

ANNUAL REPORT: AMCA'S 2007 PESP WORKING GROUP ACTIVITIES

The following report summarizes the American Mosquito Control Association's (AMCA) Pesticide Environmental Stewardship Program (PESP) activities during 2007 by "PESP partners under the AMCA's auspices". These are the regional Florida Mosquito Control Association (FMCA), Louisiana Mosquito Control Association (LMCA), Mosquito and Vector Control Association of California (MVCAC), North Carolina Mosquito and Vector Control Association (NCMVCA), New Jersey Mosquito Control Association (NJMCA), Northeastern Mosquito Control Association (NEMCA), and the Northwest Mosquito and Vector Control Association (NWMVCA). The reports of four individual "PESP partners under the AMCA's auspices" are part of the regional reports for their areas, and therefore are not reported separately. These are the Indian River (Florida) Mosquito Control District, the Pasco County (Florida) Mosquito Control District, the Cape Cod (Massachusetts) Mosquito Control Project, and the Central Massachusetts Mosquito Control Project. Teton County (Wyoming) Mosquito Abatement (TCMA), the fifth Individual Partner, does not report to a regional partner and its activities are presented here separately.

GOAL 1 & TACTICS: WORKING WITH MANAGERS OF PUBLIC LANDS. As part of our IMM approach, the AMCA will work with managers of public lands to implement focused and environmentally sound intervention strategies to control mosquitoes. These activities will typically include appropriate source reduction and the use of biopesticides to control mosquitoes early in their life cycle. In some cases, highly focused applications of adulticides directed at specific mosquito populations may be required. These IMM strategies will prevent mosquitoes from developing and dispersing from public lands. The overriding goal in selecting strategies will be to reduce the risk of disease transmission by intervening at critical points in the mosquito life cycle. "PESP partners under AMCA's auspices" will describe their IMM projects on public lands; list the number of acres under source reduction, surveyed, and/or targeted for pesticide applications; and summarize the outcomes. The EPA can support our efforts by encouraging public land management agencies to work with mosquito agencies to develop IMM strategies to resolve control issues. More IMM projects will help document the long term success of these efforts.

1.1 QUESTION ONE: DESCRIPTIONS OF IMM PROJECTS ON PUBLIC LANDS

1.2 QUESTION TWO: ACRES UNDER SOURCE REDUCTION (1.2.1), ACRES SURVEYED (1.2.2), ACRES TARGETED (1.2.3)

1.3 QUESTION THREE: OUTCOMES OF IMM PROJECTS ON PUBLIC LANDS

FMCA 01:

1.1 The Indian River Mosquito Control District (IRMCD, Vero Beach, FL) works cooperatively with the U.S. Fish and Wildlife Service (USFWS) on their Pelican Island National Wildlife Refuge (PINWR). Similarly, the Brevard County Mosquito Control District (BCMCD, Titusville, FL) works in conjunction with the Merritt Island National Wildlife Refuge (MINWR) in the management of their refuge impoundments, many of which are managed both for wildlife and mosquito control objectives. In both of these east-central Florida locations, this work includes targeted salt-marsh mosquito larviciding, primarily with Bti on refuge salt marshes, when needed. At the PINWR in Indian River County, as part of these cooperative efforts, each year during the Winter/Spring months, IRMCD manages one of their impoundments for wading bird feeding opportunities. At the

MINWR in Brevard County, some impoundments are managed annually for waterfowl habitat enhancement.

1.3 Source reduction on PINWR lands has reduced mosquito breeding which has led to less need for insecticides. This is evident in nearby non-impounded areas which typically require 10-15 aerial larviciding treatments per year. In addition, larviciding in non-impounded refuge lands has reduced adulticiding needs in nearby communities.

FMCA 02:

1.1 For the past several years, the Florida Keys Mosquito Control District has coordinated with the USFWS on mosquito control management within their District. In particular, through mark-release-recapture studies, they demonstrated that salt-marsh mosquitoes produced on federal lands (particular islands) were flying to residential areas. At times, these mosquitoes were responsible for the extremely high biting rates measured in the residential locations. As a solution, aerial larviciding with Bti has been allowed on some refuge islands leading to reduced adulticiding in the nearby residential areas.

1.3 The initiation of aerial larviciding on refuge islands in areas of the Florida Keys has resulted in a greatly decreased need for adulticiding in nearby residential communities.

FMCA 03:

1.1. Throughout the State, mosquito control agencies work with the Florida Department of Environmental Protection (FDEP) on mosquito control management for State-owned lands. This is accomplished through the development of an Arthropod Control Plan by the mosquito control office which then must be approved by FDEP. These plans typically incorporate an IMM (Integrated Mosquito Management) approach, encouraging the use of source reduction and larviciding, rather than adulticiding.

1.3 By adhering to FDEP-administered Arthropod Control Plans on State-owned lands which allow the use of Bti and the insect growth regulator methoprene (Altosid), adulticiding treatments are not necessary in many locations.

FMCA COMBINED RESULTS:

1.2.1 Acres of source reduction: approximately 30,000 acres

1.2.2 Acres under larval surveillance: approximately 60,000 acres

1.2.3 Acres with targeted applications: approximately 60,000 acres

LMCA 01:

1.1 Livingston Parish MAD Mosquito Control at Tickfaw State Park. Seasonal control of mosquitoes is necessary to protect park patrons from both disease-bearing and nuisance mosquitoes.

1.3 Despite an ongoing gate access issue, adulticiding applications of mostly nuisance mosquitoes were always productive. Mosquito control was welcomed by the patrons, who could consequently enjoy the park without being plagued by mosquitoes.

LMCA02:

1.1 State Police Emergency Response Camp Mosquito Control. This is an inner city youth camp which had a mosquito control problem.

1.3 Adulticiding during early mornings for an 8-week fostered a very positive working relationship with a large State agency.

LMCA03:

1.1 The City of New Orleans is still working in a post-disaster environment. Unattended swimming pools and ponds, as actual and potential mosquito nuisance and disease-vector production sites, posed a major threat to post-Katrina redevelopment efforts. They needed to be located and appropriate IMM (Integrated Mosquito Management) techniques applied.

