax. This mosquito breeds in tree holes, old tires, tin cans, barrels and other artificial containers. The adult *Aedes triseriatus* does not fly far from their breeding habitats, but they can transmit La Crosse Encephalitis.

Two species that have begun to appear in the area are the Asian Tiger mosquito (*Aedes albopictus*) and the Japanese Rock Pool mosquito (*Ochlerotatus japonicas*). Both species are aggressive daytime biters. The Asian Tiger mosquito first came to the U.S. from Asia in used tires. What effect these two species will have on the potential transmission of various diseases remains to be fully discovered.

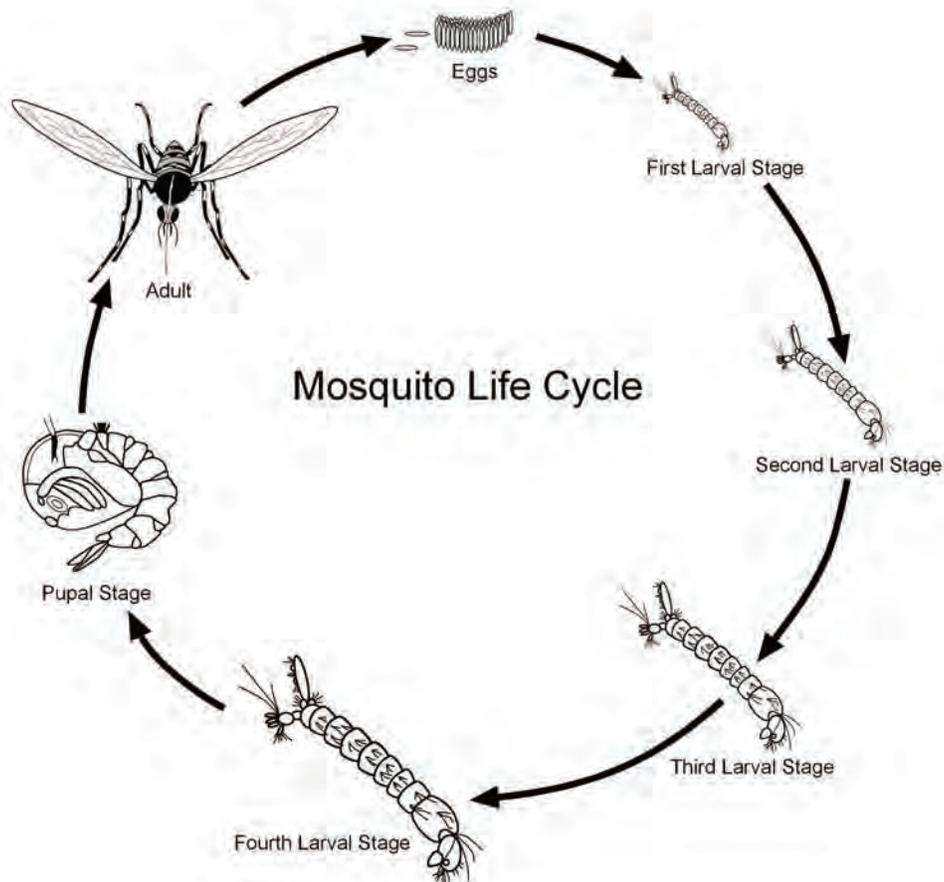
The Mosquito Life Cycle

I. The Egg Stage. Eggs are laid by the adult female: 1) singly on the water surface (*Anopheles*, the malaria mosquito); 2) singly above the water line (*Aedes*, the floodwater mosquito); 3) or in groups (egg rafts) on the waters' surface (*Culex*, the house mosquito). Floodwater mosquito species can survive the winter as eggs.

II. The Larval Stage. Mosquito larvae must develop in standing water. They breathe through an air tube at the rear of their bodies. Larvae (wigglers) feed on detritus and microorganisms. They undergo 4 stages of development called instars. Between each instar the larvae feed, shed their skins, and become larger. During the warm days of summer larvae can complete development in 5 to 7 days. *Anopheles* larvae develop in permanent ponds and marshes. *Aedes* larvae develop in temporary woodland pools and intermittently flooded ditches. *Culex* larvae are found in catch basins and polluted water.

III. The Pupal Stage. After completing the fourth instar, larvae shed their skins and become pupae (tumbler). During the pupal stage, the mosquito undergoes development into the adult. Pupae, like larvae, breathe air but they do not feed. After 2 to 4 days the skin of the pupa splits and the adult mosquito emerges on the surface of the water.

