NORTH SHORE MOSQUITO ABATEMENT DISTRICT

2018 ANNUAL REPORT

TRUSTEES
John M. Zbesko, President
Kathleen Kendrick, Vice-President
Nelson Howard, Secretary
William Zimmer, Treasurer
Carol Blustein

EXECUTIVE DIRECTORS
Mark Clifton, Ph.D.
May 1, 2018

Roger S. Nasci, Ph.D.
January 1, 2018 – April 30, 2018

Report prepared by Dave Zazra, Communications Manager, under the direction of Mark Clifton, Executive Director, with the assistance of the NSMAD staff.
TABLE OF CONTENTS

Preface

Introduction to the North Shore Mosquito Abatement District  Pg. 1
   Area Served  Pg. 1
   Organization  Pg. 1
   Mission Statement  Pg. 1

Public Health and Mosquitoes  Pg. 2
Operations: Integrated Pest Management  Pg. 2
   Surveillance Program & Determining Action Thresholds  Pg. 2
   Environmental Surveillance  Pg. 2
   Monitoring Mosquito Populations  Pg. 3

2018 West Nile Virus Surveillance Summary  Pg. 4

2018 NSMAD WNV Test Results  Pg. 4
   Vector Species Abundance  Pg. 5
   WNV Infection Rate  Pg. 6
   WNV Vector Index  Pg. 7

NSMAD Human WNV Cases per Year by Community  Pg. 8

Nuisance Mosquito Surveillance  Pg. 9
   New Jersey Light Trap Collections  Pg. 9

2018 Female Mosquitoes Collected by Species  Pg. 10

Mosquito Control  Pg. 11
   2018 Control Activities Summary  Pg. 12

NSMAD Integrated Pest Management Protocol Summary  Pg. 13

Education and Communications  Pg. 14
   Media and Community Relations  Pg. 14

2018 Combined Budget  Pg. 15
   Staff  Pg. 15

2018 Pesticide Usage  Pg. 16

2018 Vehicles and Equipment  Pg. 17
PREFACE

2018 marked the 91st year the North Shore Mosquito Abatement District has been serving the residents of the North Shore area. It was a year of evolution, advancement and refinement of our mosquito abatement program. From new construction projects to new leadership and treatment programs, the NSMAD completed a period of renovation and is better prepared than ever to serve our community and protect the public health from vector-borne disease. The staff at the NSMAD are proud of the accomplishments made during 2018, as well as, those planned for the near future. Below you will find a brief description of some of the major projects and initiatives completed.

An important personnel change occurred in 2018. Executive Director, Roger S. Nasci, Ph.D., retired in April and was succeeded by Mark Clifton, Ph.D. Among the notable accomplishments initiated by Dr. Nasci was the construction of a new bio-safety level two laboratory and pesticide storage facility, as well as, programs that improved the capabilities and efficiencies of the District. Although Dr. Nasci's time with the NSMAD was brief, his influence and contributions were profound and the staff at the NSMAD wish him the best in his next chapter.

One of the biggest improvements involves the enhancement of our pathogen testing capabilities. At the end of 2018, we equipped our laboratory with advanced diagnostic equipment capable of detecting existing pathogens, such as West Nile virus, as well as, any pathogen which may arrive and pose a threat in the future. As the world witnessed during previous West Nile outbreaks and the 2016 Zika outbreak, little known pathogens can spread to all corners of the globe. The development of an advanced diagnostic laboratory ensures that the NSMAD is prepared for the vector-borne disease challenges of the future.

The NSMAD surveillance program received enhancements as well. First, a new insectary, capable of rearing mosquitoes from the field, was constructed. This insectary will enable us to monitor local mosquito populations for insecticide resistance to help ensure that we have effective tools available for use in our control program. In the Fall, we initiated a tick surveillance program due to the increased incidences of tick-borne illnesses both nationally and within Illinois. These seasonal field surveys will enable the NSMAD to identify and monitor the tick population throughout the district.

Constant self-evaluation is integral to organizational improvement. In 2018, the NSMAD engaged in multiple research efforts to ensure that our treatments are effective, efficient and appropriate. We evaluated the effectiveness of larval control treatments in storm water catch basins, adult control methodologies and monitored insecticide resistance in local mosquito populations. The results of these evaluations were presented both regionally and nationally at multiple conferences and symposia. The NSMAD is proud to be an active participant in the advancement of vector control and public health.