1.2 Nearly 6000 unattended swimming pools and ponds were found, inspected, and treated as required. The sites were often filled with debris. Pools which contained mosquito larvae during inspections were treated with the biological pesticide *Bacillus sphaericus* (VectoLex®) and mosquito fish (*Gambusia*) were introduced. The application of *Bacillus sphaericus* is a relatively short-term control technique which is generally effective as long as mosquito larvae are present. Introducing *Gambusia* is a long-term biological control technique. These fish eat mosquito larvae and pupae, interrupting the mosquito life cycle. They may also eat other fish, aquatic insects, plants, frog eggs, and invertebrates, allowing them to survive when mosquito larvae are not present. Mosquito fish were also introduced as a pre-emptive measure into pools and ponds that were not breeding mosquitoes. The overall estimated survival rate of the fish during the cool months of December 2005 through April 2006 was about 90%, and the survival rate in the following warmer months was estimated at over 98%. The IMM technique of using a biopesticide for immediate control in combination with mosquito fish for long-term biological control has eliminated most backyard swimming pools and ponds as mosquito production sites in post-Katrina New Orleans.

LMCA 04:

1.1 Integrated Mosquito Management by Iberia Parish MAD at Lake Fausse Pointe State Park. Mosquito control is necessary both within the park and in adjacent communities.

1.3 Both larval and adult mosquito surveillance techniques were used to justify and to pinpoint mosquito control activities within the park and in the surrounding area. Finding mosquito larvae within the park area led to applications of biorational pesticides. Adult landing counts and trap counts within and adjacent to the park led to specific adult mosquito control applications. The IMM

approach of surveillance, in combination with targeted applications, produced marked reductions in larval counts, adult mosquito trap counts, and the number of requests for adult mosquito control in communities adjacent to the Park.

LMCA COMBINED RESULTS:

1.2.1 Acres of source reduction: (LMCA03) 50

1.2.2 Acres under larval surveillance: (LMCA03) 100,000; (LMCA04) 5,280

1.2.3 Acres with targeted applications: (LMCA01&02) 60; (LMCA03) 100,000; (LMCA04) 6,000

LMCA ADDITIONAL INFORMATION: The purpose of these projects is to curtail mosquito population numbers and reduce the potential risk of exposure to mosquito vectors for citizens and visitors alike.

MVCAC 01:

1.1 California's Alameda County Mosquito Abatement District has ongoing source reduction activities that involve maintaining water circulation ditches on both U.S. Fish & Wildlife Service and California Fish & Game refuges.

1.2.1 Acres of source reduction: total floodable acreage involved is 9000+ acres.

1.2.2 Acres under larval surveillance: 1000+ acres.

1.2.3 Acres with targeted applications: 1000+ acres.

1.3 Since ditches are widespread and their maintenance is an annual activity, quantifying an overall population reduction is difficult when sampling abundance without an extensive mosquito trapping grid. However, at one trap site, mosquito counts decreased from a high of 9,000 per trap night to around 50 per trap night in conjunction with nearby ditch maintenance.

MVCAC 02:

1.1 California's Coachella Valley Mosquito & Vector Control Association (CVMVCD) has ongoing source reduction programs in cooperation with local government entities: Valley Sanitation District (15.2 acres); Cook Street, Palm Desert Waste Water Treatment Facility (90 acres); Mesquite St., Palm Springs Waste Water Treatment Facility (40 acres); the White Water Channel between Cook and Fred Waring streets (200 acres); and Coachella Valley Water District's (CVWD) Agricultural Drainage Channels 9S & 9E (400 acres).

1.2 (as above)

1.3 These projects involved water and vegetation management and the use of biorational mosquito larvicides. They required the cooperation of the land managing agencies. CVWD did the source reduction work in their drainage channels after a plan was developed with the CVMVCD.

MVCAC 03:

1.1 California's Riverside County Department of Environmental Health Vector Control Program (RCDEHVCP) and the California Department of Fish & Game (CDFG) have for several years cooperated on an IMM plan for San Jacinto Wildlife Refuge (SJWR). About 400 (4%) of SJWR's 10,000 acres are wetland habitats utilized by waterfowl and other riparian species. The CDFG monitors the wetlands and controls vegetation growth so that the environmentally friendly mosquito larvicides *Bacillus thuringiensis israelensis* (Bti) and *Bacillus sphaericus* (B. sphaericus) will function better. CDFG's aggressive rotational flooding schedule for ponds and other wetland areas plays a vital role in reducing mosquito populations. They notify RCDEHVCP prior to flooding so that sites may be pretreated with mosquito larvicides using ground or aerial application equipment. Aerial pretreatments with granular Bti formulations were made in June 2006 (about 500 acres) and in May 2007 (about 150 acres). The RCDEHVCP aggressively conducts surveillance, larviciding, and ultra-low volume (ULV) adulticiding (when required) within the wetland areas. Flooded areas are inspected weekly. All surveillance data, areas to be treated, and product information are reviewed with the CDFG senior biologist prior to any pesticide applications. In addition, public notice is given at least 48 hours prior to any adult control activities. Surveillance activities include the use CO2 baited CDC traps to monitor the occurrence of blood seeking female mosquitoes, analyses of blood samples drawn from sentinel chickens to warn of local disease transmission, and genetic analyses of pooled live mosquito samples to estimate Minimum Infection Rates (MIRs). Wetlands are surveyed weekly for mosquito larvae which are spot-treated with Bti, Bs, or a combination of both where counts exceed normal levels. Larvicided sites usually vary in size from 50 to 100 acres. When adult mosquito population densities, MIR's, and sentinel chicken sero-conversion rates are high, specific sites are targeted to receive an adult control agent delivered with a truck-mounted ULV aerosol generator. These limited applications reduce the exposure of non-target species to the adulticide.