IV. The Adult. After 15-20 minutes, the adult male or female mosquito is ready for flight. Both males and females feed on sugar from plant juices and nectar, which they use for flight energy. The female uses the protein found in red blood cells to manufacture eggs. Males do not need a blood meal and do not bite. Adult mosquitoes usually do not fly further than 1 to 4 miles, but some species such as *Aedes vexans* can fly 20 miles if weather conditions are right. *Culex* and *Anopheles* mosquitoes over-winter as adults.



Operations: Methods of Mosquito Control

The foundation of our abatement program is based on the principles of integrated pest management (IPM). IPM is a mosquito control effort that minimizes deleterious effects on the environment and non-target organisms while utilizing the most efficient means of mosquito control available. Through the IPM program we reduce and control the local mosquito populations by employing a combination of various control methods such as scouting, monitoring, larviciding, adulticiding, and source reduction (the physical reduction of mosquito breeding sites). The NSMAD's IPM program also includes an education program for both employees and the public. This education program helps the District teach residents how they can help reduce breeding sites on their property and thereby help control our local mosquito population.

Since the IPM philosophy of the District emphasizes the utmost importance of the proper use of mosquito control methods and products, employees are instructed in the following areas: safety procedures, equipment use, proper application techniques, rates and field training. After the completion of training, all workers are required by the NSMAD conditions of employment and Illinois law, to take and pass state insecticide operator or applicator exams. The exams were developed by the Illinois Department of Health and administered by the Illinois Department of Agriculture. Staff members are encouraged to bring any special problems or questions to the laboratory during the summer mosquito season.

Methods of Mosquito Control

There are three principal methods of control the NSMAD uses to manage the mosquito population:

- **Source Reduction**
- **Larviciding**
- **Adult Mosquito Control**

Source reduction (commonly known as the elimination and/or reduction of breeding sites) is one of the most effective methods of mosquito control carried out by the NSMAD. NSMAD employees inspect and clear debris from culverts, ditches, and stagnant streams. This labor-intensive process ensures rapid drainage of the standing water, thereby preventing the development of mosquito larvae. Even with an effective source reduction program in place, adult mosquito populations will periodically reach intolerable and unsafe population densities-especially in higher-than-average rainfall years. During these periods larviciding and adulticiding together, prove to be the most efficient and effective method of control in addition to source reduction.

Larviciding is aimed at controlling mosquito larvae at the source of reproduction where it is most concentrated and vulnerable. *During an average season, approximately 80-90% of the District's field program is focused on controlling mosquito larvae.* We treat approximately **5,000** off-road sites and more than **50,000** catch basins every year. Swampy lowland areas, new construction sites, ditches along roadways, railroad right-of-ways, flooded yards, storm sewers, and other small temporary impoundments of water, are all potential sources of mosquito reproduction when the water was stagnant for approximately 6-10 days without treatment. Fishponds and ornamental pools are also inspected periodically for the presence of mosquito larvae. Treatment of these mosquito-breeding sites is the primary objective of the larviciding program. The inspection of these areas continues throughout the summer on a weekly basis.

The North Shore Mosquito Abatement's Integrated Pest Management approach of surveillance, source reduction and larviciding has proven to be the most efficient and environmentally sound method of controlling the local mosquito population. The North Shore Mosquito Abatement District is proud of its IPM program and its concern for our residents and the environment. Our goal is to make the North Shore as mosquito free as possible while protecting the public health and the environment. If residents have any questions they can visit our web site (www.nsmad.com) or contact us at (847) 466-9434 or via email at nsmad@nsmad.com.

The NSMAD utilizes three categories of larval control products: growth regulators, bacterial larvicides and monomolecular films. Growth regulators are pellets and briquettes containing methoprene an insect growth-regulator that is similar to that found naturally in mosquito larvae. Extended release formulas of methoprene are used to treat small enclosures of water such as poorly maintained ornamental ponds, abandoned swimming pools and catch basins. These breeding hotspots continuously produce *Culex* mosquitoes. These briquettes, when placed in these breeding sites, slowly release methoprene into the water and prevent mosquito larvae from developing past the pupal stage. It is a mosquito specific treatment; therefore other organisms in the environment (such as insects, waterfowl, and mammals) do not suffer deleterious effects.

