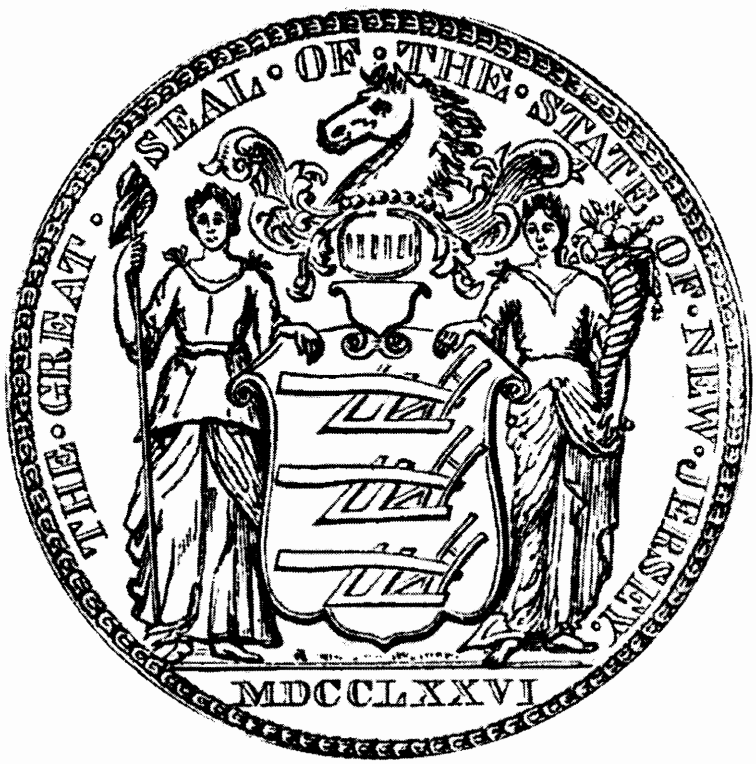
FIFTY FOURTH ANNUAL REPORT

OF THE

STATE MOSQUITO CONTROL COMMISSION

OF THE

STATE OF NEW JERSEY



For the Fiscal Year commencing July 1, 2009 and ending June 30, 2010

FIFTY FOURTH ANNUAL REPORT

NEW JERSEY STATE MOSQUITO CONTROL COMMISSION

2010

STATE OF NEW JERSEY
CHRIS CHRISTIE, GOVERNOR

N.J. DEPARTMENT OF ENVIRONMENTAL PROTECTION
BOB MARTIN, COMMISSIONER

Report prepared by the Office of
Mosquito Control Coordination,
N.J. Department of Environmental Protection
Robert Kent, Administrator
Claudia O'Malley, Principal Biologist
Steven Csorgo, Jr., Assistant Biologist
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State of New Jersey

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CHRIS CHRISTIE
Govenor

KIM GUADAGNO
Lt. Govenor

BOB MARTIN
Commissioner

To: The Honorable Chris Christie, Governor
The Honorable Kim Guadagno, Lt. Governor
and members of the Senate and the
General Assembly of the State of New Jersey

In accordance with the provisions of Title 26 Chapter 9:12.6, we are pleased to submit the Fifty Fourth Annual Report of the State Mosquito Control Commission for the Fiscal Year covering the period from July 1, 2009 through June 30, 2010

Respectfully,

John Sarnas, M.A., H.O., Chairman
Daniel Konczyk, Vice Chairman
Kenneth Bruder, Ph.D.
John Surmay, R.Ph., H.O.
Howard Emerson, H.O.
George Van Orden, Ph.D., H.O.
Mark Robson, Ph.D., M.P.H.
Anthony Petrongolo, M.S.
Shereen Semple, M.S.
Mark Mayer, M.S.

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MEMBERS OF THE STATE MOSQUITO CONTROL COMMISSION

John Sarnas, M.A., H.O., Chairman	Hudson County
Daniel Konczyk, Vice Chairman	Cape May County
Kenneth W. Bruder, Ph.D.	Ocean County
Howard Emerson, H.O.	Camden County
John Surmay, R.Ph., H.O.	Union County
George Van Orden, Ph.D., H.O.	Morris County
Bob Martin, Commissioner Ex Officio	N.J. Department of Environmental Protection
Poonam Alaigh, Commissioner Ex Officio	N.J. Department of Health & Senior Services
Douglas Fisher, Secretary Ex Officio	N.J. Department of Agriculture
Robert Goodman, Ph.D.	N.J. Agricultural Experiment Station, Rutgers University
Robert Kent, Secretary	N.J. Department of Environmental Protection

The following individuals served as representatives for the various ex officio members during the year:

Shereen Semple, M.S.	N.J. Department of Health & Senior Services
Anthony Petrongolo, M.S.	N.J. Department of Environmental Protection
Mark Mayer, M.S.	N.J. Department of Agriculture
Mark Robson, Ph.D., M.P.H.	N.J. Agricultural Experiment Station, Rutgers University

COMMISSION ACTIVITIES AND HIGHLIGHTS DURING FISCAL YEAR 2010

During the fiscal year 2009-2010, the State Mosquito Control Commission continued to monitor and address those issues, activities and legislation of importance to the mosquito control interests in New Jersey. Official meetings of the New Jersey State Mosquito Control Commission were held monthly during the year on the following dates and at the following locations:

DATE	LOCATION
July 21, 2009	Office of Mosquito Control Coordination, DEP, Trenton, N.J.
August 18, 2009	Office of Mosquito Control Coordination, DEP, Trenton, N.J.
September 15, 2009	Office of Mosquito Control Coordination, DEP, Trenton, N.J.
October 20, 2009	Office of Mosquito Control Coordination, DEP, Trenton, N.J.
November 17, 2009	Office of Mosquito Control Coordination, DEP, Trenton, N.J.
December 2009	No Meeting Scheduled
January 19, 2010	Office of Mosquito Control Coordination, DEP, Trenton, N.J.
February 16, 2010	Office of Mosquito Control Coordination, DEP, Trenton, N.J.
March 2010	Meeting Canceled
April 20, 2010	Office of Mosquito Control Coordination, DEP, Trenton, N.J.
May 18, 2010	Office of Mosquito Control Coordination, DEP, Trenton, N.J.
June 15, 2010	Monmouth County Mosquito Commission Eatontown, N.J.

In addition to the regularly scheduled meetings, the commissioners participated in numerous committee meetings and conferences with local, state and federal officials regarding mosquito control related matters. All business meetings were announced and held in compliance with the Open Public Meeting Law. P.L. 1975. C231.

State Equipment Use Program

The State Mosquito Control Commission's Equipment Use Program annually assigns different types of surveillance, research or operational control equipment to any of the New Jersey mosquito control agencies on an as-needed basis. The equipment is used and maintained under the terms of the Department of Environmental Protection's Equipment Use Agreement and the State Mosquito Control Commission's 'Guidelines for the Use and Repair of State-Owned Equipment'. During fiscal year 2010, the State Commission had in its inventory 127 pieces of equipment available to the mosquito control community through this program (Table 1). Twenty of the twenty-one county mosquito control agencies in New Jersey, as well as the New Jersey Agricultural Experiment Station at Rutgers University, the New Jersey Department of Environmental Protection's Division of Fish and Wildlife and the Office of Mosquito Control Coordination, utilized this equipment during the fiscal year.

No requests for new equipment were made during the course of the fiscal year. A total of $36,612.74 was expended for repairs to six pieces of state-owned equipment. This included $315.22 for repairs to SMCC #81, the ultra-low temperature freezer assigned to the Morris County Mosquito Extermination Commission. An amount of $1,968.87 was expended to augment $9,100.00 encumbered in fiscal year 2008 for repairs to SMCC #1, the hydraulic rotary excavator assigned to the Cape May County Department of Mosquito Control. Also, $3,587.30 was required to repair wear strips on SMCC #10, the amphibious long-reach hydraulic excavator assigned to the Salem County Mosquito Extermination Commission. SMCC #107, the ultra-low temperature freezer assigned to the Mercer County Division of Mosquito Control, required $4,750.00 for repairs. A total of $991.35 was utilized to repair SMCC #56, the 6-inch pump assigned to the Cape May County Department of Mosquito Control. Finally, $25,000.00 was expended on repairs to SMCC #2, the hydraulic rotary excavator assigned to the Ocean County Mosquito Extermination Commission.

Four pieces of equipment in the Commission's inventory were transferred during the course of the fiscal year, albeit two on a temporary basis. The Camden County Mosquito Extermination Commission surrendered SMCC # 93 and 94, a 2002 all-terrain vehicle and trailer, noting that they no longer had need of this equipment. The all-terrain vehicle and trailer were subsequently requested by and transferred to the Gloucester County Division of Mosquito Control, for use within that agency's surveillance program. SMCC #8, a long-reach hydraulic excavator, and SMCC #17, a wide-track bulldozer, were used on maintenance projects on NJDEP Division of Fish and Wildlife property in Lower Alloways Creek Township. Both pieces of equipment had been assigned to the Salem County Mosquito Extermination Commission.

SMCC # 4, the Marsh Master II; a tracked, amphibious vehicle, along with its trailer, was used by the Morris County Mosquito Extermination Commission to mow seven poorly maintained stormwater management facilities within that county that function as sites of mosquito production. The vehicle equipped with a mower attachment, was purchased through a partnership involving the State Mosquito Control Commission, the New Jersey Department of Environmental Protection Office of Engineering and Construction, the United States Fish and Wildlife Service, and the National Fish and Wildlife Foundation, through a grant administered by Ducks Unlimited. This is the first instance in which a county mosquito control agency has made use of this newly acquired equipment.

Table 1. State Mosquito Control Commission Equipment

No.	Type of Equipment	Location
1	1992 Amphibious Hydraulic Rotary Excavator	Cape May
2	1987 Amphibious Hydraulic Rotary Excavator	Ocean
3	1995 Amphibious Hydraulic Rotary Excavator	Atlantic
4	2007 Amphibious Tracked Vehicle	State
5	2003 Long-Reach Hydraulic Excavator	Essex/Morris
6	2003 Low Ground Pressure Hydraulic Excavator	Warren
7	2003 Low Ground Pressure Hydraulic Excavator	Salem
8	1992 Long-Reach Hydraulic Excavator	Salem
9		Vacant
10	1995 Amphibious Long-Reach Hydraulic Excavator	Salem
11	1986 Hydraulic Excavator	Div. Fish & Wildlife
12	2003 Low Ground Pressure Hydraulic Excavator	Cumberland
13	2002 Hydraulic Excavator	Atlantic
14	2002 All-Terrain Vehicle	Ocean
15	2002 All-Terrain Vehicle Trailer	Ocean
16	1983 Tracked Vehicle	Essex
17	1985 Widetrack Bulldozer/Backhoe	Salem
18	1972 17 Foot Boat	Atlantic
19	2002 Outboard Motor	Atlantic
20	2002 Boat Trailer	Atlantic
21	1988 13 Foot Boat	Burlington
22	1988 Boat Trailer	Burlington
23	2002 Outboard Motor	Burlington
24	1988 Stereo Microscope w/optics	Warren
25	2008 U.L.V. Machine/G.P.S. Reporting System	Warren
26	2008 U.L.V. Machine/G.P.S. Reporting System	Passaic
27	1994 Ultra Low Temperature Freezer	Rutgers
28	1995 U.L.V. Machine/2007 Variable Flow Control	Salem
29	1995 U.L.V. Machine	Cumberland
30	1995 U.L.V. Machine/Recording System	Sussex
31	2003 Stereo Microscope w/optics	Mercer
32	1995 Turbine Sprayer	Cumberland
33	1995 U.L.V. Machine	Gloucester
34	1981 Phase-Contrast Microscope/Power Pak/Camera	Hudson
35		Vacant
36	2004 Incubator	Rutgers
37	1987 Stereo Microscope w/optics	Camden
38	1987 Stereo Microscope w/optics	Hudson
39	1992 U.L.V. Machine	Cumberland
40		Vacant
41	1988 Biosafety Cabinet	Rutgers
42	1977 Flatbed Truck	Sussex

43	2002 2WD Pickup Truck w/Cap	Morris
44	1987 20-Ton Trailer	Salem
45	1976 Compound Microscope	State
46	1977 Compound Microscope	Rutgers
47	1977 Stereo Microscope	Rutgers
48	1977 Stereo Microscope	Rutgers
49	1980 Bulldozer/Backhoe	Warren
50	1980 Rotary Ditcher Attachment	Salem
51	2005 Tabletop Autoclave	Hunterdon
52	1984 Stereo Microscope w/Optics	Monmouth
53		Vacant
54	2002 4x4 Pickup Truck w/Cap	State
55	1985 Hydraulic Excavator	Essex
56	1988 6" Water Pump	Cape May
57	1989 Stereo Microscope w/Optics	Atlantic
58	1989 All-Terrain Vehicle	Salem
59	1989 All-Terrain Vehicle Trailer	Salem
60	1990 Stereo Microscope w/Optics	Sussex
61	1990 20-Ton Trailer	Warren
62	1996 All-Terrain Vehicle	Monmouth
63	1996 All-Terrain Vehicle Trailer	Monmouth
64	1997 Turbine Sprayer	Gloucester
65	1997 17 Foot Boat	Ocean
66	2007 Outboard Motor	Ocean
67	1998 Boat Trailer	Ocean
68	2000 Stereo Microscope w/Optics	Hunterdon
69	2007 U.L.V. Machine/G.P.S. Reporting System	Hunterdon
70	2007 U.L.V. Machine/G.P.S. Reporting System	Burlington
71	2007 U.L.V. Machine/Monitoring/Reporting System	Essex
72		Vacant
73	2007 U.L.V. Machine/Monitoring/Reporting System	Atlantic
74	2007 U.L.V. Machine/Monitoring/Reporting System	Hunterdon
75	2000 U.L.V. Machine	Gloucester
76	2001 Power Sprayer	Hunterdon
77	2000 U.L.V. Machine	Salem
78	2001 Ultra Low Temperature Freezer	Bergen
79	2001 Ultra Low Temperature Freezer	Middlesex
80	2001 Ultra Low Temperature Freezer	Monmouth
81	2001 Ultra Low Temperature Freezer	Morris
82	2001 Ultra Low Temperature Freezer	Salem
83	2001 Ultra Low Temperature Freezer	Warren
84	2001 Ultra Low Temperature Freezer	Camden
85	2001 Ultra Low Temperature Freezer	Sussex
86	2001 U.L.V. Machine/2006 Recording System	Sussex
87	2001 Insecticide Applicator	Sussex
88	2004 Power Sprayer	Essex
89	2001 4x4 Pickup Truck w/Cap	Atlantic

90	2002 17 Foot Boat	Ocean
91	2002 Outboard Motor	Ocean
92	2002 Boat Trailer	Ocean
93	2002 All-Terrain Vehicle	Gloucester
94	2002 All-Terrain Vehicle Trailer	Gloucester
95	2002 All-Terrain Vehicle	Essex
96	2002 All-Terrain Vehicle	Hunterdon
97	2002 All-Terrain Vehicle Trailer	Hunterdon
98	2002 4x4 Pickup Truck	State
99	2002 All-Terrain Vehicle	Sussex
100	2002 All-Terrain Vehicle Trailer	Sussex
101	2002 Acoustic Storm Drain System	Sussex
102	2002 Ultra Low Temperature Freezer	Rutgers
103	2002 All-Terrain Vehicle	Bergen
104	2002 All-Terrain Vehicle Trailer	Bergen
105	2002 U.L.V. Machine	Salem
106	2002 Ultra Low Temperature Freezer	Burlington
107	2002 Ultra Low Temperature Freezer	Mercer
108	2002 U.L.V. Machine	Cumberland
109	2002 U.L.V. Machine	Essex
110	2002 All-Terrain Vehicle	Union
111	2003 All-Terrain Vehicle Trailer	Union
112	2003 Microplate Reader	Rutgers
113	2003 Microplate Washer	Rutgers
114	2003 All-Terrain Vehicle	Mercer
115	2003 All-Terrain Vehicle Trailer	Mercer
116	2002 All-Terrain Vehicle	Ocean
117	2003 All-Terrain Vehicle Trailer	Ocean
118	2003 All-Terrain Vehicle	Cumberland
119	2004 All-Terrain Vehicle Trailer	Cumberland
120	2003 All-Terrain Vehicle	Hudson
121	2004 All-Terrain Vehicle Trailer	Hudson
122	2004 Ultra Low Temperature Freezer	Gloucester
123	2004 Ultra Low Temperature Freezer	Essex
124	2004 Ultra Low Temperature Freezer	Passaic
125	2004 Ultra Low Temperature Freezer	Cumberland
126	2004 Ultra Low Temperature Freezer	Union
127	2004 Ultra Low Temperature Freezer	Hudson
128	2008 Turbine Sprayer	Hudson
129	2007 Turbine Sprayer Trailer	Hudson
130	2009 Amphibious Tracked Vehicle Trailer	State

Program Director: Claudia O'Malley, Office of Mosquito Control Coordination, Department of Environmental Protection

State Airspray Program

The Airspray Program was more active in fiscal year 2010 than had been the case in the two previous years. Thirty-seven insecticide applications were performed in 5 counties, treating a total of 36,381 acres (Table 2). Although the program's primary focus continues to be the control of larval mosquitoes, 5 of the applications made were for adult mosquito control. It should be noted that this was the first time since fiscal year 2006 that aerial adulticide operations were performed, necessitated by both high population levels of *Aedes sollicitans* and the presence of Eastern Equine encephalitis virus within the mosquito population. Unlike prior fixed-wing aerial adulticide operations, all applications were made utilizing rotary-wing aircraft, with excellent results. The use of helicopters allows for more targeted insecticide applications, which is especially useful when treating spray blocks that contain a number of exclusion zones. Of the 32 aerial larvicide applications, 81% were made to the Atlantic coastal salt marshes and the Delaware Bayshore salt hay farms, where mosquito production is mainly influenced by monthly tidal cycles. The remaining 19% of the aerial larvicide applications were made to upland targets, where precipitation is the major factor affecting mosquito production. Additionally, one surveillance flight utilizing program aircraft was performed in fiscal year 2010.

Aircraft available to the program included a single-engine, turbine Air Tractor AT-602 and single-engine Grumman Ag Cats for high payload applications, Cessna Skylanes for observation and survey work and Bell Jet Ranger rotary-wing aircraft, which were used for both larvicide and adulticide applications.

The insecticides used in program operations included temephos (5% granular formulation), and granular and aqueous suspension formulations of *Bacillus thuringiensis* var. *israelensis*; all were used for larval control. Additionally, Malathion was utilized for adult mosquito control applications. Two trials were conducted in Atlantic County using a new larvicide, which falls in the category of naturalytes, or biorational insecticides. The active ingredient is spinosad, which is a mixture of spinosyn A and spinosyn D – metabolites of the soil actinomycete *Saccharopolyspora spinosa*, a soil bacterium. Spinosad's mode of action is through ingestion by the mosquito larva and, to a lesser degree, contact. Spinosad excites the insect's central nervous system, leading to involuntary muscle contractions, paralysis and death. It does not pose a hazard to mammals, birds, reptiles, amphibians or fish. As was noted previously, trials were conducted on a 100-acre plot on Brigantine Island, Atlantic County on September 1 and 15, 2009. An application rate of 2.8 oz/acre was used for both trials, with excellent mortality. Additional trials with spinosad are planned for fiscal year 2011.

Since fiscal year 1996, state aid has been provided to those Airspray Program counties that make insecticide applications for mosquito control to state-owned land within their corporate borders. This aid is made in the form of in-kind replacement of the insecticides applied. During fiscal year 2010 Cape May County was reimbursed with 6,575 pounds of Abate 5BG and Ocean County received 1,848 gallons of Vectobac 12AS for applications made to state-owned land within these counties.