1.2.1 Acres of source reduction: 400 maximum determined annually by CDFG.

1.2.2 Acres under larval surveillance: 400 maximum.

1.2.3 Acres with targeted applications: 400 maximum.

1.3 Measuring overall population reductions at SJWR as a result of CDFG water and vegetation manipulations is difficult. Larval counts, obtained using a standard 250 ml dipper, are typically reduced from 10-100 per dip to 1-5 per dip after Bti and B. sphaericus applications. Targeted adult control is also successful when required, with pretreatment trap counts of 3,000 to 5,000 per trap night dropping to 300 to 1,000 after ULV applications. Early spring aerial larvicide applications were used to retard normal warm weather mosquito population increases when it was likely that virus was present in over-wintering adult mosquitoes. Further research on the efficacy of this tactic is needed.

MVCAC 04:

1.1 Three substantial sites subject to vegetation and water manipulations for mosquito control are subject to a Southern California Master Plan.

- 1.2.1** Acres of source reduction: 200
- 1.2.2** Acres under larval surveillance: 1,736
- 1.2.3** Acres with targeted applications: 1,736

1.3 Larval control success for seventy-eight (78) individual projects at the three sites was measured at 75%-100%.

MVCAC 05:

1.1 California's Marin & Sonoma County Mosquito & Vector Abatement Districts' (MSMVCD) collaborative efforts with the California Department of Fish & Game (CDFG) to control mosquitoes on the Grizzly Island Wildlife Refuge (GIWR). Mosquito Abatement Districts to provide men and equipment to perform maintenance work on 2700 lineal feet of ditches. The GIWR Joice Island Unit Pond D is to be flooded and subsequently drained for larval control

- 1.2.1** Acres of source reduction: 327 at Pond D only.
- 1.2.2** Acres under larval surveillance: 18,000.
- 1.2.3** Acres with targeted applications: 3,280.

1.3 No evaluation data are currently available as the site was flooded late and has not yet been drained to reduce larval densities. Aerial treatment was required on 220 acres. More information will be available during fall 2008. It has been the goal of the Solano County, Mosquito Abatement District (MAD) to find ways to reduce the amount of chemical applications made on the Grizzly Island Wildlife Refuge when-ever possible. The decreasing buffer between residential developments and the GIWR in conjunction with the arrival of West Nile Virus has made this an ever-increasing challenge. The advent of AB1982 Funding is an important part accomplishing this endeavor. The Solano MAD has worked cooperatively with staff and management of the Grizzly Island Wildlife Area in efforts to minimize mosquito production through water management when-ever possible. Work was done under AB1982 Funding for Best Management Practices on CDFG Properties.

MVCAC 06:

1.1 California's Marin & Sonoma County Mosquito & Vector Abatement District (MSMVCD) also has begun a number of other collaborative efforts. These include:

1.1.1 Working with the USFWS on two tidal wetland projects within the San Pablo Bay Wildlife Refuge. The goal of each project is to enhance wetlands and habitat value while also minimizing mosquito production and the need for multiple applications of mosquito larvicides.

1.1.2 Working with Sonoma County Regional Parks to develop short and long term management plans for Tolay Lake Regional Park (approximately 1,700 acres). The primary goal is to minimize mosquito production and the potential for public health issues.

1.1.3 Working with the California Department of Fish and Game to minimize mosquito production in the Napa-Sonoma Marshes. Current projects involve circulation channel maintenance in tidal marshes, plus vegetation and water management in seasonal wetlands.

1.1.4 Working with the Sonoma Land Trust toward integrated mosquito management at the Sears Point restoration Project, (approximately 2,300 acres including tidal and seasonal wetland restoration) and North Parcel seasonal wetlands. These projects include water and vegetation management, mosquito larviciding, and mosquito source reduction as needed to control mosquito populations.

1.1.5 Working with the California Coastal Conservancy to control mosquito populations in the Sonoma Baylands and Bel Marin Keys. The Coastal Conservancy, MSMVCD, and the Army Corps of Engineers are collaborating on the Hamilton Wetland Restoration Project, implementing integrated mosquito management, and minimizing the potential for public health issues.

1.2.1 Acres of source reduction: Not yet researched & measured

1.2.2 Acres under larval control: Not yet researched & measured

1.2.3 Acres with targeted applications: Not yet researched & measured

1.3 These five projects are relatively new and ongoing. Measurements of public land acreage involved will require additional extensive research. MSMVCD conducts mosquito surveillance over many thousand(s) of acres. Each project reduces mosquito populations and the potential need for mosquito adulticides. Without interagency cooperation and collaboration, adult mosquito populations and public service requests would undoubtedly increase substantially. The projects also greatly reduce the potential for public health issues.

NCMVCA 01:

1.1 The US Army Corps of Engineers (COE), Wilmington District, works closely with and funds local mosquito control on COE managed lands in Brunswick and New Hanover Counties, North Carolina.

1.2.1 Acres of source reduction: 1800

1.2.2 Acres under larval surveillance: 1800

1.2.3 Acres with targeted applications: Varies due to weather conditions and flooding for maintenance dredging. Summer of 2007 was record drought year in NC and very little mosquito control work was performed.

1.3 This is an ongoing project. About 1800 acres are surveyed and treated. Using larvicides, water management and biological control with larvivorous fish, has dramatically reduced the need for adulticiding in and near the city of Wilmington and adjacent areas. Cooperation of the COE with local agencies in funding, site access and water management during dredging have led to the reductions. Little adulticiding is now needed in these areas.

NEMCA 01:

1.1 Massachusetts, Quincy - Open Marsh Water Management. An effort was made to reduce and/or eliminate larval development of mosquitoes in selected salt marshes in and near the city of Quincy.

1.3 Sources of larval development reduced dramatically and/or modified for easy access of predatory fish. Actual reductions will be verified following additional surveillance over the next few seasons.

NEMCA 02:

Massachusetts' Mashpee National Wildlife Refuge – drainage maintenance. Cape Cod Mosquito Control conducted maintenance on a drainage system through the refuge to allow predatory fish access to flooded wetlands owned by the Town of Mashpee.

