Where floodwaters rise and fall, MetaLarv™ S-PT delivers superior control

Now there’s an (S)-methoprene insecticide from Valent BioSciences, the global leader in biorational insect control. Through its advanced Triple Release Technology™, MetaLarv™ S-PT Mosquito Growth Regulator can be applied prior to flooding and control adult mosquito emergence for extended periods after flooding. MetaLarv™ S-PT’s spherical pellet is virtually dust-free and allows for more effective low-rate applications, improved aerial application swaths, and greater point-source coverage for greater application flexibility.

Contact our Public Health Team by calling 877.696.4201 or visiting us at www.valentbiosciences.com/WBA12 MetaLarv™ to learn more.
MetaLarv™ delivers superior control of adult mosquito emergence for extended periods from Valent BioSciences, the global leader from Valent BioSciences. The spherical pellet is virtually dust-free and can be applied prior to flooding and control point-source coverage for mosquito growth regulators. MetaLarv™ S-PT Mosquito Growth Regulator is available to learn more, www.valentbiosciences.com/WBA12. Contact our Public Health Team by calling 877.696.4201 or visiting us at www.mosquito.org.
Get integrated.
Ensure a cohesive program with the GeoPro Data Center by ADAPCO. Electronically compile data, geographically represent activities, expediently generate reports, and much more for one low annual fee. Ask about one of our three NEW GeoPro and GeoPro Mobile Scout subscription packages designed specifically for the mosquito control professional. Act now and inquire about the most powerful web based decision support system on the market!

Contact ADAPCO at 800-367-0659 or visit us online at www.MyADAPCO.com
Florida’s warm, rainy climate is ideal for frogs and the mosquitoes that feed on them. In fact, the southeastern United States, and Florida in particular, are home to a number of frog and mosquito species which do not occur in the rest of North America, having originated from neotropical relatives. However, little is known about Florida’s frog-biting mosquitoes. This is likely due to their elusive habits and their negligible impact as pests or human disease vectors. Still, there are several reasons for studying these creatures. Besides being fascinating in their own right, frog-biting mosquitoes can help us understand patterns and behaviors that apply to mosquitoes in general. Host selection and host defense are two such subjects. Additionally, recent evidence has pointed to the possibility that ectotherms may be involved in the maintenance of viruses important to humans, such as Eastern Equine Encephalitis virus (Cupp et al, 2004). In this article we introduce a few of the frog-biting mosquitoes of south Florida and consider some of the similarities and differences between these species.

One method for categorizing the biting habits of mosquitoes is based on host specificity. Species fall along a range anywhere from generalists to specialists. Generalists are able to feed on a variety of hosts; specialists are expected to be more highly adapted to their preferred host group. These adaptations could include any number of traits,
such as ability to detect certain host cues, preference in flight height, size of proboscis or other body parts, etc. In some environments, amphibians account for a large percentage of the vertebrate biomass, so it is not surprising that mosquitoes have adapted to this blood source. One adaptation which has been discovered in several of these frog-biting specialists is an attraction to the sound of calling male frogs. The following frog-biting species are arranged from generalist to specialist.

**Culex iolambdis**

This tropical species is found in southern Florida, the Caribbean and in Central and northern South America. Along with a number of other *Culex* species in Florida, it is a member of the subgenus *Melanoconion*. This group includes a number of small, dark mosquitoes which have often been recorded feeding on cold-blooded animals. In 1979, John Edman reported on the Florida blood meal hosts of five species of *Melanoconion* mosquitoes, three of which (*Culex opisthopus, Cx peccator, and Cx pilosus*) were found to have at least one blood meal from an amphibian. Of these species, *Cx peccator* and *Cx pilosus* obtained the majority (>50%) of their blood from ectotherms, mostly reptiles. In Edman’s study few *Culex iolambdis* were collected and host blood was only from birds. This study and others show that many *Melanoconion* mosquitoes feed on ectotherms including frogs, though in some cases, a significant number of meals also come from birds and mammals making them generalists. *Culex iolambdis* seems to follow these generalist tendencies.

**Figure 2**: Close-up of *Culex iolambdis* feeding on a turtle, the Florida Red-bellied Cooter, *Pseudemys nelsoni*.

**Figure 3**: Putative *Culex territans* feeding on the Southern Leopard Frog, *Rana sphenocephala*; ID is tentative since the mosquito escaped collection.
This species has been observed multiple times in the field, feeding on the Cuban Treefrog, *Osteopilus septentrionalis*; see Figure 1. However, Larrick et al (2010) recently reported blood meals identified from frogs, lizards, birds, rabbits and raccoons. An additional observation of several females feeding on a turtle adds to this range of hosts; see Figure 2.

### Culex territans

In contrast to many of the other frog-feeders, *Culex (Neoculex) territans* is a cold hardy mosquito; see Figure 3. Having a holarctic distribution, this species is found throughout much of the United States and Canada as well as Europe and northern Asia. Several studies have identified hosts of *Culex territans* with

---

**Figure 4:** Female *Uranotaenia sapphirina* resting on the water surface.

**Figure 5:** *Uranotaenia lowii* feeding on the Squirrel Treefrog, *Hyla squirella*.
generally 60-90% of bloodmeals taken from amphibians (eg, Burkett-Cadena et al, 2008). This places this mosquito towards the specialist end of the host generalist-specialist scale, increasing the expectation of adaptations fitting the chosen host. Indeed, Barlett-Healy et al (2008a) showed in the laboratory that females of this species are attracted to frog calls, particularly the call of the Spring Peeper, *Pseudacris crucifer*, a frog emerging from hibernation around the same time that early spring *Cx territans* are ready to feed.

**Uranotaenia lowii**

The genus *Uranotaenia* is mainly tropical, with two representatives in Florida: *Ur lowii* and *Ur sapphirina*; see Figure 4. *Uranotaenia* species are small-bodied mosquitoes, with many of the worldwide representatives thought to specialize on amphibians (eg, Tamashiro et al, 2011). *Uranotaenia lowii* itself ranges throughout the southeastern United States and is likely also an amphibian specialist, although there are currently no major bloodmeal studies to confirm this status.

In Vero Beach, *Uranotaenia lowii* is locally abundant and has been observed in numbers on the Southern Toad, *Bufo terrestris*, see front cover; Squirrel Treefrog, *Hyla squirella*, see Figure 5; Green Treefrog, *Hyla cinerea*; and even the tiny Eastern Narrowmouth Toad, *Gastrophryne carolinensis*, see Figure 6. In Costa Rica, Borkent and Belton (2006) recorded the attraction of large numbers of this species to traps using frog calls as bait, suggesting that *Ur lowii* likely uses sound to locate its host. However, the observation of feedings on such a variety of
AmVAc now offers Summit B.t.i. Briquets

For over 25 years, fast-acting Summit B.t.i. Briquets have been the industry standard in extended release B.t.i. formulations. Few products match their record of reliable and environmentally compliant performance. Now Summit B.t.i. Briquets are available through your AMVAC distributor as part of our balanced product line which includes the adulticides; Dibrom® Concentrate and Trumpet® EC.

Contact your AMVAC/AEP distributor today or AMVAC at 1-888-GO AMVAC (1-888-462-6822) and visit www.amvac-chemical.com for more information.

Always read and follow all label directions and use precautions. Summit B.t.i. Briquets™ is a trademark of Summit Chemical Co. ©2012 AMVAC Environmental Corporation.
When it comes to helping you protect your community, Univar PP&S delivers.

Univar Professional Products & Services delivers quality products, expert advice, innovative technology, and relevant training for you to provide an outstanding level of public health for your community.

See what Univar PP&S can do for you by calling (800) 609-9414. UnivarPPS.com
anuran families argues against a narrow host range within the frogs and toads, though there are likely preferences for some frog species and calls over others.