Table 2. State Airspray Program acreage treated in FY2010 by mode and county.

County	Larviciding Acreage	Adulticiding Acreage	Total Acreage
Atlantic	14,772	3,384	18,156
Burlington	-0-	4,184	4,184
Cumberland	6,621	- 0 -	6,621
Essex	3,350	- 0 -	3,350
Morris	4,070	- 0 -	4,070
State Total	**28,813**	**7,568**	**36,381**

Program Director: Claudia O'Malley, Office of Mosquito Control Coordination, Department of Environmental Protection

Biological Control Program

The Biological Control Program continued to play an important role in the State Mosquito Control Commission's integrated pest management approach to mosquito control efforts in fiscal year 2010. The Commission maintained its fiscal support of this program, and again made available five species of mosquito-eating fish to the county mosquito control agencies, for use in their programs as an alternative to the use of insecticides.

The Commission renewed its longstanding Memorandum of Agreement with the New Jersey Division of Fish and Wildlife for developing, maintaining and providing fishery stocks at the Charles O. Hayford Fish Hatchery at Hackettstown. Bureau of Freshwater Fisheries personnel raised stocks of fish for release into known mosquito production sites throughout New Jersey. The difficulties with overwintering *Gambusia affinis* experienced during the last several years were, thankfully, not evidenced this fiscal year. In addition to those reared indoors at the Hackettstown Hatchery, approximately 150,000 *Gambusia affinis* were transferred to outdoor ponds in Burlington and Cape May counties for overwintering, ensuring a more than adequate supply to meet the needs of the county mosquito control agencies.

As has always been the case, Bureau of Freshwater Fisheries personnel continue to provide invaluable assistance to the Office of Mosquito Control Coordination and the participating county mosquito control agencies. All stocking is performed strictly in accordance with the guidelines and policy outlined in the Department of Environmental Protection document "How to Use the State Bio-Control Program for Mosquito Control in New Jersey". In fiscal year 2010, a total of 162,283 fish were stocked through the Biological Control Program in twelve New Jersey counties (Table 3). This number is significantly greater than the 102,773 fish distributed in fiscal year 2009. Species stocked included the Mosquitofish, *Gambusia affinis*, and the Fathead Minnow, *Pimephales promelas*. A total of 2,931,658 fish have been provided to the counties at no cost for mosquito control purposes through the State Commission's Biological Control Program since its inception in 1992.

The cyclopoid copepod project, begun in fiscal year 2005, continued in fiscal year 2010. The State Commission renewed it Memorandum of Agreement with the New Jersey Department of Agriculture's Phillip Alampi Beneficial Insect Laboratory, and staff there worked tirelessly to ensure that an adequate supply of *Macrocyclops albidus* was available for use. Counties participating in this program during the 2009 mosquito season included Cape May, Hunterdon, Monmouth, Morris and Sussex. Habitats under investigation ranged from contrived woodland pools, natural woodland pools, pits and ornamental ponds. Mosquito control achieved was marginal; it was noted that it is very difficult to differentiate between the *Macrocyclops albidus* being introduced and copepod species already present within the habitat. It is also unclear at this time if the already-present copepod species interfere with *M. albidus'* ability to achieve control.

For the 2010 mosquito season, which corresponds with the latter part of fiscal year 2010, staff at thee Beneficial Insect Laboratory had ample stocks of copepods ready for distribution earlier in the season than had been the case in the past. Cape May, Cumberland, Hunterdon, Monmouth and Ocean counties were this season's participants, and artificial containers, constructed woodland pools, natural woodland pools, catch basins and abandoned swimming pools were the mosquito producing habitats under investigation.

Table 3. Mosquitofish stocking by county and species during FY2010.

County	Species	Number of Fish
Bergen	*Gambusia*	10,000
Camden	*Gambusia*	5,000
Cumberland	Fathead minnows *Gambusia*	12,941 5,000
Essex	*Gambusia*	5,000
Gloucester	*Gambusia*	7,600
Monmouth	*Gambusia*	26,692
Morris	*Gambusia*	5,000
Ocean	Fathead minnows *Gambusia*	62,000 5,000
Passaic	Fathead minnows	3,000
Salem	Fathead minnows *Gambusia*	3,000 2,250
Sussex	Fathead minnows	4,500
Warren	*Gambusia*	5,300
Total		**162,283**

Program Director: Claudia O'Malley, Office of Mosquito Control Coordination, Department of Environmental Protection

Monitoring the Efficacy of Insecticides for Mosquito Control in New Jersey

The intent of this program is to track and evaluate the susceptibility or tolerance of the state's salt-marsh mosquito population to the selected control formulations. Baseline data of a historical nature are compared to seasonal population data. Four insecticidal formulations are examined. Toxicity data for Bti, spinosad, temephos, and methoprene to mosquito larvae hatched from eggs obtained from females collected in southern New Jersey field sites from July through October 2009.

Summary

Toxicities of spinosad to *Aedes sollicitans* larvae from Ocean, Atlantic, Cape May and Cumberland counties were decreased 2 – 4-fold from the previous year. This decrease in toxicities needs to be closely monitored, however, these mosquito larvae are still susceptible to spinosad and well controlled with low (3 – 7) ppb doses of the compound.

Toxicities of Bti to the larvae were essentially the same as in previous years with small differences in the data falling well within normal variation. Bti is generally less toxic to these mosquito larvae than spinosad. It takes 15 – 40 ppb of Bti to achieve the same control as with 3 – 7 ppb of spinosad.

Toxicities of temephos to the larvae were decreased compared to previous years by as much as 7 – 18-fold. This comparison is based on "discriminating dose" data around 90% mortality and the comparison is therefore considerably less accurate than a comparison of LC50 doses. The apparent decrease in temephos toxicity should be closely monitored with complete LC50 bioassays.

Toxicities of methoprene to the larvae were somewhat decreased compared to the previous year in Atlantic and Cumberland counties. It was essentially the same in Cape May County. Methoprene was slightly less toxic to larvae from Ocean County females. As with the temephos data, the comparisons of the methoprene toxicities are based on "discriminating dose" data producing apparent mortalities around 90%. Methoprene toxicities also need to be closely monitored with complete LC50 bioassays.

Collection

Host-seeking *Ae. sollicitans* females were collected in four locations in New Jersey: West Creek in Ocean County, Brigantine Island in Atlantic County, Sutton Lane in Cape May County, and East Point Lighthouse in Cumberland County. We made 12 trips visiting all four field sites on each occasion with the final collecting trip for the season on October 21, 2008.

The female mosquitoes were brought back to the Headlee lab (Rutgers University) in New Brunswick and fed cattle blood, purchased from the Carteret Abattoir, with a Hemotek apparatus. After 4 feedings, the mosquitoes were transferred to glass shell vials (2 females per vial) containing a moistened cotton ball and sealed with a piece of fabric screen (bridal tulle) through which they could drink a 10% sugar solution placed on top in a saturated paper towel. During transfer, whilst holding them in the glass tube, each female was identified by inspection with a dissecting microscope. Females that were not *Ae. sollicitans* were discarded. The egg-containing shell vials were stored in plastic baskets with a wet paper towel on top and wrapped in a plastic bag. The baskets were stored at 24°C in a Percival environmental incubator set at a 16/8 day/night cycle, and the moisture level in the vials was monitored and adjusted weekly to 80 – 85%RH. The numbers of vials and the numbers of vials with eggs from each field site are shown in Table 4.

A higher percent of vials contained egg this year compared to previous years (an average of 51%). There are many possible reasons for this, mostly artifactual. The number of eggs in each vial was highly variable, ranging from fewer than 10 to well over 100. Not every egg hatched out a larva. There are variations in each step of this series of events.

Table 4. Summary of female *Ae. sollicitans* wild-caught at each field site in 2009.

County	Number of vials	Number of vials with eggs	Percent vials with eggs
Ocean	766	539	70
Atlantic	269	170	63
Cape May	324	217	67
Cumberland	144	91	63

Obtaining the mosquito larvae

The eggs were allowed to dry for three or more weeks, and eggs were caused to hatch, as needed, by adding pure fresh water to the vials and depleting the dissolved oxygen by applying a brief vacuum. Eggs in 25 – 30 vials were hatched at a time to provide a sufficient number of growing larvae so that a selection of uniformly sized larvae could be collected for the assays. The newly hatched larvae were placed in enameled trays and raised on ground Purina® Rat Chow in fresh water at 24° C and the water was kept clean by toweling the surface before feeding. Either late third or early 4th instar, larvae were selected for the experiments.

Assays to Measure Toxicity

All assays were performed in 250-mL Pyrex glass beakers that were cleaned with soapy water, distilled water, and acetone between assays. The beakers were sterilized between assays to heat-disintegrate any remnant insecticide residues from the beakers. All assays were performed with 10 mosquito larvae in 100 mL of pure, fresh water to which the insecticide was added in acetone solutions of 20µL or less except Bti, which was added in water samples of 30µL or less. All larvae were supplied with less than 1 mg of ground rat chow. In the extended-time assays for methoprene and spinosad, the larval food was re-supplied every two days.

Stock solutions of all insecticides were weighed out to 1mg/mL solutions. For spinosad, temephos, and methoprene the solvent was acetone, for Bti it was distilled water. The stock solutions were serially diluted to provide concentrations such that 20 µL or less of the acetone solutions or 30µL or less of the water solutions could be applied. Extensive insecticide-free controls have shown that there is no mosquito larvae mortality from 20µL of acetone in 100 mL of water (200 ppb of acetone).

All treated mosquito larvae were incubated at 24°C under loosely fitted aluminum foil (to reduce the light intensity: the mosquito larvae seem to prefer shade and most modern insecticides are light sensitive) in a Percival bench-top environmental incubator. The LC50 data were generated with the PoloPlus program (LeOra Software 2002 – 2008).

Figure 1 shows the general experimental set-up for the bioassays. All beakers were labeled directly on the glass with larvae origin, date of treatment, insecticide, and dose. Figure 2 shows the glass beakers inserted into plastic cages that allow adult mosquitoes fly to the top portion of the cage and effectively keep them contained.

Figure 1 (left, below). General experimental setup for *in vivo* laboratory insecticide toxicity bioassays.

Figure 2 (right, above). Experimental setup in breeding cages for *in vivo* laboratory methoprene toxicity bioassays.

This year's report includes, for the first time, "fold ratios" (FR) of toxicity of the insecticides between the years 2009 and 2008 and "synergistic ratios" (SR) for spinosad, temephos, and methoprene toxicities. The FR between years can indicate a trend in the physiological response in the larvae to an insecticide based on either a change in detoxification capacity or in molecular target site sensitivity, or both. A difference up to 3 – 4-fold can easily be the result of normal biological variation. A larger difference should prompt close scrutiny of the population and how it is controlled as it could indicate incipient resistance evolution. The SR is the ratio between the toxicity of a set dose of the insecticide alone and in admixture with a synergist. Two synergists were used (defined as a compound that is non-toxic at the dose applied but that increases the toxicity of a toxic compound, usually by inhibiting an enzyme system that the population under study is using to detoxify the insecticide). Piperonyl butoxide (PBO), which inhibits the cytochrome P450 microsomal multisubstrate monooxygenase system and *S,S,S*-tributyl phosphorotrithioate (DEF), an esterase inhibitor were used. In an insecticide-sensitive population, an SR up to 3 or 4 is commonly seen; in a population that has acquired physiological resistance based on detoxification, the SR can amount to several hundred-fold. However, even a low SR should prompt careful examination of the control practices of the population under study.

Toxicity of spinosad to *Aedes sollicitans* larvae.

A sample of spinosad marketed as Natular®, which is a 20.6% mixture of spinosyn A (major component) and spinosyn D in wintergreen oil (methyl salicylate) supplied by Clarke Mosquito Control Products, Inc., Roselle, IL, was used.

Mortality produced by spinosad was assessed after 3 days of incubation based on the progressive mortality observed and described in the 2008 Final Progress Report for this project.
The 3-day mortalities from spinosad treatment to larvae from females collected in 2008 and 2009 are shown in Table 5.

Table 5. LC50 (ppb) with 95% confidence limits 3 days after treatment with spinosad in *Ae. sollicitans* larvae.

County	2008	2009	FR
Ocean	**2.4 (2.1 – 2.6)**	**5.4 (4.1 – 6.6)**	**2.2**
Atlantic	**1.5 (1.3 – 1.7)**	**5.8 (5.2 – 6.5)**	**3.3**
Cape May	**1.4 (1.2 – 1.7)**	**3.4 (3.0 – 3.8)**	**2.4**
Cumberland	**1.7 (1.3 – 2.2)**	**6.9 (6.3 – 7.4)**	**4.1**

The 2009 acute toxicity as reflected in the LC50 data has decreased at all four field sites compared to the data obtained with larvae from females collected in 2008. The toxicity of spinosad to *Ae sollicitans* larvae is nevertheless very high. By comparison, 2 to almost 7 times higher doses of Bti have to be applied to achieve 50% mortalities. New Jersey *Ae. sollicitans* larvae are not resistant to spinosad. However, given the small but consistent decrease in toxicity, the situation warrants attention.

Wang *et al.* [Selection and characterization of spinosad resistance in *Spodoptera exigua* (Hübner) , Pesticide Biochem. Physiol., 84:180-187 (2006)] suggested that the compounds are detoxified in *Spodoptera exigua* by O-demethylation, typically an oxidation catalyzed by cytochrome P450 enzymes. There are, in the molecules, three obvious sites where O-demethylations could occur. There is also a site for a potential N-demethylation, another cytochrome P450-catalyzed oxidation. A lactone is a cyclic compound with an ester bond incorporated in the ring system, potentially making these compounds also susceptible to ester hydrolysis.

In view of the consistent although small increase in LC50 (decrease in toxicity) to larvae from all four field sites it was of interest to ascertain how the *Ae. sollicitans* larvae may detoxify the compounds. Incubations with spinosad admixed with synergists, either PBO, a cytochrome P450 inhibitor, or DEF, an esterase inhibitor showed clearly that *Aedes sollicitans* in New Jersey (Ocean County) use the cytochrome P450 system of enzymes to detoxify spinosad and not at all, currently, esterases (Table 6).

Table 6. Toxicities of spinosad to 4th instar *Ae. sollicitans* larvae in the absence and presence of the synergists PBO or DEF.

Treatment	Average % dead; N = 3	SR
2 ppb spinosad only	**35**	
2 ppb spinosad + 25 ppb PBO	**95**	**2.7**
2 ppb spinosad + **25 ppb DEF**	**25**	**0.7**
25 ppb PBO only	**0**	
25 ppb DEF only	**0**	

Toxicities of Bti to *Aedes sollicitans* larvae.

The Bti preparation was a sample of VectoBac®, donated by the Cumberland County Mosquito Control Agency, containing 11.61% active ingredient representing 1200 international toxic units per mg. There is no direct relationship between potency and the percent active ingredient by weight. It is unclear exactly what the 'active ingredient' really is. The toxic principle of Bti is a large, 144 kD protein that is clearly not the item quantified in this formulation.
The assays were performed with late (large) third instar or early (newly molted) fourth instar larvae. The mortalities from Bti to larvae were assessed 24 hours after application, as dead larvae. The LC50 from 2008 and 2009 are shown in Table 7. The variation in the toxicities from year to year is within normal variation. The largest difference was an apparent decrease in toxicity to the Cumberland County larvae. Treatment with Bti in rotation with the three other larvicides widely used in New Jersey should safeguard against resistance evolution of this valuable control agent.

Table 7. Mortalities of 4th instar larvae of *Ae. sollicitans* in 2008 and 2007 (95% lower - upper confidence limits of the LC50 value) 24 hours after treatment with Bti.

County	2008 LC50 (ppb)	2009 LC50 (ppb)	FR
Ocean	**21.6 (18.2 – 25.2)**	**15.2 (13.5 – 17.3)**	**0.7**
Atlantic	**21.6 (18.9 – 24.9)**	**26.4 (23.4 – 30.4)**	**1.2**
Cape May	**16.8 (14.8 – 19.1)**	**19.9 (16.5 – 24.6)**	**1.2**
Cumberland	**24.2 (21.7 – 27.4)**	**39.5 (32.8 – 49.3)**	**1.6**

Toxicities of temephos to *Aedes sollicitans* larvae.

Analytical grade, >99% pure, temephos (Abate®) was purchased from Chem Service, West Chester, PA. Temephos toxicity (dead larvae) was assessed 24 hours after application.

Table 8 shows the "discriminating dose" of temephos to fourth instar larvae from the four field sites.

Table 8. Discriminating dose toxicity data for temephos to 4th instar larvae of *Ae. sollicitans* from Ocean, Atlantic, Cape May, and Cumberland Counties treated with an expected LC80-90 dose of insecticide. (N = number of assays).

2008				2009			
County	Dose (ppb)	Percent mortality	N	Dose (ppb)	Percent mortality	N	Apparent FR
Ocean	**10**	**97**	**10**	**14**	**90**	**6**	**1.5**
Atlantic	**10**	**94**	**12**	**60**	**90**	**6**	**6.3**
Cape May	8	**95**	**12**	**13**	**90**	**6**	**1.7**
Cumberland	**19**	**94**	**12**	**10**	**90**	**6**	**0.6**

Toxicities of temephos to *Aedes sollicitans* larvae.

Analytical grade, >99% pure, temephos (Abate®) was purchased from Chem Service, West Chester, PA. Temephos toxicity (dead larvae) was assessed 24 hours after application.

Table 9 shows the "discriminating dose" of temephos to fourth instar larvae from the four field sites.

Table 9. Discriminating dose toxicity data for temephos to 4th instar larvae of *Ae. sollicitans* from Ocean, Atlantic, Cape May, and Cumberland Counties treated with an expected LC80-90 dose of insecticide. (N = number of assays).

2008				2009			
County	Dose (ppb)	Percent mortality	N	Dose (ppb)	Percent mortality	N	Apparent FR
Ocean	**10**	**97**	**10**	**14**	**90**	**6**	**1.5**
Atlantic	**10**	**94**	**12**	**60**	**90**	**6**	**6.3**
Cape May	8	**95**	**12**	**13**	**90**	**6**	**1.7**
Cumberland	**19**	**94**	**12**	**10**	**90**	**6**	**0.6**

Compared to data from previous years, the toxicity of temephos to Atlantic county larvae was considerably decreased. It was essentially the same as the toxicities to 2008 larvae from Ocean, Cape May, and Cumberland counties. The LC90 values for temephos to larvae from 2007 were approximately 20, 19, 10, and 15 ppb to larvae from Ocean, Atlantic, Cape May, and Cumberland counties, respectively. Thus the decreased toxicity to Atlantic county larvae is exceptional. It could be the result of an experimental artifact, or it could be real. Temephos is detoxified entirely by esterases in larvae from Ocean County, probably also in larvae from the other three field sites. The SR for DEF is 4 whereas the SR for PBO is 1, *i.e.*, no effect. This is shown in Table 10.

Table 10. Synergistic effects of PBO and DEF on methoprene toxicity to Ocean County *Ae. sollicitans* larvae from females collected in 2007.

Treatment	Average % dead; N = 3	SR
5 ppb temephos only	**20**	
5 ppb temephos + 5 ppm PBO	**20**	**1**
5 ppb temephos + 5 ppm DEF	**80**	**4**
5 ppm PBO only	**0**	
5 ppm DEF only	**0**	

This is another situation to watch and it warrants conducting complete dose-range LC50 bioassays with temephos.

Toxicity of methoprene to *Aedes sollicitans* larvae.

The methoprene (Altosid®) was purchased from Chem Service, Inc., West Chester, PA. It was a racemic mixture of the R and S forms, containing mostly the S (bioactive) form.

