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About the Cover: The Fall cover features a fruit bat surrounded by mosquitoes, from artist Golly Bard aka Holly Ward Bimba, who specializes in art for the collector with a penchant for natural history and other curiosities. For more of her beautiful graphic creations, visit her at www.gollybard.etsy.com.
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Dengue may not be as well known as malaria as an important human disease transmitted by mosquitoes; however, as climate change possibly spreads pathogens into new territory and the Navy turns its attention to Asia, this may not be the case for much longer. Dengue, also known as Break Bone Fever, is a febrile disease characterized by high fevers, low platelet counts, nausea, vomiting and rash. There are four dengue serotypes and infection with one serotype does not provide protection from the others. In fact, serial infection results in increased likelihood of developing dengue hemorrhagic fever or dengue shock syndrome.

Dengue virus is primarily found in tropic and sub-tropic environments, with over one third of the world’s population at risk. The last large outbreak of dengue in US forces occurred during Operation Restore Hope in Somalia, where 41 individuals were hospitalized and there was 7% dengue prevalence among a unit of 494 individuals.

Dengue is a daily threat to many Navy sailors, civilians and dependents in areas such as Singapore and Guam. While not many dengue cases have been reported from this area to date, the Navy has experienced negative effects of having sailors stationed in highly endemic areas in the past such as in Puerto Rico and the Philippines. For example, before closing Roosevelt Roads Naval Station, Puerto Rico (PR) in 2004, dengue presented a significant and constant threat to Navy readiness for people living on and around the Naval Station. Dengue is endemic in PR with isolated outbreaks being reported since 1915 and large island-wide outbreaks since the 1960s. "The mosquitoes would eat you alive at dusk and dengue was a huge problem for the preventative medicine team,” said LCDR Jose Medina (ret) MSC USN. “Our preventative medicine teams worked with the locals to provide mosquito surveillance and control, but we were still treating patients for dengue at the Hospital.” Since 2004 when the base was closed, outbreaks have continued to occur on the island with over 10,000 cases reported in 2007. With the high amount of travel between the PR and the continental US, it is surprising that outbreaks of dengue haven’t occurred with greater frequency. But the lack of cases in the continental US over the last 50 years is believed to be due to infrequent contact between people and the virus’ best vector, Aedes aegypti.

Along with the resurgence of dengue worldwide, the virus is making a comeback in areas of the continental US. In 2009 the first locally acquired cases of dengue in 50 years occurred in Key West, FL. Given the large presence of US Navy sailors, civilians and dependents at NAS Key West, this outbreak generated great concern. Local dengue transmission reoccurred in Key West during 2010, and in August 2012 locally acquired cases of dengue were reported in Miami-Dade County, FL. Locally acquired cases have since been reported from Palm Beach, Martin, Hillsborough, Osceola and Seminole Counties. In most areas of the world dengue is carried by the yellow fever mosquito, Aedes aegypti and the Asian tiger mosquito, Aedes albopictus. The yellow fever mosquito is especially effective in transmitting the disease to humans compared to the Asian tiger mosquito, due in part to differences in feeding behavior. Aedes aegypti tends to fly around taking small meals from multiple human hosts unlike Aedes albopictus, which tends to eat one large meal from a single host and it will feed on birds and other mammals in addition to humans. Both species are day biters with peak activity occurring two hours after sunrise and two hours before sunset.
Aedes aegypti, the history of these two diseases in the US is linked to where Aedes aegypti was and is currently found. Aedes aegypti probably arrived over 300 years ago when it travelled with the first European slave ships from the Caribbean to early settlements such as St Augustine, FL and Charleston, SC. Because Aedes aegypti was common in many parts of the US, yellow fever and dengue outbreaks were also common, particularly in the south and even during the summer months in northern cities such as Philadelphia, PA. Dengue was first described in the US by Benjamin Rush in 1789 from a victim in Philadelphia, but the history of dengue in the US is a bit murkier, because infections were probably overshadowed by the more deadly and feared yellow fever.

Following the efforts of US Army physician Walter Reed and the Yellow Fever Commission in Cuba during the early part of the 20th century, the yellow fever virus was associated with Aedes aegypti and not due to human contact as it was once believed. Based on this information, federal, state and local governments dedicated resources to develop and implement mosquito control programs throughout “hot zones” in the United States. These efforts combined with aggressive quarantine and vaccination programs proved to be extremely effective, with the last outbreak of yellow fever occurring in New Orleans in 1905. However, periodic outbreaks would occur. In 1964 the US Government led an Aedes aegypti eradication effort in Florida, Texas, Puerto Rico and the US Virgin Islands using area-wide application of DDT. Despite the best effort of control teams in the 1960s, Aedes aegypti proved to be a stubborn foe, with populations remaining in Florida and Texas due to poor control methods, insecticide resistance and reintroduction.

During the 1960s and 1970s, yellow fever vaccination and quarantine was lowering the number of cases worldwide and the risk of acquiring the disease in the US was essentially non-existent. But failure of Aedes aegypti eradication efforts left the US vulnerable to dengue until an unexpected event occurred following the Vietnam war. It is believed that the Asian tiger mosquito was accidentally introduced in tires retrograded from Vietnam, and the species began aggressively replacing the yellow fever mosquito. First recorded in the United States during the 1980s, Aedes albopictus competes with Aedes aegypti for the same egg laying habitats. It is thought that this competition may have led to increasing populations and declining Aedes aegypti populations. The spread of Aedes albopictus didn’t completely eradicate Aedes aegypti and pockets remained in Key West and along the Texas-Mexico border. And because Aedes albopictus is a much less efficient vector of the dengue virus, concern around dengue in the continental US waned until the Key West outbreak in 2009. The Navy Entomology Center of Excellence (NECE) in Jacksonville FL began studying the distribution of Aedes aegypti and Aedes albopictus to ascertain the risk of dengue transmission to US Navy personnel in the region following the Key West outbreak in 2011. In the summer of 2012 NECE and Jacksonville Mosquito Control Division (JMCD) teamed up to study where Aedes aegypti was found in Jacksonville and to determine the population size. The study found significant populations of both species and what was especially surprising was that the population of Aedes aegypti was much larger than had been anticipated and much larger than the Aedes albopictus population.

The NECE and JMCD team collected a total of 6,544 Aedes aegypti and Aedes albopictus mosquitoes over a ten-week period. Aedes aegypti (primary vector of dengue) accounted for 78% and Aedes albopictus for 17% of the collections. These results were...
significant because as of 2010, \textit{Ae aegypti} was believed by the JMCD staff to have been almost replaced by the less potent vector \textit{Ae albopictus}. Because it was believed that \textit{Ae aegypti} populations were low, the risk of locally acquired dengue was considered negligible. But this finding, and the fact that continued local transmission of dengue in Florida has become a yearly occurrence, has changed the equation.