Although these three mosquito species come from two genera and three distantly related subgenera, they face some common challenges. In order to feed successfully, a mosquito must not only be able to detect its host (through sound, carbon dioxide, etc) but also overcome host defenses (skin secretions, movements, etc). Using infrared video camera recordings, observations were made of mosquito-host interactions in the Vero Beach area. Although male frogs and toads spent most of their time calling, rapid leg motions were occasionally used to frighten off or dislodge attacking mosquitoes. These behaviors consisted mostly of quick kicks with the back legs or swipes over the head or chest with the front legs. The series of images in Figure 7 illustrates the swiping motion used by a Southern Toad to remove an attacker from its stomach. Although this attacker is a biting midge in the

Figure 7: A series of infrared images showing the defensive wiping motion of a Southern Toad, *Bufo terrestris*, against two biting midges from the family Corethrellidae, which are feeding on the toad’s stomach.
family Corethrellidae, similar defensive motions are used against mosquitoes.

Do these challenges result in similarities among the frog-biting mosquito species? Several generalities can be suggested. First, frog-biting diptera tend to be nocturnal. There are exceptions, such as the biting ceratopogonid midge Forcipomyia fairfaxensis, but the majority of flies which are known to feed regularly on frogs are active at night. This is not too surprising, since most frogs and toads are also active and calling at night. This is the time when these hosts are easiest to detect. Secondly, the frog-biting species discussed here all spend their larval stages in ground pools rather than container habitats. This may increase contact with frog hosts and in Cx territans, larval habitat has been shown to be closely correlated with host presence (Bartlett-Healy et al, 2008b). A final similarity among frog-biting species is small body size. The genus Uranotaenia includes some of the smallest mosquitoes of any genus and the subgenus Melanoconion includes some of the smallest of the Culex. Even Cx territans is a fairly small Culex mosquito, although not as small as these other groups. In parasite biology, Harrison’s rule states that parasite body size tends to correlate to host size such that larger hosts have larger parasites. Examples are seen in insects that are closely associated with their host such as lice, fleas and flower thrips (Kirk, 1991). Although mosquitoes do not live on their host, sufficient host interaction may occur to select for body size. The frog’s combination of relatively small body size and good defensive abilities may favor mosquitoes having a small, agile body for successful blood feeding.

There is much to be learned from Florida’s frog-biting mosquitoes. The ability to observe natural mosquito-host interactions is a great opportunity that could lead to discoveries applicable to other hosts which are more difficult to observe directly. The importance of ectotherms as disease reservoirs is receiving increased attention leading to questions about the habits of the biting flies which feed on them. And, if nothing else, there is a fascinating story behind the lives of these small, secretive mosquitoes.

REFERENCES CITED


Extend the effectiveness of your mosquito control program with

FYFANON® ULV
INSECTICIDE

Ultra Low Volume Concentrate Insecticide

• A proven adulticide that can significantly delay pyrethroid resistance development
• Approved for use on rangeland and pastureland, unlike most adulticides
• Available in five-gallon pails, 55-gallon plastic drums, and 260-gallon mini-bulk containers
• Proudly manufactured by Cheminova since 1968

1.919.474.6600 | www.FyfanonFacts.com

© 2011 CHEMINOVA, INC. Always read and follow label directions. FYFANON is a registered trademark of Cheminova. Contact your local distributor for complete information.
FlightMaster™ is a next generation GPS Precision Navigation system that utilizes new Spray Drift Compensation technology to optimally determine flight offset requirements for mosquito adulticiding.

**FlightMaster™ Features:**

- Rugged and lightweight color display (3.3 lbs)
- Designed exclusively to integrate with the Ag-Nav™ Guia™ GPS
- Delivers unprecedented aerial application accuracy
- Spray drift compensation calculated exclusively for products, droplet size, spray system and aircraft used in the application
- On-board AIMMS20 Meteorological Data Probe
- Real-time information on wind speed, wind direction, relative humidity, temperature and wind direction relative to nose of aircraft
- MET data and drift offset updated every second and shown on MMD during navigation
- Provides swath, directional guidance and other information required to carry out precise aerial applications

**FlightMaster™ can interface with all AIMMS20 devices; therefore, you can upgrade your existing navigation system by adding the FlightMaster™ navigation to your MET probe.**
One of my duties at the Collier Mosquito Control District in Naples, Florida, is to rear *Aedes aegypti* for public educational events. I learned how to rear mosquitoes years ago from Johnny Jackson at the USDA Center for Medical and Veterinary Entomology Laboratory, in Gainesville, from Mike Greer at the Public Health Entomology Research and Education Center in Panama City, and by reading the Manual for Mosquito Rearing and Experimental Techniques, published by the AMCA. During community events, we discuss the mosquito life cycle and use live mosquito larvae for school science programs. PowerPoint presentations, classroom activities, and information booths are great, but adding live wigglers always gets everyone’s attention. A few days before each event, I hatch the mosquito eggs, sprinkle the water with food and then watch them grow. For school projects, such as a bioassay, I use second to third instar larvae or I may need all the stages for a public information event. Also, rearing to replenish egg stock is a vital ongoing process. One of the more interesting times of the rearing process is anticipating the change from the fourth instar to pupae. What I work towards is a high percentage, synchronized change to pupae. I get really excited when I go to the insectary and see trays of pure pupae, as pictured above. So, the next time you see pupae, think of me pouring thousands into a sieve, with a smile on my face, as I put them into the rearing cages.

---

**Public PowerPoint Presentations and Pupae by Adrian L Salinas**

Adrian L Salinas  
Public Information Officer  
asalinas@cmcd.org  
Collier Mosquito Control District  
600 North Road  
Naples, FL 34104  
239-436-1000
The Entomological Society of China (ESC) and Beijing Institute of Microbiology and Epidemiology (BIME) hosted the 2nd International Forum for Surveillance and Control of Mosquitoes and Mosquito-borne Diseases in Beijing, China, May 23-27, 2011. The meeting theme was impact of global climate change and urbanization on mosquito-borne diseases. The meeting provided an opportunity to discuss mosquito-borne disease status and future challenges caused by global warming and urbanization in China and elsewhere. Other objectives were to share information about research and management of vector mosquitoes and mosquito-borne diseases, to promote new techniques and methods for surveillance and control of mosquitoes and mosquito-borne diseases, and to identify possible areas of worldwide collaboration for research and development of new methods and techniques for surveillance and control of mosquitoes and mosquito-borne diseases.

More than 15 leading scientists in the fields of mosquito surveillance and control of mosquito-borne diseases from eleven countries were invited to give presentations in the 3 panel sessions in the morning or one of 10 sections in the afternoon. The 3 panel sessions included impacts of global climate changes and urbanization on diseases, vector biology and toxicology, and control and management of projects. The 10 sections included diseases, vector surveillance, molecular biology and physiology, behavior and ecology, repellents, insecticides and toxicity, invasive vectors and their management, technology and equipment, programs, legislation, education and professional association. A total of 25 presentations were given in the 3 panel sessions, and 47 presentations given in the 10 sections. The meeting attracted over 200 attendees from 11 countries, 30 Chinese provinces, and 10 private companies achieving both national and international attention. Six of the eight participants from Florida provided 11 presentations. Oral presentations were in English only. Three projectors (the center screen was in English and 2 side screens were in translated Chinese) were used to facilitate the communications. The program was printed in both English and Chinese. The presentations, abstracts, and participants' names and contact information were brought together on a single DVD that was distributed to all participants. All participants in the 1st day were photographed together in front of the hotel. All international scientists and participants were invited to visit and tour the Medical Insect Gallery and the Department of Vector Biology and Control, BIME, Fengtai, Beijing and the Department of Vector Biology and Control, Institute for Communicable Disease Control and Prevention (ICDCP), China CDC, Changping, Beijing, and the Great Wall following the facility tours.

Tong-Yang Zhao (Professor and Director of the Department of
Vector Biology and Control, BIME, Beijing, China) and Rui-De Xue (Director and Entomologist, Anastasia Mosquito Control District [AMCD], St Augustine, FL) opened the meeting and moderated the 1st panel session. Rui-De Xue gave the conference presidential address: “Where should we go?” Zhong-Ning Zhang (Secretary of the ESC and China Congressman) and Wu-Chun Cao (Director of the BIME) gave the welcome address.