The methoprene toxicity test was performed according to Ali *et al*., [1995 Comparative toxicity of selected larvicides and insect growth regulators to a Florida laboratory population of *Aedes albopictus*, J. Amer. Mos. Cont. Assoc., 11:72-76.] Ten early (newly molted) 4th instar or late (large) 3rd instar mosquito larvae were used for the bioassays with methoprene. When all larvae in the control beaker had emerged as adults, or after 10 - 14 days, the experiment was terminated and adults emerged in all experimental beakers were counted. The results of the test are described as the inverse of the number of eclosing adults, both males and females, *i.e*., cumulative mortality over the experimental period. We have not noticed any differences in mortalities between male and female mosquitoes. Male mosquitoes usually eclose a day or two earlier than females.

A dose expected to produce 80 – 90 percent mortality was used. [R. T. Roush & G. L. Miller, 1986. Considerations for design of insecticide resistance monitoring programs. J. Econ. Entomol., 79:293-298.] The mortalities obtained in 2008 and 2009 are shown in Table 11.

Table 11. Discriminating dose toxicity data for methoprene to 4th instar larvae of *Ae. sollicitans* from Ocean, Atlantic, Cape May, and Cumberland Counties treated with an expected LC80-90 dose of insecticide. (N = number of assays)

2008				**2009**			
County	Dose (ppb)	Percent mortality	N	Dose (ppb)	Percent mortality	N	Apparent FR
Ocean	**15**	**88**	**12**	**36**	**90**	**3**	**2.4**
Atlantic	**15**	**90**	**6**	**50**	**90**	**6**	**3.3**
Cape May	**15**	**94**	**9**	**25**	**90**	**6**	**1.7**
Cumberland	**15**	**90**	**6**	**50**	**90**	**6**	**3.3**

It appears that there is a small but consistently decreased toxicity of methoprene to larvae from three out of the four field sites. Data from the next few years should diagnose if this is, indeed, beginning resistance evolution, something that can neither be determined nor ruled out on the basis of the mortality data from these years. Complete dose range LC50 bioassays is called for with this compound.

Methoprene is a juvenile hormone analog with an ester bond at one end and a methoxy group at the other.

The methoxy group can be, and usually is in most species, deleted from the molecule by a cytochrome P450-catalyzed oxidation, leaving the methoprene residue with a hydroxyl (-OH) group instead of the methoxy group; this metabolite is non-toxic. The ester bond is easily hydrolyzed by an esterase, also leaving a detoxified metabolite. Data in Table 12 show that *Ae. sollicitans* larvae from Ocean County (probably from all south New Jersey counties) use both enzyme systems to detoxify methoprene. The data show that methoprene alone is less toxic than when it is applied in admixture with PBO (the cytochrome P450 inhibitor) or DEF (the esterase inhibitor). The synergistic ratio for both synergists is about 2-fold. This is a low ratio and characteristic of non-resistant populations.

Table 12. Synergistic effects of PBO and DEF on methoprene toxicity to Ocean County *Ae. sollicitans* larvae from females collected in 2007.

Treatment	**Average % dead; N = 3**	**SR**
4 ppb methoprene only	**40**	
4 ppb methoprene + 5 ppm PBO	**90**	**2.25**
4 ppb methoprene + 5 ppm DEF	**90**	**2.25**
5 ppm PBO only	**0**	
5 ppm DEF only	**0**	

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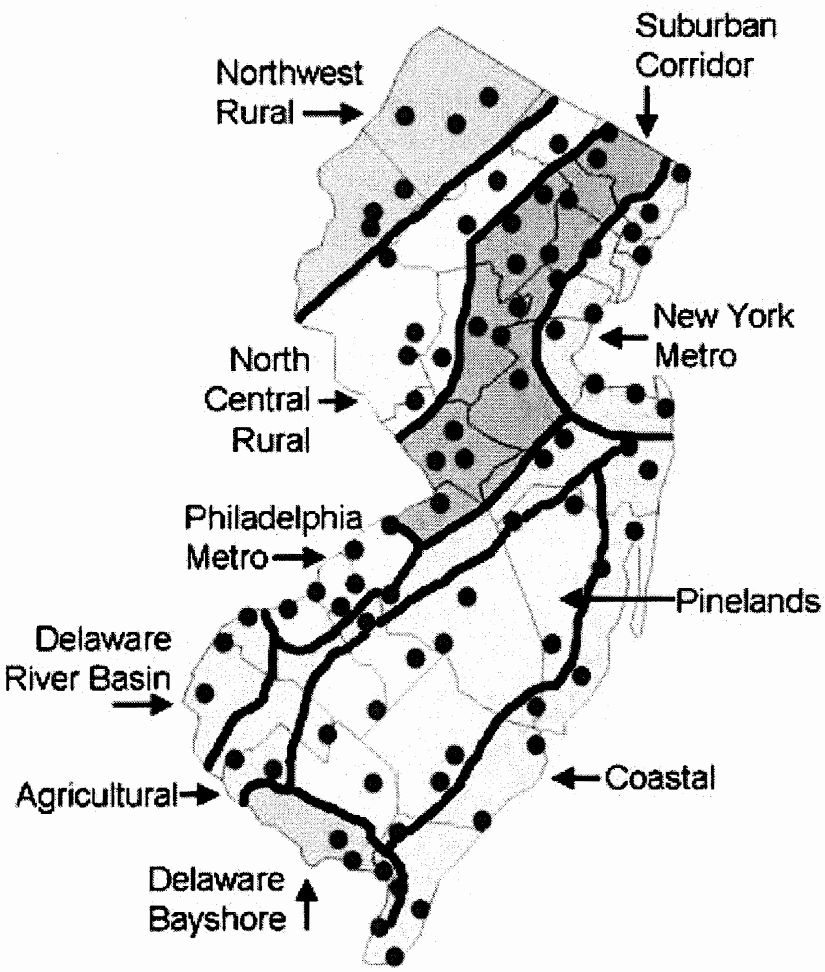
NEW JERSEY STATEWIDE ADULT MOSQUITO SURVEILLANCE

Data from 84 New Jersey light traps contributed by county mosquito control agencies are used to calculate trends in mosquito populations for species of nuisance or health concerns.



Calculations are based on regional distributions, with emphasis on mosquito habitat and land use. Trends will allow a statewide evaluation of changing mosquito populations, in response to control and/or changes in habitat.

The State Surveillance Program Overview

In New Jersey, county-level mosquito control agencies use New Jersey light traps to monitor certain nuisance and health-risk mosquito species. Agencies have many years worth of experience in the placement, use, and interpretation of light traps and their data as monitoring mosquito populations is an essential part of an integrated pest management approach. But county agencies are limited to county data, and a landscape-wide view of changing mosquito trends is not available. The purpose of this program is to cover that gap and provide information of nuisance and health-risk mosquito populations on a regional level.

The 2009 Season: Nineteen of the 21 county mosquito control agencies participated in this program during the season. Most agencies provided data in a timely matter. However, at times, most agencies were occasionally pressed to get the data to Headlee Labs. Therefore, interpretation of the data is more robust for the previous week's report than during the current week. Care must be taken with the interpretation of the most current week's data.

During 2009, 36 mosquito species were identified out of the 237,436 individual mosquitoes caught in the statewide surveillance light trap network throughout New Jersey. This number appears to be within the range from recent years (between 100,000 and 300,000 individuals). No *Anopheles earlei* were trapped, and those species with less than 10 individuals trapped for the entire season includes *Aedes abserratus, Ae. atropalpus, Ae. barberi,* and *Psorophora howardii.*

The Coastal and Pinelands collected a wider variety of mosquitoes than did other regions. This is different than several times in the past where the Suburban Corridor instead of the Pinelands collected more species. Also, the number of traps set in each region was significantly correlated with the number of species found (Table 13. Pearson's $r=0.671$, $n=10$, $p < 0.02$) but the correlation was not "tight" so that the suburban corridor, with the most number of traps actually caught fewer species this year. It was, however, the region with the largest number of individuals trapped (at 43,280) yet the number of traps used did not correlate with the number of mosquitoes caught (Pearson's $r=0.55$, $p>0.05$). The second most abundant numbers caught was in the Northwestern Rural region, with only 7 traps.

Table 13. Number of county traps used in each region with the number of mosquito species identified in the traps.

Region	*Number of Traps*	*Number of Species*	*Number of Mosquitoes*
Agricultural	**6**	**26**	**7,134**
Coastal	**9**	**30**	**39,902**
Delaware Bayshore	**6**	**23**	**35,626**
Delaware River Basin	**2**	**15**	**6,538**
New York Metro	**10**	**25**	**26,493**
North Central Rural	**8**	**20**	**4,281**
Northwestern Rural	**7**	**22**	**40,294**
Philadelphia Metro	**6**	**22**	**13,743**
Pinelands	**11**	**29**	**20,145**
Suburban	**17**	**27**	**43,280**
Statewide Total	**82**	**36**	**237,436**

The most abundant species caught statewide were the *Culex* Mixed (including *Cx. pipiens, Cx. salinarius* and *Cx. restuans*), *Aedes vexans, Ae. sollicitans* and *Ae. cantator* (Figure 3). In half of the 10 regions, the Mixed *Culex* populations were in greatest number. In the other half of the regions, *Ae. vexans* was the predominant species. *Ae. sollicitans* is a significant pest in five of the regions. In some previous years, this species has been outnumbered by *Ae. cantator* or *An. bradleyi* in regions that *Ae. sollicitans* has dominated. Regional population totals are presented in figures 4 – 13.

A calibration class in the spring prior to the 2009 mosquito season was offered to any county that wished to learn about the proper maintenance and calibration of light traps of which several counties attended. Cleaned and calibrated traps confer compatibility of the datasets.

Figure 3. Cumulative totals for light trap species statewide for the season of 2009.

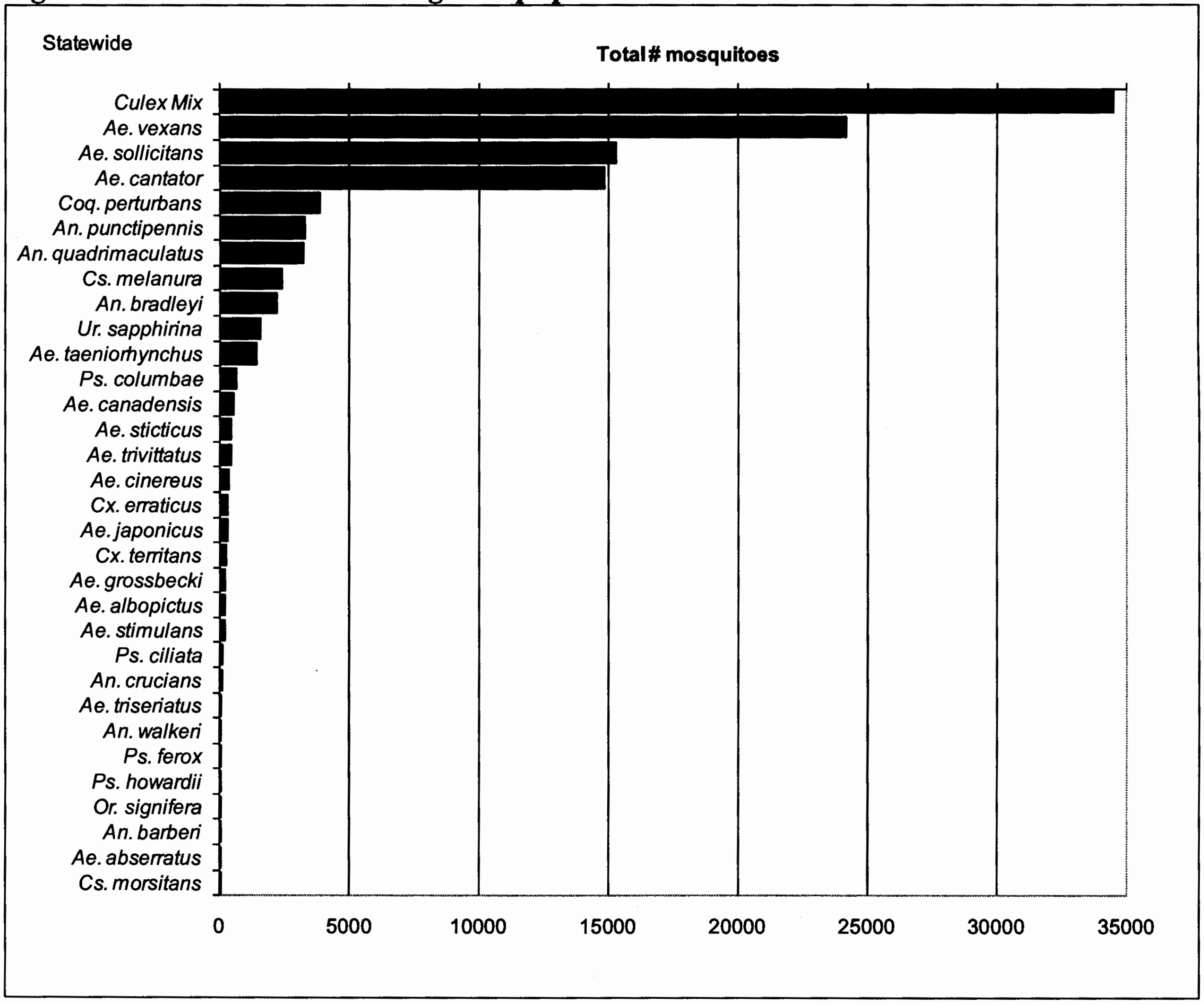


Figure 4. Agricultural Region.

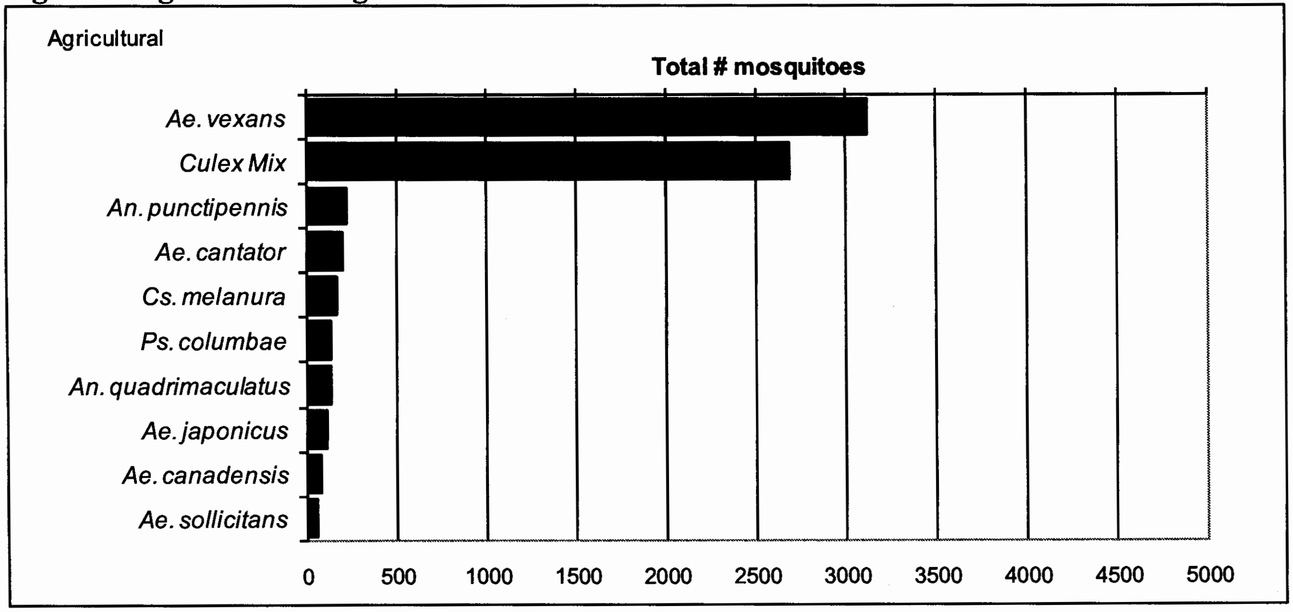


Figure 5. Coastal Region.

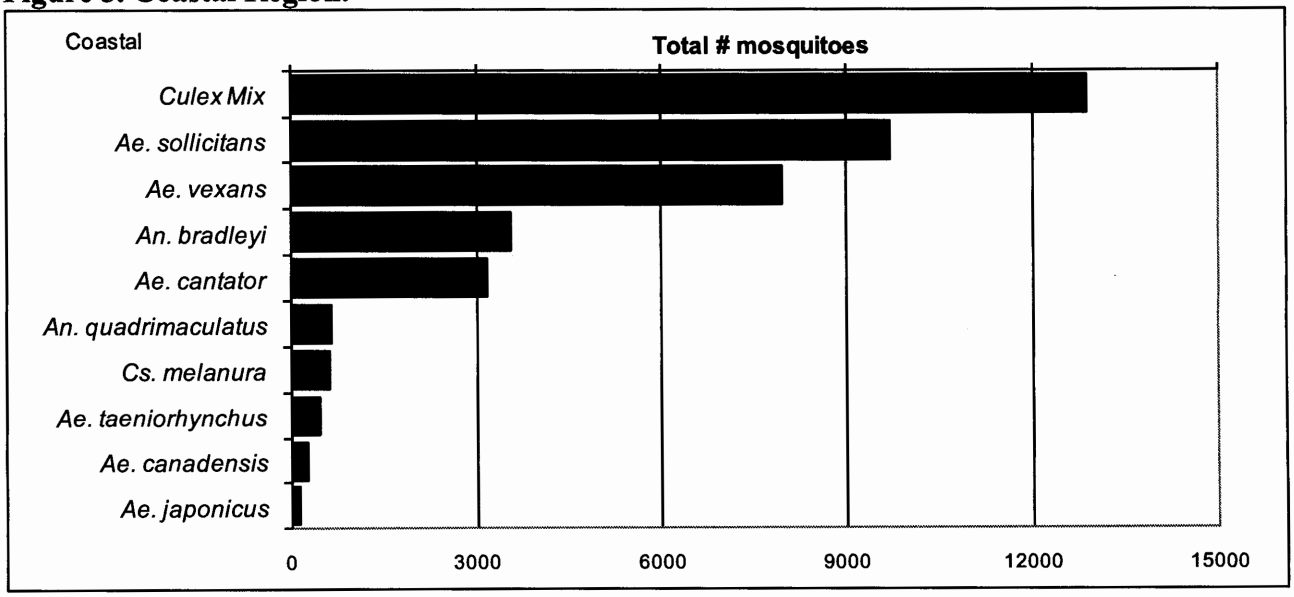


Figure 6. Delaware Bayshore Region.