1.3 Due to improved access for natural predators as well as the increased flow through the system larvicide did not need to be applied at this site in 2007.

NEMCA 03:

1.1 Massachusetts, Cape Cod – Biopesticide use to control arbovirus vectors. The Cape Cod Mosquito Control Project used methoprene briquettes and *Bacillus sphaericus* packets in rain catch basins and manmade retention/detention basins to control *Culex pipiens* and *Culex restuans* mosquitoes. These two species are the local vectors of West Nile Virus and the effort was to reduce/prevent West Nile Virus build up and transmission in the Cape Cod area.

1.3 The results are difficult to quantify other than to verify no human West Nile Virus cases were reported in or near the managed areas.

NEMCA COMBINED RESULTS:

1.2.1 Acres of source reduction: > 200 acres

1.2.2 Acres under larval surveillance: > 50,000 acres

1.2.3 Acres with targeted applications: > 10,000 acres

NJMCA 01:

1.1 Twelve projects, maintenance or restorative in origin, are conducted by county mosquito control agencies in cooperation with the New Jersey Department of Environmental Protection (NJDEP), the US Fish & Wildlife Service (USFWS), or other county agencies.

1.3 Although some projects are still ongoing, Open Marsh Water Management and stream de-snagging projects have reduced larval habitat, restored tidal flow, and reduced, or even eliminated, the need for larvicidal applications and adult mosquito spraying.

NJMCA 02:

1.1 Thousands of acres of ditches, storm drains, and streams are regularly cleaned by the 21 county mosquito control agencies to reduce larval habitat, flooding, and subsequent pesticide use. Thousands of predatory fish are also stocked annually by various counties under NJDEP Fish & Wildlife Division guidelines.

1.3 Substantial reduction of larval habitat in man-made drainage structures, some reduction in natural drainage corridors, and reduced flooding have been observed.

NJMCA 03:

1.1 Two pesticide efficacy evaluation studies (with Duet adulticide, & Aquabac-400 larvicide) and one cooperative tire removal project were conducted during 2007.

1.3 The lowest efficacy levels of the two pesticides were established. A total of 48 tons of tires, which constituted mosquito habitat, were eliminated.

NJMCA COMBINED RESULTS:

1.2.1 Acres of source reduction: 3,861

1.2.2 Acres under larval surveillance: 133,706

1.2.3 Acres with targeted applications: 38, 510

NWMVCA 01:

1.1 In cooperation with the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Bti was used to manage mosquitoes on a CTUIR wildlife refuge. Bti also was used on state and federal lands.

1.3 Mosquitoes in these areas were reduced to tolerable level for the residents affected by them.

NWMVCA 02:

1.1 To improve the effectiveness and efficiency of mosquito larval management, a GPS/GIS Operational Database for Hand Held Recon computers is being developed for field personnel.

1.3 The GPS/GIS database was not completed until the end of the 2007. It will be used and evaluated in 2008

NWMVCA 03:

1.1 Larval mosquito control in wetlands using contracted aerial applicators was initiated to reduce the need for adult mosquito management.

1.3 Aerial larviciding reduced adult control by 20% during 2007. In 2008, our aerial larviciding will be increased in anticipation of even greater reductions in adult control.

NWMVCA 04:

1.1 Oregon’s Department of Fish and Wildlife (ODFW) – Area Mitigation Project. To reduce larval breeding sites and adult harborage, the ODFW removed cattails, deepened ponds, and cleared Russian olive trees from adjacent areas.

1.3 The project resulted in a 50% reduction in adult mosquito numbers from pre-completion trap counts.

NWMVCA COMBINED RESULTS

1.2.1 Acres of source reduction: 1,500

1.2.2 Acres under larval surveillance: 43,900

1.2.3 Acres with targeted applications: 12,578

TCMA 01:

1.1 Teton County (Wyoming) Mosquito Abatement has three public land entities in its district. They are Yellowstone National Park, Grand Teton National Park and the Elk Refugee. These sites currently only allow surveillance for WNV on their property

GOAL 2 & TACTICS: TRAINING MOSQUITO CONTROL WORKERS. The AMCA believes that the best way to reduce pesticide risk is through continuous education of mosquito control staff on pesticide use and safety. Numerous states have educational programs which lead to certifying workers as proficient in "Public Health Pest Control" (or similar title). The AMCA strongly encourages implementing and enhancing such education/certification programs. “PESP partners under the AMCA’s auspices” will submit annual reports detailing the number of workers that received training, the type of training received, the number of “certified workers”, the number of new “certified workers”, and additional pertinent information. The data should indicate trends in training and certification. The EPA could help by providing and distributing educational information on pesticide use and safety and by providing speakers on these subjects at regional and state mosquito control meetings.

2.1 QUESTION ONE: NUMBER OF WORKERS RECEIVING MOSQUITO CONTROL TRAINING

FMCA	450 (DODD Short Courses)
LMCA	79

MVCAC	816 (at least)
NCMVCA	380
NEMCA	381
NJMCA	216
NWMVCA	59
TCMA	5

2.2 QUESTION TWO: TYPE OF TRAINING RECEIVED (SEE 2.2.1 -2.2.5 BELOW)

2.2.1 NUMBER ATTENDING RECERTIFICATION (REGIONAL) TRAINING

LMCA	52
MVCAC	YES
NCMVCA	120
NEMCA	31
NJMCA	137
NWMVCA	24
TCMA	3

2.2.2 NUMBER ATTENDING STATE ANNUAL CONFERENCE

FMCA	220
LMCA	189
MVCAC	YES
NCMVCA	105
NEMCA	160
NJMCA	107
NWMVCA	8
TCMA	3

2.2.3 NUMBER ATTENDING REGIONAL ANNUAL CONFERENCE

MVCAC	YES
NCMVCA	12
NEMCA	261
NJMCA	17
NWMVCA	11
TCMA	3

2.2.4 NUMBER ATTENDING NATIONAL ANNUAL CONFERENCE

FMCA	310
LMCA	14
MVCAC	YES

NCMVCA	6
NEMCA	5
NJMCA	14
NWMVCA	7
TCMA	3

2.2.5 NUMBER ATTENDING PERTINENT COLLEGE COURSES

FMCA	YES – Number Unknown
LMCA	2
MVCAC	YES – Number Unknown
NCMVCA	YES – Number Unknown
NEMCA	14
NJMCA	7
NWMVCA	1