One other positive finding of the study was that the Insecticide treatments conducted by JMCD during the study period, as part of their mosquito control program for West Nile virus vectors and other mosquitoes, were extremely effective at lowering the \textit{Ae aegypti} populations. This provides evidence that the Jacksonville \textit{Ae aegypti} population can be controlled using standard mosquito control methods, and if an outbreak were to occur, we wouldn’t be helpless. Also, NECE found no apparent insecticide resistance in the Jacksonville \textit{Ae aegypti} to any of the standard insecticides, using the CDC Bottle Bioassay method. Testing for insecticide resistance genes in the population using molecular methods is ongoing.

Dengue cases in Key West served as a “Warning Sign” for sailors and civilians stationed there and across Florida. As locally acquired cases are again a possibility in Key West, and cases slowly creep north towards NAS Pensacola, NAS Jacksonville, NS Mayport and NSB Kings Bay, Navy Medicine personnel should be aware of the risk and be ready to consider dengue as a possibility. Preventive Medicine personnel must also be aware of increases in mosquito populations, especially \textit{Ae aegypti} and \textit{Ae albopictus}, and be ready to implement effective prevention and control programs.

As there are currently no vaccines available for the disease, avoiding contact with mosquitoes through personal protection methods, such as wearing repellents that contain DEET and wearing a permethrin treated uniform, continue to be the best practices for avoiding infection. However, scientists and physicians at the Naval Medical Research Center in Silver Spring, MD are in the early stages of developing a vaccine through cutting edge research using DNA, with results expected at the end of this year. A second novel approach also being pursued, uses whole virus preparations that have been rendered non-infectious. This latter approach is in the pre-clinical stage of development.

NECE has subject matter experts that provide surveillance and mosquito control and other control strategies against blood-feeding insects that transmit human diseases. This center of mosquito experts provide vector surveillance and control training to civilian and Department of Defense (DoD) technicians who are responsible for ensuring disease vectors are monitored at US DoD installations throughout the world. Additional guidance on \textit{Ae aegypti} and \textit{Ae albopictus} control can be found in the the “Dengue and Chikungunya Vector Control Pocket Guide” (Technical Guide 47), which can be found on the Armed Forces and Pest Management Board’s website at www.afpmb.org. For assistance or information on control of any vector-borne disease contact NECE at NECE-FleetSupport@med.navy.mil.

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\textbf{Figure 3:} HM2 Michael Denson and LT James Harwood conducting an trial to determine the efficacy of different insecticide formulations from a ULV sprayer and a thermal fogger. Photograph by LT Jen Wright

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Management of mosquito-borne disease and nuisance-biting requires an integrated approach. Regardless of the effectiveness of your mosquito surveillance and control strategies, authorities still need engagement with the local community. While new technologies help us control mosquito populations more effectively, it is also allowing us to be more engaged with our local communities. The rise of social media, in particular Twitter, is a new addition to our mosquito management tool kit.

The 2012 outbreak of West Nile virus (WNV) in North America has brought into focus the importance of engaging the local communities. One of the largest outbreaks of WNV in North America since it was first introduced in 1999 caught many by surprise (Beasley et al. 2013). While those in the field of mosquito control were acutely aware of the potential threat, the declining level of activity over previous years seems to have resulted in WNV drifting from the minds of most in the community.

With the surge in human disease came the need to shake off the complacency of many. Whether it is spreading the word on recent virus isolates from mosquitoes, birds or humans, promoting source reduction of mosquito habitats around the home, providing advice on mosquito repellent use or putting forward the case for large scale mosquito control activities, communication was vital. This “education” process was especially vital in Dallas, Texas where large scale mosquito control was required, but met with protest by some sections of the community. Social media ended up being a valuable asset for local authorities during this period.

The rise of social media as been phenomenal. Online services such as Twitter are used by millions of people every day across the world and is becoming the primary source of news and information for many people. Twitter is a free social media service currently estimated to have over 500 million users worldwide (http://twitter.com). Users share short messages (commonly known as “tweets”) with other users who have chosen to “follow” them. In turn, those users can share the original message (commonly known as “retweets”) with their “followers.” Messages on specific topics can also be easily sorted and searched for through the addition of a “hashtag” (eg, #mosquitoes, #westnile, #dengue, #health). These processes can act as a digital word of mouth.

How important a role could Twitter play in assisting the management of mosquito-borne disease?

There is evidence that people are looking to social media, in combination with traditional media outlets, for news and information. The recent activity of WNV has highlighted this phenomenon. Analysis of activity on Twitter showed that during August and September 2012 there were almost 300,000 tweets sent that included a mention of “West Nile,” according to data sourced from the Twitter Analytics website “Topsy” (http://topsy.com).

While Twitter may provide an opportunity to communicate directly with the community, perhaps from a mosquito-borne disease management perspective, it is the ability to engage with local media that is most important (Webb 2012). Some of the most active users of Twitter are the traditional media outlets and their journalists. Breaking news stories and commentaries on the latest developments are often shared by these users. Even during natural disasters – hurricanes, bushfires, floods and earthquakes – studies have shown that Twitter can form an important source of news for those involved as well as government authorities disseminating important information.

Twitter and media interaction during the 2012 WNV outbreak in Dallas proved essential in the news cycle, and educating citizens to the threat. Within mere hours of sharing Dynamic Aviation’s aerial spraying Twitter handle with 2 reporters, their followers increased by 1,664%. Followers were kept abreast of aerial spraying plans and aircraft locations in real-time. Media outlets then used this information for their live shots and news stories.

Among those hundreds of thousands of “tweets,” a number of different conversations took place. Following the release of official statistics from CDC and/or local health authorities, local and national media outlets “tweeted” links to stories about the outbreak. These links were then shared among the followers of those news services. There were also many messages expressing concern about the news, either prompted by the news stories or personal experiences of friends or relatives diagnosed with WNV.
One of the interesting aspects of the news coverage associated with the WNV activity was discussion surrounding the aerial insecticide spraying activities. There was much debate about when, where and how insecticides were to be applied. Despite the obvious benefit to human health, there were vocal groups in some areas expressing concerns regarding potential non-target impacts of mosquito control. Educating the public and addressing these concerns in near real-time proved very favorable for mosquito control professionals and all the stakeholders involved.

We have reached a place in society where the exchange of information happens immediately. The news cycle has also changed with the introduction of social media. Followers and citizens no longer have to wait 8-12 hours for the next news broadcast, but rather follow in real-time the developments and happenings of events around the world via social media such as Twitter. As society and media embrace this change, professionals and organizations must do so as well. But they need to use it effectively.

All too often, Twitter is used as simply an extension of traditional communications strategies (e.g. media releases, emails, website updates). The real benefit is potential community engagement. Studies have shown that government health authorities in the US generally fail to embrace those opportunities (Waters and Williams 2011, Thackery et al 2012). There may be many reasons for this lack of engagement but careful consideration should be given to how the use of social media can benefit the organization.

In May 2012, the American Mosquito Control Association took a big first step towards encouraging more of its members to try out Twitter. A webinar was broadcast that introduced many of the basics of Twitter; a copy is available from the members area of the AMCA website. The presentation covered all the basics of setting up a Twitter account and getting down to the business of following others and sending out “tweets.” In addition, the Centers for Disease Control and Prevention in the US have some excellent resources (http://www.cdc.gov/socialmedia), including a particularly useful guide to writing for social media.