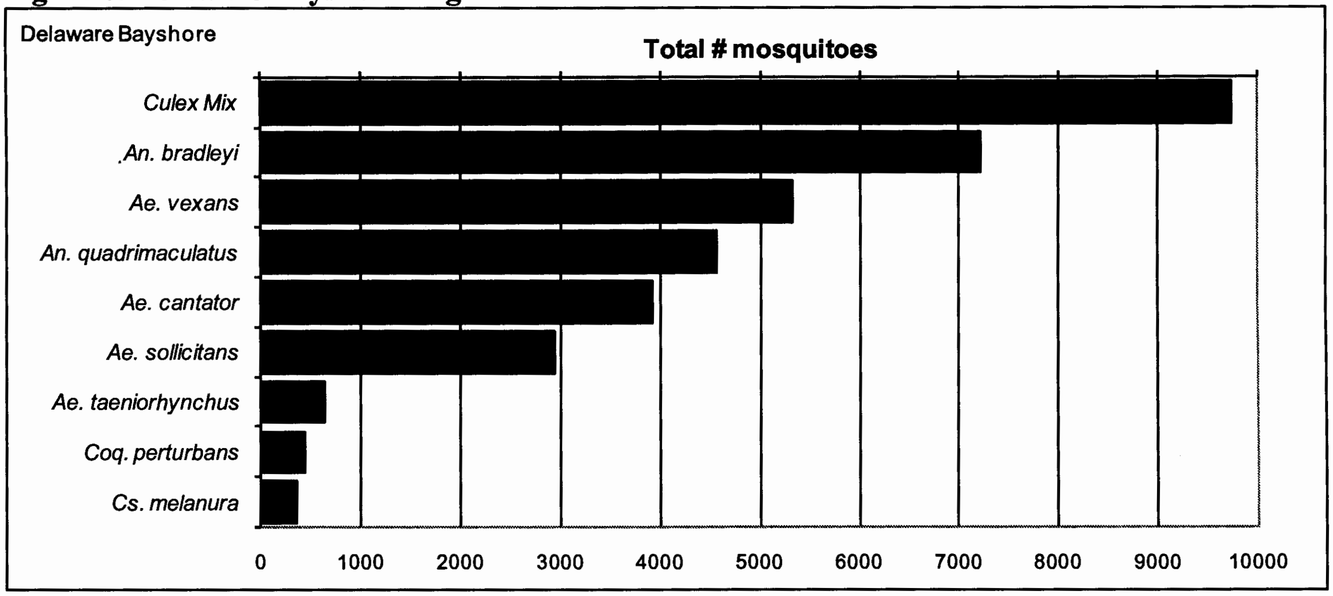


Figure 7. Delaware River Basin Region.

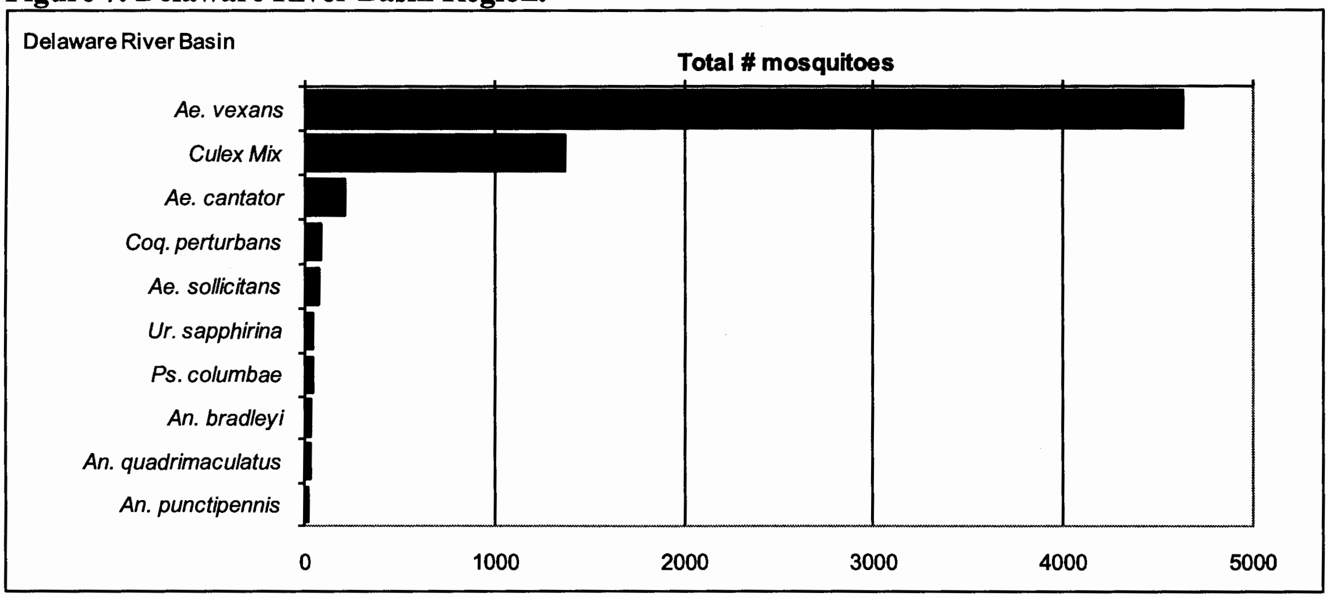


Figure 8. New York Metropolitan Region.

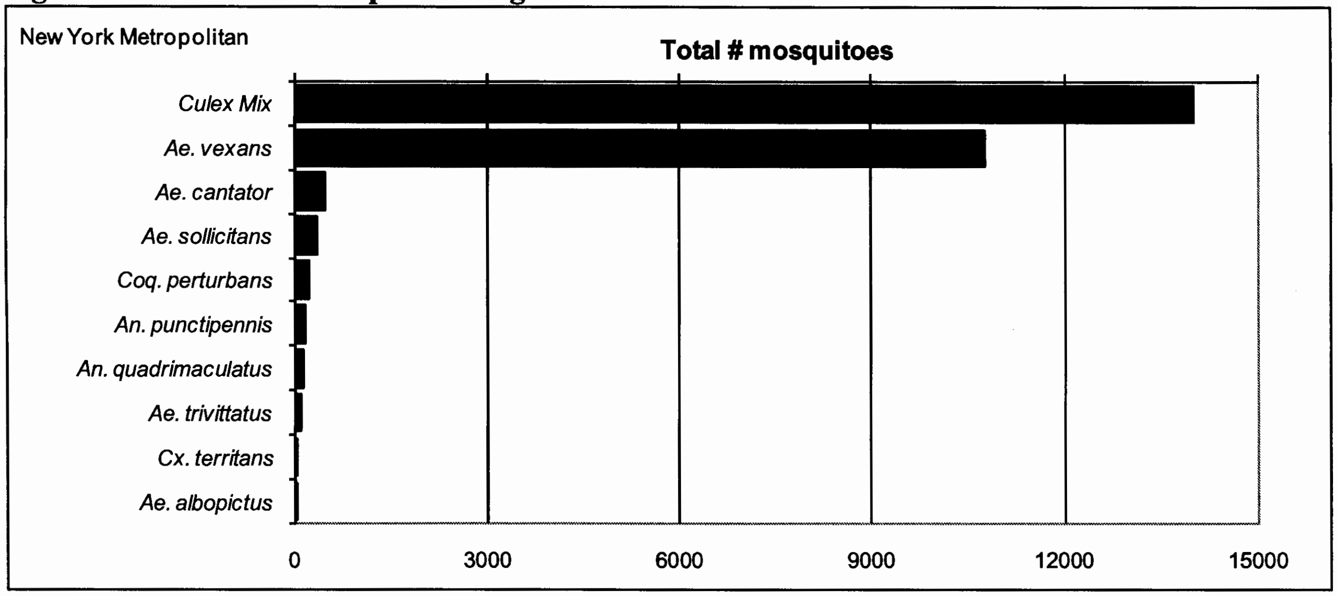


Figure 9. North Central Region.

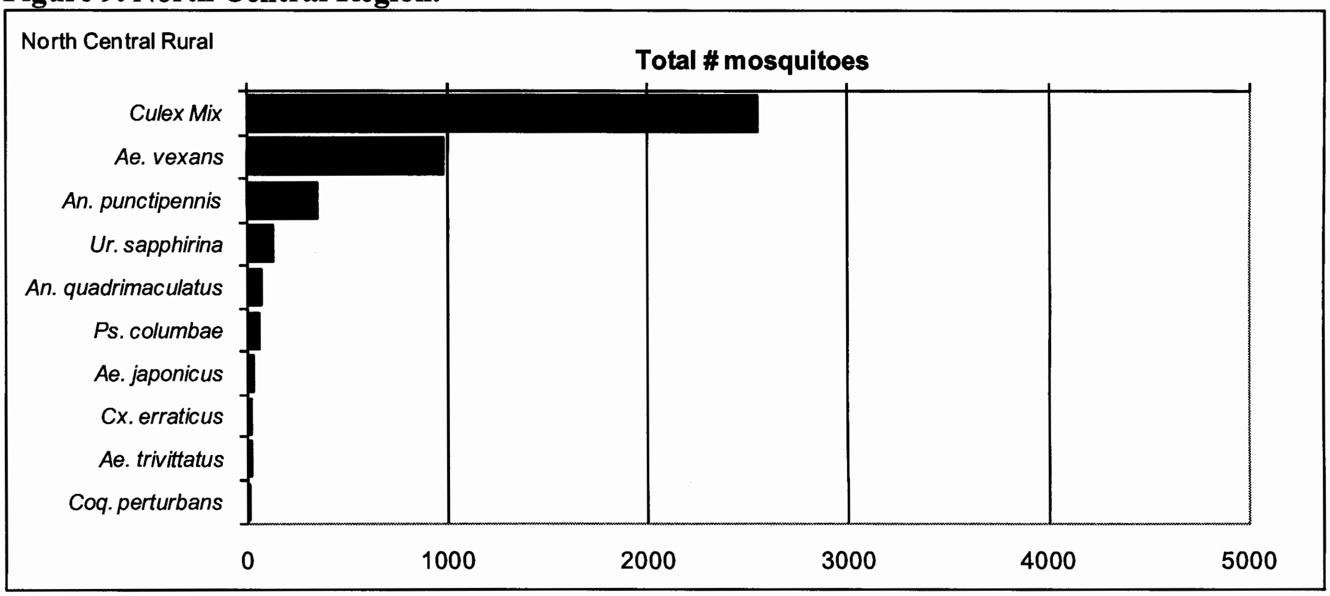


Figure 10. Northwestern Rural Region.

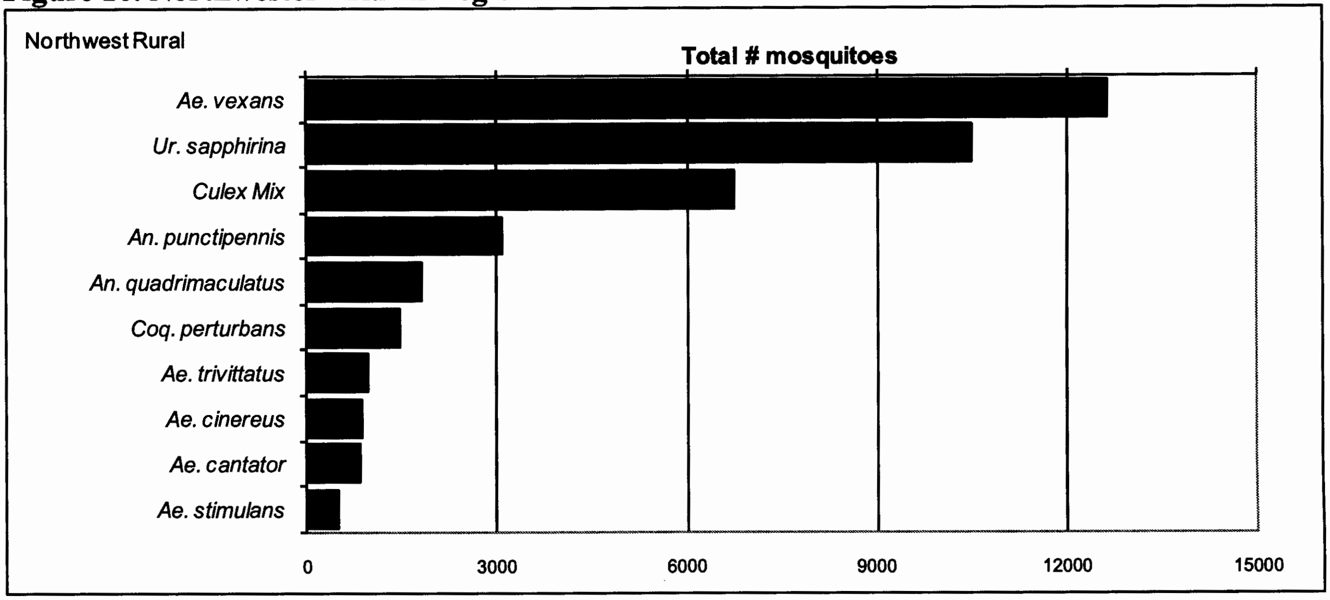


Figure 11. Philadelphia Metropolitan Region.

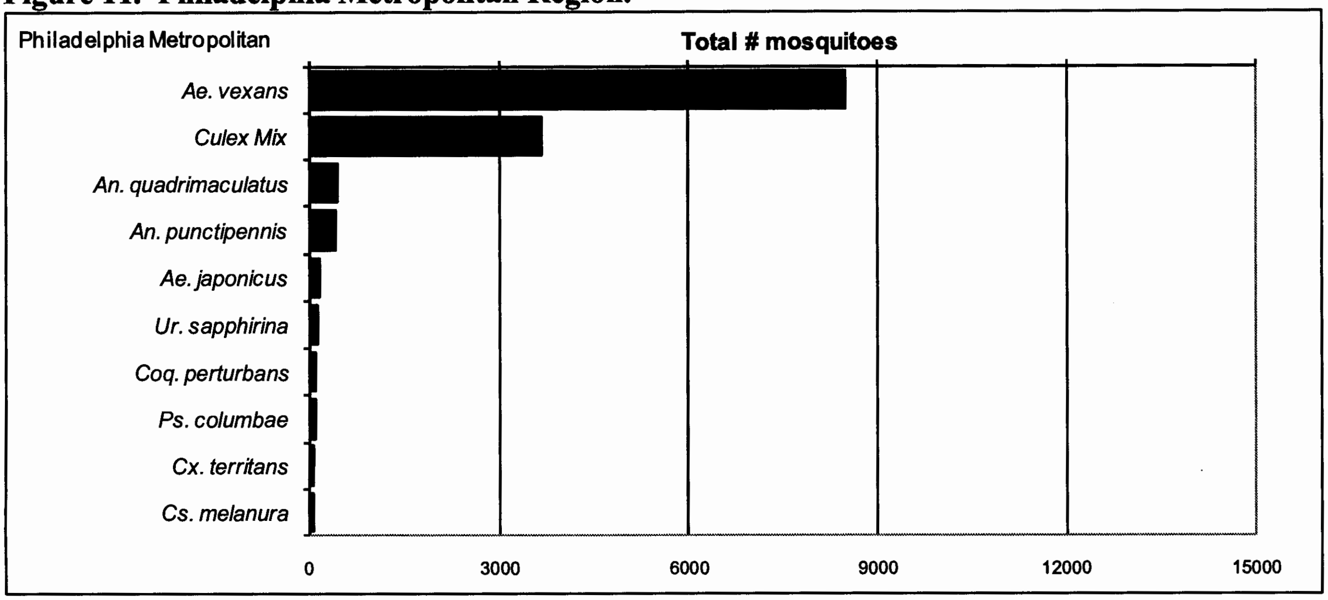


Figure 12. Pinelands Region.

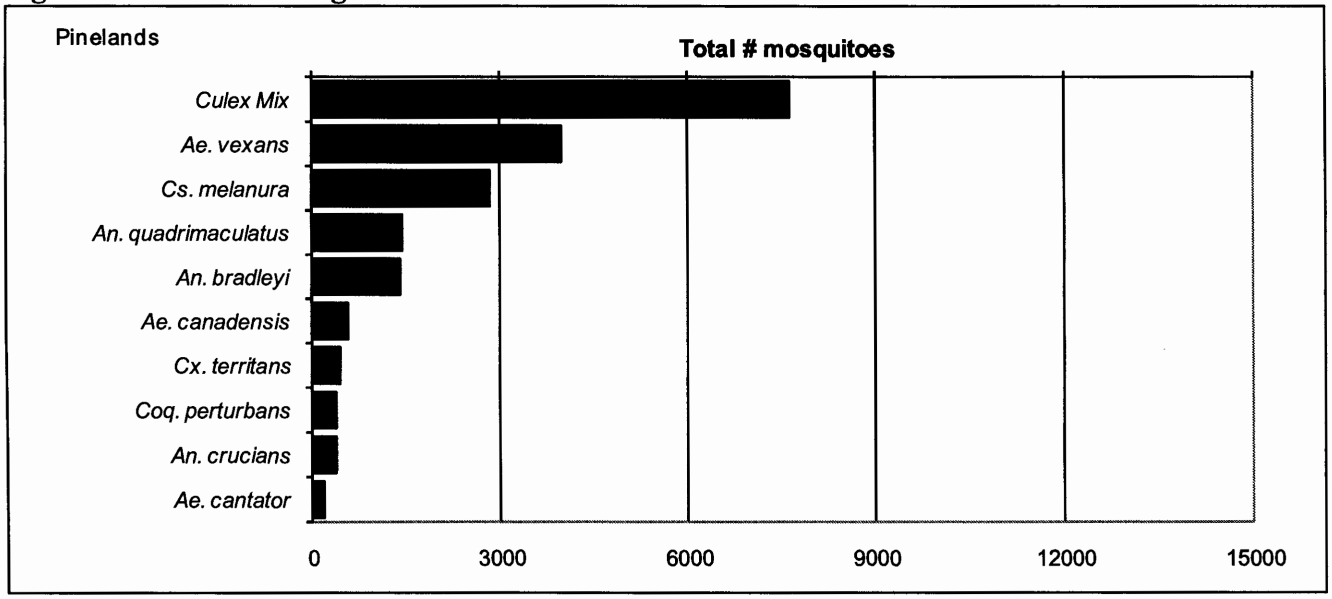
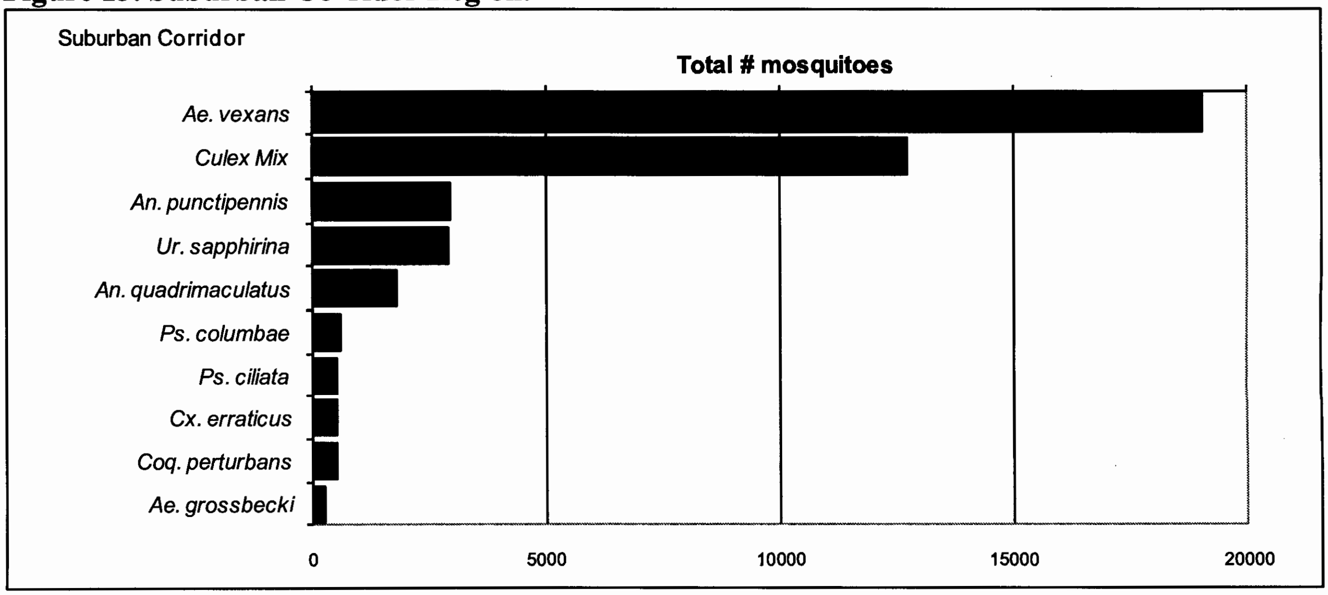


Figure 13. Suburban Corridor Region.