Because of globalization and a changing climate, the distribution of disease vectors is growing and the threat from vector-borne diseases is rising. To address these new realities, the staff of the NSMAD created a comprehensive, five-year, strategic plan that encompasses the years 2019-2023. This plan outlines initiatives that will drive efficiencies, enhance our capabilities and improve customer service, all while reducing our ecological footprint and maintaining a responsible budget. Most importantly, this plan outlines the strategy the NSMAD will take to address the public health threats of the future. We encourage you to learn more about our vision for the future and read our five-year strategic plan which can be found on our website, www.nsmad.com.

You will find further details of the 2018 mosquito season in this Annual Report, including surveillance and collection data and detailed descriptions of the methods we use to control the local mosquito population.
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 September 1927, prompted a group of citizens to work for the establishment of a mosquito abatement program for the North Shore of Cook County. This led to the organization of the North Shore Mosquito Abatement District (NSMAD), which was officially chartered on December 8, 1927.

Area Served

The District serves approximately 330,000 residents in the municipalities of Deerfield (east of Pfingsten and south of Lake Cook Road only) Evanston, Glencoe, Glenview (east of Pfingsten Road), Golf, Kenilworth, Lincolnwood, Morton Grove (east of Washington Street), Niles (east of Harlem Avenue), Northbrook (east of Pfingsten Road), Northfield, Skokie, Wilmette and Winnetka.

The area covered by the NSMAD consists of 70 square miles of Cook County's North Shore. This sprawling and diverse area includes more than 900 miles of streets, 40,000 catch basins, 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 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 employs seven full-time staff members and between 10-12 seasonal field technicians. Full time staff positions include: The Executive Director, a Chief Field Inspector, a Communications Manager, a Field Supervisor, an Internal Operations Manager, an Operations Manager and a Vector Biologist.

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

Mission Statement

The NSMAD controls mosquito populations in the District to:

1. Reduce the risk of disease from mosquito-borne illness
2. Minimize the negative impact mosquitoes have on quality of life
Public Health and Mosquitoes

Mosquitoes are responsible for the transmission of many debilitating and potentially deadly diseases around the globe, such as malaria, yellow fever, dengue, Zika, 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. West Nile Virus (WNV), St. Louis Encephalitis (SLE), Eastern Equine Encephalitis (EEE), Western Encephalitis (WE), and La Crosse Encephalitis (LAC), are serious diseases with symptoms ranging from mild or flu-like to severe, including paralysis, coma and death. In northern Illinois, WNV is the mosquito-transmitted virus of greatest concern. Recovery from these diseases can be a long and painful process, with some people never fully recuperating. Unfortunately, there are no vaccines for humans for any of these diseases at this time, and prevention relies on mosquito control and avoiding mosquito bites.

Operations: Integrated Pest Management

Our abatement program is based on the principles of integrated pest management (IPM). IPM utilizes a thorough understanding of the biology and ecology of the mosquitoes and mosquito-transmitted viruses that occur in the District and employs a comprehensive surveillance program to provide the information needed to develop action thresholds and to make sound decisions about mosquito control activities. In addition, IPM utilizes the full range of mosquito control tools and procedures and applies them as appropriate for a given situation.

There are four principal components of the NSMAD Integrated Pest Management Program:

- Surveillance/Action Thresholds
- Larval Control/Source Reduction
- Adult Mosquito Control
- Public Outreach/Education

Surveillance Program and Determining Action Thresholds

The surveillance program monitors local mosquito population abundance and the prevalence of WNV-infected mosquitoes in the area. We also collect data about weather patterns that are associated with mosquito abundance and WNV activity levels. This information is evaluated against our evidence-based action thresholds and helps us make decisions regarding appropriate control methods.

Environmental Surveillance

Weather conditions have a significant influence on the type and number of mosquitoes produced in NSMAD. Temperature and rainfall patterns are monitored throughout the year, and help determine when we initiate our surveillance and control efforts and to anticipate the type of mosquito problems we will encounter. Heavy, flooding rains early in the year tend to create large broods of nuisance mosquitoes that can affect the quality of life in the area, while warm and dry early-season conditions tend to create a favorable environment for increased Culex mosquitoes and a greater risk of WNV transmission during the latter part of the summer.