2.2.6 NUMBER ATTENDING SPECIAL TRAINING SESSIONS/OTHER

LMCA	47
MVCAC	YES
NCMVCA	300
NEMCA	35
NJMCA	67
NWMVCA	49
TCMA	3

2.3 QUESTION THREE: NUMBER OF CERTIFIED WORKERS (CERTIFICATIONS)

FMCA	1394
LMCA	67
MVCAC	1243
NCMVCA	522
NEMCA	119
NJMCA	145
NWMVCA	60
TCMA	5

2.4 QUESTION FOUR: NUMBER OF NEW CERTIFIED WORKERS (NEW CERTIFICATIONS)

FMCA	95
LMCA	9
MVCAC	42
NCMVCA	7

NEMCA	30
NJMCA	5
NWMVCA	21
TCMA	2

2.5 QUESTION FIVE: ADDITIONAL INFORMATION

FMCA: Approximate 20 training opportunities, approved for Continuing Education Units for Public Health Pest Control, were provided during 2007. Totals of 127 Workers hold the Public Health Aerial License, and 89 PHPC License holders also have passed the Florida Director's Exam.

LMCA: Training in Louisiana continues through the LMCA annual workshop, LMCA Annual Meeting, University classes, and in-house training. In-house training has been conducted on calibration, a variety of insect biology (mosquitoes, ants, termites, spiders, bees, general entomology and rodents). Training opportunities have also diversified during the year as well. Many mosquito control workers have taken National Incident Management Systems (NIMS) courses required by FEMA. Additional courses were taken in Rodent Control, Community Public Health, Industrial Pest, and Right-of-Way.

MVCAC: Only mosquito control technicians were counted among those who received formalized training over the past year. "At least" was used indicating there might have been some turnover in staff and the number might have been larger at the beginning of the year. There may have been a number of Limited Public Health Vector Control Technicians in non-mandatory attendance. Data are not available for numbers attending the various types of training, and all types are utilized in counts. There were 854 Certified Public Health Vector Control Technicians and 389 Limited Public Health Vector Control Technicians in California during 2007.

NEMCA: Workers attended the following training programs: the Northeastern Mosquito Control Association annual meeting and University of Massachusetts courses for recertification. Four workers are taking college courses, one is working on master's degree, one is working on a BS, and one is working on a community college environmental science program certificate. In-house technical training included reading labels and msds, Lyme disease avoidance, and instruction on other safety issues. The Pennsylvania Department of Environmental Protection runs special training.

GOAL 3 & TACTICS: DISEASE SURVEILLANCE. Important strides in reducing pesticide risk are achieved through careful surveillance for mosquito-transmitted pathogens of public health significance, e.g., the viruses that cause St. Louis encephalitis, West Nile encephalitis, eastern equine encephalomyelitis, and western equine encephalomyelitis. If a pathogen is discovered through surveillance, appropriate actions can be taken which may include more carefully directed pesticide applications. "PESP partners under the AMCA's auspices" will submit annual reports documenting pathogen surveillance methods, provide overviews of pathogen ecology, and indicate whether pesticides were used to ameliorate conditions. The data will allow an analysis of the relationship between disease surveillance and pesticide applications. The EPA could support more flexible label

language for pesticide applications when mosquito-borne pathogens have been identified by surveillance.

3.1 QUESTION ONE: PATHOGEN SURVEILLANCE METHODS

FMCA: A variety of surveillance techniques were used in Florida during 2007. Vector mosquito populations were monitored with CDC traps (some CO₂ baited); bait cans (with chickens or dry ice), New Jersey traps, gravid traps, suction traps, and truck traps. Mosquito pools were tested for West Nile Virus (WNV) via PCR, VecTest, RAMP test and cell cultures. Sentinel chickens were used in 30+ counties to monitor for SLE, EEE, and WNV. Initial screenings were via HI testing while confirmations were via IgM Elisa and/or serum neutralization tests. Dead wild birds were tested for WNV via PCR and cell culture. Weekly reports were provided by the Florida Department of Health.

LMCA: Members used a cadre of methods in our region. Mist netting wild birds, Modified gravid traps, EVS traps, CDC traps, New Jersey Light traps, landing rate counts, larval counts and dead bird submissions. Sentinel chickens were less utilized as a surveillance tool to monitor mosquito-borne diseases this year for a number of reasons primarily, because humans and chickens show first positives during the same time of the year. Also, concerns with the threat of Asian Bird flu approaching our country. Once mosquitoes taken from traps were pooled by species and results received a calculation of the minimum infection rate (MIR) was done. Typically transmission of WNV to humans began to show up when MIR's were above 6.

MVCAC: California's mosquito and vector control districts monitor mosquitoes, sentinel chickens, and dead birds for virus activity. County and state agencies identify humans, horses, and other animals with mosquito-borne diseases.

District personnel collect mosquitoes using CO₂-baited traps, infusion-baited gravid traps, and with hand-held aspirators. Mosquitoes are anesthetized with triethylamine (TEA), sorted by species and sex, and females are pooled in groups of 5 to 50 and tested for West Nile virus (WNV), western equine encephalomyelitis virus (WEE), and St. Louis encephalitis virus (SLE).

Sentinel chicken flocks (4-15 chickens per flock) are placed in locations with either historical virus activity or with histories of consistent populations of *Culex* spp. mosquitoes. A small quantity of blood is collected either by comb-stick or from a wing vein using a syringe, and the blood is tested for antibodies to WEE and flaviviruses. The majority of samples are tested by the State of California's Viral and Rickettsial Diseases laboratory (VRDL); a few vector control districts conduct an in-house EIA as a preliminary screen; results are confirmed by the VRDL.