Twitter has already been adopted by some mosquito and vector control districts; see Table 1. The amount of activity varies between the districts but generally they use the service to distribute news
about mosquito control activities, provide alerts of public health warnings and promote educational activities.

In this way, Twitter is an extension of the traditional communication methods used by mosquito control and health authorities. It is another way to increase awareness of information provided on websites and provide links to that content. It can also be an effective networking tool that connects mosquito control districts across the country – and even down to Australia too.

**REFERENCES CITED**


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**Table 1: A selection of mosquito and vector control associations and districts with active Twitter accounts.**

<table>
<thead>
<tr>
<th>Mosquito and Vector Control District</th>
<th>Twitter name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alameda County Mosquito Abatement District</td>
<td>@AlamedaMosquito</td>
</tr>
<tr>
<td>American Mosquito Control Association</td>
<td>@AMCAUpdates</td>
</tr>
<tr>
<td>Antelope Valley Mosquito and Vector Control District</td>
<td>@AVMosquito</td>
</tr>
<tr>
<td>Benton County Mosquito Control District</td>
<td>@Benton_MCD</td>
</tr>
<tr>
<td>Bristol County Mosquito Project</td>
<td>@BCCPMMSQ</td>
</tr>
<tr>
<td>Cass County Vector Control District</td>
<td>@CCVectorControl</td>
</tr>
<tr>
<td>Central Massachusetts Mosquito Control Project</td>
<td>@CMassMosquito</td>
</tr>
<tr>
<td>Contra Costa Mosquito and Vector Control District</td>
<td>@CCMosquito</td>
</tr>
<tr>
<td>Florida Mosquito Control Association</td>
<td>@FLMOSQCON</td>
</tr>
<tr>
<td>Greater Los Angeles Vector Control District</td>
<td>@GLACVCD</td>
</tr>
<tr>
<td>Georgia Mosquito Control Association</td>
<td>@GAmosquito</td>
</tr>
<tr>
<td>Marin/Sonoma Mosquito and Vector Control District</td>
<td>@MSMVCD</td>
</tr>
<tr>
<td>Metropolitan Mosquito Control District Twin Cities</td>
<td>@metromosquito</td>
</tr>
<tr>
<td>Norfolk County Mosquito Control District</td>
<td>@NorfolkMosquito</td>
</tr>
<tr>
<td>Orange County Vector Control District</td>
<td>@OCVector</td>
</tr>
<tr>
<td>Placer Mosquito and Vector Control District</td>
<td>@PlacerMosquito</td>
</tr>
<tr>
<td>Sacramento-Yolo Mosquito and Vector Control District</td>
<td>@SYMVCD</td>
</tr>
<tr>
<td>Santa Clara Vector Control District</td>
<td>@SCCVCD</td>
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<tr>
<td>Shasta Mosquito and Vector Control District</td>
<td>@SMVD</td>
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<td>Tangipahoa Mosquito Abatement District</td>
<td>@TangiMosquito</td>
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<tr>
<td>Texas Mosquito Control Association</td>
<td>@TexasMosquito</td>
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<tr>
<td>Turlock Mosquito Abatement District</td>
<td>@Turlock_MAD</td>
</tr>
<tr>
<td>West Valley Mosquito and Vector Control District</td>
<td>@WestValleyMVCD</td>
</tr>
</tbody>
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Around this time every year when the mosquito season (hopefully) winds down, we take stock of the mosquito season and the efforts made during the year to inform and educate the public about these flying pests. Over the years, our outreach efforts have shifted focus. Technology is changing and we’ve started to rely on the Internet and providing information electronically. There is one outreach program which was established in the year 2000, that we may have tweaked a bit, but will keep pretty much as it is. That is our award winning Mosquito Beater program.

Each spring I provide a 40-minute awareness and prevention presentation to over 800 third grade students from the county’s 10 elementary schools. The program combines a “Jo-Jo the Mosquito” video, a lively question and answer segment that follows a “Wheel of Fortune” theme to reinforce what was learned, and a follow-up poster contest in which prizes are awarded.

We encourage all third graders to submit a poster in the contest. One winner is chosen from each school, from the many colorful posters received from the Little Skeeter Beaters. The award is based on mosquito prevention information and creativity. Each elementary school’s selected winner is visited in his or her classroom and presented with a $25 Barnes & Noble gift card.

One winner is chosen out of the 10 school finalists, and that student is presented with an additional $25 gift card. Every child who submits a poster receives a Certificate of Achievement for participating in the contest. I always emphasize to the students that it’s important to get involved and the Certificate is a small token of appreciation for those who make an effort to participate.

This Mosquito Beater awareness and Prevention program has proven very effective over the years for over 9,500 students, and was recognized with a national achievement award in 2005 as being innovative. But the biggest acknowledgement of all is the stories we hear from children and their parents who say that the student went home from school and involved the family in backyard mosquito prevention by eliminating mosquito larval habitat in their own yards. That’s what it’s really all about.

And to top it all off, this program fits in with the Virginia Department of Education’s third grade Standards of Learning requirement. Talk about a win-win situation! The only loser here is the mosquito population of York County.

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Of the Florida mosquito species that feed on humans, the majority are a nuisance, while others pose a disease threat to state residents and visitors. As recently as 100 years ago, Virginia Congressman John Randolph declared Florida uninhabitable due in large part to the legions of mosquitoes ready to bite and potentially spread diseases such as malaria and yellow fever. Today, there are more than 60 mosquito control programs across the Sunshine State that labor year-round to make this once “uninhabitable” region much safer and more hospitable.

Military entomologists focus on vector-borne disease (VBD) prevention to ensure the health and readiness of US troops. Two of the biggest VBD threats, malaria and dengue, are vectored by mosquitoes; therefore, mosquito control is a prime objective of military entomology. The Navy Entomology Center of Excellence (NECE), Jacksonville, FL, is a unique Department of Defense (DoD) command that specializes in VBD to reduce disease risk among US and allied forces. The 34 member staff includes a diverse group of scientists, administrators, and preventive medicine personnel made up of active duty, civilians and contractors. NECE has a long history of close association and partnership with several Florida mosquito control districts. According to CAPT Eric Hoffman, NECE Officer-in-Charge, “for NECE to be successful, we must have access to the most effective surveillance and control tools and techniques. Collaboration with mosquito control districts provides a unique opportunity for each of us to learn from our collective experience during discussion and training and pool resources to discover workable solutions to common problems. Clearly, these relationships are critical in delivering the best possible support to both our military and civilian customers.”

Recent fiscal restrictions at both the state and federal level have served to solidify these relationships/collaborations as organizations strive to meet their missions with less. Here, we highlight just a few recent examples of the partnership between NECE and Florida mosquito control districts.