Weather Monitoring

The graphs on the following page show the weekly precipitation and average temperature for the 2018 season (top graph) and 2012 (the last outbreak year; bottom graph). Average temperatures during spring 2018 were cooler and wetter than in 2012. Large rainfall events during late April, mid-May, late June, late August and early September led to large broods of floodwater/nuisance mosquitoes.
Monitoring Mosquito Populations

We utilize mosquito traps, strategically placed throughout the District to monitor mosquito abundance and WNV infection rates. Nine New Jersey Light Traps (NJLT) are placed in residential yards. These traps are used primarily to monitor the abundance of nuisance mosquitoes in the area. Mosquitoes are attracted to a light source in the trap and a fan blows the mosquitoes into a jar where they are killed and held until picked up by one of the NSMAD field technicians. New Jersey Light Traps are run four nights/week and the collections are made once per week.

Gravid traps are placed at 19 sites throughout the District and are used to capture Culex mosquitoes, the vector of WNV and other mosquito-transmitted diseases in this area. These traps are run seven days a week and the collections are returned to the laboratory for processing three times per week. Gravid traps provide a measure of the abundance of Culex mosquitoes. In addition, the mosquitoes are tested for the presence of WNV. Mosquitoes collected from the traps are identified to species and sex, then female Culex mosquitoes are grouped into batches of 50 or fewer mosquitoes and tested in our laboratory for WNV via the Rapid Analyte Measurement Platform (RAMP®) Test. This information is used to provide an estimate of the WNV risk in the area. In addition to being used by the NSMAD, the data is shared with the Illinois Department of Public Health (IDPH) and the Cook County Department of Public Health (CCDPH) for use in developing statewide and countywide WNV risk evaluations.
Larval mosquito populations are monitored either by directly observing the larval habitat for the presence of mosquito larvae and pupae in the water, or by taking water samples from the aquatic habitats using a standard volume dipper and examining the sample for the presence of larvae or pupae.

2018 West Nile Virus Surveillance Summary

As of the date of this report, the Illinois Department of Public Health is reporting 177 human WNV cases have occurred statewide with 17 deaths. There were 105 from Cook County. Of the human cases reported in Cook County, seven are from communities served by the NSMAD. Symptom onsets of the cases in the NSMAD occurred during weeks 32 through 36.

2018 NSMAD WNV Test Results

During 2018, a total of 109,752 Cx. *pipiens/restuans* mosquitoes were collected in gravid traps. Of these, 77,053 were tested for WNV in a total of 1,705 pools. Evidence of WNV was detected in 581 pools and positive pools were found in all of the municipalities where gravid traps are placed (see table below).

<table>
<thead>
<tr>
<th>Municipality</th>
<th># Positive Batches</th>
<th># Batches Tested</th>
<th># of Mosquitoes Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evanston</td>
<td>102</td>
<td>372</td>
<td>15,855</td>
</tr>
<tr>
<td>Glencoe</td>
<td>16</td>
<td>62</td>
<td>2,470</td>
</tr>
<tr>
<td>Glenview/Golf</td>
<td>90</td>
<td>186</td>
<td>8,550</td>
</tr>
<tr>
<td>Kenilworth</td>
<td>16</td>
<td>51</td>
<td>2,066</td>
</tr>
<tr>
<td>Lincolnwood</td>
<td>32</td>
<td>111</td>
<td>5,511</td>
</tr>
<tr>
<td>Morton Grove</td>
<td>38</td>
<td>103</td>
<td>4,826</td>
</tr>
<tr>
<td>Niles</td>
<td>30</td>
<td>91</td>
<td>4,127</td>
</tr>
<tr>
<td>Northbrook</td>
<td>27</td>
<td>78</td>
<td>3,455</td>
</tr>
<tr>
<td>Northfield</td>
<td>25</td>
<td>84</td>
<td>3,787</td>
</tr>
<tr>
<td>Skokie</td>
<td>130</td>
<td>357</td>
<td>16,781</td>
</tr>
<tr>
<td>Wilmette</td>
<td>18</td>
<td>75</td>
<td>3,192</td>
</tr>
<tr>
<td>Winnetka</td>
<td>57</td>
<td>135</td>
<td>6,433</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>581</strong></td>
<td><strong>1,705</strong></td>
<td><strong>77,053</strong></td>
</tr>
</tbody>
</table>