Kenneth Linthicum (Center Director, USDA Center for Medical, Agricultural, and Veterinary Entomology, Gainesville, FL) presented the keynote address, “Impacts of global climate change/variability and its impacts on mosquito-borne diseases.” Wu-Chun Cao spoke about “Global status of infectious diseases.” Jandouwe Villinger (International Center for Insect Physiology and Ecology, Nairobi, Kenya) spoke about “MassCode for Pan-arbovirus surveillance in East Africa.” Ary Farajollahi (Superintendent, Mercer County Mosquito Control and Center for Vector Biology, Rutgers University, NJ) gave a presentation about “Area-wide management of Aedes albopictus, the Asian tiger mosquito, USA.” Tong-Yan Zhao gave a presentation about “The impacts of urbanization on control of mosquitoes and mosquito-borne disease in China.” David Brown (Director of Sacramento-Yolo Valley Mosquito and Vector Control District, Sacramento, CA) gave a presentation about “Legislative and regulatory issues affecting mosquito control in the United States.” In the 2nd panel session, Ken Linthicum and Err-Lieh Hsu (Taiwan) moderated the session. Qi-Yong Liu (Professor and Director, Department of Vector Biology and Control, ICDCP, China CDC) spoke

FourStar Microbial Products is pleased to introduce your latest tool: FourStar SBG. By formulating on high density sand with patented Dual Action Release technology, we’ve created a better Bti granule.

FourStar SBG Operational Benefits Include:

- Better vegetation penetration
- Wider application swath from the air and on the ground
- Reduced bulk allows more acres per load with less ferry time
- Applications at higher wind speeds and higher altitudes
- Uniform, highly spherical sand is easy to calibrate
- Less off target drift

To learn more about FourStar SBG, contact ADAPCO toll free by phone at (800) 367-0659 by email at info@myadapco.com, or visit us at www.fourstarmicrobials.com.
New Product Announcement

HIGH EFFICIENCY, WIDE SPECTRUM DROPLET SAMPLER

This new spinner (Model 319) was developed by Dr. Jane Barber and others at Florida A&M for measuring droplet size spectrum from the newer Microair and Bete impinger nozzles producing smaller emission spectra (DVD’s of 12-30 µm). For more details see web.

7409 NW 23rd Avenue, Gainesville, FL 32606
(352) 378-3209 V (352) 372-1838 F JWHock@JohnWHock.com www.JohnWHock.com

about “Mosquito-borne disease surveillance in China CDC.” Günter Müller (Visiting Professor, Hebrew University of Jerusalem, Israel) gave a presentation about “Sugar feeding behaviors and possible use for mosquitoes and sand fly control.” Theeraphap Chareonviryaphap (Professor, Department of Entomology, Kasetsart University, Bangkok, Thailand) spoke about “Overview of impact of insecticides on mosquito behaviors.” Paul Linser (Professor, University of Florida, Whitney Laboratory, St Augustine, FL) gave a presentation entitled “Molecular analysis of alimentary canal function: targeting for novel control strategies.” Nan-Nan Liu (Professor, Auburn University, AL) spoke about “Genes and mechanisms: how mosquitoes develop resistance to insecticides.” Chuan-Ling Qiao (Professor, Institute of Zoology, Chinese Academy) gave a presentation about “Status of insecticide resistance of mosquitoes in China.” Tong-Yan Zhao gave a presentation about “Control and management of chikungunya vectors in China” and Harry Zhong (Professor, FAMU-PHEREC, Panama City, FL) spoke about “Minimizing nontarget impacts for aerial Ultra Low Volume mosquito adulticiding.” In the 3rd panel session, Paul Linser and Qi-Yong Liu moderated the session.

Xue-Li Zheng (Professor, Nanfang Medical University, Guangzhou, China) gave a presentation about “Expression, purification and identification of the domain III of DENV II envelope protein in Escherichia coli” and Jonas Schmidt-Chanasit (Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany) spoke about “German Arbovirus surveillance, 2009-2010.” Err-Lieh Hsu (Emeritus Professor, National Taiwan University) gave a presentation about “Mosquito-borne diseases and vector control measurements in Taiwan.” Mustapha Debboun (Colonel and Entomologist, US Army Medical Department Center and School) gave a presentation about “Molecular and physiology. In this section, there were 4 presentations about resistance evolution, molecular resistance to Bacillus spp, efficacy of Bacillus spp isolates, gene
Don’t Miss the 14th Annual AMCA Washington Day Conference!

The Washington Conference is THE venue to identify issues or concerns that can only be examined and resolved at the federal level or on a nationwide basis.

April 30 – May 2, 2012

The Hilton Alexandria Old Town
1767 King Street
Alexandria, VA 22314

Housing Deadline: April 6, 2012
For hotel reservations call (703) 837-0440 or visit www.mosquito.org

Full Meeting Information is available online

See you in Washington!

PROVEN ACTIVES
LONG-LASTING CONTROL

FourStar Microbial Briquets
—the silver bullet you’ve been waiting for.

Three sizes available:

- 45 day briquets
- 90 day briquets
- 180 day briquets

To learn more about FourStar Briquets, contact ADAPCO toll free by phone at (800) 367-0659 by email at info@myadapco.com, or visit us at www.fourstarmicrobials.com.
Helping Clients
**Incorporate**
New Technologies

Data Management Systems
GIS Mapping
Consulting
Guidance Systems
Surveillance

Software Design
Imagery
GPS Tracking
Customization

**Leading Edge...**
guidance and direction
for your technology needs.

info@LeaTeam.com          www.LeaTeam.com          (828) 926-6525
Bill Reynolds   407.468.0008       Mike Reynolds   828.246.2111
Chareonviryyaphap and Mei-De Liu (Associate Professor, BIME) co-moderated the behavior and ecology section. In this section, there were 3 presentations about habitats of sand flies in Mali and Middle East, activity of stomoxine flies in Thailand and biting activity of Anopheles sinensis in China.

M Debboun and G Müller co-moderated the repellent section, where there were 4 presentations about behavioral response of mosquitoes to DEET, green chemistry repellents, designing and developing spatial and topical repellents, and evaluation of spatial repellents. The section on insecticides and toxicology was moderated by Chuan-Ling Qiao and Nan-Nan Liu. There were 4 presentations about new insecticide resistance genes, resistance bioassays for larval and adult mosquitoes, resistance surveillance, and pyrethroid insecticide resistance detection. There were 3 presentations in the invasive vectors and their management section dealing with dengue vector control, investigation in border area, and mosquitoes in entry ships.

Günter Müller and Wei-Long Tan (BIME) co-moderated the technology and equipment section. In this section, there were 8 presentations about attractive toxic sugar baits, acoustic larvicide, products from BASF, thermal foggers and ULV machines, Beijing GreenLeaf products, Bayer’s vector control solution and products.

In the section dedicated to programs, Janice Bequette (Commissioner, AMCD) moderated. In this section, there were 3 presentations about USDA-CMAVE programs, AMCD’s applied research program, and the FAMU-PHEREC program. Jeanne Moeller (Commissioner, AMCD) moderated the legislation, education, and association section. In the final section, there were 5 presentations about California mosquito and vector control, education programs in Florida, Society of Vector Ecology, Chinese Society of Vector Biology and Control, and Academic Association of Medical Entomology, ESC.

At the end of the conference, Rui-De Xue made some concluding remarks about the meeting’s programs and success. He expressed thanks and appreciation to the meeting hosts and organizers, funding organizations and associations, companies, hotel, all speakers, moderators, and attendees. The program committee has decided that the 3rd International Forum for Surveillance and Control of Mosquito and Mosquito-borne Diseases will be held in Suzhou, China, May 27-31, 2013.