The three types of bacterial larvicides the NSMAD uses are: *Bacillus sphaericus* (B.s.), *Bacillus thuringiensis var. israelensis* (BTI) and spinosad. These larvicides are mosquito specific and pose very little risk to humans and other animals. In order to treat small marshes, wastewater, drainage systems, tire dumps, and natural or manmade aquatic sites and catch basins, the district may apply either of these bacterial larvicides in either granular or liquid formulations. *Bacillus sphaericus* can be applied to stagnant and polluted water-areas where the encephalitis transmitting *Culex sp.* breeds and flood prone areas where nuisance mosquitoes may breed. Spinosad is derived from a naturally occurring soil bacterium and is a new, cutting edge, reduced risk, larval control product.

Monomolecular films are used when pupae are present. The film causes the surface tension of the water to become unstable and not allow for pupa and larvae to attach to the surface to breath, resulting in their death.

Supplementing the larviciding program is the **adult mosquito control** program. The adult mosquito control program is comprised of barrier and truck mounted insecticide applications. The barrier control program was initiated during the 2000 season. Based on its successful trial in 2000, it became an integral part of adult mosquito control. Barrier control is utilized in order to protect a specific and limited area. Barrier control products are designed to have a residual effect on the area treated. Heavily vegetated locations that will attract or harbor mosquitoes are treated. The treatment consists of an application of the barrier control product by either a hand-held ULV or backpack sprayer directly to bushes, tall grasses and/or extreme ground cover creating a repellent barrier to adult mosquitoes. The applications have been successful and have resulted in control that lasted up to four weeks under ideal weather conditions.

The use of the NSMAD's truck mounted ULV sprayers is a highly regulated and last-ditch effort to control adult mosquitoes. It is initiated only in the evening and only when mosquito populations pose a health threat to the community. If truck mounted ULV control operations is embarked upon, then depending on the data, the NSMAD puts into place a program to either cover the District's hot spots or begin a systematic sweep of the entire district. The NSMAD's most experienced employees, who are licensed by the Illinois Department of Agriculture, operate the truck mounted ULVs. Truck mounted ULV operations are conducted in a systematic section-by-section (section=1 square mile) manner for control of adult mosquitoes. This effort is undertaken to reduce the adult mosquito population and interrupt the rapid reproductive cycle. The NSMAD's trucks are equipped with GPS enabled Clarke SmartFlow control units. Based on the speed of the vehicle, these control units constantly adjust the flow of the insecticide Anvil 2+2 in order to maintain the proper application rate of 0.0018 - 0.0024 lbs. of active ingredient per acre as recommended by the product label and the State of Illinois Department of Agriculture guidelines. This method of adult control does not have a residual effect on the area treated and is designed for a quick knock down of adult mosquitoes.

The NSMAD only conducts adult mosquito control operations at night when mosquitoes are most active and other insects are not. This minimizes exposure to non-target insects (i.e. bees).

The NSMAD maintains a Prior Notification List of residents who wish to be notified when adult mosquito control will be occurring. When control operations in the immediate neighborhood of these residents are scheduled, a telephone call is made by a NSMAD employee to each resident on the list to notify them of the details. This allows residents to take any precautions they may deem necessary. Residents who wish to have their property skipped during adult mosquito control operations should provide the NSMAD with a physician's note supporting a medical reason for such action. Please contact the NSMAD via telephone during normal business hours for further information.

Operations: Off-Season

Winter provides a time to review and plan for the next mosquito season. Off-season projects typically include:

1. Updating district road maps.
2. Revising and amending larviciding maps that were extensively resurveyed during the summer.
3. Updating our Geographic Information System (GIS) program.
4. Updating the District's records.
5. Filing the annual report with the Illinois Department of Public Health.
6. Updating the larviciding log records.
7. Equipment maintenance, repair and set-up of vehicles.
8. General maintenance of offices and shop areas.
9. Updating the prior notification list.
10. Identifying potential new mosquito breeding sites.
11. Larviciding and monitoring of adult mosquitoes in the Water Reclamation District in Skokie.
12. Further development of community outreach and educational programs.
13. Attending industry and public health meetings to maintain best practice standards.

Alternative Mosquito Control

There are few alternatives to using pesticides for controlling adult mosquitoes. One of the more successful alternatives to pesticides for controlling mosquitoes is the use of Gambusia, also known as mosquito fish, which can eat large numbers of mosquito larvae. Caution is advised when using these fish so as to not upset native species.

The Citrosa plant will, when the leaves are moved, release citronella, a natural and well-known, but not always effective, mosquito repellent. You may find citronella in lotions, but more commonly you will find it sold as candles. However, there are no known plants that prevent mosquitoes from biting or entering a house.