**FLORIDA KEYS MOSQUITO CONTROL DISTRICT: DENGUE - 2009-2010**

In September 2009 dengue virus was confirmed in a New York tourist who recently traveled to Old Town, Key West. During 2009, 22 confirmed cases of locally-acquired dengue fever were identified followed by 66 cases in 2010 including an active duty Navy service member. In response to the 2009 cases, the Florida Keys Mosquito Control District (FKMCD) mounted a targeted campaign to control local *Aedes aegypti* with the use of lethal ovitraps (LOT) (Trap-N-Kill®, SpringStar...
The LOT is a black cup that contains a bifenthrin impregnated strip that will kill female mosquitoes after oviposition, as well as larvae that hatch in the cup; see Figure 1 inset. It was originally developed by the US Army and is reported to be successful against *Ae aegypti*. The public acceptance of LOTs in combination with low toxicity makes this product an attractive tool for the mosquito management toolbox. However, the deployment, monitoring and maintenance of 7000 LOTs in Key West required a considerable amount of labor making it difficult to conduct daily operations without additional personnel. In response to FKMCD’s operational void, NECE provided a team of six officers and Preventive Medicine Technicians (PMT), who assisted during two visits; see Figure 1. By the way, it was not hard to find willing volunteers, even in light of a dengue threat! NECE assisted FKMCD to place and maintain LOTs, dumped small containers of water at residences and helped to apply larvicide to permanent larval habitats. Valuable information was obtained regarding the LOT units, which was useful for product refinement.

**ANASTASIA MOSQUITO CONTROL DISTRICT: PYRIPROXYFEN STUDIES 2010-2012**

With the consistent global threat of dengue fever and the potential introduction of other viruses such as chikungunya, there is a need for novel strategies to control *Aedes aegypti* and *Aedes albopictus*, the vectors of these diseases. NECE, Anastasia Mosquito Control District (AMCD) along with The Center for Vector Biology at Rutgers University partnered to evaluate pyriproxyfen use as a novel mosquito control technique. Pyriproxyfen, an insect growth regulator that disrupts mosquito larval development, is a potentially ideal larvicide since it is lethal to mosquito larvae at extremely low concentrations, but is considered safe for humans and other vertebrates.

Results of these efforts suggest that pyriproxyfen could be applied against *Ae aegypti* larvae at least as far as 75 ft from the spray truck (not measured beyond that distance). Further, adult *Ae albopictus* trap captures suggested that pyriproxyfen affected the population, as the mosquitoes captured averaged 50% fewer than those from the control following treatments. Autodissemination was not observed in the mentioned studies, however; efforts to refine the technique are ongoing among NECE and the Rutgers group through use of an autodissemination station.

**JACKSONVILLE MOSQUITO CONTROL DIVISION AND LEE COUNTY MOSQUITO CONTROL DISTRICT**

A number of other collaborations between NECE and various Florida mosquito control districts have occurred and are ongoing. NECE personnel have recently worked with the City of Jacksonville Mosquito Control Division (JMCMD) to survey rebounding *Ae aegypti* populations in the Jacksonville area; see Figure 3. With the invasion of *Ae albopictus* in the 1980-90s, this species displaced *Ae aegypti* in a number of locations. This trend
seems to be reversing to some extent and was confirmed in the Jacksonville area during this study. JMCD has also assisted NECE in its equipment evaluation mission by field testing various sprayers during their control operations. This collaboration provides valuable information to NECE regarding the durability and reliability of equipment for military application.

NECE also received operational mosquito control exposure and training by participating with Lee County Mosquito Control District (LCMCD). LCMCD is the most hi-tech, extensive and well-funded mosquito control district in the nation. Their fleet of mosquito control vehicles alone gives a clear picture of the magnitude of their operation: eleven helicopters, three airplanes plus numerous boats, airboats, trucks and various other vehicles. This land, sea and air capability is something a Navy entomologist definitely appreciates! The NECE team who trained with LCMCD received exposure to a wide range of operations, including air and land larval surveillance, sentinel chicken surveillance, airboat surveillance and numerous adult and larval control efforts; see Figure 4.

THE CONTINUED FIGHT

Civilian-Military collaborations have provided valuable information in the fight against pestiferous and disease-carrying mosquitoes. Continued joint-force research, operations and training encourages innovative ideas and facilitates the sharing of mosquito management techniques that provide a competitive edge in the shared fight against mosquitoes.

Disclaimer: The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the US Government.

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When Googling famous quotes about the role of educators to give this article a proper, brainy introduction, I was hit with close to 400,000,000 search results. A lot of people have given their two cents on the importance of education, from Aristotle to the current Secretary of Education, Arnie Duncan. The quote that stuck out among the myriad statements about testing, parenting, philosophy, and politics was from the late American poet and writer, Mark Van Doren. He stated that “The art of teaching is the art of assisting discovery.” These words relate well to the workings of the Lee County Mosquito Control District’s most primary mosquito education program, because they describe what our ultimate goal is when presenting to five and six year olds. We want to assist in their discovery and build an appreciation for science.

“The Misunderstood Mosquito” Kindergarten Program began by serving two fundamental purposes: to engage primary students and their classroom teachers with hands-on science experiences in a fashion similar to our other outreach programs, and to provide meaningful service-learning opportunities to Florida Gulf Coast University (FGCU) students who are interested in assisting us with education outreach. The program has evolved to meet an additional goal: to ensure the primary mosquito lesson we provide supports the current science standards set by the State, giving additional purpose for kindergarten teachers to request us.

From the beginning, we have viewed this experience as a “science-readiness” program. Our other outreach programs in elementary, middle, and high school tie in key concepts related to environmental science and the role of mosquito control, whereas this lesson serves to generate excitement for learning about science related topics. Sacks et al (2010) states, in their study of the influence of early science experiences in young children, that offering developmentally appropriate learning experiences in science at a young age provides a solid foundation for further development of scientific concepts later on in school.

The State of Florida’s Department of Education has established standards related to content at each academic level. “The Misunderstood Mosquito” program addresses a number of these standards for kindergarten. For instance, the Florida Next Generation Sunshine State Standard (NGSSS) SC.K.N.1.4 states that kindergarten students will be

Figure 1: Left - FGCU intern Baylee King engaging students with a read-aloud; right - FGCU intern Ed Foley displaying the mosquito life cycle poster provided to classroom teachers.
able to “Observe and create a visual representation of an object which includes its major features.” We accomplish this by showing students various photos of mosquitoes and then by leading them to create their own mosquito model. The point being, aside from the fact that educators love using acronyms and code, is that in today’s educational environment it is crucial to align lessons and presentations to academic standards – even in kindergarten.

This forty-five minute kindergarten lesson begins with an introduction and a simple question and answer session: What do you know about mosquitoes and what do you want to know? Those in the business of education know this as two-thirds of the famous Know, Want to Know, Learned (KWL) teaching strategy. Students are then gathered around a reading center, usually a carpeted area headed by a comfortable rocking chair, and read the non-fiction picture book, Mosquito by Margaret Hall. This is one of a series of “Bugs, Bugs, Bugs!” books published by Capstone Press and is available from just about any book vendor. The book highlights the basic attributes of mosquitoes and uses stunning close-up photographs that are engaging and fascinating to students.