Also, the committee meeting for the Asian Society of Vector Ecology and Mosquito Control (ASVEMC) was held in Beijing after the international forum. The logo, by-laws, and officers for the society were discussed and approved by the committee. Tong-Yan Zhao was elected as the 1st President of the ASVEMC. Other officers for the society are Qi-Yong Liu, Günter Müller, Xiao-Peng Zeng, Jun Sun, Erri-Lieh Hsu, Theeraphap Chareonviryyaphap, B Reddya Naik, Abu Ahmad, and K Murugan. The ASVEMC will sponsor and organize the 3rd International Forum with the ESC and BIME.
Early one morning in November 2011, while running routine mosquito surveillance activities in Fairfax County, Virginia, I removed the lid from a container and found a Culex mosquito resting on the surface of the water inside the container. Upon closer observation, I realized that the mosquito was frozen and that small ice crystals had formed on its body overnight. It was an amazing sight. Unfortunately, I did not have my micro lens with me that day, so I returned the next day with hopes that the crystals had formed on the mosquito again during the cold night. However, due to warmer temperatures, the crystals had melted and turned into water droplets along the wings, abdomen, legs and proboscis of the insect. The mosquito was photographed many times over until it was properly photo-documented.

This particular mosquito is thought to be Culex pipiens, rather than Culex restuans, due to the fact that Cx pipiens is more common later in the year.
Swingfog – the optimal machines for Vector and Pest Control.
Plant Protection in Greenhouses and Plantations.
Disinfection in Food Processing and Animal Production. Stock Protection in Warehouses.
Anti-Sprouting Treatment of Potatoes.

Jasmic
Distributor USA
and Canada:
www.jasmic.net
Call Toll Free:
(888) 4–JASMIC
(888) 4–527642

Swingtec GmbH, Postfach 1322, 88307 Isny, Germany, Tel. +49 7562 708-0, Fax +49 7562 708-111, Email: info@swingtec.de, www.swingtec.de
NOTHING REMAINS THE SAME....
EVEN IN MOSQUITO CONTROL
From an idea to reality – evolution is happening.

WHERE WOULD WE BE WITHOUT CHANGE?
We don’t have to look far— either in our daily lives or in our industry— to answer that question. Whether change comes from an idea, a vision or need, new products and practices are improving mosquito control.

PUTTING IDEAS INTO ACTION
Product innovation isn’t just about researching new products and new actives. It’s also about improving upon what we have...and willingly shelving products or practices that are outmoded by comparison. It’s striving to make sure everything we do is better than what preceded. A few examples:

- **Natular™**, five OMRI-listed larvicide formulations and the 2010 U.S. EPA Presidential Green Chemistry Challenge Award winner
- **Duet™**, two unique active ingredients achieving new adulticide performance levels
- **AquaAnvil™ & AquaHalt™**, water-based adulticide formulations that use Droplet Optimization Technology to maximize performance

PEOPLE ...SPARKING CHANGE AND COMMITMENT
Our greatest resource has always been the people of Clarke. And while we may have evolved in the way we work, our commitment to serving the needs of our customers is unwavering.

GIVING BACK ...CHANGING FOR GOOD
Clarke has long supported community efforts and student scholarship opportunities. But even in giving back, we’ve discovered new ways to touch more lives around the world. For example, thanks to your help, thousands of bed nets have been donated to areas in Nigeria that are stricken with mosquito-borne disease.

*Clarke: Changing today for a better tomorrow.*
Keeping our Customers Mosquito & Disease Free

World Wide for over 40 years!

Our line of defense

**18-20**
High output ULV machine. Most popular ULV aerosol generator in the world.

**XKE**
Large area coverage ULV. Very simple to operate from truck or trailer.

**MAG**
Medium area ULV. Indoor and outdoor coverage from ATV or cart.

**COLT**
Portable ULV for indoor and outdoor application.

www.londonfoggers.com

Mosquito, Vector, Pest, and Odor Control

© Copyright London Foggers 2011. All Rights Reserved

505 Brimhall Avenue - Long Lake, MN 55356
TF. 800-448-8525 - P. 952-473-5366 - F. 952-473-5302
On August 29, 2005, Hurricane Katrina brought New Orleans a flood of unexpected and devastating consequences. Among them was the sudden creation of several thousand unattended swimming pools, littered with fallen trees, furniture, and other household goods and debris from the hurricane and receding flood waters. The mucky water in the pools provided ideal habitat for vectors of West Nile virus, eastern equine encephalitis, and St Louis encephalitis. During the months immediately following the hurricane, many of the pools were infested with large numbers of Culiseta inornata, Culex quinquefasciatus, and Cx salinarius larvae. There were few people in New Orleans at that time, but no one knew whether this unprecedented mosquito production would set in motion a serious disease outbreak when people returned. Many people would be living in trailers for extended periods, exposing them to mosquitoes.

Fish seemed most promising because a single treatment could provide long-lasting control. The effectiveness of fish was apparent in pools that already contained them from the Katrina flood, a natural stocking of approximately 750 pools with mosquito fish, mollies, killifish, and minnows. In January 2006, a decision was made to introduce fish to all unmaintained swimming pools. Thus began a program of emergency mosquito control for a city in disarray, a program that sometimes had to proceed under makeshift conditions and with less than adequate information, and which continued to be extremely challenging for several years.

Before Hurricane Katrina, Mosquito Control sometimes trapped local killifish or mollies for introduction to unmaintained swimming pools, but a larger fish supply was needed on a regular basis. After several months of searching, a catfish farm with large numbers of Gambusia affinis was found in Mississippi. Twenty thousand fish at a time were transferred by truck from the catfish farm to New Orleans for holding in two 18-foot-diameter, above-ground, aerated swimming pools. Fish introductions began in April 2006 and continued throughout the hot New Orleans summer.

Transporting fish from the holding tanks to swimming pools was an enormous job. Fortunately, the non-profit organization Operation Blessing provided out-of-town volunteers to assist Mosquito Control staff. Each morning an assembly line netted fish from the holding tanks, counted out approximately 50 fish by pouring them into a calibrated cylinder, poured those fish into a plastic bag, and put oxygen into the bags. The bags were transported to the pools in large coolers (without ice) in the back of pickup trucks that set out for the entire day. The crews worked with swimming pool address lists compiled from records of real estate listings and several thousand backyard inspections conducted during the previous months. Later, Mosquito Control staff used a Pictometry® aerial photo system and Google Map to survey every street by computer, viewing overhead photos to retrieve the addresses of houses with pools; see Figure 1. In the end, field teams inspected 4,651 pools to ascertain whether they needed fish.
One bag of fish was poured into each pool, and VectoLex® (Bacillus sphaericus) was applied to suppress mosquito production until the fish established a larger population. As the City was under a state of emergency due to public health threats, Mosquito Control crews had the authority to enter backyards even if no one was at the house. This was usually easy, but if the gates were locked, the policy was not to risk injury by climbing fences. Instead, a plastic bag containing fish, and arranged to open on impact, was lobbed over the fence and into the pool.

Fish were introduced to 1,278 unmaintained pools by September 2006. In October, field teams began returning to pools to check on the fish where they had already been introduced. Assessments were based on seeing fish or their characteristic ripples. As winter set in, some of the inspections revealed no fish, which could have been due to inactivity with pool temperatures as low as 11 ºC. Various fish traps and nets were used to check the pools for fish, but we never found a completely reliable assessment method for the winter. The following spring, quality control tests were run with each inspection crew to assess the presence or absence of fish in pools that were independently known to contain fish or not. They confirmed visual assessment to be completely reliable outside the winter season.

By September 2007, the inspections extended to 600 pools that received fish the previous year, and 86% of those pools contained fish. Gambusia were reintroduced to pools where they had not survived, and they were introduced to hundreds of additional pools that were newly identified as abandoned. A few pools did not receive fish in order to monitor adult mosquito populations in the surrounding area.

How effective were the fish at preventing mosquito production? Very effective, but not a hundred percent. During 5,883 pool inspections in 2006-2008, mosquito larvae were observed in 2.2% of the pools that contained fish, compared to 36% of the pools without fish. Culex quinquefasciatus and Anopheles (An crucians and An quadrimaculatus) were most common. Cx quinquefasciatus larvae were seen throughout...
The development of the (S)-methoprene molecule is smart science. Every Altosid® formulation contains (S)-methoprene, an insect growth regulator (IGR) that stops mosquitoes from becoming breeding, biting adults. (S)-Methoprene has the industry’s lowest toxicity rating. It is target-specific, and will not affect fish, waterfowl, mammals or beneficial predatory insects. This makes Altosid® larvicide the rational choice for MADs looking for long-term control without additional worry.
the year in pools without fish. They were sometimes very numerous, though less common during the summer; see Figure 2. *Anopheles* larvae were also observed throughout the year, but their numbers were seldom large. *Culiseta inornata* could be very numerous during November to March, *Cx salinarius* during November to May, and *Cx coronator* during July to November.