Bug zappers will not effectively reduce the number of mosquitoes found around homes and in fact may act to attract more to the property. Products known as “mosquito magnets” may be effective for residents with large pieces of property. They have been shown to attract mosquitoes. However, it is not known if they are attracting more mosquitoes than would normally appear. Placement of these devices is very important; they should be as far away from areas where people will congregate.

The most effective method to prevent mosquito bites is to wear loose clothing that covers all parts of the skin in combination with an insect repellent that contains DEET. The best commercial repellent you can buy should contain 7% to 30% DEET. DEET repels mosquitoes, no-see-ums, fleas, ticks, gnats, horse flies, deer flies, yellow flies, and chiggers.

Bats and Purple Martins are not effective options for adult mosquito control. Research conducted in the 1950s indicated that bats released in a room filled with mosquitoes could catch up to 10 mosquitoes per minute. The research was conducted to measure the effectiveness of echolocation in insectivorous bat species. The results have been extrapolated to suggest that wild bats can consume 600 mosquitoes per hour. Using that figure, a colony of 500 bats will remove 250,000 mosquitoes each hour and theoretically afford mosquito control for an entire neighborhood.

Research since that time has shown that insectivorous bats are opportunistic feeders and mosquitoes make up a very small percentage of their natural diet. Bats' behavior when locked in a room with nothing to feed upon but mosquitoes has no bearing on their behavior in the wild. Bats feed on the same insects that turn up in bug zappers and are no more effective for controlling mosquitoes than their electronic equivalent. Providing habitat to enhance bat populations is an admirable activity for conservation purposes. Using mosquito control as the reason to initiate public interest is misleading at best.¹ Additionally, bats are known to carry rabies, a very serious health threat to both humans and other mammals.

Purple Martins, like all swallows, are aerial insectivores. They eat only flying insects, which they catch in flight. Their diet is diverse, including dragonflies, damselflies, flies, midges, mayflies, stinkbugs, leafhoppers, Japanese beetles, June bugs, butterflies, moths, grasshoppers, cicadas, bees, wasps, flying ants, and ballooning spiders. Martins are not, however, prodigious consumers of mosquitoes as is so often claimed by companies that manufacture martin housing. An intensive 7-year diet study conducted at PMCA headquarters in Edinboro, PA, failed to find a single mosquito among the 500 diet samples collected from parent martins bringing beakfuls of insects to their young. The samples were collected from martins during all hours of the day, all season long, and in numerous habitats, including mosquito-infested ones. Purple Martins and freshwater mosquitoes rarely ever cross paths. Martins are daytime feeders, and feed high in the sky; mosquitoes, on the other hand, stay low in damp places during daylight hours, or only come out at night.²

**A Note Regarding Repellents:
The entire label should be read before choosing what is best for you. You should be sure to read and follow the directions before applying repellent. Contact your physician before applying any repellents or insecticides.**

¹ <http://www.rci.rutgers.edu/~insects/propprom.htm>

² *The Purple Martin Conservation Association web site (<http://www.purplemartin.org>)*

Laboratory Report

The function of the laboratory is to monitor the local mosquito population for density, potential diseases and recommend the appropriate control methods. Monitoring of mosquitoes is accomplished by

During the 2011 season, 1135 mosquito pools were tested for West Nile Virus, of which 149 were positive. While 13.13% of the total number of mosquitoes tested positive for WNV this year, the NSMAD saw a spike of 875% from July 25 - August 21, initiating an adult mosquito control response. Experts consider a level of 10% positive mosquitoes to be of greater risk for transmission to humans.