The State's WNV Dead Bird Surveillance Program encourages local citizens to report dead birds either on-line (www.westnile.ca.gov) or by telephone (877-WNV-BIRD); birds that are suitable for testing, i.e., dead less than 48 hours, intact, and not obviously dead of traumatic injuries are referred to a local agency for collection and/or testing. Equivocal results are submitted to the State Lab for confirmation. Once WNV is well-established in an area, testing is discontinued but residents are encouraged to continue reporting dead birds to help direct surveillance activities. Non-equine

mammals are also reported to the State's Dead Bird Surveillance Program e.g., squirrels and rabbits. Each District receives a weekly update of all dead birds reported to the WNV Hotline and a listing of the WNV-positive birds from their jurisdictions. Additionally, a password-protected map is available through the State's website that shows the locations of the dead bird reports and the WNV+ dead birds throughout the state.

As new equine cases of WNV are detected, districts receive updates, including date of onset, date of diagnosis, and stable address from the California Dept. of Food & Agriculture. As new human cases of WNV are detected, districts receive updates from our County's Department of Health, which, when possible, includes dates of onset and testing, and the patient's residential address.

NCMVCA: Surveillance consisted of sentinel flocks (20 in 16 North Carolina counties), mosquito pooling (100+ trap nights in 36 counties with about 5,000 mosquitoes trapped and identified to species). The record drought in North Carolina during 2007 dramatically decreased surveillance activities. CO₂-baited CDC light traps yielded only a few mosquitoes per night, often none.

NEMCA: The Connecticut Agricultural Experiment Station performs mosquito surveillance from May-October of each year using CO₂-baited light traps and gravid traps at 91 stations throughout the state with the ability to add more traps/sites as needed. They test all mosquitoes in their lab using vero cell culture for several pathogens including EEE, WNV and SLE. The Connecticut Department of Public Health, in conjunction with the Connecticut Department of Agriculture, monitors domestic animals and humans for mosquito-borne diseases and can test (upon request) dead birds and animals.

In Massachusetts a variety of mosquito traps were used to sample for arbovirus. Trapping methods included light traps, light traps baited with carbon dioxide placed at ground level and canopy level, gravid traps, and resting boxes. Surveillance included the collection & testing of mosquito, avian, equine, human specimens.

The Pennsylvania Department of Environmental Protection and county staff performed mosquito surveillance from April-October, 2007. Over 50,000 collections representing 775,000 specimens were made using larval dippers, gravid traps, CO₂-baited traps, Fay-Prince traps, Mosquito Magnets, aspirations, resting boxes, and BG-Sentinel traps. These surveillance activities enabled Pennsylvania mosquito workers to pinpoint problem areas, which reduced overall pesticide usage. Many of the specimens were tested for WNV, EEE, and/or LaCrosse Encephalitis using RT-PCR. Dead birds were also monitored with corvids and raptors being submitted for testing. Equines and sentinel chickens were tested using ELISA technologies. The Pennsylvania Department of Health tested human serum for the presence of WNV and other arboviruses.

New Hampshire's arbovirus testing for humans includes WNV, EEE, and LE. Depending upon availability of reagents, human specimens may also be tested for LE and Powassan virus. Mammalian, avian, and mosquito samples are tested for WNV and EEE only. New Hampshire does not conduct wild bird serology or sentinel bird testing

NJMCA: Surveillance is largely conducted using gravid traps, light traps, resting boxes, and CO₂ baited traps, as well as hand aspiration in the field. Viral surveillance is accomplished via submission for testing by the NJ Department of Health & Senior Services (PHEL), county laboratories, Rutgers University, and rapid analyte measurement platforms (RAMP) distributed to various county agencies. Two counties report maintaining sentinel bird flocks, and dead wild bird specimens are submitted for testing by all counties when discovered. In some cases live wild bird specimens are also tested.

The infection rate for West Nile virus appears to be declining. Only one human case of WNV was reported statewide in 2007 vs. five in 2006. The number of WNV positive mosquito pools also fell even though the number of pools tested increased overall. The number of positive Triple E mosquito pools, however, increased from one in 2006 to ten in 2007 although no human cases were reported. It remains to be seen whether Triple E, SLE, and especially LaCrosse virus will become a major threat in New Jersey in the near future.

Application decisions were based on the detection of viral pathogens either in collected mosquito pools, dead bird samples or positive results in a sentinel flock. Most applications were conducted via ground-based ULV although a small number of aerial ULV applications were also conducted. The pesticides reported used in response to a disease threat were resmethrin and malathion. About 2,000 acres were reported treated.

TCMA: Teton County Mosquito Abatement monitors mosquitoes for virus activity from April through November each year. Surveillance for mosquitoes is primarily conducted with a variety of CO₂-baited traps and New Jersey light traps. Mosquito pools are tested for WNV with the Response Biomedical RAMP test, and RAMP-positive samples are submitted to a cooperating laboratory at the University of Wyoming for PCR confirmation.

The Wyoming Department of Public Health, which previously had monitored dead birds for WNV, discontinued its support of dead bird reporting and WNV testing. However, TCMA continues to test dead birds that have been reported directly to that organization and that are also in suitable condition for RAMP testing.