Collections for WNV surveillance started May 21, 2018 (week 21). In the graphs on the following pages, 2018 surveillance results are shown as the black line, results obtained during 2012 (the most recent WNV outbreak year with 20 human cases in the District) are shown in the dark grey area, results obtained between 2010 and 2017 (excluding 2012) represent non-outbreak years (0-4 cases per year) and are shown in the light grey area.
Vector Species Abundance: *Cx. pipiens/restuans* abundance in gravid traps was above average early in the season, venturing into numbers seen during the 2012 WNV outbreak, and remained above average until week 33, when they began to decline. The decline in vector populations was helpful in lowering the risk of human WNV during the period of the season when infection rates were greatest. WNV surveillance ended September 28, 2018.
**WNV Infection Rate:** WNV infection in *Cx. pipiens/restuans* (shown in the graph below as the Maximum Likelihood Estimate of the Infection Rate per 1000 mosquitoes) was first detected during week 21. At that point, the infection rate was low at .85/1000. Infected mosquitoes were consistently found somewhere in the District during every subsequent week of the surveillance season.

The prevalence of West Nile virus in mosquitoes remained relatively low from week 21 through week 28, then increased rapidly and reached moderately high levels of 18-23 infected mosquitoes per 1000 captured. This high rate of infection lasted for approximately six weeks through week 35. Infection rates during that period were considerably above the non-outbreak-year levels. By week 36, the infection rate had decreased to low levels and continued to decline through the remainder of the season with a slight uptick in the last two weeks.
**WNV Vector Index:** The Vector Index combines the *Cx. pipiens/restuans* abundance and infection rate data to produce an estimate of the number of WNV infected mosquitoes in the area. This index is associated with human risk of WNV infection and helps us identify locations and time periods when risk increases. In the NSMAD surveillance program, a vector index >1 occurring early in the season is associated with increased risk of multiple human WNV cases. During 2018, the Vector Index exceeded 1.0 at week 30 and remained at increased risk levels through week 35.
### NSMAD Human WNV Cases
#### Per Year by Community

<table>
<thead>
<tr>
<th>Year</th>
<th>Evanston</th>
<th>Glencoe</th>
<th>Glenview</th>
<th>Golf</th>
<th>Kenilworth</th>
<th>Lincolnwood</th>
<th>Morton Grove</th>
<th>Niles</th>
<th>Northbrook</th>
<th>Northfield</th>
<th>Skokie</th>
<th>Wilmette</th>
<th>Winnetka</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>30</td>
<td>3</td>
<td>16</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>12</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>49</td>
<td>22</td>
<td>6</td>
<td>158</td>
</tr>
<tr>
<td>2003</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2004</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2005</td>
<td>8</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>8</td>
<td>6</td>
<td>3</td>
<td>39</td>
</tr>
<tr>
<td>2006</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2007</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2008</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2011</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2012</td>
<td>10</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>2013</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2014</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2015</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2016</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2017</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2018</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
<td>4</td>
<td>30</td>
<td>0</td>
<td>6</td>
<td>7</td>
<td>19</td>
<td>14</td>
<td>11</td>
<td>4</td>
<td>72</td>
<td>31</td>
<td>10</td>
<td>269</td>
</tr>
</tbody>
</table>

The first West Nile virus outbreak in the NSMAD occurred in 2002. Human WNV cases have occurred in the district each subsequent year with the exception of 2009. Following 2002, outbreaks have occurred in 2005, 2006 and most recently in 2012. Human cases of WNV have been reported from every town served by the NSMAD, with half of the reported cases in the district occurring in Skokie and Evanston.
Nuisance Mosquito Surveillance

New Jersey Light Traps are placed in nine locations throughout the district to sample biting adult mosquitoes that affect quality of life. Specimens are collected four nights per week, identified and counted to provide an estimate of the biting mosquito abundance in the district. This information is used to determine nuisance mosquito levels and plan larval and adult control activities. The graph below shows the median number of mosquitoes (all species) collected per trap night, per week during 2010-2017 in the grey area. The black line indicates the number collected per week during 2018. In general, biting mosquitoes become very noticeable to residents when the abundance reaches 20-30/trap night.

During 2018, sampling using NJLTs began in mid-May (week 21). There were three distinct spikes in floodwater mosquito populations during the 2018 season, each of which coincided with large rainfall events (see 2018 Temperature and Precipitation graph on page three). An unprecedented late season surge in the population of floodwater mosquitoes throughout the entire Chicagoland area made for an unpleasant early fall.