Most larvae in pools with fish were *Anopheles*, sometimes present even when fish were abundant. *Cx quinquefasciatus* were observed only where fish numbers were low. Other mosquito species were almost never seen in pools with fish.

In 2007, we initiated a research program to help guide the operational program. It was encouraging that so many pools had fish after the introductions in 2006, but we needed to understand why fish were missing from 14% of those pools. We wanted to know:

- Did fish take hold after introduction, but drop out of the pools later? Were they continuing to disappear from pools in which they were established?
- Was there still a fish survival problem in the pools?
- How were ecological conditions in the pools affecting larval abundance, fish abundance, and the effectiveness of fish for larval control?

We monitored a selection of pools for an extended period after introducing fish. We also conducted experiments to address specific concerns. For example, it was not unusual to see empty bleach bottles because people had dumped bleach in a dirty pool to "clean it up." However, bleach could wipe out the fish and other aquatic predators, converting a pool into prime mosquito habitat if left unmaintained. To gain perspective, we poured four

![Figure 3: A pool treated experimentally with bleach to see its impact on the fish population. Fish normally thrived in this pool. Dumping four gallons of bleach led to high fish mortality, but the fish population recovered within a month.](image)
gallons of bleach into each of three pools with thriving Gambusia populations, creating a chlorine concentration of 0.1-0.5 ppm. Massive fish deaths followed. No fish were observed in any of the pools the next day, but every pool had a thriving population within a month, despite the fact no fish were reintroduced to those pools; see Figure 3.

We observed a disturbing number of partially drained pools with only one or two feet of water at the bottom, no fish, and numerous mosquito larvae. The owners had drained the pools, killing all the fish and leaving the pools to collect rainwater after that. If the pool contained much trash, the organic pollution could be particularly severe in shallow water, creating ideal habitat for Cx quinquefasciatus. Because well-intentioned but counterproductive homeowner interventions were a problem, a sign was left at every inspected swimming pool informing the owner that the pool was under Mosquito Control management, urging the owner not to add chemicals that could injure the fish, and requesting the owner to notify Mosquito Control if the pool was drained or filled in.

The research program included systematic data collection with regard to physical conditions, water quality, trash (eg, wood, furniture, and other household goods), leaves and branches, aquatic vegetation, aquatic insect predators, mosquito larvae, and fish at several hundred swimming pools. A temperature range of 11-35 ºC, a pH range of 6-9, and a salinity range of 0.1-10 ppt observed in the various pools over the course of a year were comfortably within the published tolerances for Gambusia. We suspected that high concentrations of nitrite, which is toxic to aquatic animals, could be a problem, but the fish appeared to be unaffected at the highest nitrite concentration observed (2 ppm). Toxic chlorine concentrations were observed on a few occasions. The data revealed four main swimming pool ecotypes. Some pools fell clearly within a single ecotype, while others displayed the characteristics of more than one. (Swimming pool photos were taken by Cynthia Harrison.)
1. **Severe organic pollution**; see Figures 4 and 5. Turbid and foul-smelling water, associated with fallen tree branches, trash, and other rotting materials, provided particularly favorable habitat for *Cx quinquefasciatus* larvae when there were no fish in a pool. This ecotype was particularly common during the first year after Katrina, with the pollution declining gradually after that, so it was much less noticeable by the third year. Fish generally provided effective mosquito control in this ecotype, except when organic loading was extreme. We were particularly concerned about the low oxygen concentrations and high levels of ammonia that could accompany organic pollution. It turned out that oxygen was not a problem. *Gambusia* thrived in many pools with no measurable oxygen. However, high ammonia concentrations of 10-40 ppm, though rare in occurrence, were distinctly associated with smaller fish populations.

2. **Ecologically productive without pollution**; see Figure 6. This ecotype lacked the putrid conditions and numerous *Cx quinquefasciatus* larvae so characteristic of organically polluted pools. These pools were somewhat saline, suggesting that they had been flooded with brackish water from Lake Pontchartrain. Aquatic insects such as water boatmen, dragonfly nymphs, and water striders were often abundant, along with *Anopheles* and *Cx salinarius* larvae. Conditions favorable for one seemed favorable for all. *Gambusia* did well in this ecotype and eliminated *Culex* larvae, but *Anopheles* larvae frequently coexisted in small numbers with the fish, apparently because the larvae could avoid fish predation by clinging to floating pine needles, small floating sticks, or grass around the edge of a pool.

3. **Oak leaves**; see Figure 7. Pools with a large number of oak leaves, and distinctively brown water from tannins in the leaves, provided favorable habitat for *Culex* and *Anopheles* larvae and water boatmen. *Gambusia* survived in this ecotype, but their populations were generally low. Mosquito

---

**Figure 6:** The “ecologically productive without pollution” ecotype supported large populations of aquatic insects and provided favorable habitat for *Anopheles* larvae, which avoided fish predation by clinging to floating pine needles, floating sticks, or grass around the edge of a pool.

**Figure 7:** The “oak leaves” ecotype provided favorable habitat for *Culex* and *Anopheles* larvae, but supported relatively few fish. A Mosquito Control sign with information for homeowners is in the background.
**FFast® Bti reaches the mosquito larvae that others don’t.**

Introducing FFast® Bti, a new larvicide that uses Bayer’s FFast technology to control larvae up to 300 feet from your spray vehicle.

- Controls container-breeding mosquitoes including *Aedes albopictus* and *Aedes aegypti*
- Use it in your ULV equipment night and day
- Saves time and labor each time you spray
larvae were sometimes observed when fish were in a pool.

4. Floating algal mats; see Figure 8. Dense mats of filamentous algae were most prominent in the summer, sometimes almost completely covering a pool. The clear water, shaded by the mats, supported few mosquito larvae even in the absence of fish. Back-swimmers and diving beetles were often common if fish were not present. Fish thrived in this ecotype, and mosquito larvae were virtually absent if fish were present.

Why were fish missing from 14% of the pools to which they were introduced in 2006? Some of the introductions during 2006 simply failed to take hold in the first place. Dumping bleach was counterproductive, and draining pools could wipe out the fish, but this was not happening on a scale to explain so many pools without fish. While some pools were probably too polluted in 2006 for fish to survive, we concluded that the main problem was trauma during transport from holding tank to pool. The pace was intense, and the fish sometimes appeared in poor condition (swimming at a slant and moving erratically) when poured from the plastic bag into a pool, particularly if it was hot and they had been in the bag for the entire day. The success rate of Gambusia introductions during 2006 improved with experience. While 84% percent of the pools to which fish were introduced during the first two months of the program still had fish when next inspected, this measure of success increased month by month to 95% for pools receiving introductions late in the year. By 2007-2008 the pollution had declined significantly, and the smaller number of introductions at that time allowed more careful attention to the fish, including rapid transport to pools. Every monitored Gambusia introduction during 2007-2008 led to a thriving population within a month – an introduction success rate of 100% – and the population in every pool lasted for as long as the pool contained water.

Experience with the swimming pools taught us some lessons that could be of use to others for disaster readiness planning. For example, it is best to line up a reliable source of fish in advance. It took us several months to track down a supply for such large-scale use.

We also used larvicides, mainly VectoLex, to suppress mosquito production until the fish took over. VectoLex does not kill Anopheles larvae but is known for its effectiveness and residual capacity against Culex. We could count on a single VectoLex application to kill all the Culex and Culiseta larvae in a swimming pool within a day or two. However, the residual period in such deep water was limited because Bacillus sphaericus eventually sank to the bottom while the mosquito larvae fed mainly at the top. We found that VectoLex reliably killed all new larvae for only a few days after application, though complete kill extended for as much as 10 days in pools with heavy organic loading.