The snowpool mosquito, *Aedes stimulans* is appropriately named as it is found in woodland pools of the northeastern US and southwestern Canada. Here in New Jersey, the region with the most predictable populations is the Northwestern Rural. This cold tolerant mosquito develop from overwintering eggs in pools until in early spring when surrounding woodland trees develop leaves and subsequently drain the pools and force *Ae. stimulans* to emerge quickly. Thus, it may be on the wing before this surveillance program begins. The current year pattern in the Northwestern Rural region is typical for this species. Last year, *Ae. stimulans* showed up in number also in the New York Metro region, but this did not happen again this year.

Aedes grossbecki, an early to mid-season mosquito, is found in all regions of New Jersey, but with varying abundance, likely due to the majority of its distribution is in the southeast US. Previously, higher abundances were found in the Delaware Bayshore and New York Metropolitan regions. This year, the Suburban Corridor is the region showing the most abundance. This species is considered a "minor" pest because although it may have a noticeable bite, its overall numbers tend to be low with a muted distribution.

Aedes canadensis canadensis experienced higher than historical trends in the Coastal region as well as the Delaware Bayshore region. This species is an early season univoltine mosquito found throughout New Jersey, often with a late season emergence. These later waves of *Ae. canadensis* are not a second generation: this species is not considered to be multivoltine in New Jersey and thus the source of later emergences are eggs that failed to hatch early in the year. If flooding events are greater than events that initiated the spring emergence, then the smaller, late season emergence will occur. This occurred most notably for the Pinelands and the Suburban Corridor regions.

Aedes cinereus is a species that appear after early-season species such as *Ae. excrucians* or *Ae. fitchii*. As with *Ae. canadensis*, later emergences can occur from eggs that had not previously hatched. *Ae. cinereus* is very cold-tolerant, with a range that extends into Canada and up through Alaska and can tolerate the early season temperatures. As with the previous year, the Northwestern Rural region experienced abundances well above historical values.

Aedes sticticus is a univoltine aedine mosquito with re-occurrence patterns similar to *Aedes canadensis*. After an initial spring emergence from shaded woodland pools located in floodplains, an additional emergence will come from other pools located slightly elevated (i.e., near the edge of the floodplain) when these areas become flooded later during the summer. This double emergence can be seen most easily in the historical data of the Agricultural and the New York Metro regions. This year, activity was high early in the season in the Delaware Bayshore region, with late season activity particularly noticeable in the Suburban Corridor. These likely generated many complaints as this species can be an aggressive biter.

Aedes vexans is the model for the fresh floodwater mosquito that produces multiple generations a year. Populations are very dependent on local conditions, although some areas can be influenced by distant conditions, such as floodwater from streams that overflow banks despite no local rains. This condition is found in the Northwestern Rural region, where three rivers meet and flood after rains from upstate New York flow into New Jersey. This year, *Ae. vexans* populations were highly abundant across the state in nearly all regions, reflecting the wetter than average summer New Jersey experienced in 2009.

Aedes trivitattus, a multivoltine floodwater species, can generate a number of complaints from residents after flooding events. This aggressive, persistent biter is most abundant in the Northwestern Rural region where this year two significant emergences occurred. Other regions such as the New York Metro and the Suburban Corridor also showed increased abundances over historical trends. *Ae. trivittatus* can transmit trivittatus virus to mammalian vertebrates, but this disease is virtually unknown in New Jersey. *Ae. trivittatus* can also transmit WNV when taken from a highly viremic source.

Psorophora columbiae is a smaller psorophoran that is preyed upon by its larger brethren. All the psorophorans are floodwater mosquitoes in New Jersey. As such, and as one of the food sources for the larger psorophorans, the population size of this mosquito as well as rain events can regulate the larger psorophorans. This year, population levels were down in just about all regions including the Agricultural, Coastal, Delaware Bayshore, Delaware River Basin, North Central Rural, Philadelphia Metro, Pinelands and the Suburban Corridor. The lower level of this prey item for other mosquitoes likely had an impact on the predator population abundances as well.

Psorophora ciliata is a large mosquito that preys upon smaller mosquitoes such as *Psorophora columbiae* as larvae. As a floodwater mosquito, both habitat and prey are important in the abundance that could result. This year, there were regions that supported fewer than historical records would suggest that they could support (Agricultural, Delaware Bayshore and River Basin regions and the Philadelphia Metro region). Precipitation was substantial this year, but the data for *Psorophora columbiae* suggests that one prey population levels were down in those regions. However, the Northwestern Rural region experienced high population levels of *Ps. ciliata* without the corresponding high levels of *Ps. columbiae* in that regions and the timing of both populations is off for the Suburban Corridor, suggesting other prey items are also important.

Psorophora ferox is a fierce biter found in wooded areas generating numerous complaints when in close proximity to humans. They frequently attack when disturbed at their resting site. As like other multivoltine aedine-type life cycles, *Ps. ferox* can emerge in numbers after flooding events. This year saw a continued decline from the previous year in regions where they are often found: Agricultural, Delaware River Basin, New York and Philadelphia Metro. The Suburban Corridor was the only region that had a sustained population.

Aedes sollicitans is the significant salt marsh mosquito along the eastern half of the US, and one of the motivations for the early attentions paid to mosquito control in New Jersey. This long-flying mosquito can generate nuisance complaints far from its natal habitat. Most abundance comes from the Coastal and Delaware Bayshore regions (the latter of which whose population was reduced in the middle of the season, possibly due to changes in the pesticides used), but more inland sites can also record their presence. This species may contribute to the coastal cases of Eastern Equine encephalitis.

Aedes cantator is a facultative salt marsh floodwater species that can exploit both natural and anthropogenic sources of saline habitat. Their significant presence in the Coastal and Delaware Bayshore regions is obvious. The Northwestern region, however, might be a puzzlement until the habitat is understood: a textile factory contributes habitat through the use of saline waters to help set the dye in fabrics. In this region this year, numbers were significantly higher than historical values as they were also in the Delaware River Basin region, but to a lesser extent.

Aedes taeniorhynchus is a floodwater species found primarily in coastal salt water habitats. Its most abundant populations are found along the Delaware Bayshore region and can often be found in conjunction with *Ae. sollicitans*, where both can be intolerable pests. Fortunately, *Ae. taeniorhynchus* is not an efficient vector or either EEE or WNV. Migration flights are not as long as *Ae. sollicitans* and this mosquito is usually not seen far from either the Delaware Bayshore or Coastal regions. This year, the population in the Delaware Bayshore region appears impacted, likely by the same circumstances as with *Ae. sollicitans*.

Aedes triseriatus, the Eastern Treehole mosquito, is a known vector of La Crosse encephalitis virus. Transmission to the following year is through overwintering eggs (vertical transmission) that develop into infected adults. Amplification is through small vertebrates such as chipmunks and tree squirrels. The CDC reports 3 known cases of La Crosse in New Jersey, all occurring during the mid 1970's. This species is not well attracted to light traps. Last year, the largest populations were trapped in the Delaware River Basin. But this year, no individuals were seen in this region. The Philadelphia Metro region did not have the population numbers seen in previous years. In the Northwestern Rural region which can also have significant populations, significant numbers were seen during the middle of the season.

Aedes japonicus, a cold-tolerant invasive species, was very abundant in the Delaware River Basin and the Philadelphia Metro regions last year. This year, population levels remained high in the Philadelphia Metropolitan region, as well as most other regions, but were not recorded in the Delaware Bayshore region. Despite the low numbers of the Japanese Rock Pool mosquito that are attracted to light traps, the numbers track natural population trends (Falco 2002). Pools positive for West Nile virus are often found in this vector-competent species.

Aedes albopictus made its first appearance in New Jersey in 1995, ten years after the initial US invasion in Texas. In New Jersey, all counties but those in the Northwestern Rural region have reported populations, some with significant numbers. In 2009, the Coastal region experienced higher than historical trends while on the other side of the state, the Philadelphia Metropolitan region had a sporadic presence of this species. The Delaware River Basin recorded no *Aedes albopictus* in the traps from that region.

Anopheles quadrimaculatus is the type species for multivoltine mosquitoes that lay non-desiccant resistant eggs on clean water and that overwinters as adult females. *An. quadrimaculatus* will utilize brackish water for larval habitat, allowing it to exploit a variety of habitat that gives it greatest range in New Jersey. In the past, *An. quadrimaculatus* has been a significant vector of malaria in New Jersey. This year, population levels were generally along the historical trends, with a few exceptional emergences occurring in the Coastal, Philadelphia Metro and Suburban Corridor. The Agricultural region continued to experience a reduction of this mosquito.

This small mosquito is generally considered not to be a health threat, although Eastern Equine encephalitis and West Nile viruses have been detected in them in the US. Although it is found throughout New Jersey and is often recorded in the light traps of this program and can overwinter near anthropogenic sources, this mosquito apparently bites few humans. Largest populations usually occur in the Northwestern Rural region and the Suburban Corridor. Typically, populations will build up and then slowly decline. This year, populations flourished in the Northwestern Rural region, with abundances also seen in the North Central Rural and the Suburban Corridor. Populations were reduced in the Agricultural, Delaware River Basin and the Pinelands regions.

Culex erraticus was first detected in New Jersey in the late 1960's. For most of the years since then, this mosquito has been thought of as rare. Recently, populations have begun to show up more frequently in traps seen before as well as being seen for the first time in other areas. Catholic in its diet, *Cx. erraticus* has been implicated in the amplification and transmission cycle of Eastern Equine encephalitis. For the first time in New Jersey, this species has been found to be positive for EEE. In fact, it was the species with the second most numerous pools to *Cs. melanura* and was found positive in two distinct areas of southern New Jersey. This species should be regularly included in the testing of mosquito pools for EEE.

Culex territans is a specialized frog-feeder with cold tolerance that allows it to be present when early-season frogs appear. This means that a portion of the population is not likely recorded in the light traps as they have already appeared and disappeared before the traps were turned on. As with other *Culex*, females overwinter in protected hibernaculae. This species is found throughout most of New Jersey. It is most common in the Pinelands regions although there was a large and similarly patterned abundance found in the Northwestern Rural region. *Cx. territans* was noticeably missing from the Delaware River Basin.

Anopheles bradleyi is a salt tolerant floodwater species that exploits more brackish water areas near salt marshes. Its largest populations are found in the Coastal and Delaware Bayshore, but surprisingly not in the Delaware River Basin, where dredge spoil impoundments have produced significant populations in earlier years (Slaff and Crans 1982). This year, abundances in several regions were above historical levels, including the Delaware Bayshore, River Basin and the Suburban Corridor.

Anopheles punctipennis showed a variable response this year, with higher than historical values in the New York Metro and the Northwestern Rural while population suppression occurred in the Delaware Bayshore, Delaware River Basin and the Suburban Corridor. Historically, the Delaware Bayshore has been a region of high production, but this is the second year in a row that fewer *An. punctipennis* mosquitoes have been found. Several viruses have been isolated in this multivoltine species, including West Nile and Eastern Equine encephalitis. Malaria, caused by the *Plasmodium* protozoan, has also been found in this species, but unlike *An. quadrimaculatus*, *An. punctipennis* is not considered a major vector.

Mixed *Culex spp.* (including *Culex pipiens, Cx. restuans* and *Cx. salinarius*) are consolidated into one group as individuals from the three species can be difficult to distinguish after going through a light trap. Two of these (*Cx. pipiens* and *Cx. restuans*) are primarily bird feeders, although they may change their diet to include mammals as the summer ends. This is the primary enzootic vector for West Nile virus in the northeast US. Populations in 2009 were around historical values, with notable increases in the Coastal and Northwestern Rural regions and decreases in the Delaware Bayshore and River Basin regions. This year saw a decrease in WNV activity.

Culiseta melanura is the enzootic vector of Eastern Equine encephalitis virus. This species overwinters as larvae in the acidic waters of peat bogs, usually safely inside crypts formed at the base of trees. This makes larval control of them particularly difficult. Historical values of the Pinelands clearly show the second generation where most EEE amplification occurs that develops during the second half of the season. This season shows this generation's elevated abundances in the Pinelands, Agricultural, Coastal, Delaware Bayshore and the Northwestern Rural regions. This occurred during a year when EEE activity was high.

Anopheles crucians has not been reported previously in the final reports due to low numbers, but this year, abundances in the Pinelands and Philadelphia Metro regions elevated this species. *An. crucians* is similar to *Cs. melanura* with overwintering larvae that likely spend time burrowed in bottom sediment. It can apparently exploit habitats with varying amounts of mineral salts not tolerated by other species. Although reported in saline habitats in the past, (perhaps misidentified i.e. *An. bradleyi*) few *An. crucians* appeared in either the Coastal or Delaware Bayshore habitats. This species is a potential vector of malaria.

Coquillettidia perturbans, a suspected vector of inland EEE cases, spends its larval time attached to plants and gaining oxygen through the piercing of the plant phloem. This exploitation of plants makes this species more difficult to control. This year, population suppression occurred to some degree in the Agricultural, Coastal, Delaware Bayshore, Philadelphia Metro, Pinelands and Suburban Corridor while the Northwestern Rural region experienced an abundance of this species.

Anopheles walkeri is the only anopheline to overwinter as an egg and is thus given its own life cycle classification (Crans 2004). This species has been found in association with beaver dams in the Northwestern Rural region (Duckworth & Musa 2002). Primary habitat is found in certain Suburban areas in Morris County as well as more rural areas in Sussex County. This year, populations in the Suburban Corridor, apart from an exceptional emergence during week 27, were generally absent. However, in the adjacent Northwestern Rural region, this species flourished, with abundances well above the historical trends for the last five years.

Season of 2010: The following remarks reflect the early mosquito population of the season of 2010.

Surveillance data generally became available for evaluation in May and continued to the end of the fiscal year, which ended on June 30.

Aedes vexans populations remained at low levels throughout the state. Early spring rains were predicted for parts of New Jersey. Local mosquito populations had the potential to emerge if precipitation occurred. This effect was widely scattered.

Culex populations presented levels that could become significantly below historical values for some regions, such as the Northwest, should the abnormally dry conditions continue throughout the remainder of the season.

Populations of *Culiseta melanura*, the enzootic ornithophilic vector of Eastern Equine encephalitis, appeared to decrease in early spring, except for the Delaware Bayshore. This region had shown a slight increase. It was too early to determine if this is part of the normal, slow increase toward the second generation emergence (perhaps including some 1st and 2nd overwintering instars) or merely part of the normal variation seen in populations.

Coquillettidia perturbans decreased for all regions except for the Coastal region. It appeared that a true shift in the population presence of this species had occurred, with emergence beginning earlier in the season and possibly ending earlier. Some historical data suggests later emergences can occur early in the season.

Aedes sollicitans population numbers were low this spring at the two regions of highest production, the Coastal and the Delaware Bayshore. The abundance in the New York Metro region was as high as historical trends.

Aedes japonicus, a hardy cold-tolerant species, were initially higher than historical numbers for several regions over several weeks. But, numbers declined in some regions as possible habitat may have dried, including Agricultural, Pinelands and the Suburban Corridor. Costal and New York Metro region populations still appeared strong.

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Falco RC, Daniels TJ, Slamecka MC 2002 Prevalence and Distribution of *Ochlerotatus japonicus* (Diptera: Culicidae) in Two Counties in Southern New York State. Journal of Medical Entomology: 39(6):920–925.

Slaff, M., and W.J. Crans. 1982. Impounded water as a major producer of *Culex salinarius* (Diptera: Culicidae) in coastal areas of New Jersey, USA. Journal of Medical Entomology. 19: 185-190.

Reported By Lisa Reed, Ph.D., and Scott Crans, Department of Entomology, Rutgers University

Surveillance for the Mosquito Vectors of Eastern Equine encephalitis and West Nile Virus in New Jersey

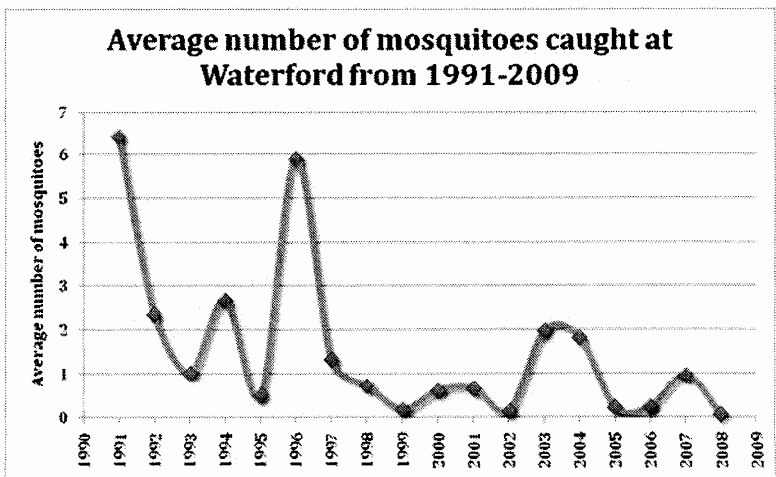
Introduction

The NJ State Mosquito Control Commission (SMCC) has monitored potential vectors of mosquito-borne encephalitis in New Jersey since 1975 with a vector surveillance program designed to keep health related agencies aware of the potential for human involvement. Eastern Equine encephalitis (EEE) was an original target for investigation because of its impact on coastal resorts in the southern portion of the state. West Nile virus (WNV) was added to the program in 2000 following an outbreak in New York City the previous year. In 2009, Saint Louis encephalitis and La Cross encephalitis surveillance were added. County mosquito control personnel were recruited to collect and process specimens. This program functions as a cooperative effort that includes the NJ Department of Environmental Protection, the NJ Department of Health, the NJ Agricultural Experiment Station at Rutgers and the 21 county mosquito control agencies in the state. The goal is a disease surveillance effort that provides mosquito control with information to target vector populations for the prevention of human disease. This report documents the results of virus surveillance efforts during the 2009 encephalitis season.

Methodology of EEE Surveillance

The mosquito, *Culiseta melanura*, is monitored from late May to about mid-October as the primary indicator of EEE virus in southern New Jersey. This ornithophilic mosquito transmits virus to birds as part of the amplification and transmission cycle. It usually does not bite mammals but can be used to monitor virus levels as the season progresses. Weekly collections of *Cs. melanura* were made from resting boxes at permanent study sites by teams of field staff from four counties: Atlantic, Cape May, Monmouth and Ocean counties. The mosquitoes were frozen on dry ice at the collection site and transported to county labs for further processing. The frozen specimens were sorted on chill tables to maintain the cold chain and were identified to species, pooled and submitted weekly to the PHEL facility in Trenton or to the Cape May labs at the Cape May County Department of Mosquito Control for virus testing. Positive pools were detected by Taqman RT-PCR. Information from the investigation was summarized and distributed weekly to mosquito control and public health agencies in New Jersey and the Northeast. The resting box collection sites for 2009 included: Turkey Swamp in Monmouth Co., Green Bank in Burlington Co., Corbin City in Atlantic Co., Dennisville in Cape May Co., and Centerton in Salem Co. Two new sites were added in 2009: near Glassboro in Gloucester County and near Winslow in Camden County. Collection at the Waterford site in Camden County was discontinued after CDC week 30

Figure 13. Average number of mosquitoes caught at the Waterford site from 1991-2009.