Once the read-aloud session is complete, students view living mosquito larvae in a BioQuip® breeder and review the life cycle of a mosquito. A discussion takes place about where mosquitoes may grow around houses and where to look for standing water. The students then begin constructing an adult mosquito model using a pre-drawn template on cardstock, a pair of pipe cleaner antennae, a wooden tongue depressor, scissors, tacky glue, and crayons. For many of the 5 and 6-year-olds, this may be the first time using scissors and, as to be expected, lots of teacher assistance is required.

To wrap up the lesson students review the major body parts of a mosquito, key facts covered from the book, and view a variety of preserved insects in cases. Students are then provided with an opportunity to share what they have learned about mosquitoes and insects. Kindergartners love to share stories, and this often turns into a “go ‘round” of their scariest mosquito encounters. It is great to hear stories of campfires and cookouts and to see the kids making real-life connections to what they’ve learned in the lesson. Interest and excitement is what we aim for. If students go home thrilled to talk about what they have learned in class that day, then we’ve accomplished our goal.

The School District of Lee County serves approximately 85,000 students from Pre-Kindergarten through High School. Across the district there are over 7,000 kindergarten students. In order to provide instruction in as many kindergarten classrooms as possible, while simultaneously providing programs to the other grade levels we serve, we are
University to provide opportunities for students to meet this responsibility, while gaining meaningful skills. Many of the university students who come to us are seeking degrees in communication, education, or environmental studies – all programs that easily relate to the fields of mosquito control and community outreach.

Interns are trained to teach “The Misunderstood Mosquito” lesson through modeling and practice. All prospective intern teachers are invited to a kindergarten classroom to see the lesson taking place prior to teaching it themselves. Once the interns are comfortable presenting the information, they are scheduled in area schools. All university interns are assigned to classrooms with at least one other peer, so they are never responsible for teaching a class alone. An appointed Lead Intern, who has prior experience teaching the program, is present at each school to assist the newer recruits. As the coordinator of the internship program, I also visit each site to ensure things are running smoothly and troubleshoot any scheduling or material issues as they arise.

Figure 4: Above - A kindergarten student coloring her mosquito.

Figure 5: Right - FGCU intern Baylee King showing student mosquito larvae in BioQuip breeder.

Figure 6: Below - Students busily working on creating mosquitoes.

very fortunate to have the assistance of Florida Gulf Coast University interns. Students enrolled at FGCU are required to complete a number of service-learning hours for certain class requirements and to graduate. We have partnered with the
Many of the interns in our program require an evaluation at the end of the semester to earn credit, and it is important that we provide support to help them succeed. This also ensures the program is of the highest quality for the kindergarten students and teachers we serve. Soon after our visit, Kindergarten teachers are asked to complete a short survey to help our team gather data on how we can continually improve the program to meet their needs.

Since the “The Misunderstood Mosquito” Kindergarten Program began a few years ago, we have expanded from reaching a few hundred students to a few thousand. Thanks to the efforts of our university interns and the interest of school district kindergarten teachers, the program continues to grow and is one of our most sought after school-based programs.

While visiting a kindergarten classroom in the spring of last year, I watched students busily finishing up their mosquito models while others proudly flew their newly “emerged” mosquitoes around the room. In the corner of the classroom near the teacher’s book shelves, a little girl sat crossed-legged on the floor with a stack of books building up in front of her. I walked over, knelt down, and asked if she had fun learning about bugs. She laughed, looked up at me and said, “Mosquitoes aren’t bugs, silly! They’re flies. Look! I found a book on beetles, and grasshoppers, and butterflies!” Future entomologist? Maybe. Excited about science? Definitely.

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The call from Clark “Woody” Wood came in late on August 10, 2011. “Pack your bags. Dallas may be going aerial as soon as tomorrow.” This was not an uncommon conversation; over the last 11 years, Woody and I have worked on large-scale or high-profile mosquito control operations all over the country. He manages the logistics of the operation with a team of Clarke professionals and partners like Dynamic Aviation. I work with the media and communication professionals.

Within days – we knew that the operation in Dallas was like nothing we had experienced before. While it was equally as high profile as our work in New York back in 1999, with the advent of West Nile virus in the United States, the media landscape has changed tremendously. Citizen journalists, real-time resident interactions and an ever-changing landscape of logistics created a whole new ballgame for communication at every turn. The choice to conduct aerial applications in Dallas and Denton Counties generated stories in media outlets from Al Jazeera to the Los Angeles Times, Daily Mail UK, ABC Nightly News, and hundreds of news outlets in between.

Most importantly, the news of the outbreak and the subsequent efforts to suppress the virus showcased mosquito control as a sophisticated, science-based operation with demonstrable results. In short, aerial mosquito control in Dallas was a success story. But mosquito control doesn’t always generate positive media, especially in high-profile situations. The approach in Texas was simple: be open and transparent, give media access and opportunity, and give clear information consistently.

THE SITUATION

With West Nile now endemic to the continental US, a conspiracy of weather and opportunity can create an outbreak in virtually any part of the country. As the summer of 2012 – and the tremendous drought in Texas – began to take shape, West Nile virus cases in Dallas, Tarrant and Denton Counties skyrocketed. In a short period of time, it became clear that the Dallas-Fort Worth area was the epicenter of the West Nile outbreak with Dallas, Denton and Tarrant Counties reporting more than 800 human cases.

Ground spraying operations and community education efforts ramped up to stem the outbreak, but cases continued to rise. By late July, the outbreak had reached level 5, and the Centers for Disease Control and Prevention (CDC) recommended aerial application for adult control to temperatures, the Dallas area experienced conditions that created the perfect storm for a West Nile emergency. In July, Texas Department of State Health Services (DSHS) began to field reports of high numbers of positive pools of mosquitoes and infection rates began to skyrocket. Professionals from DSHS, Texas Emergency Management and local officials worked to secure resources and provide consultation to local and state officials on how to address the outbreak.

With a long drought and high

Figure 1: Dynamic Aviation crew loading plane for Dallas operation.
suppress the disease. On August 7, with consultation from the CDC and Texas DSHS, Dallas County Judge Clay Jenkins declared a state of emergency, enabling authorizing aerial ULV spraying.

HOME RULE & RAMP UP

Within hours, Dallas County activated an emergency contract with Clarke and Dynamic Aviation to provide a scope of service and background on the process of aerial application. Major metropolitan areas do not commonly use fixed-wing aircraft for mosquito control operations, but with the widespread nature of the disease and the need to treat large areas over a short period of time, the choice was made to offer cities in Dallas County access to aerial treatments funded by Texas DSHS.

Texas is a “home rule” state; this means that each autonomous municipality within the municipality would need to opt in to aerial spraying. From August 10-15, 32 cities were given the chance to access this resource or continue with ground ULV. By August 13, Clarke and Dynamic began moving personnel, equipment and product to Dallas Executive Airport. By August 16, with 230 cases and 10 deaths reported in Dallas County, the planes were cleared for takeoff.