Locating swimming pools was a challenge when searching through a hundred thousand houses in a city devoid of residents over areas extending for miles. The Pictometry aerial photo system, Google Earth, and real estate listing records proved invaluable for tabulating the addresses of houses with pools. Up-to-date photos showed whether pools were maintained.

Cleaning trash out of pools was basic habitat management because organic detritus fueled the food web leading to mosquito larvae. Putrid conditions, which could last for more than a year if not corrected, were ideal for Culex larvae and stressful for fish. Trash of any kind provided refuge for Anopheles larvae to evade predators.
Healthy fish were a key to successful introduction. Careful handling, limiting the transport time from holding tanks to swimming pools to a few hours, and watching for signs of stress were important. At first, we transported the fish in a separate plastic bag for each pool, but later we stopped using the plastic bags, transporting all the fish for one trip together in a large cooler. It saved work, and the fish arrived in good condition.

Use of the media for clear communication with the public about what was happening and what was expected from the public helped pave the way for reconnaissance and fish-introduction teams. Wherever we introduced fish, we posted a sign with key information for homeowners. Access to properties was a concern when residents were not at home and gates were locked. The legal basis for access should be clear, and the public should be thoroughly informed about policies and procedures in this regard.

Systematic records were essential. They can be simple. At every visit we recorded the state of pool maintenance, whether fish were already in the pool, whether larvicide was applied to the pool at the time of the visit, whether fish were introduced, and whether there were mosquito larvae in the pool. If there were larvae, we took a standard number of dips and a sample for identification. The number of pools without fish after the introductions in 2006 caught us by surprise. Particularly at the beginning of a program, pools should be checked about a month after fish introduction to make sure they contain viable populations.

Non-profit organizations can offer exceptional flexibility for providing resources and other forms of assistance after a disaster. Volunteers were particularly important for an enterprise of this scale. Careful supervision and training of volunteers was essential because volunteer turnover was often high, most volunteers had no experience with this kind of work, and the calamitous conditions after Katrina hindered orderly operations. The general practice was to have a Mosquito Control staff person working directly alongside volunteers at all times.

Organizational self-sufficiency helped to get things done under chaotic conditions. Coordination with other agencies was necessary and beneficial, but it was not wise to be totally dependent. Although other City agencies had to focus on their own post-Katrina priorities, we were fortunate to receive valuable assistance from state and federal sources.

In conclusion, the fish introductions were well worth the effort. It was a strenuous couple of years, but ultimately satisfying for everyone involved. Using mosquito larvae in unmaintained swimming pools without fish as an indicator of adult mosquito populations, 53% percent of those pools contained larvae during March-August 2006, when fish were not yet established in many of the pools. This figure dropped to finding larvae in only 8% of pools without fish during the same months in 2007, indicating a dramatic decrease in adult mosquito populations from 2006 to 2007-2008. There was a surge in West Nile virus after Hurricane Katrina, 12 cases in Orleans Parish in 2006 compared to the one or two cases during the two years preceding Katrina. West Nile virus dropped to two cases per year in 2007-2008 and no cases have been reported since then.

While many of the swimming pools that needed emergency fish introductions in 2006 are now maintained by their owners or have been filled in, fish still provide mosquito control in approximately 600 of those pools. Additional unmaintained pools have come into the system in recent years due to home mortgage foreclosures and other causes unrelated to Hurricane Katrina. Further details about this story and the research program can be found at www.gerrymarten.com/swimmingpoolsneworleans.html.
Why is ADAPCO

Is not getting products on time causing delays in your operation?

My customers always come first. We work together as a team to accomplish the same end goal: to deliver a quality product when you need it. It’s a good feeling to know that I play a part in keeping customers’ operations running smoothly.

Wendy Decorah,
Customer Service & Inside Sales

Have you ever been forced to shut down a mission because you lacked immediate support with chemicals or equipment?

My customers can trust they are getting unbiased expert advice from a dedicated partner when they need it. I follow the Golden Rule: I treat my customers the way I would want to be treated.

Chris Pederson,
Outside Sales Consultant

A best-in-class customer service team to

ADAPCO is the name you trust in the mosquito control industry.

ADAPCO is the name you trust in the mosquito control industry.
My customers can trust they are getting unbiased expert advice from a dedicated partner when they need it. I follow the Golden Rule: I treat my customers the way I would want to be treated.

I make sure my customers’ equipment is up and running with unique service programs to ensure little or no downtime. I also help them access technology for a more efficient and compliant operations.

I listen to my customers’ needs in order to develop real-life, innovative solutions that ensure their compliance with regulations, reduce liability exposure and improve the efficiency of their operation.

Has a down piece of equipment hampered your ability to protect the public?

I make sure my customers’ equipment is up and running with unique service programs to ensure little or no downtime. I also help them access technology for a more efficient and compliant operations.

TJ Leibee,
Service Team Member

Do you fear you don’t have sufficient documentation in the event your operation was sued?

I listen to my customer’s needs in order to develop real-life, innovative solutions that ensure their compliance with regulations, reduce liability exposure and improve the efficiency of their operation.

Derek Wright,
National Technology Manager

Has a down piece of equipment hampered your ability to protect the public? Do you fear you don’t have sufficient documentation in the event your operation was sued?

support all of your mosquito control needs.

Contact us toll free: 800 367-0659 or on the web: www.MyADAPCO.com
In a previous Wing Beats article (Vol 21, No 4), the Washoe County Health District Vector-Borne Diseases Program provided the process and steps of establishing regulations that allow for design standards on new public and private development projects to eliminate mosquito colonization. This article describes requirements established by the Vector-Borne Diseases Program (VBDP) in collaboration with Community Development Departments in Reno, Sparks and Washoe County used during review and approval of retention basins, channels, landscape improvements, ponds, wetlands and catch basins to reduce the impact of nuisance insects, including mosquitoes. Instead of reacting to mosquito issues caused by poorly designed development projects, our approach is to collaboratively work with planners and civil engineers to establish better designs based on regulations to minimize the nuisance and public health risks associated with mosquitoes.

Detention basins are required by local government to store water runoff from large storm events in order to reduce down stream flooding. If not designed properly, these areas provide an ideal larval habitat for nuisance insects. To alleviate this, the VBDP requires a cobble line (4-6 inch rock) low flow channel between the inlet(s) and outlet pipe. This allows water flow that often occurs from over watering landscape to trickle through these facilities without reducing the capacity of the basin to handle large storm events. Moreover, an infiltration trench 2 feet wide and 3 feet deep (depending on soil profile) is constructed below the low flow channel between the inlet and outlet pipe to provide additional infiltration. VDBP also requires no vegetation plantings within one foot of the low flow channel. Specific maintenance language is provided to Homeowners Associations (HOAs) and Landscape Maintenance Associations (LMAs) to maintain the basins annually. For retention basins we require the
same designs for infiltration, maintenance and a low flow channel constructed from the inlet to the length of the basin since there is no outlet in these facilities.

The program is a strong component of Low Impact Development (LID) designs that have been used in Reno, Sparks and Washoe County under the guidance of the Truckee Meadows Storm Water Permit Coordinating Committee. Low Impact Development is storm water management modeled so runoff from rainfall and urban uses is captured, filtered, stored, detained and infiltrated at its source. Features such as bio swales, rain gardens and curb cuts to landscape areas captures and infiltrates water runoff, reducing these waters from entering the hard infrastructure system. When LID plans are distributed to our program, infiltration systems are added for additional percolation.

Typically, new drainage channels are designed to be constructed as flat bottom channels in Reno, Sparks and Washoe County. Over time with little maintenance, these channels build up sediment and lose their constructed grade resulting in water “ponding.” To avoid this, the program requires a low flow channel which allows water to flow through the facility while having the capacity to accommodate large storm events. Depending on the project and who is responsible for maintaining the structure, the low flow channel is lined with cobble rock (4-6 inch rock).

Landscape designs that contain turf for residential and commercial common areas are required to have an 18 inch xeriscape buffer from the back face of sidewalk or other impermeable surfaces. Over watering turf during the summer months creates nuisance water to enter this landscape buffer and infiltrates as opposed to running down the curb and ponding in catch basins. If a curb exists without a sidewalk the buffer is the same 18 inches. The VBDP also directs the landscape architect to place a wind sensor control unit at the site in which the irrigation system shuts off when the wind exceeds a specified speed reducing nuisance water runoff.