New Jersey Light Trap Collections
2018 Female Mosquitoes Collected by Species

Illinois is home to approximately 75 different mosquito species. Of these, 20 species are routinely collected in NSMAD’s surveillance system. The three most commonly collected species are *Aedes vexans*, the primary floodwater/nuisance species found in NSMAD and *Culex pipiens/restuans*, the primary West Nile virus vectors in the region. The third most abundant species is the invasive Asian Bush Mosquito, *Aedes japonicus*. The number of each species collected by NSMAD surveillance during 2018 is shown below.

<table>
<thead>
<tr>
<th>Trap Type</th>
<th>Mosquito Species</th>
<th>New Jersey</th>
<th>BG(^1)</th>
<th>Gravid</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aedes</strong></td>
<td><em>albopictus</em>(^2)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><em>canadensis</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><em>grossbecki</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><em>japonicus</em></td>
<td>26</td>
<td>0</td>
<td>358</td>
<td>384</td>
</tr>
<tr>
<td></td>
<td><em>stimulans</em></td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>sticticus</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><em>triseriatus</em></td>
<td>55</td>
<td>0</td>
<td>170</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td><em>trivittatus</em></td>
<td>89</td>
<td>0</td>
<td>115</td>
<td>204</td>
</tr>
<tr>
<td></td>
<td><em>vexans</em>(^3)</td>
<td>32,310</td>
<td>0</td>
<td>494</td>
<td>32,804</td>
</tr>
<tr>
<td><strong>Anopheles</strong></td>
<td><em>barberi</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><em>punctipennis</em></td>
<td>52</td>
<td>0</td>
<td>43</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td><em>quadrimaculatus</em></td>
<td>97</td>
<td>0</td>
<td>26</td>
<td>123</td>
</tr>
<tr>
<td><strong>Culex</strong></td>
<td><em>pipiens/restuans</em>(^2)</td>
<td>3,887</td>
<td>0</td>
<td>132,419</td>
<td>136,306</td>
</tr>
<tr>
<td></td>
<td><em>salinarius</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><em>tarsalis</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Culiseta</strong></td>
<td><em>inornata</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Coquillettidia</strong></td>
<td><em>perturbans</em></td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Orthopodomyia</strong></td>
<td><em>signifera</em></td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Psorophora</strong></td>
<td><em>ciliata</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><em>ferox</em></td>
<td>7</td>
<td>0</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td><em>howardii</em></td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td><strong>Uranotaenia</strong></td>
<td><em>saphirina</em></td>
<td>41</td>
<td>0</td>
<td>2</td>
<td>43</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td>36,575</td>
<td>0</td>
<td>133,640</td>
<td>170,215</td>
</tr>
</tbody>
</table>

---

1 BG Sentinel Traps
2 *Aedes albopictus* is a potential vector of Chikungunya, and Zika virus
3 *Aedes vexans* are the primary nuisance/floodwater species found within the NSMAD
4 *Culex pipiens/restuans* are the primary WNV vector species found within the NSMAD
Mosquito Control

Mosquito larvae develop in water, and are found in a variety of water-holding habitats including numerous types of man-made structures. Larval Control is aimed at killing mosquitoes while in their larval stages when they are the most concentrated and accessible. Source reduction is the physical elimination and/or reduction of aquatic breeding sites. Our employees are trained to identify potential breeding sources and remove and properly discard them when possible. When the physical elimination of a breeding site is not possible, we utilize a variety of insecticide products specifically designed for larval mosquito control.

During an average season, approximately 90 percent of the District’s field program is focused on controlling mosquito larvae. We treat approximately 3,000 off-road sites and more than 40,000 stormwater 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 potential sources that can produce a brood of mosquitoes in 6-10 days. Fishponds and ornamental pools are also potential mosquito sources. These and other similar habitats are mapped and inspected periodically for the presence of mosquito larvae and are treated when natural predators are not present. Inspection and treatment of these types of areas continues throughout the summer on a weekly basis.