THE RIGHT VOICES

We know that in the absence of clear, direct communication about mosquito control, the void will be filled by many voices. The moment news leaked of a probable aerial application, images of crop dusting planes with huge plumes of smoke behind them created unnecessary panic and concern. Fringe groups objecting to mosquito adulticiding contacted the media.

As the Clarke/Dynamic team assembled in Dallas, it was obvious that a clear communications strategy had to be a major component of the operation. With so many municipalities, government agencies, contractors and interested parties used to talking to the media, it was imperative to establish roles and responsibilities to ensure that the message to residents was accurate, consistent and current.

Daily press briefings were coordinated in tandem with Dallas County and the Mayor, Mike Rawlings. Designated representatives with particular expertise spoke about the maps, the product, the aircraft, city services and health information. As a result of this focus, the media response to the aerial operation began almost immediately to shift to a positive, collaborative tone.

OPEN AND ACCESSIBLE

There were two keys to this shift in tone. First was providing the media accurate context for understanding the operation enabling them to communicate information reliably. Second was giving them access to information and spokespeople. Both the Clarke and Dynamic teams provided on-ground, dedicated communications professionals to help augment the existing messaging from the municipalities.

Tactically, specific measures were taken to ensure the right message was shared; for example:

Camera crews were able to get up close and personal with one of the King Air fixed-wing aircraft used in the operation to film extensive footage of nozzles, tanks, dashboards and the sophisticated equipment used in the operation. This wasn’t a one-night opportunity – each evening, media were able to capture new footage, get updated information via interview or email and report changes as they happened.

Media were invited to set up remote trucks near an open-air plaza, giving them an unobstructed view of the planes taxiing and taking off.

Figure 2: Left to right – Clark Wood, Clarke; Brian Irby, Clarke; Dallas County Judge Clay Jenkins; and Doug Carroll, Clarke.
When it comes to mosquito control, it’s tough to communicate information that seems contrary to information on the Internet, on labels or even seen with the naked eye. During the operations, representatives from the various municipalities were invited to watch firsthand as the planes prepared for takeoff. They watched Dynamic’s flight tracking software and were able to experience firsthand the level of application accuracy.

Despite these efforts, we encountered skepticism about our ability to control droplet dispersion to specific areas. The Dynamic Aviation planes use the FlightMaster system to take the plane’s real-time meteorological and location data and model with precision where the aircraft needs to fly to ensure only target zones are treated. This means the plane uses a deliberate offset to reach targeted areas; sometimes the plane flying overhead is treating an area up to 2 miles away. That’s a challenging concept to understand.

During one of our operational nights in Dallas, residents in some of the cities that had opted out of aerial spraying began calling local officials, reporting that the planes were overhead and they were being treated. The officials who were fielding calls were alarmed, as their constituents were reporting things that were contrary to what they had decided. While we did explain how drift was necessary to disperse droplets in the intended areas, it was a tough thing to take on faith.

The solution to the educational challenge was simple: invite those officials to be present during a demonstration of the technology, with slide spinners placed both inside and outside the treatment areas. We watched as the planes flew over non-target areas, and tracked droplet dispersion on the slides. The result? The officials saw with their own eyes that the operation was living up to its claims, and that droplets of the appropriate size were in the targeted areas – and more importantly, only in the targeted areas.

When it comes to mosquito control, it’s tough to understand. That’s a challenging concept to understand.

PROOF AND TRANSPARENCY: THE DROPLET TEST

When we can help fill those three-minute news segments each day with solid science, accurate information and great visuals, we can help make sure the story remains consistent. And that’s critical, because many of the reporters we worked with were general assignment reporters without a scientific background, so it was essential that technical information be provided in an accessible way to minimize fears and alleviate concerns.

SOCIAL MEDIA = ENGAGEMENT

The greatest shift in communication for Dallas came through the use of social media. Just as the media will find secondary sources if we don’t provide new information each day, residents need their questions answered quickly, or they’ll go looking elsewhere.

Open communication goes a long way to ensure success of an operation. The Texas initiative resulted in 100 percent control in cage test checks and preliminary data showed that the operation controlled the mosquito population and significantly reduced the mosquito infection rate. Most importantly: after the planes flew, the number of new human cases dropped from 30-40 per week to near zero. And that’s good news worth sharing.
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Catch basins have significance for vector control agencies throughout the United States because they collect water for extended periods of time, allowing mosquito larvae to develop. The Washoe County Health District (WCHD) Vector-Borne Diseases Prevention Program (VDPP) correlates poor water quality to increases in the colonization of catch basins by mosquitoes. While we educate our communities to place screens on windows and maintain urban ponds and swimming pools, little attention by the public is given to catch basins, street “incubators” that produce hundreds of adult mosquitoes weekly throughout the summer months.

With increased growth in the Truckee Meadows Community since 2000, our District initiated a GIS database program in response to the concerns of mosquito production in catch basins. There are over 35,000 catch basins in the Truckee Meadows Community (Cities of Reno, Sparks and Washoe County) with the City of Reno having 15,000, the City of Sparks with 11,000, and Washoe County 10,000; this does not include the privately maintained catch basins that are not part of the public infrastructure. Typically our District can inspect and treat 7,000 to 8,000 catch basins annually. While this may be considered a large number, it falls short of the total drop inlets (DIs) that should be sampled. Since 2002, all development and redevelopment projects sent to the VDPP from City of Reno, Sparks and Washoe County Community Development are reviewed with design standards required for detention, retention basins, channels, wetlands, swales and ponds. Based on regulation 040.013 that states that drop inlets and/or catch basins shall have no free-standing water, we initiated design modifications for catch basins to eliminate water standing in this infrastructure.

The WCHD VDPP collaborated with Washoe County Public Works engineers and private industry to develop a catch basin design that provides water quality benefits while not posing public health issues. The first attempt to modify catch basin designs occurred in 2007. Jensen Precast, a firm that manufactures catch basins, modified their basin design to include placing one-inch diameter weep holes on the side and end wall of the DIs. As water enters the basin from the curb it is seeped out through the one inch diameter holes, thereby eliminating any standing water in the basin sump.

After working on this design for a year it was accepted and placed in the Washoe County Hydrology Manual, Standard Specifications for Public Works Construction (Orange Book). This new detail design was required on new development projects and building plans for the cities and Washoe County.

Figure 1: A Type 4R catch basin, showing the insert frame with a single paver on the frame above the outlet pipe (left) and the Xeripave insert with the 5 pavers and overflow unit (right).
acceptance of this design, the cities of Reno and Sparks rejected the modification in the public infrastructure because the seep hole catch basin design was considered an injection well by definition of the Nevada Department of Environmental Protection. Yet, the program continued to pursue a design and/or modification for catch basins to improve water quality and eliminate mosquito production.