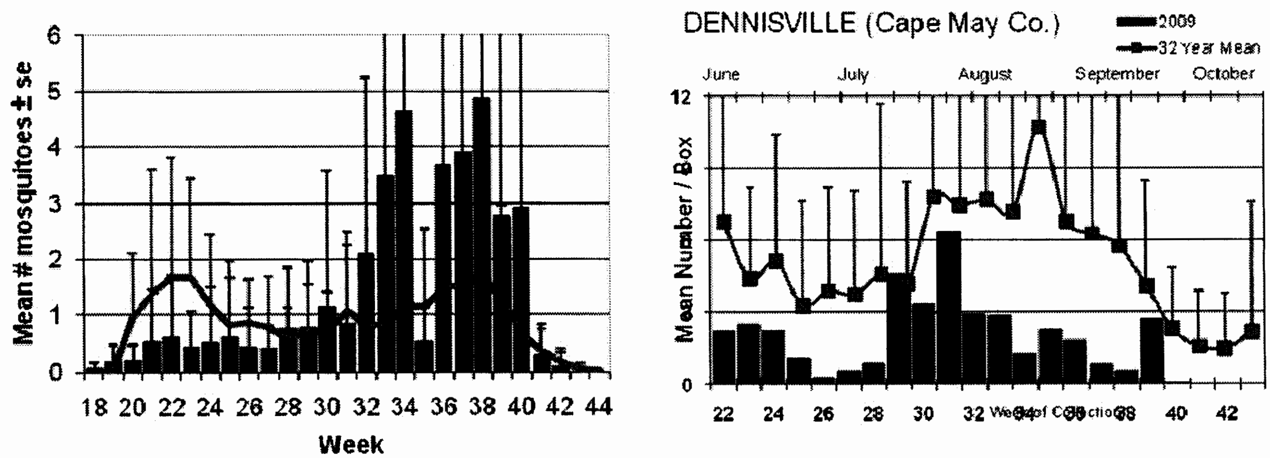


due to the persistent lack of mosquitoes. The Waterford site had been in operation since 1991. However, the past several years produced few mosquitoes at the site and the site was deemed no longer capable of adequate surveillance (Figure 13).

Results of EEE Surveillance in 2009

The 2009 mosquito season began with low levels of *Culiseta melanura* in both the Statewide Surveillance light traps of the Pinelands and resting box populations in the Vector Surveillance program (Figure 14). During the second half of the season, population levels differed between the two sampling methods, with higher than historical trends in light trap as compared to the resting boxes. This was unusual as generally higher counts are found in the resting boxes. A few resting box sites developed higher populations toward the end of the season, but in general, this occurred after positive pools were detected as the second generation experienced peak emergence.

Figure 14. Populations of *Culiseta melanura* in two types of traps in southern New Jersey during 2009. On the left side is the data from the statewide adult mosquito surveillance program, the Pinelands region *Cs. melanura* population collected with New Jersey light traps. On the right is the resting box population at the Dennisville, Cape May County site.

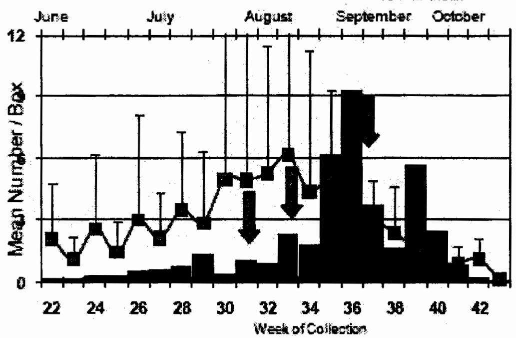


Positive mosquitoes were detected numerous times at the traditional resting box monitoring sites (Figure 15, next page). The largest number of pools occurred at the Dennisville site, followed by the Winslow site (the newest added site). Detections occurred at sites with few mosquitoes (Green Bank) during the upswing of the second generation. Thus the presence of low numbers of mosquitoes did not result in a lack of positive pools. (It should be noted that the discontinuation of the Waterford site occurred because after having low numbers, the site produced NO mosquitoes after 10 straight weeks of surveillance.) All sites (other than Waterford) produced at least one positive pool (Table 14, page 4). MFIR values at the sites were calculated to range from 2.93 to 11.66, with the highest MFIR value at Dennisville. The earliest detection occurred on 16 July. Past experience suggested that detections occurring prior to the first week in August can result in multiple horse cases, and this year was no exception (see horse and human section, below).

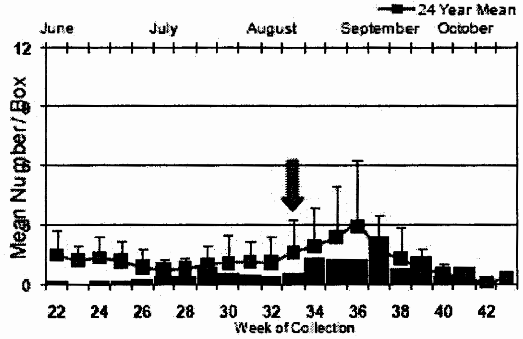
Culiseta melanura Population Graphs

Coastal

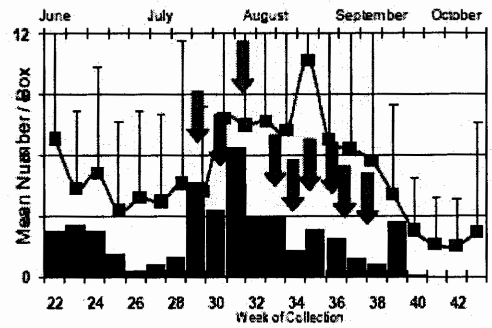
GREEN BANK (Burlington Co



CORBIN CITY (Atlantic Co.)

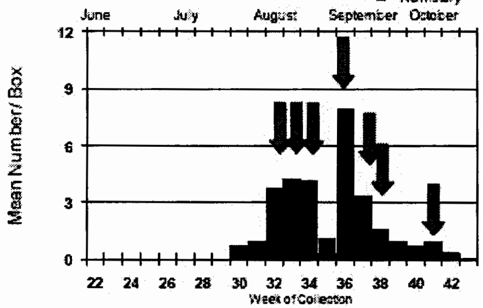


DENNISVILLE (Cape May Co.)

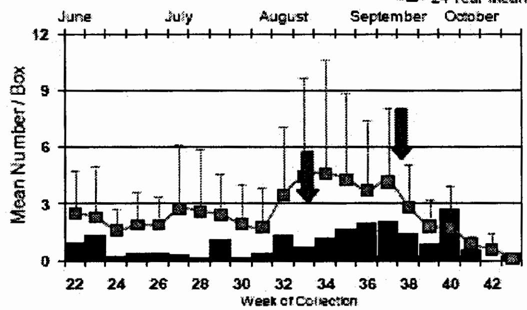


Inland

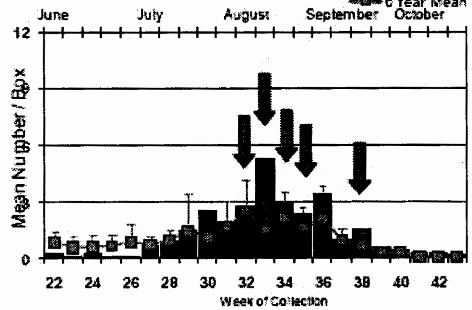
WINSLOW (Camden Co.)



CENTERTON (Salem Co.)



TURKEY SWAMP (Monmouth Co.)



All mosquito species are experiencing significant drops in population levels as colder weather approaches.

= positive pool(s) detected.

GLASSBORO (Gloucester Co.)

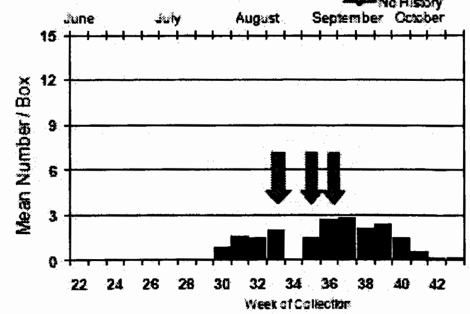


Table 14. Total number of *Culiseta melanura* tested for EEE by site in 2009, together with positives and earliest isolation dates. The Waterford site was discontinued on week 30 after running from 1991-2009. The Winslow site was begun at the same week.

Site Name	Coastal or Inland	Total Pools	Total Mosquitoes	Positive pools	MFIR	Earliest Date
Corbin City	Coastal	25	310	1	3.23	8/18/2009
Dennisville	Coastal	55	1715	20	11.66	7/21/2009
Green Bank	Coastal	42	1023	3	2.93	8/3/2009
Centerton	Inland	36	571	2	3.50	9/3/2009
Glassboro	Inland	46	1130	4	3.54	8/18/2009
Turkey Swamp	Inland	130	1437	11	7.65	8/12/2009
Waterford	Inland	7	22			
Winslow	Inland	37	1539	16	10.40	8/12/2009
Statewide		**378**	**7747**	**57**	**7.36**	7/21/2009

The activity in New Jersey appeared to mirror the activity on the eastern seaboard, with much increased activity over the previous year. In 2008, the nation had 87 pools of positive mosquitoes. In 2009, the total number of positive mosquito pools was 580, a greater than 550% increase from the previous year. In New Jersey, there were fewer than 10 positive pools, all in *Cs. melanura* in 2008. This year, there were 118 positive pools. Fifty-seven of them came from *Cs.* melanura collected at the traditional resting box sites while 35 positive *Cs. melanura* pools came from sites sampled by individual counties (Table 15). Counties caught *Cs. melanura* in a variety of traps, including CO2 traps, gravid and resting boxes.

Table 15. Total number of *Cs. melanura* caught at non-traditional sites, by county and trap.

County/Trap Type	Total Pools	Total Mosquitoes	Positive Pools	MFIR
Atlantic	5	139		
CO2 Trap	5	139		
Burlington	76	2272	9	3.96
CO2 Trap	76	2272	9	3.96
Cape May	194	3165	18	5.69
CO2 Trap	3	13		
Gravid	80	154	2	12.99
Other	1	21		
Resting Box	110	2977	16	5.37
Cumberland	15	139		
CO2 Trap	3	15		
Resting Box	12	124		
Gloucester	54	538	4	7.43
CO2 Trap	3	9	1	111.11
Resting Box	51	529	3	5.67
Monmouth	15	42	1	23.81
CO2 Trap	9	32	1	31.25
Gravid	3	7		
Other	3	3		
Ocean	51	283	3	10.60
CO2 Trap	24	167	1	5.99
Gravid	14	39		
Resting Box	13	77	2	25.97
Salem	7	21		
CO2 Trap	7	21		
Sussex	8	28		
CO2 Trap	4	10		
Gravid	1	1		
NJ Light Trap	3	17		
Grand Total	425	6627	35	5.28

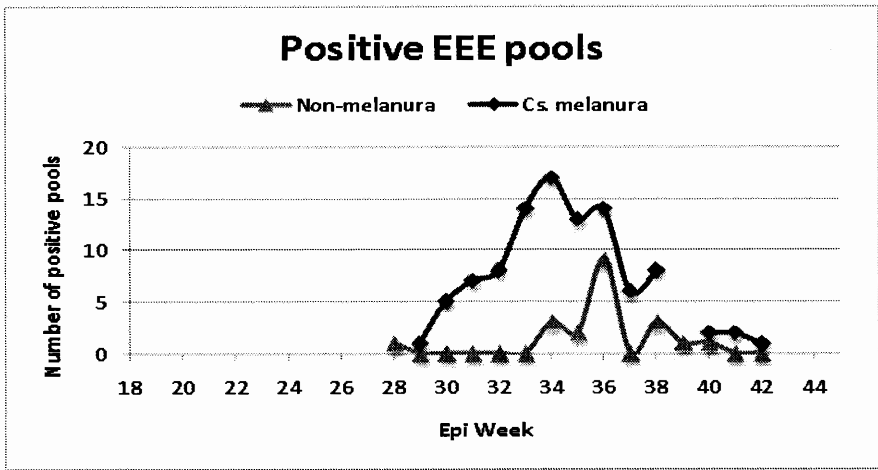
In addition to *Cs. melanura* positive pools, EEE was detected in other species. Table 16 indicates that the most frequent species other than *Cs. melanura* was *Culex erraticus*. *Cs. erraticus* was first detected in New Jersey in the 1960's and has been considered relatively rare until the past several years (Crans 1970). A significant increase in both numbers and range in New Jersey, plus the involvement of *Cx. erraticus* in the EEE cycle in the southeastern US (Cupp 2003, 2004) prompted its inclusion in the testing for EEE. The first year resulted in no positives, but this year 13 positive pools were detected from two distinct sites. Other species were both ornithophilic (*Cx. pipiens*) as well as mammaphilic (*Aedes vexans*).

Table 16. Total non-*Cs. melanura* species tested for EEE. EEE was detected in eight species, with the most frequently found positive pools in *Culex erraticus*. A total of 26 pools were detected in non-*Cs. melanura* species for 2009.

Species	Total Pools	Total Mosquitoes	Positive Pools	MFIR
Aedes abserratus	1	1		
Aedes albopictus	80	381		
Aedes atlanticus	8	23		
Aedes atropalpus	2	16		
Aedes canadensis canadensis	52	834	3	3.60
Aedes cantator	8	81		
Aedes cinereus	1	6		
Aedes japonicus	76	250	1	4.00
Aedes sollicitans	15	286		
Aedes sticticus	1	41		
Aedes taeniorhynchus	4	57		
Aedes thibaulti	1	1		
Aedes triseriatus	26	99		
Aedes trivittatus	4	11		
Aedes vexans	49	841	1	1.19
Anopheles barberi	3	14		
Anopheles bradleyi	18	600		
Anopheles crucians	7	37		
Anopheles punctipennis	65	356	1	2.81
Anopheles quadrimaculatus	50	251		
Anopheles walkeri	1	19		
Coquillettidia perturbans	27	313		
Culex erraticus	184	7050	13	1.84
Culex pipiens	76	505	2	3.96
Culex restuans	115	512	1	1.95
Culex salinarius	120	3202	1	0.31
Culex spp.	294	8286	3	0.36
Culex territans	15	69		
Culiseta inornata	1	2		
Culiseta morsitans	2	2		
Psorophora ciliata	3	35		
Psorophora columbiae	3	9		
Psorophora ferox	11	186		
Psorophora howardii	1	6		
Uranotaenia sapphirina	7	25		
Grand Total	1331	24407	26	1.07

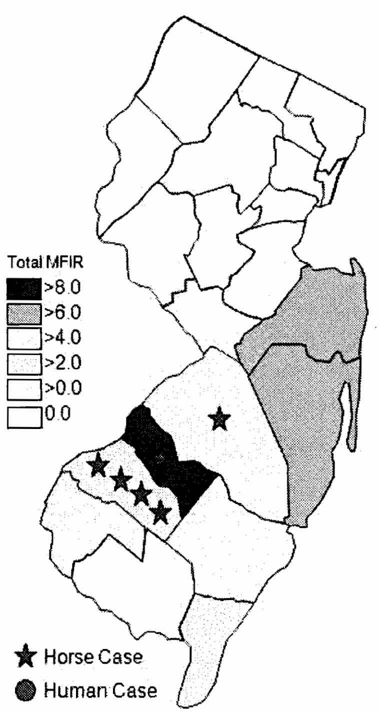
Another unusual feature about the pattern of vector infection was that the first positive pool detected was in *Culex salinarius* rather than the enzootic vector *Culiseta melanura* (Figure 15). This occurred one week prior to the detection in *Cs. melanura* and 18 days prior to detection at the closest traditional monitoring site Green Bank.

Figure 15. Timeline for positive pool detection of EEE in *Cs. melanura* (the enzootic vector) and non-*Cs. melanura* species in 2009.



Horse and Human Involvement with EEE: As with vector activity, the nation experienced an increase in mammalian acquisition of EEE infection. In 2008, national equine infections were 185 with 1 infection in New Jersey. In 2009, there were 301 equine infections nationwide, with 6 cases in New Jersey. One occurred in Burlington County (onset 4 Sept), one in Camden County (onset 13 Sept) and four in Gloucester County (earliest onset 18 Aug).

Figure 16. Distribution of EEE horse cases by county (symbol not location) against county EEE MFIR values in 2009.



There were no human cases. Figure 16 indicates distribution by county of horse cases with associated county EEE MFIR values.

Methodology of WNV Surveillance

New Jersey's WNV surveillance program in 2009 relies on significant county initiative to conduct meaningful surveillance within their county borders. Counties have various approaches to monitoring West Nile virus activity, ranging from focusing on the enzootic vector, *Culex pipiens* (primarily through the submission of Mixed *Culex* pools) to the submission of a wide range of potential bridge vectors.

Results of WNV Surveillance in 2009

During the 2009 mosquito season, a total of 226,590 mosquitoes were tested in 9,764 pools. Results from the surveillance effort produced 323 WNV positive pools, about half from the previous year despite the increase in the number of mosquitoes tested. All of New Jersey's 21 county mosquito control agencies participated in the state program during 2009. Table 18 indicates species results from county efforts in mosquito collection. The majority of positive pools came from *Culex* Mix species, which included *Cx. pipiens, Cx. restuans* and *Cx. salinarius*. The MFIR value of the Mixed pools was the highest at 1.929. *Cx. pipiens* pools were the second most abundant positive pools and likely contributed the most toward the Mixed pools MFIR as compared to the relatively small (*Cx. restuans*) or non-existent (*Cx. salinarius*) positive pools of the other *Culex* species. The MFIR of the Mixed species was considerably lower than the previous year's value of over 5.

Table 17. Mosquitoes tested for West Nile in New Jersey during 2009.

Species	Total pools	Total mosquitoes	Positive pools	MFIR
Aedes abserratus	1	1		
Aedes albopictus	697	4541	3	0.661
Aedes atlanticus	17	52		
Aedes atropalpus	2	16		
Aedes canadensis canadensis	138	2881		
Aedes cantator	56	467		
Aedes cinereus	2	7		
Aedes grossbecki	3	35		
Aedes japonicus	856	5064	1	0.197
Aedes sollicitans	33	370		
Aedes sticticus	12	115		
Aedes taeniorhynchus	17	141		
Aedes thibaulti	6	9		
Aedes triseriatus	311	1181	1	0.847
Aedes trivittatus	41	609		
Aedes vexans	199	2863	1	0.349
Anopheles barberi	7	24		
Anopheles bradleyi	47	847	1	1.181
Anopheles crucians	7	37		
Anopheles punctipennis	176	648		
Anopheles quadrimaculatus	148	1557		
Anopheles walker	1	19		
Coquillettidia perturbans	65	622		
Culex erraticus	203	7222		
Culex pipiens	1037	21657	17	0.785
Culex restuans	649	6964	2	0.287
Culex salinarius	188	3900		
Culex spp.	3999	152901	295	1.929
Culex territans	33	119		
Culiseta inornata	1	2		
Culiseta melanura	730	10893	2	0.184
Culiseta morsitans	3	5		
Orthopodomyia signifera	3	3		
Psorophora ciliata	7	50		
Psorophora columbiae	10	239		
Psorophora ferox	48	495		
Psorophora howardii	1	6		
Uranotaenia sapphirina	10	28		
Statewide	**9764**	**226590**	**323**	**1.425**

Table 17 also lists infection rates in potential bridge vectors. In previous years, WNV was detected in *Aedes albopictus, Ae. japonicus, Culex salinarius* and sometimes *Coquillettidia perturbans*. This year 2 percent of the positive pools were in species other than ornithophilic species, including *Aedes albopictus, Ae. japonicus, Ae. triseriatus, Ae. vexans* and *Anopheles bradleyi* . No positive pools were found in *Cx. salinarius*.