NSMAD utilizes three categories of larval control products: growth regulators, bacterial insecticides and surface oils. Growth regulators contain methoprene, an insect hormone that is similar to that found naturally in mosquito larvae. Pellet formulations containing methoprene are used to treat small enclosures of water such as poorly maintained ornamental ponds, abandoned swimming pools and catch basins that frequently produce Culex mosquitoes. When placed in these sites, the pellets slowly release the active ingredient into the water and prevent mosquito larvae from developing past the pupal stage for at least 30 days. Methoprene-containing formulations are categorized as bio-rational products that have limited effects on non-target organisms.

The bacterially derived larval control products used by NSMAD contain active ingredients produced by naturally occurring, soil inhabiting, bacteria species: Bacillus sphaericus (B.s.), Bacillus thuringiensis var. israelensis (Bti) and Saccharopolyspora spinosa (Spinosad). These larvicides pose very little risk to humans and other animals. In order to treat small marshes, wastewater, drainage systems, tire dumps, and natural or man-made aquatic sites and catch basins, we apply these bacterial larvicides in granular formulations. Bti and B.s. granules are used in a variety of habitats ranging from temporary floodwater sites to permanent water sites. Bacillus sphaericus performs very well in stagnant and polluted water-areas where the encephalitis transmitting Culex sp. breed. Spinosad is derived from a naturally occurring bacterium and is a reduced risk, larval control product formulated as both short-duration and extended-release products for use in a variety of larval habitats.

Surface oils are used when late-stage larvae or pupae are present. These products prevent pupae and larvae from attaching to the water surface to breathe, resulting in their death. Surface oils are quick acting short duration products.

The NSMAD adult mosquito control program is comprised of barrier applications and truck mounted, ultra-low-volume (ULV) insecticide applications. Barrier control consists of applying a mosquito insecticide to vegetation (shrubs and bushes, tall grasses, hedges) and surfaces where mosquitoes rest. Care is taken to avoid applying barrier treatments to flowering plants to reduce the potential impact on pollinators. Barrier applications are utilized to protect a limited size area for a relatively short period of time. Under ideal weather conditions, these applications can reduce local biting mosquito numbers for up to four weeks. The NSMAD uses barrier control to reduce mosquito biting before events in public areas, such as picnics, movies in the park, and other special municipal events. We use Flit™ for barrier control treatments.
NSMAD’s truck mounted ULV sprayers are an essential tool when controlling adult mosquitoes is required. It is used only when action thresholds are met and is applied only in the evening when host-seeking mosquitoes are active. The ULV adult mosquito control operations are used to immediately reduce the adult mosquito population to reduce the number of WNV-infected mosquitoes in an area, to interrupt WNV transmission and to limit the production of new mosquitoes in the area. The ULV technology uses specially designed spray devices to deliver very small amounts of insecticide per acre in a fine aerosol mist that contacts and kills flying mosquitoes. The NSMAD currently uses Duet™, at a rate of 1.25 ounces per acre, for ULV applications. This insecticide contains the active ingredients Sumithrin and Prallethrin, and a Piperonyl Butoxide synergist, providing a quick knockdown of adult mosquitoes with no residual effect.

As part of the adult mosquito control program, the NSMAD maintains a Prior Notification List for residents who wish to be informed before adult mosquito control operations occur in their neighborhood. Residents can sign up for notification via our website to receive either an email or text message alerting them to scheduled adult mosquito control operations, as well as other important mosquito related news. When operations in the immediate neighborhood of these residents are scheduled, an email or SMS message will be sent to the resident typically with a 24-hour advance notice. Persons unable to receive email or SMS notification may contact our office to arrange to be notified via telephone. Residents who wish to have their property skipped during adult mosquito control operations provide the NSMAD with a physician’s note supporting a medical reason for such action.

The NSMAD also maintains a list of beehives in the area and avoids applying adult mosquito control products in areas where active beehives are present. This, in addition to spraying at night when bees are inactive, provides an added measure of pollinator protection.

**2018 Control Activities Summary**

**Larval mosquito control**

During the 2018 season, the NSMAD treated the following with larval control products:

- 473 floodwater sites
- 2,279 permanent water sites
- 43,095 catch basins (two – three times each)

**Adult mosquito control**

During the 2018 season, the NSMAD treated the following with adult mosquito control products:

- two barrier treatments
- 22 ULV application nights
  - 75,682 acres
  - 2,081 road miles
# NSMAD Integrated Pest Management Protocol Summary

The table below is excerpted from the NSMAD Pesticide Discharge Management Plan (PDMP) and summarizes the management options, associated surveillance and action thresholds, and the application methods used in the NSMAD integrated pest management program.