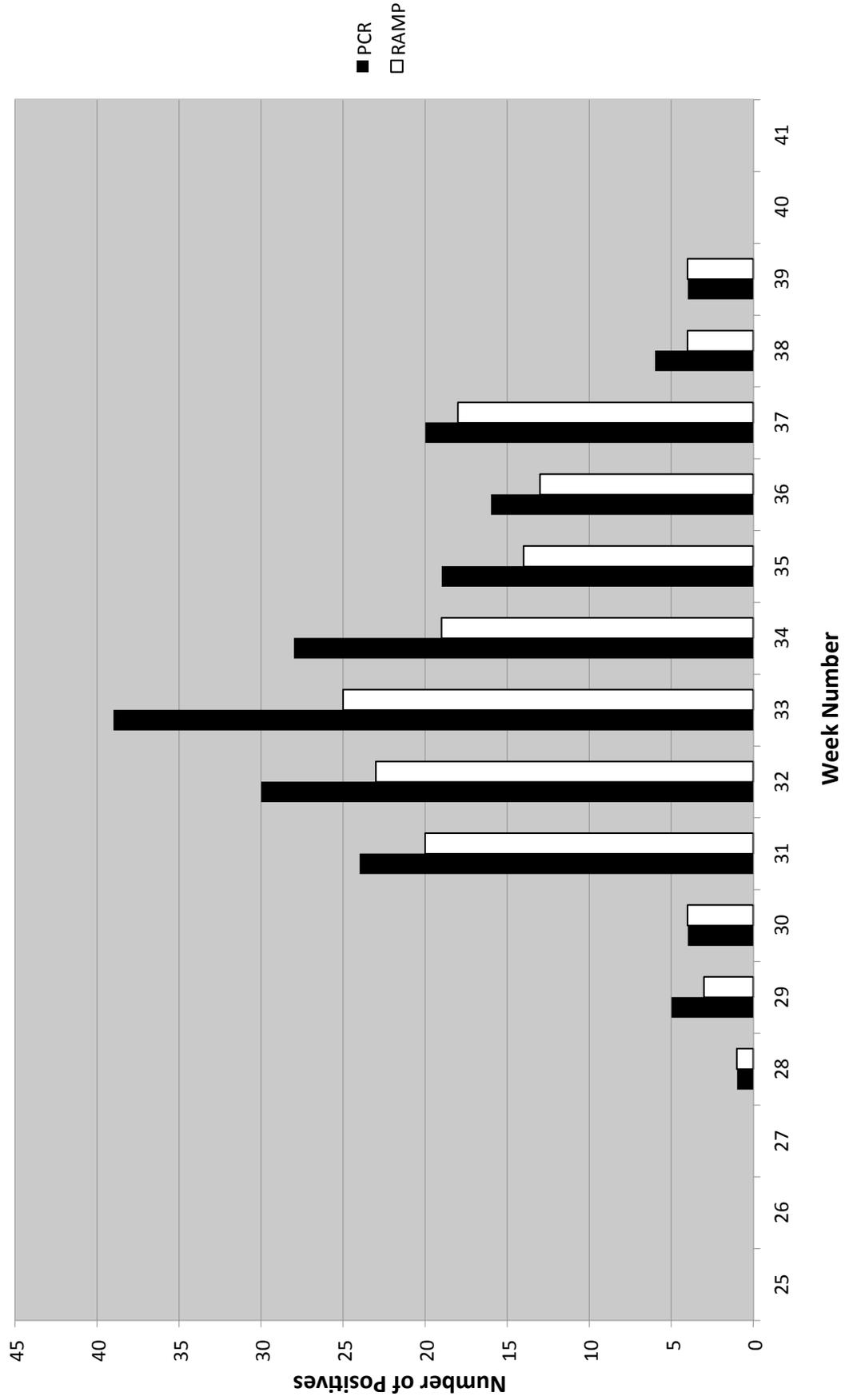
examining specimens brought in from the 25 traps distributed geographically throughout our district. The nine light traps were set up in residential yards where access to electricity runs a light bulb triggered by a photocell. Mosquitoes are attracted to the light and a fan blows the mosquito into a jar that contains a pest kill strip. Floodwater mosquitoes are typically captured in light traps.

The 16 gravid and three CO2 traps were set up at different sites throughout the season and collections were made three times per week. Gravid and CO2 traps are used to capture *Culex* mosquitoes, the vector of WNV and other potential diseases in this area. Counts of *Culex* mosquitoes from these traps not only gives an indication of the mosquito populations, but they also help the NSMAD and the Illinois Department of Public Health (IDPH) test for St. Louis Encephalitis, Eastern Equine Encephalitis, and West Nile Virus.

Mosquito pools were tested in the laboratory for WNV via RAMP Test. These sample pools of mosquitoes were also sent to the University of Illinois Natural History Survey Medical Entomology Annex (INHS) in Champaign, Illinois, for analysis via a more sensitive testing procedure known as a RT-PCR test. In addition to WNV, the INHS also tests mosquitoes for SLE and EEE.