In 2008 work began with Xeripave, a company that manufactures pervious pavers, and with Washoe County Public Works engineer Norman Lindeman, to eliminate the amount of debris, organic matter and pollution by collecting this material below the grate and onto the pavers, thus preventing this material from entering tributaries to the Truckee River. The support structure of the water quality paver tray insert consists of four 2 inch wide by 0.25 inch thick vinyl strips anchored onto the side and end walls of the catch basin with two vertical supports made from aluminum angle iron. Five pavers are placed on top of this support system. The one opening left in the water quality paver tray system is for a 12 x 12 inch rectangular overflow flapper valve. This overflow unit ensures that during flood events water flowing in the catch basin is carried through the outlet pipe without reducing the hydrological capacity of the basin. Additionally, there is a flapper valve at the end of the outlet pipe which operates by gravity, preventing female mosquitoes from flying into the water-filled basin sump.

One pilot demonstration was conducted in Washoe County and in the City of Reno to test for sediment clogging. A water truck was used to simulate large storm events to determine if the paver tray insert in the catch basin met Washoe County hydrological standards. As water rises in the catch basin during a flood event, it spills into the rectangular overflow unit, discharging storm water to the outlet pipe. When the high water flows recede, the flapper valve closes, sealing the opening of the overflow unit, which prevents the entry of female mosquitoes searching for ovipositional sites.

Public Works staff members from Reno, Sparks and Washoe County, as well as civil engineers from the entities and the Truckee Meadow Storm Water Permit Coordinating Committee, were invited to the demonstrations simulating flood events and the removal of debris and sediment from the catch basin with a vactor truck. Public Works staff provided changes to the design based on the additional time it would take to vacuum the sumps and outlet pipe with the vactor truck. As a result, modifications were made to the vertical supports making them easier to remove by notching them onto the rack, rather than anchoring them to the side walls, and the overflow unit was moved to the center of the Xeripave Water Quality Tray Insert. These changes allowed more water to enter the unit. The two year testing period culminated in the Xeripave Water Quality Paver Tray Insert being approved by Washoe County and the new design placed in their Orange Book. As trash is captured below the grate and above the outlet pipe, debris cannot be discharged through the public infrastructure to tributaries to the Truckee River. The material collected does not have a chance to decompose because it does not collect in the sump, eliminating odor, while removing access to adult mosquitoes.

Since our initial involvement in Community Development Planning in 2002, the WCHD Vector-Borne Disease Prevention Program (VDPP) continues to play a role in consulting on designs based on our regulations. The collaborative working relationship with Community Development, Public Works, engineering firms and industry have provided dividends to our program to develop infrastructure that has multiple benefits. Typically, public health concerns are not a priority unless a disease outbreak sickness or causes deaths, and even after such an event, it maybe soon forgotten. Working with Community Development in planning provides a long-term approach through better design in our infrastructure in which planners, engineers and designers understand our “prevention through design approach.” This also has had a profound influence on our program, in that we are not viewed by the public as a typical mosquito control district that is thought of as an agency that sprays pesticides. Planning with this new infrastructure design lessens public concern over pesticide use and promotes public health in our community.
Carl Sagan, one of the pre-eminent astrophysicists of all time, once said, “It’s a foreboding I have – maybe ill-placed – of an America in my children’s generation or my grandchildren’s generation…when clutching our horoscopes, our critical faculties in steep decline, unable to distinguish between what’s true and what feels good, we slide almost without noticing, into superstition and darkness.” An ominous premonition, indeed – but one unfortunately unfolding before our eyes in the vector control community’s struggles to provide public health protection from mosquito-borne illness. A few recent events illustrating the demise of scientific truth that should inform public policy come to mind.

The Connecticut legislature’s recent ban on the use of methoprene and resmethrin in coastal areas because of their reputed effects on lobster populations is a classic example of politics and pressure groups exerting a determinative influence on policy based upon a willful denial of the weight of scientific evidence that these products present no meaningful adverse effects on the lobster fishing industry. Literally reams of studies documenting lack of adverse effects from these public health pesticides were summarily dismissed or ignored so that the mollification of the lobstermen could be obtained. A number of stakeholders with impeccable scientific credentials testified or wrote letters on behalf of a dispassionate appraisal of the pesticides in question. The AMCA sent out a press release to all written and broadcast media outlets in Connecticut decrying the passage of the bill in the legislature, which generated some press coverage. The AMCA also sent a letter to the Governor of the state, Dannel Malloy, asking that he veto the bill.

Despite all of our efforts, the bill was put into law with the proviso that it would be repealed if a study of methoprene/resmethrin’s effects on lobsters by the University of Connecticut commissioned by the state legislature exonerates the pesticides in question. Think about it for a minute. Given the preponderance of studies already presented by researchers from several laboratories in various states absolving these pesticides of any culpability, why would this particular research sway the day? The fact is, it probably won’t and the law will stay on the books until some politician’s family is stricken by mosquito-borne disease. Then with furrowed brow while stroking their chins, those entrusted with overseeing our public health will make impassioned speeches about protecting “the children.” The irony of needlessly outlawing the use of legally registered public health pesticides that could have prevented the disease based upon myths and junk science will have escaped them, of course.

I’m not sure of the operative lesson here or what more could have been done. The best that can be said is that we now have a concrete instance in which politics trumped the public good. Should the tragedy of mosquito-borne disease strike those Connecticut shoreline areas affected by the ban, we now have legislators on the record to point the finger at - and point we will!

Equally distressing is the recent kerfuffle regarding mosquitoes being produced in the Bandon Marsh area on the Oregon coast. The mosquitoes in question appear to be reproducing in the Niles’tun Unit, a marshland which, until recently, had much of its area diked, allowing it to be utilized as cattle-grazing lands. This lasted for several decades, without much by way of mosquito production. However, in 2011 the US Fish and Wildlife Service (USFWS) enlarged the marshland so as to restore the tidal flats therein to their natural state. While laudatory, this initiative has also produced an ideal habitat for egg-laying by several species of mosquitoes known for their prodigious numbers and having extensive flight ranges, with predictable consequences for people and wildlife in its surrounding environs. This was done without even providing the protective mosquito prevention infrastructure which is now routinely used along the east coast when impounding valuable wetlands.

The absence of a formal national policy on mosquito control on federal lands is now unfortunately bearing fruit and the citizens are paying the price in a compromised standard of living and an economic downturn in tourism that is so vital to this spectacular part of the country. This issue speaks eloquently to the need for appropriate mosquito control as an integral part...
of Refuge plans nationwide. Early involvement by mosquito control professionals in refuge planning could prevent these types of mosquito problems that might be unforeseen by USFWS personnel not conversant with mosquito bionomics and their niche in ecosystems.

A great deal of debate on the issue at town hall meetings was engendered by townspeople and resort personnel, who now found the mosquito populations intolerable and severely affecting the local tourist economy. Jimmy Lunders, an AMCA Board member and Director of the Jackson County Vector Control District in Oregon, most ably provided testimony on behalf of mosquito control. Unfortunately, members of the Xerces Society, an environmental organization that focuses on invertebrates and their role in biological diversity, decided to weigh in with a number of cherry-picked studies emphasizing the adverse impacts of pesticide use – tellingly, not involving mosquito control applications – in ecosystems. They chose to ignore a plethora of studies demonstrating minimal impacts on aquatic organisms from these products used in vector control settings. Most problematic was their insistence that hazard equates to risk, ignoring the critical role exposure plays in determination of actual effects.