Last year, the total number of mosquitoes caught by a county was correlated with the number of positive pools. This year, this trend was not observed (Pearson's r = 0.297, n=21, p>0.01). Urban counties where West Nile activity has been high (Bergen, e.g.) continued to show significant WNV activity (**Table 18**).

Table 18 County cumulative infection rates for the 2009 season.

County	Total pools	Total mosquitoes	Positive pools	MFIR
Atlantic	274	6376	3	0.471
Bergen	229	15096	80	5.299
Burlington	581	14986	25	1.668
Camden	275	7201	20	2.777
Cape May	2372	38041	13	0.342
Cumberland	142	2506	1	0.399
Essex	280	3817	2	0.524
Gloucester	686	13632	3	0.220
Hudson	238	11726	44	3.752
Hunterdon	462	18604	40	2.150
Mercer	654	10191	20	1.963
Middlesex	329	13833	13	0.940
Monmouth	755	6450	2	0.310
Morris	215	8678	9	1.037
Ocean	705	10812	6	0.555
Passaic	120	2193	4	1.824
Salem	262	6661	3	0.450
Somerset	345	7075	16	2.261
Sussex	380	9981	6	0.601
Union	169	4552	12	2.636
Warren	291	14179	1	0.071
Grand Total	**9764**	**226590**	**323**	**1.425**

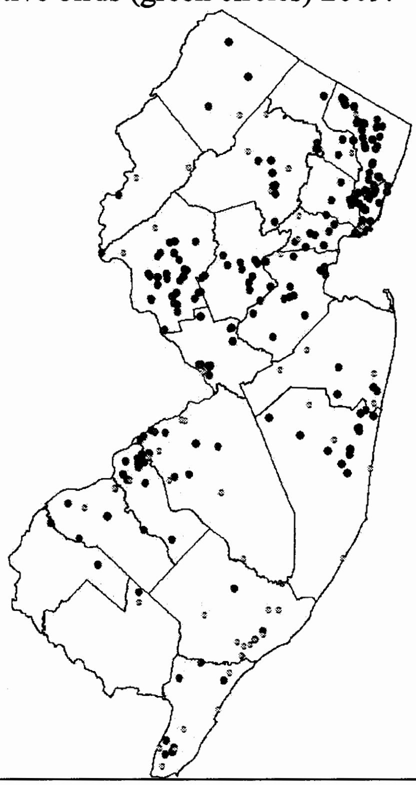
Avian Specimens: One hundred and eighteen birds were submitted and tested at PHEL in 2009. Three hundred and two were submitted in total, but only a little over than 1/3 were suitable for testing. Of those suitable for testing (Table 19), 69% were corvids (American, Fish or Unidentified Crow or Blue Jays). Twenty-five percent of the corvids were positive for West Nile virus. Notably, Fish Crows were not found to be positive even though the same number of individuals was submitted as American Crows, with an infection rate of 38%. This would suggest that Fish Crows were surviving the infections while American Crows were still sensitive to WNV effects (Reed 2009). Blue Jays also appeared to be sensitive to WNV infections, with an infection rate of 47%. This would also imply that American Crows and Blue Jays may still offer valuable information about the presence of virus in an area while Fish Crows might not.

Table 19. Birds tested at PHEL for the presence of WNV and their corresponding infection rates.

Common Name	Species	Negative	Positive	Total	IR
American Crow	*Corvus brachyrhynchos*	8	5	13	0.38
Fish Crow	*Corvus ossifragus*	13		13	0.00
Unidentified Crow	*Corvus*	13	7	20	0.35
Blue Jay	*Cyanocitta cristata*	19	17	36	0.47
Hawk	Falconiformes	9	2	11	0.18
Other	Unknown	24		24	0.00
	Grand Total	87	31	118	0.26

In addition to a decrease in the information about virus activity that positive birds used to give, there was also an apparent disconnect in the location of positive birds. Figure 178 maps the distribution of positive mosquitoes against positive and negative birds. Mosquito activity is clearly along the lines of urban-suburban distribution, with the greatest activity in those areas between Philadelphia and New York Metropolitan areas (with some coastal activity).

Figure 17. Distribution of West Nile positive mosquitoes (red circles), positive birds (black circles) and negative birds (green circles) 2009.

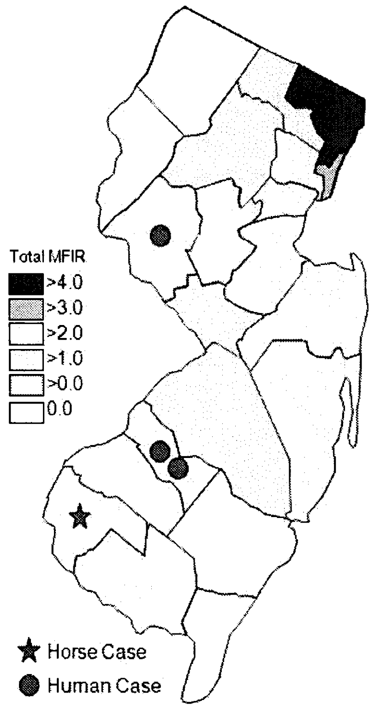


The distribution of positive birds does not follow the distribution of positive mosquitoes. One difficulty in interpreting these distributions is the uneven effort given to both tasks. Mosquitoes are collected and submitted by each county mosquito control agency. Dead birds, however, are submitted by other agencies for only some of the counties. Bergen County, for example, has the highest amount of mosquito activity, but only one avian submission.

Horse and Human Involvement: One horse with an uncertain vaccination history in Salem County acquired West Nile virus in 2009. Date of onset was 18 August 2009.

Human involvement with West Nile virus decreased considerably from the previous year. In 2008, there were 10 cases. In 2009, with much less positive mosquito activity, human cases decreased to three, with one case in Hunterdon County (symptom onset of 18 Aug 2009) and two cases in Camden County (earliest symptom onset was 28 Aug 2009). There were no fatalities.

Figure 18. Distribution of WNV horse (stars) and human (circles) cases by county (symbol not location) against county WNV MFIR values in 2009.



Methodology and Results of St. Louis Encephalitis (SLE) Surveillance

New Jersey selectively tested for St. Louis encephalitis virus (SLE) in 2009. SLE has had previous activity in New Jersey, most notably in 1964 and 1975 (CDC's SLE website), the latter prompting the vector surveillance reporting by Rutgers. SLE is a flavivirus and has a similar transmission pattern to West Nile, with *Culex* species as the predominant vectors. Between 1964 and 2008, New Jersey has experienced 131 cases. Fatality rates are from 5-15% (CDC.gov website).

No pools tested positive for 2009 (**Table 20**).

Table 20. Mosquito species by county tested for SLE in 2009 through RT-PCR at NJDHHS PHEL.

	Pools	Mosquitoes
Burlington	500	12870
Aedes abserratus	1	1
Aedes albopictus	45	316
Aedes atlanticus	3	18
Aedes atropalpus	2	16
Aedes canadensis canadensis	21	649
Aedes cantator	6	70
Aedes cinereus	1	6
Aedes japonicus	37	184
Aedes sollicitans	5	71
Aedes sticticus	1	41
Aedes taeniorhynchus	4	57
Aedes triseriatus	15	84
Aedes trivittatus	2	9
Aedes vexans	28	793
Anopheles barberi	1	1
Anopheles bradleyi	11	490
Anopheles crucians	2	11
Anopheles punctipennis	9	40
Anopheles quadrimaculatus	3	11
Coquillettidia perturbans	21	288
Culex erraticus	11	36
Culex pipiens	1	75
Culex restuans	2	4
Culex salinarius	24	603
Culex spp.	151	6469
Culex territans	2	7
Culiseta inornata	1	2
Culiseta melanura	76	2272
Psorophora ciliata	2	34

Psorophora columbiae	2	7
Psorophora ferox	7	182
Psorophora howardii	1	6
Uranotaenia sapphirina	2	17
Camden	191	4887
Aedes albopictus	29	146
Aedes japonicus	29	82
Aedes triseriatus	5	5
Aedes vexans	1	1
Culex pipiens	2	95
Culex restuans	1	1
Culex spp.	121	4554
Orthopodomyia signifera	3	3
Cape May	974	17345
Aedes albopictus	18	88
Aedes cantator	1	2
Aedes japonicus	6	34
Aedes triseriatus	3	14
Anopheles quadrimaculatus	1	1
Coquillettidia perturbans	2	22
Culex erraticus	2	78
Culex pipiens	350	6575
Culex restuans	178	1775
Culex salinarius	21	182
Culex spp.	379	8423
Culiseta melanura	13	151
Essex	216	3563
Aedes albopictus	21	128
Aedes japonicus	17	107
Aedes sticticus	1	1
Aedes triseriatus	9	14
Aedes vexans	9	25
Anopheles punctipennis	1	1
Coquillettidia perturbans	1	1
Culex spp.	155	3283
Psorophora ferox	2	3
Hunterdon	66	3300
Culex spp.	66	3300
Mercer	636	10089
Aedes albopictus	102	388
Aedes japonicus	106	294
Aedes triseriatus	18	31
Culex erraticus	3	3

	Culex pipiens	127	1322
	Culex restuans	135	1865
	Culex salinarius	6	36
	Culex spp.	139	6150
Ocean		2	3
	Aedes albopictus	1	1
	Culex spp.	1	2
Somerset		22	557
	Aedes albopictus	1	4
	Culex spp.	21	553
Sussex		30	187
	Aedes triseriatus	30	187
Warren		15	739
	Culex spp.	15	739
Grand Total		**2652**	**53540**

Methodology and Results of La Crosse Encephalitis (LAC) Surveillance

New Jersey selectively tested for La Crosse (LAC) virus this year. New Jersey has had 3 cases of this encephalitic disease since 1964 (see CDC's LAC website). The mortality is low but like other encephalitides, LAC can have both personal (lasting neurological sequelae) and economic impacts. LAC is a bunyavirus with a transmission cycle involving mosquitoes such as *Aedes triseriatus* and small mammals such as squirrels and chipmunks. LAC can infect *Aedes albopictus* with transovarial transmission also demonstrated (Tesh and Gubler 1975 Laboratory studies of transovarial transmission of La Crosse and other arboviruses by *Aedes albopictus* and *Culex fatigans.* American Journal of Tropical Medicine and Hygiene 24(5):876-880).

There were no positive pools detected in 2009 (Table 21).

Table 21. Mosquito species by county tested for LAC in 2009 through RT-PCR at NJDHHS PHEL.

	Pools	Mosquitoes
Cape May	322	1397
Aedes albopictus	120	440
Aedes japonicus	146	577
Aedes sollicitans	1	2
Aedes triseriatus	42	138
Anopheles bradleyi	1	34
Culex pipiens	1	41
Culex restuans	1	8
Culex salinarius	2	77
Culex spp.	6	70
Culiseta melanura	2	10
Passaic	2	17
Aedes triseriatus	2	17
Salem	6	22
Aedes triseriatus	6	22
Sussex	58	394
Aedes japonicus	2	30
Aedes triseriatus	47	259
Culex pipiens	1	11
Culex spp.	8	94
Warren	2	5
Aedes triseriatus	2	5
Grand Total	390	1835

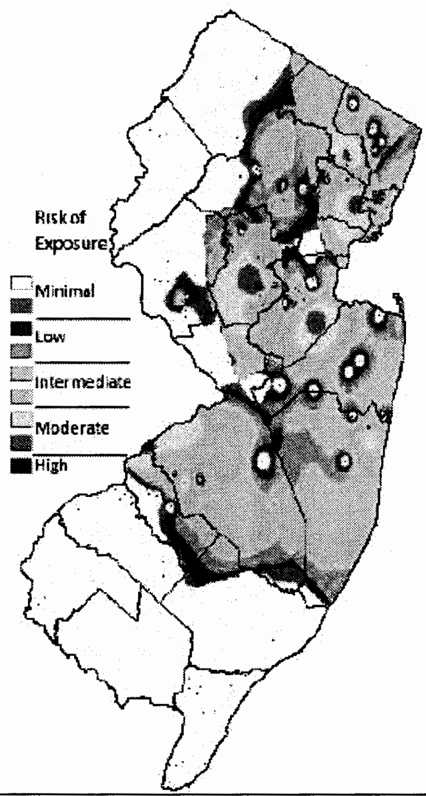
West Nile Risk Assessment

In order to produce predictability about how likely disease may be transmitted to humans, we developed a multivariate linear equation model building from factors that included climatic and biotic characteristics. Human cases were defined by the NJDHSS and were from 2000-2005. Variables were also tested that occurred two weeks prior to human cases in order to reproduce conditions that would increase the probability of an infected mosquito biting a human and subsequent transmission of West Nile as well as incubation time for symptoms to appear. Variables included spring rainfall, temperature, precipitation, degree days, mosquito abundance, and MFIR values of various mosquito groups. Variables were calculated as week averages. Variables used in the regression model were chosen to reduce the effects of multicollinearity. The resulting standardized equation was derived: number of human cases = + 0.709 * (*Culex* MFIR two weeks prior) + 0.632 * (Spring Rainfall) - 0.492 * (Cumulative Degree Days) - 0.318 * (MFIR "other" feeders two weeks prior) + 0.328 * (Percent positive dead birds two weeks prior) and the unstandardized equation : number of human cases = -10.925(a constant) + 0.330 * (*Culex* MFIR two weeks prior) + 0.738 * (Spring Rainfall) - 0.002 * (Cumulative Degree Days) - 0.388 * (MFIR "other" feeders two weeks prior) + 1.675 * (Percent positive dead birds two weeks prior) ($F_{14,56}$=9.545, $p<0.000$, $R^2 = 0.76$; significance of all variables $p<0.01$, except positive dead birds, where $p=0.048$.).

In addition to a multivariate approach, we began the season by reporting a single variable prediction of human cases through the use of two-week lagged *Culex pipiens* MFIR. This allowed readers who might not be familiar with risk assessment modeling and GIS presentation to be able to read the maps (using ArcGIS v9.2 Build 1324) presented. Thus, after the first positive pools were detected, the maps were employed, building up information over time to introduce the multivariate approach.

The multivariate approach was done by creating a layer for each variable which was then interpolated throughout the state. The interpolated values at positive mosquito sampling sites were then determined for each variable and human case potential was calculated using the above equation and the determined values at those points. This final set with calculated risk and the associated latitude and longitude was mapped out in ArcGIS and presented in the vector surveillance reports (Figure 19).

Figure 19. Multivariate linear model mapping human WNV risk.



The maps indicated the spread of West Nile through New Jersey as the season progressed. However, while risk maps may be indicative of the presence of virus and the risk of human involvement, their determination of error and ease of interpretation are two important variables to consider. In the creation of these maps, it became apparent that the error rate of the overall equation likely increased as each layer was interpolated and added to the prediction of human cases. We are exploring the different ways that models can be implemented through GIS programs that should reduce error.

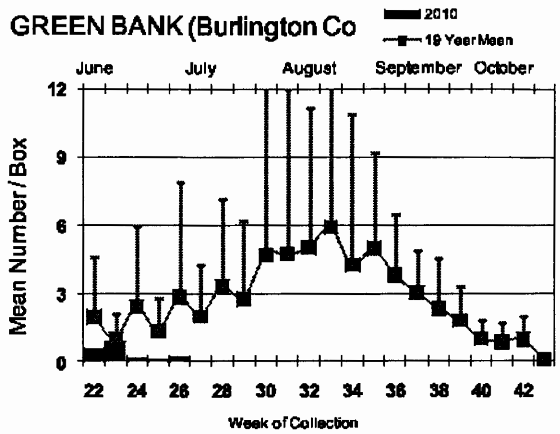
Single variable models are much easier to interpret, and the use of the two-week lagged MFIR value of *Culex pipiens* may be able to provide useful information to predicting human cases without the difficulty of interpreting other variables that are involved in multivariate equations. However, the use of *Culex pipiens* posed a problem. Currently, in this state, few people are certified to separate the three species of *Culex* that make up mixed pool (*Culex pipiens, Cx. restuans* and *Cx. salinarius*). While some counties often do separate these species (hence the MFIR values for the individual species), past experience has shown that the ability to do so correctly varies widely. We encourage anyone who identifies mosquitoes in New Jersey to contact the Center for Vector Biology for testing *Culex* identification should they wish to separate these species with confidence.

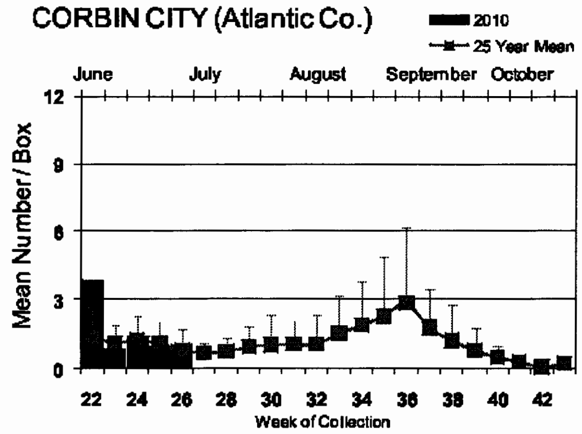
The Season of 2010: The season of 2010 began in late May and continued surveillance procedures as in the prior season. New Jersey Department of Health and Senior Services (NJDHSS Public Health and Environmental Laboratories, PHEL) and the Cape May County Division of Mosquito Control continued to test mosquito pools using RT-PCR Taqman techniques.

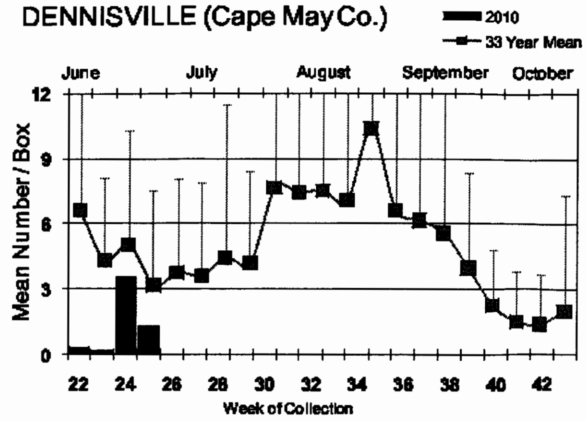
These procedures continued throughout the balance of the fiscal year (to June 30) with the expectation that the next fiscal year will commence without any interruption in protocol, data collection, evaluation and reporting. The following *Culiseta melanura* population graphs illustrate the early season collection of this species at the traditional resting box sites in southern New Jersey.