3.1.1 NUMBER OF MOSQUITO POOLS TESTED

FMCA	1,767
LMCA	24,886
MVCAC	27,067
NCMVCA	450
NEMCA	46,622
NJMCA	7,062
NWMVCA	2,349
TCMA	225

3.1.2 NUMBER OF SENTINEL FLOCKS MAINTAINED

FMCA	275
LMCA	16
MVCAC	245
NCMVCA	20
NEMCA	4
NJMCA	12
NWMVCA	9

3.1.3 NUMBER OF DEAD BIRDS RECORDED

FMCA	4,569
LMCA	303
MVCAC	31,867
NEMCA	3,731
NJMCA	367
NWMVCA	208
TCMA	1

3.1.4 NUMBER OF DEAD BIRDS TESTED

FMCA	164
LMCA	44
MVCAC	5,852
NEMCA	406
NJMCA	163
NWMVCA	84
TCMA	1

3.1.5 NUMBER OF WILD BIRD SERA TESTED

LMCA	2,576
NJMCA	215

3.1.6 NUMBER OF MAMMALIAN SAMPLES TESTED

MVCAC	544 (212 Squirrels, 332 Horses)
NEMCA	8 veterinary, 292 (Massachusetts) 8 (New Hampshire) human
NWMVCA	2

3.2 QUESTION TWO: OVERVIEW OF PATHOGEN SITUATION

FMCA: When ground or aerial treatments are made, it is usually a local decision, one which is based on surveillance data - sentinel chickens and other animal sera results, vector mosquito population data, etc. During 2007, there wasn't any significant mosquito-transmitted disease threat in Florida. However, most individual mosquito control offices carried out adulticiding (both ground and aerial) totaling several hundred thousand areas treated. The adulticides used primarily included permethrin, naled, and malathion. Larviciding was conducted by many mosquito control offices on a need basis (both ground and aerial). Larvicides used include Bti, methoprene (=Altosid), temephos (=Abate), Agnique, Vectolex (Bs) and Golden Bear Oil.

LMCA: Louisiana experienced an unusually low number of positive mosquitoes and a small number of human cases this year compared to recent past years. In New Orleans, the inspection and treatment of abandoned swimming pools continues to be one of the primary functions of mosquito control personnel in the aftermath of Hurricane Katrina. Over 5000 unattended pools have been inspected and treated by New Orleans Mosquito & Termite Control Board (NOMTCB). As thousands of homes remain unoccupied since the storm, NOMTCB used aerial photos to find and pinpoint new pools which needed larviciding and the introduction of mosquito fish (*Gambusia affinis*). Re-inspection of pools previously treated continues. Pesticide application decisions were based on previous activity as well as WNV positive mosquito pools. Additionally, several other factors were considered such as; Service request, mosquito species and prevalence, time of year and disease cycle. Aerial applications during the year totaled over 500,000 acres treated primarily with Dibrom®. Ground applications during the year totaled over 1.6 million acres treated with Scourge® as the pesticide of choice. Larval treatments were done with Bti and BS products (granular and liquid) for early instars while, Light oils were used for 4th instar and pupae.

MVCAC: Early surveillance and incidence of West Nile Virus indicated that the level of viral activity was approaching that of 2005, the year that the greatest number of human infections occurred in California. This prompted the Governor to issue an emergency proclamation and release funds which were used to enhance the operations of vector control agencies throughout the state. Several vector control agencies used adulticides on their operations; their decision to use them was based on a scientific protocol developed by the State Department of Public Health and vector control agencies.

NCMVCA: For the first time since we have kept records, there were no cases of domestic animal WNV or EEE in North Carolina. Sentinel flocks yielded a few WNV, Highlands J and EEE positive birds, but numbers were far below normal. Blood donor WNV positive humans were detected and two or three frank human cases were reported. Several towns and counties in North Carolina regularly use ground ULV spraying, based on surveillance and public demand. Almost all of the 104 organized mosquito control programs in North Carolina larvicide and do public education work. No acreage estimate is available.

NEMCA: WNV-positive mosquitoes were identified in 15 towns in Connecticut from June 26 to October 3. Eastern equine encephalitis virus (EEEV) was identified in mosquitoes collected in two towns. Six persons have recovered after being diagnosed with WNV-associated illnesses. No human

cases of EEEV have been identified in Connecticut. In Connecticut, a number of WNV-positive pools were showing up in a neighborhood that had significant WNV activity in 2006. Working with the local health department and a private contractor, a neighborhood campaign was conducted and many backyard mosquito-breeding sites were located and eliminated. Ground larviciding (using *Bacillus sphaericus*) was performed in areas that could not be eliminated. Additionally, approx. 40 acres were treated (via ground ULV) with bifenthrin (Telstar) to reduce adult mosquito populations.

In Massachusetts in 2007, 3059 dead birds were reported to the MDPH Arbovirus Surveillance Program. Of the 223 that were tested for WNV, 43 specimens were positive for WNV. Sixty-five of 7,271 mosquito samples collected and tested were positive for WNV during the 2007 transmission season. Thirty-one of the 7,271 mosquito samples tested were positive for EEE virus in Massachusetts in 2007. A combination of larviciding, increased education, and ground ULV treatments were used to reduce public risk for arboviruses.

In 2007, there were 244 positive WNV mosquito pools in Pennsylvania. Twenty-one out of our 67 counties had at least one positive pool and over half of the positive pools were from 5 counties in the southeastern portion of the state. There were 9 human cases of WNV and 15 Dengue cases. County staff concentrated on larval control and used truck-mounted ULV applications when adult numbers reached a treatment threshold. For one larger project near Philadelphia, the state used a contractor to apply *B. sphaericus* (VectoLex) larvicide by helicopter.

New Hampshire's arbovirus testing for humans includes WNV, EEE, and SLE. Depending upon availability of reagents, human specimens may also be tested for LE and Powassan virus. Mammalian, avian, and mosquito samples are tested for WNV and EEE only. New Hampshire does not conduct wild bird serology or sentinel bird testing. Individual towns and cities are ultimately responsible for pesticide application decisions. The Health Department produces a State Plan in which recommendations are made regarding pesticide application decisions. The Plan highlights the importance of risk-based, IPM sound decisions, such that non-chemical means should be implemented during times of low risk, with chemical means reserved for higher risk events. Overall, pesticide application decisions should be based on surveillance findings. Ground adulticiding and/or ground larviciding were used when indicated.

In Vermont, the 2007 season was generally dry, with two small rain events that produced a low number of pest mosquitoes. There were no WNV positive mosquito pools, although we did have 3 WNV positive birds (all crows). The small amount of larvicide used this year (608 acres) was for pest mosquito reduction.

TCMA: In Teton County, the 2007 season was generally hotter and drier than is typical. Local hayfields and pastures saw a heavier than usual irrigation schedule, and resulting populations of our primary disease vector (*Culex tarsalis*) were higher than normal.