As an indication of their mosquito control bona fides underlying their testimony, the Xerces Society has recently published a document entitled *Ecologically Sound Mosquito Management in Wetlands* on their website at http://www.xerces.org/mosquito-management-wetlands. While, in toto, an apparently reasonable treatise on the subject to the layperson, there are a great many factual and conceptual inaccuracies in the document that could have been eliminated if they had bothered to have it reviewed by competent authority like the AMCA. They of course didn’t and the result is flawed to a significant degree. Frankly, I find it particularly galling to be lectured on mosquito control by someone who has never practiced it, nor had any formal training in it. Maybe we should invite them to speak at the annual meeting on Integrated Mosquito Management in Seattle since they consider themselves experts on the subject. The society is headquartered in Portland, OR so it’s just a short drive to Seattle. Let’s see what they say to a room full of PhDs with practical experience in vector control that don’t share their views. I’ll buy the popcorn.

**MEETING ANNOUNCEMENTS**

**November 17-20, 2013:** The Florida Mosquito Control Association will hold their 85th Annual Fall Meeting at the Westin Cape Coral Resort at Marina Village. FMCA has negotiated a room rate of $109 per night for attendees and their families. If you have any questions, please contact FMCA Executive Director Debra Smith at 855-OUR-FMCA, e-mail her at ExecutiveDirector@FloridaMosquito.org or visit www.floridamosquito.org.

**November 19-22, 2013:** The Pan American Health Organization, the US Centers for Disease Control and Prevention, and the Gorgas Memorial Institute for Health Studies invite you to participate in the Second International Meeting for the control of *Aedes aegypti*, to be held in Panama City, Panama, Central America. For more information, please go to http://www.meetingaedes2013.com.

**November 21-22, 2013:** The 59th Annual Meeting of the Illinois Mosquito & Vector Control Association will be held at the Springfield, IL Hilton. Additional information can be found at our website http://IMVCA.org.

**January 7-9, 2014:** The Florida Mosquito Control Association’s 2014 Annual Aerial Fly-In will be held at the Lee County Mosquito Control District, Lehigh Acres, FL. For more information on the Aerial Short Courses or to register, please visit http://www.floridamosquito.org/Events/Aerial.aspx or contact Mark Latham at manateemcd@aol.com.

**January 20-24, 2014:** The 2014 Florida Mosquito Control Association’s Dodd Short Courses will be held at the Ocala Hilton, Ocala, FL. For more information visit http://dodd.floridamosquito.org or contact FMCA Executive Director Debra Smith at 855-OUR-FMCA or e-mail ExecutiveDirector@FloridaMosquito.org.

**February 2-6, 2014:** Save the date! The 80th Annual Meeting of the American Mosquito Control Association will be held at the Washington State Convention Center, Seattle, WA. For more information about the meeting and to register, please visit the AMCA website at www.mosquito.org.

**March 25-27, 2014:** The 11th Arbovirus Surveillance and Mosquito Control Workshop will be held at Anastasia Mosquito Control District (AMCD), St Augustine, FL. The workshops are organized and sponsored by AMCD and USDA-ARS-Center for Medical, Agricultural and Veterinary Entomology, Gainesville, FL. Visit AMCD’s website at www.amcdsjc.org or contact Jodi Scott at 904-471-3107 or jodiamcd@bellsouth.net.
The bottom line is that, while larviciding was eventually allowed on the refuge, adulticiding was prohibited due to a wholesale buyer who wouldn’t purchase cranberries if there was over the one part per trillion naled residue that represented the lower limit for which Oregon State University could test. The fact, stated by Mr Lunders, that naled possesses an EPA 0.5 PPB crop tolerance was lost on this individual. Interestingly, the Ocean Spray buyer stated that he had no problem purchasing cranberries in the spray block. But the Xerces representative had already done the damage by placing doubt in the minds of the county commissioners. Most infuriating is the Xerces Society crowing via press release about their “saving” 10,000 acres of land from pesticide sprays – while asking for donations.

The only salutary outcome of this whole sordid episode was the acknowledgement by the US Fish and Wildlife Service that they had caused the problem in the first place and were responsible, to a point, for its remediation. It is also noteworthy that the problem was “nuisance” mosquitoes, not vectors per se. This is critical because while anti-pesticide activists will grudgingly occasion the use of pesticides to quell an outbreak – usually long after the preventive controls theynegated could have preempted it in the first place – they usually find nuisance to be a non-issue. In fact, nuisance spraying has been shown to keep bridge vector species, such as Aedes vexans, from contributing to viral amplification and transmission to humans. Even in the absence of disease or significant impact on quality of life, mosquito bites themselves present some profound clinical issues as even a cursory review of the literature can attest.

So, what have these episodes taught us? Alas, science may not win the day when a scientifically naive populace or legislative body has the final say and economics are involved. It can be frustrating at times, but that shouldn’t discourage us from intervening. Ours is a profession, a calling to do what is right in saving lives and making the world a better place to live. However, it’s rapidly approaching a time when we may need to confront those who will put the populace at risk in the name of an ideologically driven agenda. The public needs our expertise if they are to be properly protected from mosquito-borne diseases.

Somehow we need to devise a way to put an end to this nonsense, for this provides a template for all kinds of unscientific mischief if it wins the day. On-site testimonials from mothers who have lost children to mosquito-borne diseases that could have been prevented by the application of federally-registered pesticides such as methoprene could be one effective component of a successful rebuttal strategy.

I’m beginning to think that we need to get a great deal more aggressive in combatting this – not only in the sheer number and timing of our arguments, but in the way some (not all) are presented. Dispassionate presentation of impacts based upon actual science seem to be lacking sufficient gravitas – or at least a means to penetrate the superstitions of the grossly ill-informed. I’ve always been of the mind that practices that place the public at risk should draw a factually irrefutable and vehement response from our side – particularly when delivering our message on-site. We are talking about people’s lives here, and soft-peddling our scientific bona fides isn’t getting it done. At some point our delivery of the facts supporting our side needs to be passionate enough to elicit a visceral and vocal response from those who will be impacted. If the opposition’s presentations are not supported by facts and science, we should in no uncertain terms say so – and appeal to the mothers, family members, etc, whose lives will be unnecessarily risked based upon what amounts to superstition. We should make no bones about assigning the blame concerning those ramifications precisely where it rests – with those who are purposely removing products that can save children’s and the elderly’s lives. Shame is a powerful tool that has lost favor in the recent past because it makes the shamed feel uncomfortable -- well, they should when they are foisting legislation on us that can deliver catastrophic consequences to our most vulnerable citizens! I grow weary of the charade to which we are continually subjected. This anti-pesticide nonsense, with its whack-a-mole history, which has the potential to become overwhelming, if allowed to continue to be effective. We live in the most technologically advanced civilization on the planet. It’s long past time we started acting like it.

“Falsehood flies, and the truth comes limping after it.”
— Jonathan Swift 1710

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