Municipality	# RAMP Positives	# RT-PCR Positives
Evanston	13	19
Glencoe	6	9
Glenview/Golf	27	32
Kenilworth	11	16
Lincolnwood	2	5
Morton Grove	5	7
Niles	7	10
Northbrook	9	14
Northfield	5	8
Skokie	51	58
Wilmette	8	9
Winnetka	5	9
Totals	149	196

Positive Mosquito Pools By Week



2011 Female Mosquito Count Totals by Trap Type

Species		New Jersey	Aspirator	Gravid	Totals
<i>Aedes</i>	<i>vexans</i>	8777	350	54	9181
<i>Aedes</i>	<i>sticticus</i>	1	0	4	5
<i>Aedes</i>	<i>trivittatus</i>	81	41	313	435
<i>Aedes</i>	<i>grossbecki</i>	0	0	0	0
<i>Aedes</i>	<i>triseriatus</i>	19	0	510	529
<i>Anopheles</i>	<i>punctipennis</i>	21	1	29	51
<i>Anopheles</i>	<i>quadrimaculatus</i>	16	0	28	44
<i>Anopheles</i>	<i>barberi</i>	0	0	0	0
<i>Coquillettia</i>	<i>perturbans</i>	9		2	11
<i>Culex</i>	<i>pipiens</i>	727	174	103514	104415
<i>Culex</i>	<i>restuans</i>	0	0	10329	10329
<i>Culex</i>	<i>territans</i>	0	0	0	0
<i>Culex</i>	<i>salinarius</i>	1	0	12	13
<i>Culex</i>	<i>tarsalis</i>	0	0	4	4
<i>Culiseta</i>	<i>inornata</i>	24	0	48	72
<i>Ochlerotatus</i>	<i>japonicus</i>	3	0	203	206
<i>Orthopodomyia</i>	<i>signifera</i>	0	0	13	13
<i>Psorophora</i>	<i>ciliata</i>	3	0	4	7
<i>Psorophora</i>	<i>ferox</i>	2	0	3	5
<i>Uranotaenia</i>	<i>sapphirina</i>	19	2	6	27
	Totals	9703	568	115076	125347

Education and Communications Information

The District instructs full and part-time employees on the measures that homeowners should participate in to reduce potential mosquito breeding sites on private property. One such educational effort is the door-to-door distribution of an informational door hanger that describes remedies for reducing breeding sites and the importance of wearing repellents.

The Superintendent and the Communications Manager visit with public health officials from within our district and the state to keep them apprised of our activities. A weekly status report is delivered via email with updates about operations and mosquito testing. During the season, media interviews are conducted to cover timely topics such as repellent usage, WNV, trap counts, testing data, and when adult mosquito control operations are to be conducted in the District. In addition to the District's website (www.nsmad.com), the District has a 24-hour hotline to enable the residents in the District to call in and determine the status of our program and inform us of matters that we can address (i.e. larviciding, and high adult mosquito activity in a specific area).

The Communications Manager and several NSMAD employees attended numerous public events throughout the season with our public information booth. The NSMAD appears at these events to speak with residents regarding personal protection methods and answer questions. This season, the public information booth visited Northbrook's Earth Day celebration, farmer's markets in Lincolnwood and Morton Grove, Glencoe Public Works Open House and participated in the Fourth of July parades in Evanston and Skokie. The NSMAD information booth is available to appear at community events upon request.

The NSMAD was featured in several news media outlets this past year. The Communications Manager provided information for stories about mosquitoes and personal protection measures to The Chicago Tribune, Chicago Sun-Times, Pioneer Press and other community newspapers throughout the season. NBC-5 TV in June and ABC-7 TV in July, featured the NSMAD in stories regarding mosquito populations affecting the Chicago area. Additionally, the Communications Manager spoke with WBBM-AM 780 in May.

The NSMAD web site (www.nsmad.com) contains a substantial amount of information and links. This season, we continued to utilize Google Maps to provide a better visual reference to residents during adult mosquito control operations. Minutes from the Board of Trustee's meetings can be found at our web site. Residents are encouraged use the web site to find out where and when adulticiding will be taking place, report dead birds, catch basins and standing water.

2011 COMBINED BUDGET AND APPROPRIATIONS

PURCHASE OF EQUIPMENT & SUPPLIES	\$ 355,700.00
BUILDING MAINTENANCE & REPAIRS	\$ 12,000.00
CAPITOL IMPROVEMENTS FUND	\$ 7,500.00
UTILITIES	\$ 36,300.00
LEGAL & AUDIT	\$ 43,000.00
SALARIES & WAGES	\$ 659,341.00
SOCIAL SECURITY & IMRF	\$ 89,500.00
INSURANCE & SURETY BONDS	\$ 227,500.00
CONTINGENCY	<u>\$ 62,870.00</u>
	\$ 1,493,711.00

2011 PESTICIDE USAGE

Larvicides

Agnique MMF	76 gallons
Altosid XR	898 lbs.
Altosid Pellets	66 lbs.
Natular	2,968 lbs.
Vectolex CG	2,840 lbs.