Ponds provide an aesthetic feature in new developments and can be used to capture storm water runoff. They afford habitat for non-biting nuisance midges, which the VBDP has no pesticide material to combat. As a control measure, ponds are constructed with a fountain aerator or multiple aerators and operated daily for two hours in the morning and evening annually from April through October. The agitation of the surface water from the aerators discourages adult female mosquitoes and midges from laying their eggs. The aerators improve water quality by preventing algae and weed formation by oxygenating the water through mixing. Our program also requires cobble rock placed two feet below and two feet above the mean water line. This reduces weed growth used as habitat for mosquito and...
midge while minimizing the burrowing of rodents.

In addition, our program developed a wetland model design using a meandering low flow channel in which storm water runoff from development flows through the wetland. Ponds can be constructed and connected to the low flow channel with water flowing into and exiting the pond through the meandering channel system. Forebays are constructed below the outfall pipes which capture sediment, debris and urban litter from development discharges from entering the wetlands. Included in our wetland design are native plants associated with our high desert environment planted on the upland slopes. Our experience in wetlands is if an unmanaged monoculture, such as perennial pepper weed (Lepidium latifo- lium) and/or cattails (Typha spp) is allowed to exist, it out competes a desirable and diversity of plant species creating an environment conducive to mosquito development.

The Cities of Reno, Sparks and Washoe County Community Development require rockery walls and mechanically armoring slopes to stabilize hillsides as development moves off the valley floor. The Vector-Borne Diseases Program has standards for rockery walls, by filling the voids with smaller rock in the rockery wall for the entire height. For slope stabilization of hill sides, mixed aggregate rock is placed in the voids to a depth of 3 inches. With plague endemic in Washoe County, these design standards also discourages void formation for rodent habitat.

The VBDP began a collaborative effort with Washoe County Community Development and Jensen Precast to design new as well as retrofitting existing catch basins/drop inlets (DIs) that improves water quality and at the same time prevents the colonization by mosquitoes. Our first design was developed in 2008 with Jensen Precast modifying the basin by placing 1 inch diameter weep holes on the side walls and end walls of the DIs. As water enters the basin from the curb it will weep out through the one inch diameter holes in the basin, eliminating any standing water in the sump. Unfortunately, our design was not approved by Reno and Sparks because the weep hole catch basin was considered an injection well by definition of the Nevada Department of Environmental Protection (NDEP).

In 2009 work began with Washoe County and Xeripave which manufactures pervious pavers to

![Figure 3: Our design standard of a cobble line low flow channel for detention/retention basins.](image)
eliminate the amount of debris, organic matter and pollution by collecting this material below the grate and on the pavers while preventing this material from entering water ways that flow directly to the Truckee River. We initiated demonstration projects with Washoe County and Reno testing for sediment clogging and using a water truck to simulate large storm events to determine if the Xeripave Tray System met Washoe County hydrological standards. Over a two year period the testing culminated in the Xeripave Tray System design being placed in the Washoe County Hydrology Manual. The Xeripave installed below the existing grate and above the outfall pipe prevents access for adult mosquitoes. As a result of the demonstration projects, the Vector-Borne Diseases Program is requiring this retrofit in catch basins.

With our review of new developments through the Community Development process, what assurances do we have that our design standards are constructed as required on the civil/building plans? In 2009 we developed a Compliance Inspection Handbook that contains our design standards to initiate on site compliance. As contractors work on the project, they contact VBDP for a compliance inspection, which allows us to examine their work to ensure standards established for public and private infrastructure construction are followed.

When the Vector-Borne Diseases Program regulations were approved in 2002, little did we realize the positive effects it would have on infrastructure through our planning in Community Development. It is through these designs that the citizens of Washoe County have benefited.

The “prevention through design” approach undertaken by the Washoe County Health District Vector-Borne Diseases Program has transitioned our program from reliance on the use of pesticides for insect control, to becoming proactive through the Community Development process.
DIBROM® CONCENTRATE
TRUMPET® EC
Protecting public health for more than 50 years.

Used all season long where serious mosquito control is required.

For decades, Dibrom® Concentrate and Trumpet® EC have been the known as the premier aerial adulticides after disastrous hurricanes occur. The fact is that these products effectively control nuisance and disease vectoring mosquitoes all season long. Contact your AMVAC/AEP distributor today or AMVAC at 1-888-GO AMVAC (1-888-462-6822) and visit www.amvac-chemical.com.
Efforts to obtain a Senate floor vote on HR 872, the “Reducing Regulatory Burdens Act of 2011” continue apace. As you are aware, Senator Barbara Boxer (D-CA), preventing a debate and a floor vote on the measure, has put this bipartisan piece of legislation on a procedural hold. Senator Harry Reid (D-NV), the Senate Majority Leader, has not decided, as yet, to schedule a vote and is not likely to until a majority of the Senate Democrat Caucus, to whom he is beholden, decides that a vote is needed. A bipartisan letter, signed by 14 Republican and 11 Democrat senators, urging Senator Reid to bring HR 872 to a vote has been, to date, to no avail.

A number of efforts to engage Senator Boxer, encouraging her to release her “hold” on the bill have met with some success. In a classic move that got inside Senator Boxer’s “decision loop,” Deborah Bass, from the Contra Costa Mosquito and Vector Control District, penned a release calling into question the procedural hold that was picked up by local news media. Once published, it went viral through social networking media. This was a beautiful illustration of the power of social media to shape strategy and should be a lesson to us all in harnessing this means of rapid communication to promulgate our message.

Unfortunately, Senator Boxer’s rebuttal was fraught with inaccuracy, eg, “EPA allows pesticide spraying to combat diseases such as the West Nile virus, and no change in federal law is required to ensure that the public is protected. In fact, EPA allows immediate spraying of pesticides to address public health emergencies even without a permit. I believe we must protect public health as our top priority, and current law does just that.” Seeking to correct these inaccurate statements concerning HR 872, I sent a letter to the editor that stated the facts of the case. It was not printed. Fortunately, during the AMCA Annual Conference in Austin, the initiative to have an accurate rebuttal to Senator Boxer’s assertions was taken up by the AMCA Board of Directors and I met with Thomas Buckley, a trustee having communications experience, and we penned the following for publication in the Desert Sun Times in Palm Springs, Senator Boxer’s new residence:

“One year ago, a bill designed to help protect the public from mosquito-borne diseases like West Nile and Encephalitis passed the House of Representatives with broad bipartisan support. The same bill, known as HR 872 (the Reducing Regulatory Burdens Act of 2011) already has broad bipartisan support in the Senate. So why has this bill – a bill that will save lives and save tax dollars to boot – not been made into law yet?”

Three words: Senator Barbara Boxer.

Despite the pledges of support for the bill’s passage through the Senate of significant majority of her colleagues – Democrat and Republican – Senator Boxer has sadly blocked the bill from reaching the Senate floor for either a debate or a vote.

The bill itself is not complex – it simply codifies the regulatory practices which have been adhered to by public health mosquito control agencies across the country for decades. The bill specifically exempts public health agencies from having to get a costly and restrictive NPDES (National Pollutant Discharge Elimination System) permit in order to apply life saving insecticides. The compounds currently used by mosquito control agencies to eliminate mosquitoes (the deadliest animal on the planet, actually) are already thoroughly investigated and vetted for safety and efficacy by a whole host of state and federal agencies; demanding that public health agencies essentially get yet another piece of paper (an expensive piece of paper – at least $500,000 per year in California alone) that will not actually protect a single species or a single acre of habitat is not only pointless but also a particularly glaring example of duplicative federal regulatory overreach.
Your Leader in Aerial Mosquito Abatement Insurance

Aerial mosquito abatement requires specialized insurance knowledge. NationAir has provided coverage in this area for more than three decades, so we understand the details and issues related to your business. As the leader in private aviation insurance services, we provide you with expert advice on maximizing your coverage at the most competitive rates. We’ve written 95 percent of the clients we’ve had the opportunity to quote!