In 2007, 225 mosquito pools were tested by TCMA using the RAMP system. Two RAMP-positive pools of *Ochlerotatus fitchii* were reported by TCMA and were later PCR confirmed. These WNV positive pools were found in early July, and TCMA responded with increased aerial and ground

adulticide operations. Despite increased WNV surveillance, no further positive mosquito samples were discovered.

Statewide, there were 181 human cases of WNV in 2007, including 121 in counties adjacent to Teton County. To date, there have been no reported human cases of WNV in Teton County.

3.2.1 HUMAN CASES – WEST NILE VIRUS (WNV)

FMCA	3 (Acquired out of state)
LMCA	50 (27 NID; 13 fever; 10 Asym)
MVCAC	378
NCMVCA	1
NEMCA	20
NJMCA	1

3.2.2 HUMAN CASES – ST LOUIS ENCEPHALITIS (SLE)

LMCA	3
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3.2.3 HUMAN CASES – EASTERN EQUINE ENCEPHALITIS (EEE)

NEMCA	3
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3.2.4 HUMAN CASES – LACROSSE ENCEPHALITIS (LE)

FMCA	1 (acquired out of state)
NCMVCA	7

3.2.5 HUMAN CASES – WESTERN ENCEPHALITIS (WE)

None Reported

3.2.6 HUMAN CASES – MALARIA

NEMCA	8 (New Hampshire – acquired out of state)
NJMCA	1

3.2.7 HUMAN CASES – DENGUE

FMCA	13
NEMCA	15 (Pennsylvania)

3.2.8 AVIAN CASES WNV – NUMBER OF POSITIVE DEAD BIRDS

MVCAC	1,396
FMCA	13
LMCA	9
NEMCA	58
NJMCA	36
NWMVCA	4

3.2.9 AVIAN CASES WNV – NUMBER OF POSITIVE WILD BIRDS

LMCA	117
NEMCA	48

3.2.10 AVAIN CASES WNV – NUMBER OF SENTINELS CONVERTED

FMCA	57
LMCA	76
MVCAC	510
NCMVCA	1
NJMCA	1

3.2.11 AVAIN DATA SLE – NUMBER OF POSITIVE DEAD BIRDS

None Reported

3.2.12 AVIAN DATA SLE - NUMBER OF POSITIVE WILD BIRDS

LMCA	1
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3.2.13 AVIAN DATA SLE – NUMBER OF SENTINELS CONVERTED

FMCA	5
LMCA	10

3.2.14 AVAIN DATA EEE – NUMBER OF POSITIVE DEAD BIRDS

NJMCA	6
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3.2.15 AVIAN DATA EEE - NUMBER OF POSITIVE WILD BIRDS

FMCA	113
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3.2.16 AVIAN DATA EEE – NUMBER OF SENTINELS CONVERTED

FMCA	104
NCMVCA	15
NJMCA	4

3.2.17 AVIAN DATA WE – NUMBER OF POSITIVE DEAD BIRDS

None Reported

3.2.18 AVIAN DATA WE - NUMBER OF POSITIVE WILD BIRDS

None Reported

3.2.19 AVIAN DATA WE – NUMBER OF SENTINELS CONVERTED

MVCAC	13
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3.2.20 MOSQUITO DATA WNV – NUMBER OF POSITIVE POOLS

LMCA	606
MVCAC	1007
NEMCA	312
NJMCA	223
NWMVCA	9
TCMA	2

3.2.21 MOSQUITO DATA SLE – NUMBER OF POSITIVE POOLS

LMCA	101
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3.2.22 MOSQUITO DATA EEE – NUMBER OF POSITIVE POOLS

LMCA	7
NEMCA	37
NJMCA	10

3.2.23 MOSQUITO DATA WE – NUMBER OF POSITIVE POOLS

MVCAC	16
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3.3 QUESTION THREE: ADDITIONAL INFORMATION

MVCAC: Totals of 26 squirrels and 28 horses were positive for West Nile Virus in California during 2007.

The following is a brief summary of lessons learned by the Greater Los Angeles County Vector Control District since the initial detection of West Nile virus (WNV) was in California in 2003. Los Angeles County can be characterized as a dense urban population center. There are, however, numerous sites within the county populated by wild birds, e.g. crows and domestic livestock, e.g. horses. Due to widespread vaccinations of horses and other equines since WNV was first encountered, they are no longer significant in the overall surveillance system. It may be prudent to remove equines from the list of factors in the State's Risk Assessment Model for this area.

Wild bird serology is an important component of our surveillance system in the long run, as we are just beginning to understand how sero-prevalence in local wild bird populations affects virus amplification. Reporting dead birds and testing them for infections is still an effective indicator that the virus is being transmitted, but in the future their role as an early-warning indicator may decrease. Mortality in corvids, especially American Crows, was quite significant in 2004 when we experienced a WNV epidemic in urban Los Angeles. After that, dry weather contributed to a reduced mosquito population near our largest crow roost; this may have allowed the crow population to recover.

Sentinel chicken serology continues to be a relatively effective tool in the overall surveillance system; though seroconversions tend to occur relatively late in the season compared to other indicators that virus is being transmitted. Trapping adult mosquitoes and testing them for infections is an important surveillance tool, but mosquito abundance is not singularly predictive. We have experienced human cases when mosquito populations were relatively low. During the past 3 years, Los Angeles experienced dry weather conditions. This affected larger, natural sources of standing water and reduced mosquito abundance at these sites. At the same time "Angelenos" used more water to compensate for the lack of rain, creating myriads of hidden sources in urban backyards, and runoff accumulated in roadside gutters and underground storm drain systems. Increased outdoor activities during summer exposed humans to mosquito bites.

Aerial adulticiding in the urban Los Angeles area is only a remote possibility; unless there is an epidemic of major proportions such measures would be hotly contested. A well-coordinated ground-fogging operation, however, should be part of a control plan.

It is presumptuous to make definitive statements about effectively managing a potential outbreak of WNV. Attempts to effectively reduce human exposure require further research.