Adulticides

Anvil 2+2 ULV	635 gallons
Flit 13.3	.5 gallons
Maverick	11.5 oz.

2011 VEHICLE AND EQUIPMENT REPORT

VEHICLES

- 3 2000 GMC Sonoma Pick-Up Trucks
- 1 2001 GMC Sonoma Pick-Up Truck
- 1 2001 GMC Sierra Pick-Up Truck
- 2 2002 GMC Sonoma Pick-Up Trucks
- 3 2004 GMC Canyon Pick-Up Trucks
- 1 2006 GMC Canyon 4x4 Pick-Up Truck
- 1 2007 GMC Canyon 4x4 Pick-Up Truck
- 1 2009 GMC Canyon 4x4 Pick-Up Truck
- 1 2010 Ford F150 Extended Cab Pick-Up Truck
- 1 2011 Ford F250 4x4 Pick-Up Truck w/ Snow Plow
- 1 2011 Ford Escape SUV

EQUIPMENT

- 2 LECO ULV CF
- 6 Cougar ULV
- 11 Solo Pump Sprayers
- 23 New Jersey Light Traps
- 30 Gravid Traps
- 2 Aero Gun Larviciding Applicator
- 5 Maruyama Backpack Misters
- 8 Co2 Traps
- 1 LECO Handheld ULV

Centers for Disease Control Information Regarding Mosquito Repellents

Repellents are an important tool to assist people in protecting themselves from mosquito-borne diseases.

CDC recommends the use of products containing active ingredients which have been registered by the U.S. environmental Protection Agency (EPA) for use as repellents applied to the skin and clothing. EPA registration of repellent active ingredients indicates the materials have been reviewed and approved for efficacy and human safety when applied according to the instructions on the label.

Repellents for Use on Skin and Clothing:

CDC evaluation of information contained in peer-reviewed scientific literature and data available from EPA has identified several EPA registered products that provide repellent activity sufficient to help people avoid the bites of disease carrying mosquitoes. Products containing these active ingredients typically provide reasonably long lasting protection.

- **DEET** (Chemical Name: N, N-diethyl-m-toluamide or N, N-diethyl-3-methyl-benzamide.
- **Picaridin** (KBR 3023, Chemical Name: 2-(2-hydroxyethyl)-1-piperidinecarboxylic acid 1-methylpropyl ester)
- **Oil of Lemon Eucalyptus*** or **PMD** (Chemical Name: para-Menthane-3, 8-diol) the synthesized version of oil of lemon eucalyptus
- **IR3535** (Chemical Name: 3-[N-Butyl-N-acetyl]-aminopropionic acid, ethyl ester)

EPA characterizes the active ingredients DEET and Picaridin as “conventional repellents” and Oil of Lemon Eucalyptus, PMD and IR535 as “biopesticide repellents”, which are derived from natural materials. For more information on repellent active ingredients see http://www.epa.gov/pesticides/health/mosquitoes/ai_insectrp.htm.

Published data indicate that repellent efficacy and duration of protection vary considerably among products and among mosquito species and are markedly affected by ambient temperature, amount of perspiration, exposure to water, abrasive removal and other factors.

In general, higher concentrations of active ingredient provide longer duration of protection, regardless of the active ingredient, although concentrations above ~50% do not offer a marked increase in protection time. Products with <10% active ingredient may offer only limited protection, often from 1-2 hours. Products that offer sustained release or controlled release (micro-encapsulated) formulations, even with lower active ingredient concentrations, may provide longer protection times. Regardless of what product you use, if you start to get mosquito bites reapply the repellent according to the label instructions or remove yourself from the area with biting insects if possible.

These recommendations are for domestic use in the United States where EPA-registered products are readily available. See [CDC Travelers' Health website](#) for additional recommendations concerning protection from insects when traveling outside the United States.

Repellents for Use on Clothing:

Certain products containing **permethrin** are recommended for **use on clothing, shoes, bed nets, and camping gear**, and are registered with EPA for this use. Permethrin is highly effective as an insecticide and as a repellent. Permethrin-treated clothing repels and kills ticks, mosquitoes, and other arthropods and retains this effect after repeated laundering. The permethrin insecticide should be reapplied following the label instructions. Some commercial products are available pretreated with permethrin.