Culiseta melanura Population Graphs

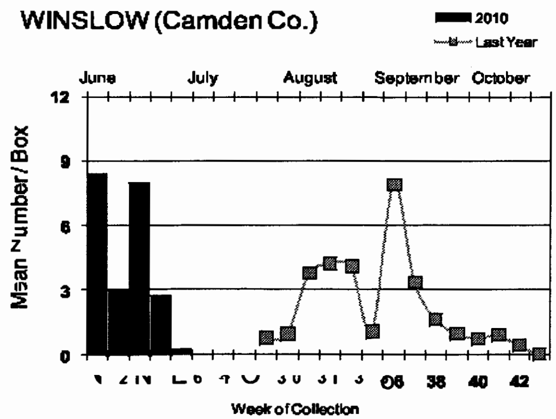
Coastal

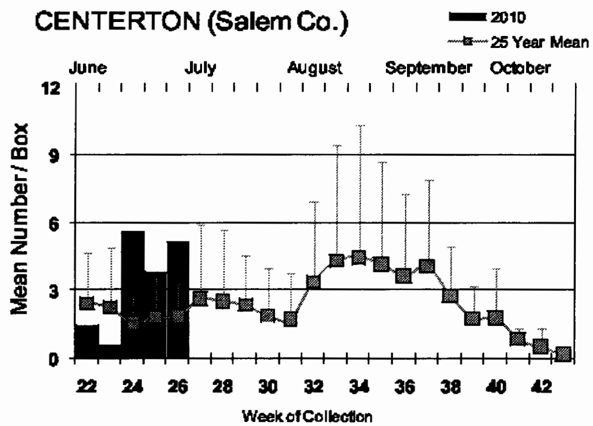


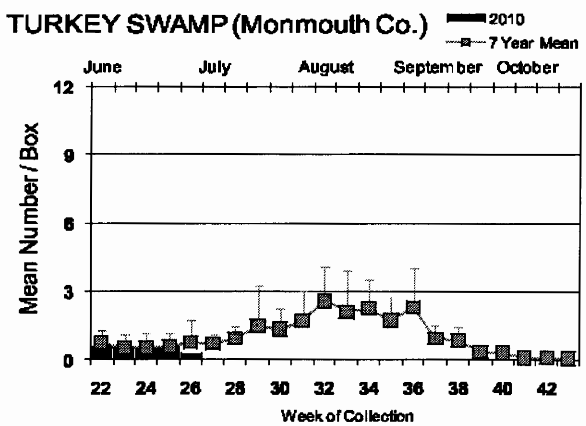




Inland

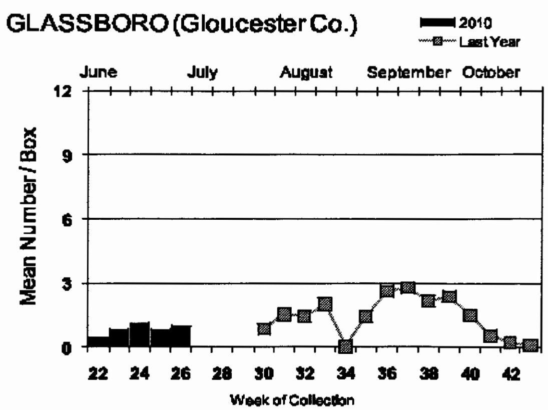






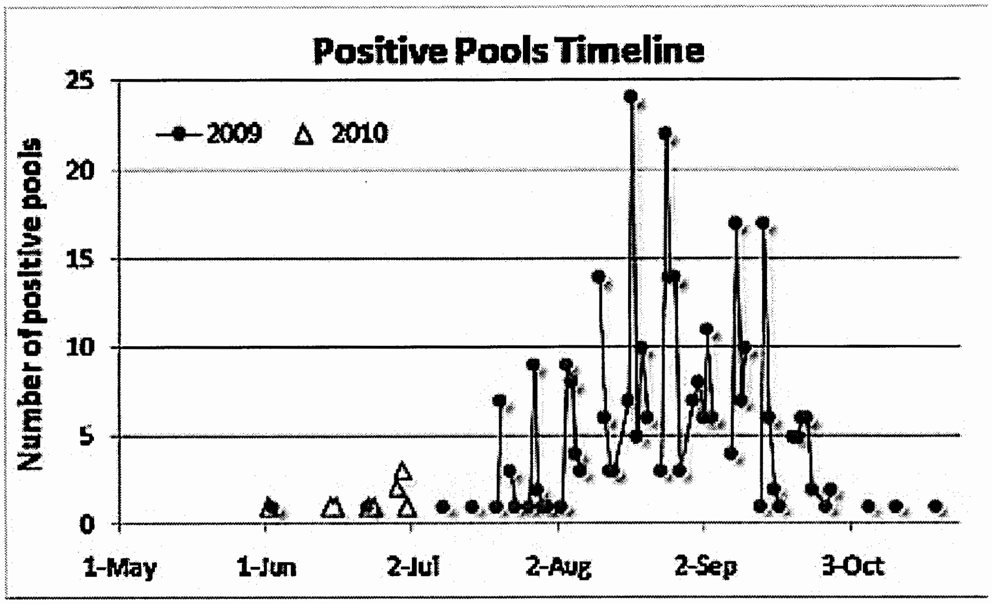
Cs. melanura populations in resting boxes at the seven monitoring sites decreased at Dennisville (first zero collection since 2002), Winslow and Turkey Swamp but increased slightly at Green Bank, Corbin City and Glassboro. Populations at Centerton also increased substantially. The populations caught in resting boxes appear to be somewhat lagged over those caught in the standard New Jersey light traps of the adult surveillance program. That population appears to have peaked and declined.

↓ = Zero positive pool(s)



Mosquito Species Submitted for West Nile Virus Testing through 1 July 2010

Species	Pools	Mosquitoes	Positives	MFIR
Aedes albopictus	35	124		
Aedes canadensis canadensis	18	354		
Aedes cantator	7	21		
Aedes japonicus	70	370		
Aedes sticticus	1	1		
Aedes triseriatus	23	69		
Aedes trivittatus	2	24		
Aedes vexans	6	63		
Anopheles punctipennis	6	120		
Anopheles quadrimaculatus	7	96		
Anopheles walkeri	1	1		
Coquillettidia perturbans	32	876		
Culex erraticus	2	61		
Culex pipiens	122	3197	5	1.564
Culex restuans	63	492		
Culex salinarius	5	13		
Culex spp.	484	18228	9	0.494
Culiseta melanura	122	2175		
Culiseta minnesotae	1	1		
Orthopodomyia signifera	1	1		
State Total	**1008**	**26287**	**14**	



he number of positive WNV mosquito pools reported by the end of the fiscal year was 14. The increase in this ear's activity is ahead of what happened in 2009 (see the following graph). This pattern of increased activity is ccurring during a period of abnormal dryness (www.drought.gov). Periods of drought has been reported by ɜsearchers to correlate with increased WNV activity.

lo humans, horses or wild birds had been reported by the end of the fiscal year.

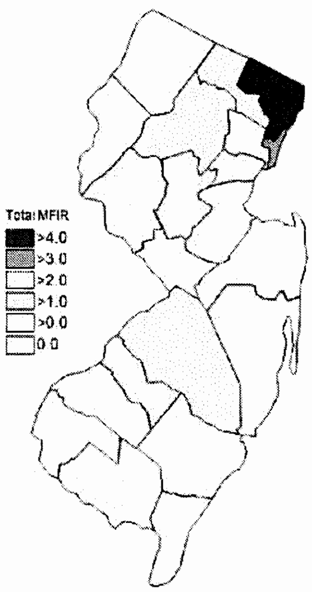
WNV Results by County through 1 July 2010

County	Species	Pools	Mosquitoes	Positives	MFI
Atlantic		**58**	**1787**	**3**	**1.679**
	Aedes albopictus	2	4		
	Aedes canadensis canadensis	2	54		
	Aedes cantator	3	14		
	Aedes japonicus	2	4		
	Aedes trivittatus	2	24		
	Aedes vexans	2	51		
	Anopheles punctipennis	1	37		
	Anopheles quadrimaculatus	1	2		
	Coquillettidia perturbans	3	4		
	Culex spp.	30	1343	3	2.234
	Culiseta melanura	9	249		
	Orthopodomyia signifera	1	1		
Bergen		**30**	**2250**		
	Culex spp.	30	2250		
Burlington		**20**	**1132**	**1**	**0.883**
	Culex spp.	6	450	1	2.222
	Culiseta melanura	14	682		
Camden		**18**	**594**	**1**	**1.684**
	Aedes albopictus	1	1		
	Aedes canadensis canadensis	1	1		
	Aedes japonicus	2	2		
	Culex spp.	14	590	1	1.695
Cape May		**226**	**2978**		
	Aedes albopictus	2	5		
	Aedes japonicus	10	23		
	Aedes triseriatus	4	19		
	Anopheles quadrimaculatus	1	10		
	Coquillettidia perturbans	1	1		
	Culex erraticus	2	61		
	Culex pipiens	68	1158		
	Culex restuans	53	387		
	Culex salinarius	1	7		
	Culex spp.	42	543		

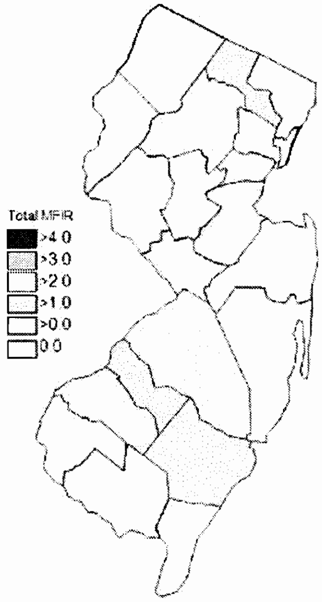
	Culiseta melanura	42	764		
Gloucester		**52**	**2207**	**5**	**2.266**
	Aedes japonicus	1	8		
	Culex pipiens	43	1987	5	2.516
	Culiseta melanura	8	212		
Hudson		**43**	**1267**	**1**	**0.789**
	Culex spp.	43	1267	1	0.789
Hunterdon		**45**	**2244**		
	Culex spp.	45	2244		
Middlesex		**60**	**2900**	**2**	**0.690**
	Aedes albopictus	1	7		
	Aedes japonicus	3	21		
	Aedes triseriatus	1	6		
	Culex spp.	55	2866	2	0.698
Monmouth		**105**	**695**		
	Aedes albopictus	11	19		
	Aedes canadensis canadensis	9	88		
	Aedes cantator	3	6		
	Aedes japonicus	17	56		
	Aedes triseriatus	4	4		
	Anopheles punctipennis	1	1		
	Anopheles quadrimaculatus	1	1		
	Coquillettidia perturbans	4	7		
	Culex pipiens	1	1		
	Culex restuans	1	1		
	Culex salinarius	2	2		
	Culex spp.	30	385		
	Culiseta melanura	21	124		
Morris		**28**	**889**		
	Aedes vexans	1	5		
	Anopheles punctipennis	2	6		
	Anopheles quadrimaculatus	3	82		
	Coquillettidia perturbans	4	184		
	Culex spp.	18	612		
Ocean		**84**	**1548**		
	Aedes albopictus	11	77		
	Aedes canadensis canadensis	6	211		

	Aedes japonicus	13	64		
	Aedes sticticus	1	1		
	Aedes triseriatus	4	18		
	Aedes vexans	2	6		
	Coquillettidia perturbans	5	81		
	Culex spp.	29	974		
	Culiseta melanura	13	116		
Passaic		**41**	**827**	**1**	**1.209**
	Aedes albopictus	2	4		
	Aedes japonicus	8	95		
	Aedes triseriatus	5	13		
	Coquillettidia perturbans	2	27		
	Culex spp.	24	688	1	1.453
Salem		**19**	**64**		
	Aedes albopictus	1	1		
	Aedes cantator	1	1		
	Aedes japonicus	3	4		
	Aedes triseriatus	1	1		
	Aedes vexans	1	1		
	Anopheles quadrimaculatus	1	1		
	Anopheles walkeri	1	1		
	Culex restuans	1	1		
	Culex spp.	9	53		
Somerset		**30**	**318**		
	Aedes albopictus	2	3		
	Aedes japonicus	5	31		
	Aedes triseriatus	4	8		
	Anopheles punctipennis	1	1		
	Culex spp.	18	275		
Sussex		**80**	**1865**		
	Coquillettidia perturbans	4	201		
	Culex pipiens	10	51		
	Culex restuans	8	103		
	Culex salinarius	2	4		
	Culex spp.	40	1477		
	Culiseta melanura	15	28		
	Culiseta minnesotae	1	1		
Union		**39**	**1318**		
	Aedes albopictus	2	3		

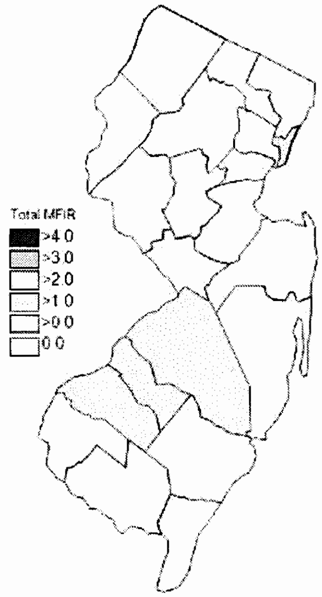
	Aedes japonicus	6	62		
	Coquillettidia perturbans	1	9		
	Culex spp.	30	1244		
Warren		**30**	**1404**		
	Anopheles punctipennis	1	75		
	Coquillettidia perturbans	8	362		
	Culex spp.	21	967		
Grand Total		**1008**	**26287**	**14**	**0.533**



Cumulative WNV activity in 2009.



WNV activity to 29 June, 2010.



WNV activity last week, 2010.

Saint Louis Encephalitis (SLE) through 1 July 2010.

New Jersey will be selectively testing for SLE this season. SLE has had previous activity in New Jersey, most notably in 1964 and 1975 (CDC's SLE website), the latter prompting the surveillance reporting by Rutgers. SLE is a flavivirus and has a similar transmission pattern to West Nile, with *Culex* species as the predominant vectors.

No pools tested positive to date for 2010.

County	Species	Pools	Mosquitoes	Positives	MFI
Burlington		**15**	**1089**		
	Culex spp.	6	450		
	Culiseta melanura	9	639		
Camden		**18**	**594**		
	Aedes albopictus	1	1		
	Aedes canadensis canadensis	1	1		
	Aedes japonicus	2	2		
	Culex spp.	14	590		
Hudson		**13**	**234**		
	Culex spp.	13	234		
Salem		**1**	**7**		
	Culex spp.	1	7		
Grand Total		**42**	**1549**		

La Crosse Encephalitis (LAC) through 1 July 2010.

New Jersey will be selectively testing for La Crosse (LAC) virus this season. New Jersey has had 3 cases of this encephalitic disease since 1964 (see CDC's LAC website). The mortality is low but like other encephalitides, LAC can have both personal (lasting neurological sequelae) and economic impacts. LAC is a bunyavirus with a transmission cycle involving mosquitoes such as *Aedes triseriatus* and small mammals such as squirrels and chipmunks. LAC can not only infect *Aedes albopictus* but transovarial transmission was also demonstrated.

No pools tested positive to date for 2010.

County	Species	Pools	Mosquitoes	Positive	MFIR
Cape May		**3**	**9**		
	Aedes triseriatus	3	9		
Warren		**6**	**9.**		
	Aedes canadensis canadensis	4	86		
	Aedes triseriatus	2	4		
Grand Total		**9**	**99**		

Report submitted by: Lisa Reed, Ph.D., and Mr. Scott Crans, Department of Entomology, Rutgers University

STATE MOSQUITO CONTROL COMMISSION
End-of Year Financial Statement*
(FY'10)

FY'10 STATE MOSQUITO CONTROL, RESEARCH, ADMINISTRATION AND OPERATIONS APPROPRIATION	**$1,410,000.00**
Office of Mosquito Control Coordination	**($ 300,000.00)**
Carry forward	**$ 3,957.48**
FY CF Downstown APO cancellation	**$ 81,326.46**
FY CF OMCC temporary services APO cancellation	**$ 21,914.75**
FY CF PHEL encumbrance balance cancellation	**$ 7, 468.75**
FY CF Publications, Hardware, Calibration cancellations	**$ 1,247.78**
FY'10 STATE MOSQUITO CONTROL COMMISSION	**$ 1,225,915.22**

PROGRAMS/SERVICES	**ALLOCATED**	**EXPENDED**	**BALANCE**
Administration Parking ($973.20) Toll-Free number ($315.32) Coffee, danish -July ($40.00) Coffee, danish-Sept. ($40.00) H. Emerson- expenses ($168.88) Coffee, danish- Jan. ($40.00) SOVE journal ($100.00) Legis. Index ($325.00) NJMCA Proc. ($120.00) Coffee, danish- Feb. ($40.00) Coffee, danish- Apr. ($40.00) Coffee, danish- May ($40.00) Coffee, danish- July ($50.00) K. Bruder expenses- ($301.32) H. Emerson expenses- ($144.15)	$3,000.00	$ 2,737.87	$262.13
State Airspray Program Insecticides ($13,200.00) Insecticides ($93,350.00) Insecticides ($2,775.00) Insecticides ($813.33) Solvent ($60.20) Oil cards ($133.68) Micrometer ($112.00) Downstown ($309,000.00) Insecticides ($9,537.00) Salinometer ($262.53) Insecticides ($52,612.56) Insecticides ($40,502.00) Insecticides ($15,032.16) Insecticides ($40,134.16)	$691,923.52	$691,653.52	$270.00

Downstown May- ($79,016.40) Downstown June- ($35,112.50)			
Equipment Repairs/Purchases	$ 43,145.59	$ 43,145.59	$0.00
Amph. Ex. Repair-Salem ($8,000.00) Freezer Repair- Morris ($400.00) Amph. Ex. Repair-Cape May ($1,968.87) Resting Boxes ($1,487.25) Freezer Repair-Mercer ($5,000.00) Fish tanks equipment ($298.12) Amph. Ex. Repair- Ocean ($25,000.00) Pump repair parts- Cape May ($991.35)			
Education and Information	$170.00	$170.00	$0.00
Public Relations NJMCA Exhibit ($170.00)			
MOA			
DH/SS WNV Testing	$176,883.50	$176,883.50	$0.00
CM Surveillance/Testing	$ 45,000.00	$ 45,000.00	$0.00
Biological Control-Mosquitofish	$ 25,000.00	$ 25,000.00	$0.00
Biological Control-Copepods	$ 25,000.00	$ 25,000.00	$0.00
Courier for Specimen Transport-North	$ 6,500.00	$ 6,500.00	$0.00
Courier for Specimen Transport-South	$ 9,500.00	$ 9,500.00	$0.00
Professional Services			
Vector Surveillance ($90,000.00) Monitor of Insecticides ($72,687.00) Statewide Surveillance ($37,000.00)	$199,687.00	$199,687.00	$0.00
Uncommitted	$105.61	$0.00	$105.61
Total	$1,225,915.22	$1,225,277.48	$637.74

* Financial report is conditional in anticipation of end-of-year, close-out reports from Rutgers Service Contracts and other state contracts and memoranda-of-agreement.

COMMISSION-SUPPORTED PUBLICATIONS AND PRESENTATIONS

JULY 1, 2009 – JUNE 30, 2010

Presentations

Reed, L. 2009 Northeastern Mosquito Control Association, Plymouth Massachusetts: *Vector and Mosquito Population Surveillance in New Jersey, 2009.*

Kent, R. 2009 Northeastern Mosquito Control Association, Plymouth Massachusetts: *Experiences with the New Liquid Spinosad Formulation, Natular®*

Reed, L. 2010 New Jersey Mosquito Control Association, Atlantic City, New Jersey: *Vector and Mosquito Population Surveillance in New Jersey, 2010.*

Kent, R. 2010 New Jersey Mosquito Control Association, Atlantic City: *The Annual Report of the NJ State Mosquito Control Commission and the Office of Mosquito Control Coordination*

O'Malley, C. 2010 New Jersey Mosquito Control Association: *Experiences with the New Liquid Spinosad Formulation, Natular®*

Publications

Reed, L. 2009 New Jersey Vector Surveillance Program, 2009. *Proc: Northeastern Mosquito Control Association (in prep)*

Reed, L. 2009 Vector and Mosquito Population Surveillance in New Jersey, 2009. *Proc: Northeastern Mosquito Control Association (in prep)*

Reed, L. 2010 Vector and Mosquito Population Surveillance in New Jersey, 2010. *Prop: New Jersey Mosquito Control Association, Atlantic City (in prep)*

Kent, R. 2010 The Annual Report of the NJ State Mosquito Control Commission and Office of Mosquito Control Coordination. *Prop: New Jersey Mosquito Control Association, Atlantic City (in prep)*

O'Malley, C. 2010 Experiences with the New Liquid Spinosad Formulation, Natular® *Prop: New Jersey Mosquito Control Association (in prep)*