<table>
<thead>
<tr>
<th>Pest Management Options</th>
<th>Surveillance / Threshold</th>
<th>Application Method</th>
</tr>
</thead>
</table>
| Pesticide Application (Larval) | • Weather or environmental conditions  
• Rainfall producing standing water in forested areas  
• Larval surveillance conducted by dip samples of standing water and containers holding water containing 1-5 larvae per dip on average  
• Seasonal temperature and precipitation changes warrant the beginning of larval control in catch basins and off road sites  
• Inspecting catch basins and other sources of stagnant water for breeding and larval activity  
• Institutional knowledge and experience  
• Inspecting known mosquito breeding habitats | Hand application of either granular or briquette product using the application rates stipulated on the product labels. |
| Source Reduction - Urban | • Property checks for mosquito breeding and larvae in pools, ponds, fountains and any other container with the ability to hold water  
• Larval dip counts looking for presence of mosquito larvae in containers | Removing and or emptying containers that hold water. |
| Source Reduction - Forested | • Weather conditions  
• Environmental conditions  
• Rainfall producing standing water in forested areas  
• Institutional knowledge and experience  
• Inspecting known mosquito breeding habitats | Flood prevention, removing and or emptying containers that hold water, ditch clearing, debris removal, increasing flow of water. |
| Pesticide Application ULV (Adult Control) | • WNV positive mosquito pool found via RAMP test resulting in an infection rate ≥5/1000  
• WNV, SLE, EEE or other vector/mosquito borne virus positive human, bird or other animal reported within the district or its border  
• High count or significant increase of public health risk mosquitoes (Cx. pipiens) in trap collection (daily average greater than 45 mosquitoes per trap for ≥ 2 weeks)  
• Resident complaints of mosquitoes  
• High count or significant increase of nuisance mosquitoes in trap collection (daily average greater than 25 mosquitoes per trap)  
• Combination of precipitation and temperature per institutional knowledge and experience | Ultra Low Volume (ULV) application of insecticide via hand or truck mounted spray equipment applied as stipulated on the product labels. |
| Pesticide Application Barrier (Adult Control) | • Resident complaints of mosquitoes  
• Public gatherings and events  
• Any combination of light trap counts, gravid counts, WNV or other positive pools of mosquitoes, dip samples or environmental and weather conditions  
• Areas inaccessible to truck ULV | Insecticide applied to vegetation using a handheld or backpack sprayer as stipulated on the product labels. |
Education and Communications

The NSMAD website (www.nsmad.com) provides residents a user-friendly interface with easy access to a wealth of information and links. Residents are encouraged to visit our website to find out where and when adult mosquito control operations will be taking place (we utilize embedded Google Maps to provide a better visual reference), report biting activity, standing water and any other concerns regarding mosquitoes. Residents can sign up for email and/or SMS text message blasts to provide the most current information regarding our adult mosquito control operations, the risk of infection and other important mosquito news. Additionally, minutes from the NSMAD Board of Trustee’s meetings can be found on our website.

The NSMAD Twitter feed (@NorthShoreMAD) is used to provide information on adult mosquito control operations and other important news items and information.

In addition to our website and Twitter feed, the NSMAD has a 24-hour hotline that residents can call to learn the status of our adult mosquito control program, inform us of matters that we can address (i.e. increased adult mosquito activity in a specific area) and report standing water sites.

Media and Community Relations

During the season, a weekly status report is distributed via email with updates about our surveillance and operations along with insight regarding mosquito borne illness risk. This report is delivered to numerous stakeholders and members of the news media. It is also posted on the front page of our website for residents and the general public.

Media interviews are conducted to cover timely topics such as repellent usage, WNV activity, trap counts, testing data, and when adult mosquito control operations are to be conducted in the District. The NSMAD was consulted on numerous news stories this past year. We provided information for at least 40 news items regarding mosquitoes, mosquito-borne illness and personal protection measures to The Chicago Tribune, The Chicago Sun-Times, The Daily Herald, Pioneer Press, 22nd Century Media, The Daily Northwestern, Evanston Now, The Patch and other community newspapers. WMAQ-TV, WLS-TV, WBBM-TV, WGN-TV and WBBM-News Radio.