EPA Recommends the Following Precautions When Using Insect Repellents

- Apply repellents only to exposed skin and/or clothing (as directed on the product label.) Do not use repellents under clothing.
- Never use repellents over cuts, wounds or irritated skin.
- Do not apply to eyes or mouth, and apply sparingly around ears. When using sprays, do not spray directly on face—spray on hands first and then apply to face.
- Do not allow children to handle the product. When using on children, apply to your own hands first and then put it on the child. You may not want to apply to children’s hands.
- Use just enough repellent to cover exposed skin and/or clothing. Heavy application and saturation are generally unnecessary for effectiveness. If biting insects do not respond to a thin film of repellent, then apply a bit more.
- After returning indoors, wash treated skin with soap and water or bathe. This is particularly important when repellents are used repeatedly in a day or on consecutive days. Also, wash treated clothing before wearing it again. (This precaution may vary with different repellents—check the product label.)
- If you or your child get a rash or other bad reaction from an insect repellent, stop using the repellent, wash the repellent off with mild soap and water, and call a local poison control center for further guidance. If you go to a doctor because of the repellent, take the repellent with you to show the doctor.

Note that the label for products containing oil of lemon eucalyptus specifies that they should not to be used on children under the age of three years. Other than those listed above, EPA does not recommend any additional precautions for using registered repellents on children or on pregnant or lactating women. For additional information regarding the use of repellent on children, please see CDC’s Frequently Asked Questions about Repellent Use. [http://www.cdc.gov/ncidod/dvbid/westnile/qa/insect_repellent.htm]

DEET-based repellents applied according to label instructions may be used along with a separate sunscreen. No data are available at this time regarding the use of other active repellent ingredients in combination with a sunscreen.

See <http://www.epa.gov/pesticides/health/mosquitoes/insectrp.htm> for additional information on using EPA-registered repellents.

* Note: This recommendation refers to EPA-registered repellent products containing the active ingredient oil of lemon eucalyptus (or PMD). “Pure” oil of lemon eucalyptus (e.g. essential oil) has not received similar, validated testing for safety and efficacy, is not registered with EPA as an insect repellent, and is not covered by this CDC recommendation.

References:

Barnard DR, Xue RD. Laboratory evaluation of mosquito repellents against *Aedes albopictus*, *Culex nigripalpus*, and *Ochlerotatus triseriatus* (Diptera: Culicidae). *J Med Entomol.* 2004;41(4):726-30.

Barnard DR, et al. Repellency of IR3535, KBR3023, para-menthane-3,8-diol, and DEET to Black Salt March mosquitoes (Diptera: Culicidae) in the Everglades National Park. *J Med Entomol.* 2002; 39(6): 895-899

Fradin MS, Day JF. Comparative efficacy of insect repellents against mosquito bites. *N Engl J Med.* 2002; 347(1):13-8.

Thavara U et al. Laboratory and field evaluations of the insect repellents 3535 (ethyl butyletylaminopropionate) and DEET against mosquito vectors in Thailand. *J of Am Mosq Cont Assoc.* 2001, 17(3):190-195

Homeowner/Resident Tips

The following are recommendations from the Illinois Department of Public Health as preventive measures that can be taken against mosquitoes:

1. Clean and properly maintain catch basins that hold water.
2. Cut, remove, and properly discard excess overhanging vegetation along or over the banks of drainage ditches or stagnant slow-moving streams, especially those that receive effluent from sewage treatment plants or where other waste may enter a stream.
3. Cut, remove, and properly discard excess vegetation and weeds around the margins of cannery waste lagoons, hog lagoons, sewage lagoons, and similar operations, so that a shaded canopy of vegetation is not allowed to provide an ideal environment for the development of the mosquito.
4. Clean out debris, broken tree limbs, and objects that impede the normal stream flow so polluted pockets of water do not remain. Also, remove discarded containers.
5. Prevent drainage of improperly treated sewage effluent into drainage ditches and other low areas by assuring that private sewage systems are installed in compliance with applicable local, state, and federal codes.
6. Stack pails, barrels, tubs, vases, wheelbarrows, and similar containers upside down so water does not accumulate in them.
7. Fill or drain any low places where water may stand for more than a week.
8. Inspect and clean rain gutters and downspout if leaves or other debris blocks them.
9. Collect and properly discard all useless artificial containers and old tire casings.
10. Properly maintain backyard swimming pools to discourage the development of mosquitoes by draining and covering any pool not in use.
11. **WEAR REPELLENT!** Wearing repellent is the most effective way to prevent mosquito bites. Studies have shown that wearing repellent may reduce the chance of acquiring a mosquito borne illness by as much as 50%.