Mosquito abatement policies can be customized to provide specific coverage to all your business needs, including fixed wing and rotor wing aircraft, as well as general liability. We stand ready to improve your program today!

To learn more, contact
Bob Cox
800-327-2222
rcox@nationair.com

www.nationair.com

So why the hold up? Senator Boxer suggests that no change in Federal law – ie, the passage of 872 – is necessary to protect public health. In reality, though, federal law was changed by a court decision that occurred over 3 years ago and altered the clear Congressional intent that had been in place since the early 1970s. The passage of 872 would essentially reiterate the original intent and continue the longstanding and proven safe practices.

The bill not only has broad support in Congress, but overwhelming public support. Organizations from the American Mosquito Control Association to the National Association of Farm Bureaus have been working doggedly to ensure its passage, only to come up against this seemingly inexplicable opposition. This intransigence has not only held up the actual vote on the bill, but it has even blocked any Senate debate on the issue.

We urge the public to learn more about the bill and talk to their elected representatives about it (you can “Google” HR 872 or go to www.mosquito.org for more information).

We would also urge the Senator – whom we know shares our concern for the health of our citizens and the environment – to reconsider her position and allow those of us in the public health field to get back to doing what we do best – protecting the public.”

Joseph Conlon
National Technical Advisor AMCA
conlonamcata@gmail.com

The more we can force Senator Boxer to respond to public comment, the more light can be shed on the issue and the more pressure can eventually be brought to have her release the “hold” – at least that’s the strategy. In this way, we seize the initiative, controlling the narrative. Hopefully, this will become enough of an irritant to force some movement on the issue, or at least compel a public discussion wherein both sides can explain their rationales. We’ll see.

At any rate, ambiguities about the permit remain, despite EPA’s attempt to explain them. For instance, applicators are still unsure as to whether applying mosquitocides in a ditch...
connected to a body of water or applications of pesticides to an intermittent stream when it is dry requires an NOI (Notice of Intent). According to EPA, the answer is “no” in both instances.

Nonetheless, concerns remain because of several Agency initiatives involving potential increases in the number of projects and number of waters subject to Clean Water Act jurisdiction. For instance, the House Science, Space, and Technology Committee has just asked the Environmental Protection Agency to provide more information about an EPA draft study of biological, chemical and physical connections between ephemeral, perennial, and intermittent waters and wetlands and larger navigable waters. This study is being reviewed at the same time that the White House Office of Management and Budget (OMB) has begun reviewing Clean Water Protection Guidance, which was developed jointly by EPA and the US Army Corps of Engineers to clarify the scope of federal protection over US waters. As proposed in May 2011, the guidance would expand federal jurisdiction and permitting requirements to include many intermittent and ephemeral streams and wetlands not covered. Such OMB reviews are generally required to be completed within 90 days but the final guidance could be released within the next 30 days.

The guidance, crafted jointly with the Army Corps of Engineers, is expected to generally expand CWA jurisdiction over tributaries to traditionally navigable waters, wetlands adjacent to those tributaries and other marginal waters by offering a new interpretation of when discharges to these waters are subject to regulation. The proposed joint guidance was issued after years of confusion over how to interpret two US Supreme Court decisions on what constitutes waters of the United States and after previous guidance attempted to interpret these cases [Solid Waste Agency of Northern Cook County v US Army Corps of Engineers (SWANCC), 531 US 159, 51 ERC 1838 (2001); Rapanos v United States, 547 US 715, 62 ERC 1481 (2006)]. Justice Antonin Scalia stated that only “relatively permanent” waters that hold a “continuous surface connection” to a traditionally navigable water of the United States can be considered jurisdictional, whereas Justice Anthony Kennedy opined that waters sharing a “significant nexus” with jurisdictional water bodies can be subject to CWA regulations as well. As you can see, it needs clarification and, in my view, a narrow interpretation.

Muddying the waters, so to speak, even further is the remarkable variation in state permits when compared to the EPA Pesticide General Permit (PGP). This may prove problematic if legal challenges are forthcoming. According to Rebeckah Adcock, senior director of government affairs for CropLife America, if a citizen’s lawsuit alleges that a state’s permit is not the equivalent of the PGP, the EPA has indicated that “that’s your permit and you’re going to have to defend it.” She thinks it will take longer than the February 29 beginning of enforcement for suits to surface, and I agree, “because the activist community will want to seek out states and/or patterns in a particular case that work most in their favor.”

As of the date of this writing, Charles Tebbutt, the attorney whose suit forced EPA to issue the permit, would not indicate whether he or other environmentalists will sue either the states, districts or EPA. Nevertheless, Tebbutt has stated that “...the EPA pesticide permit is very weak, and say at this point very much favors industry.” Tebbutt remains unconvinced that increased resource requirements to meet the NPDES mandates will adversely affect the provision of vector control services, echoing other activists opinions that says those fears are baseless. Pest control methods are broader than pesticide application, he says, and in cases where pest control districts have been compelled to limit their use of pesticides, the impacts on human health or the spread of disease have been negligible. “The whole thing with West Nile virus and the ability to spray or not is really just fear mongering,” Tebbutt said. “Again, this is the chemical industry driving the process so they don’t lose sales, is the basic fact here.”

Welcome to the activist mindset and rationale for imposition of the NPDES. You’d better hope and work to see that HR 872 gets debated and passed, for activist attorneys will no doubt inexorably push for increasingly restrictive regulation – and judicial interpretations are the means to get it.

Joseph M Conlon
AMCA Technical Advisor
conlonamcata@gmail.com
1500 Millbrook Court
Fleming Island, FL 32003
904-215-3008
Electronic Data Solutions provides complete solutions for recording, mapping, managing, and reporting data for all sizes of mosquito control operations.

**Introducing Our New Generation Software**

**FieldSeeker**
For Mosquito Control

*Esri® ArcGIS® for Server, ArcGIS® for Mobile and web applications.*

**Sentinel**
Applications based on *Esri® ArcGIS® for Desktop and ArcPad® Software.*

**Integrates Adulticide • Larvicide • Surveillance • Service Request**

Applications based on *Esri® ArcGIS® for Desktop and ArcPad® Software.*

**Powerful.**
Ready-to-use applications built on core *Esri® ArcGIS® platform leveraging advances in web, mobile computing, and cloud technology.

**Dedicated.**
We’ve been supplying and supporting field data collection solutions for over 25 years.

**Proven.**
Our software is used at over 250 mosquito control agencies in the U.S. and Canada.

Dedicated.
We’ve been supplying and supporting field data collection solutions for over 25 years.

Proven.
Our software is used at over 250 mosquito control agencies in the U.S. and Canada.

Electronic Data Solutions
208-324-8006  |  Call for a demo today!  |  www.elecdata.com

In partnership with: Juniper Systems® Inc., Field Computers, Esri® GIS Software and Trimble® GPS Receivers

Sentinel GIS Sales Representatives: Univar USA and Clarke  -  FieldSeeker GIS Sales Representative: Clarke

Copyright 2011© by Field Data Solutions, Inc. All rights reserved worldwide. DataPlus, HydroPlus, VCMS, Vector Control Management System, FIELDBRIDGE and Electronic Data Solutions are registered trademarks of Field Data Solutions, Inc. FieldSeeker and DataLink are recognized trademark for Field Data Solutions, Inc. Trademarks provided under license from Esri. All other trademarks are registered or recognized trademarks of their respective owners.
WHAT IS THE PRICE FOR PEACE OF MIND?

Having a Contingency Emergency Aerial Contract in place for any type of emergency mosquito control application is priceless. Being prepared brings confidence that you have taken a proactive approach in protecting public health.

No other contract team has done more aerial applications than Clarke and Dynamic Aviation. With a contingency contract in place you’ll have the support of an expert team and a quality plan that includes preliminary area mapping, a pre-approved FAA plan, public notification procedures, appropriate licenses and certificate of insurance (with additionally insured clause) completed and on file.

The best part….there is no cost for a contingency plan.

To learn more about securing peace of mind for your program give us a call at 1-800-323-5727 or email your request to clarke@clarke.com.