The NSMAD public information booth visits numerous public events throughout the year. The Communications Manager, along with other staff members, attend these events to educate residents regarding personal protection methods and answer questions about mosquitoes and our control program. This season, the public information booth visited Glenview Park District Earth Day, Village of Northbrook, Earth Day, Glenview Park District Get Out & Go, Village of Glencoe Meet the Machines and the Village of Skokie National Night Out. The NSMAD information booth is available to appear at community events upon request.

We utilize the GovDelivery System to inform our subscribers about adult mosquito control operations, West Nile virus activity and risk, as well as, other important mosquito information during the season. Additionally, we post adult mosquito control operations and WNV activity our website's front page.

The Executive Director and Communications Manager attended the American Mosquito Control Association’s Washington Conference to meet with several of our elected officials to engage in dialogue regarding issues pertinent to mosquito control and public health.
2018 Budget

Purchase of Equipment & Supplies $ 165,794.00
Mosquito Control Products $ 195,000.00
Building Maintenance & Repairs $ 20,000.00
Capital Improvements Fund $ 107,500.00
Utilities $ 27,900.00
Legal & Audit $ 28,400.00
Salaries & Wages (7 Full-Time & 12 Seasonal) $ 705,000.00
Social Security $ 57,400.00
IMRF $ 39,000.00
Liability Insurance $ 64,637.00
Health Insurance $ 94,000.00
Contingency $ 15,369.00

$ 1,520,000.00

2018 Staffing

- Executive Director: Mark Clifton (May 1, 2018) and Roger Nasci (Retired April 30, 2018)
- Chief Field Inspector: James Binnall
- Operations Manager: Marlon Henry
- GIS Manager/Field Supervisor: Amy Runde
- Vector Biologist: Christopher Xamplas
- Communications Manager: David Zazra
- Internal Operations Manager: Jennifer Zimmer
- Seasonal Staff
  - Laboratory: two, part time technicians
  - Field operations: 10 technicians
# 2018 PESTICIDE USAGE

## Larval Control Products
- Altosid® Pellets: 918 lbs.
- Altosid Pellets WSP: 779 packets
- BVA Oil: 24 gallons
- FourStar® 180: 15 briquettes
- FourStar® MB: 202 briquet
- FourStar® BTI CRG: 70 lbs
- FourStar® CRG: 105 lbs
- FourStar® MBG: 181 lbs
- Natular™ G30: 3,401 lbs
- Natular™ T30: 1,961 briquet
- Natular™ XRT: 1,276 briquettes
- Spheratax® SPH 50G: 38 lbs
- VectoLex® FG: 4140 lbs.
- VectoLex® WSP: 17 packets

## Adult Mosquito Control Products
- Duet™ ULV: 702 gallons
- Flit™ 13.3: 0.027 gallons
2018 VEHICLES AND EQUIPMENT

VEHICLES
1 2001 GMC Sierra Pick-Up Truck
1 2006 GMC Canyon 4x4 Pick-Up Truck
1 2007 GMC Canyon 4x4 Pick-Up Truck
1 2008 GMC Canyon 4x4 Pick-Up Truck
1 2011 Ford F250 4x4 Pick-Up Truck w/ Snow Plow
1 2011 Ford Escape SUV
1 2012 Ford F150 Pick-Up Truck
1 2012 Toyota Tacoma Pick-Up Truck
1 2014 Ford F150 Pick-Up Truck
1 2015 GMC Sierra K1500 4x4 Pick-Up Truck
1 2015 GMC Canyon Crew Cab Pick-Up Truck
2 2016 GMC Canyon Pick-Up Truck
1 2016 GMC Sierra K1500 4x4 Pick-Up Truck
2 2018 GMC Canyon Pick-Up Truck

EQUIPMENT
Application Equipment
6 Cougar Ultra Low Volume Sprayers (Gas Engine)
2 ProMist Dura Ultra Low Volume Sprayers (Electric)
4 Stihl® Backpack Sprayers
5 Maruyama Backpack Sprayers
1 Vortex Granular Spreader
1 Buffalo Turbine Mist Sprayer

Trap Equipment
10 BG Sentinel™ Traps
4 BG Counters
10 CO₂ Traps
30 Gravid Traps
18 New Jersey Light Traps
8 Encephalitis Virus Traps (EVS)
11 Gravid Aedes Traps (GAT)