

*Suffolk County Vector Control & Wetlands
Management Long Term Plan & Environmental
Impact Statement*



Task 3 Literature Review
**Book 6 Part 3 : Suffolk County Reports of Ecological
Impacts from Larviciding and Adulticiding**

Prepared for:

Suffolk County Department of Public Works
Suffolk County Department of Health Services
Suffolk County, New York

**CASHIN ASSOCIATES, P.C. AND SUFFOLK COUNTY
DEPARTMENT OF HEALTH SERVICES**

October 2004

**SUFFOLK COUNTY VECTOR CONTROL AND WETLANDS MANAGEMENT
LONG - TERM PLAN AND ENVIRONMENTAL IMPACT STATEMENT**

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LIST OF ABBREVIATIONS AND ACRONYMS

CEQ	Council on Environmental Quality
DO	Dissolved Oxygen
NYSDEC	New York State Department of Environmental Conservation
SCDHS	Suffolk County Department of Health Services
SCERP	Southampton College Estuary Research Program
SCVC	Suffolk County Vector Control

Executive Summary

This document presents information regarding the ecological effects of larvicides and/or adulticides used for mosquito control in Suffolk County, New York. A total of 54 agencies, organizations, and interested parties were contacted to solicit information regarding local impacts from these chemicals. Twenty-two responses were received, although the majority of the answers were that the respondent knew of no known impact. However, the report does discuss the findings from two legal claims and three scientific inquiries on local effects of pesticide usage.

The two legal claims, one regarding a fish kill in Flanders and the other regarding crab deaths in Mastic-Shirley, indicate that the application of pesticides near marine environments can result in adverse effects to certain marine organisms. However, these claims have not been scientifically investigated, and are currently in litigation. As such, they are allegations, and should not be accepted as fact.

The scientific inquiries address the following topics:

- the effects of mosquito control applications on sheepshead minnows
- the 1999 lobster die-off in the Long Island Sound
- the impacts of larvicides on salt marsh organisms.

None of the three studies could conclusively link ecological adverse effects to the usage of mosquito control adulticides or larvicides. Instead, they indicate that detected adverse impacts to organisms were likely due to environmental stressors.

Introduction

The scope of work for the Suffolk County Vector Control and Wetlands Management Long Term Plan and Environmental Impact Statement included collecting information regarding the ecological effects of adulticiding and larviciding activities that have been reported locally. A variety of agencies/organizations were contacted to obtain information on any ecological occurrences that may have resulted from vector control activities. Appendix A lists the 54 agencies, organizations, and other interested parties that were contacted for information. Appendix B lists the 22 respondents to the general inquiry from whom information was obtained. “Information” includes direct references to an ecological occurrence, suggestions for a possible contact, and negative responses regarding the possession of relevant information.

Very little information was obtained through this search. The following are reports of alleged ecological effects from the application of mosquito control pesticides in Suffolk County. They include results from three organized scientific inquiries, and claims associated with lawsuits; the claims associated with the litigation are still before the court, and certainly have not been verified in any setting.

1. Effects of Mosquito Spraying on Caged Fish - 2003

In 2003, the Southampton College Estuary Research Program (SCERP) performed a preliminary study intended to determine the effects of aerial application of mosquito control pesticides on sheepshead minnows (*Cyprinodon variegatus*) in salt marshes of Suffolk County, New York. The results were self-published in 2004 (SCERP, 2004).

Using cage experiments, the researchers examined the growth and survival rates of sheepshead minnows when exposed to the larvicide methoprene or the adulticide resmethrin in different settings. Pesticides were applied via helicopter by the Suffolk County Department of Public Works, Division of Vector Control (SCVC). The fish were placed in cages in a variety of estuarine environments, including mosquito ditches in salt marshes. The experiment, conducted from August 25 to September 21, 2003, occurred in the following locations: two mosquito ditches at the Grand Canal in Oakdale; a mosquito ditch and a canal in Mastic-Shirley; an open estuarine setting in Old Fort Pond, near the College experimental station; and a mosquito ditch in Goose Creek, Flanders Bay. The Goose Creek and Old Fort Pond sites served as control sites, which were not sprayed. In addition, a trial run was performed at Old Fort Pond from August 9 to August 19, 2003. The caged fish were placed at each site for seven days, allowing them to acclimatize to the study site for, at the very least, one day prior to any pesticide application. The experiment was conducted weekly, with four replicates.

During the first week of September, the fish at Grand Canal were exposed to the larvicide methoprene. The fish at Mastic-Shirley were exposed to the adulticide resmethrin on August 27, 2003. SCVC was unaware of the experiment and did not coordinate spray events with the researchers. However, the researchers had taken into account historical pesticide applications in choosing the study sites. There were only two spray events during the course of the experiment.

Experimental results showed that growth and survival of minnows caged in a mosquito ditch in Oakdale were significantly lower, relative to control sites, during the aerial application of the larvicide methoprene. Growth rates of caged minnows exposed to an aerial application of resmethrin at one of two mosquito ditch sites in Mastic-Shirley were significantly lower, relative to control sites, but survival rates were unaffected. The study found no significant differences at the second Mastic-Shirley site. The researchers recognized the importance of other co-occurring environmental stressors not measured as part of the “caged fish” experiment, and that further

studies were needed. Other researchers have identified several major confounding factors of the Southampton College study as essential to any conclusions in that dissolved oxygen (DO) levels in the mosquito ditches where minnows were placed were not continuously monitored, and the study did not incorporate water sampling for pesticide concentrations. Therefore, the impacts of low DO concentrations on fish survival was unknown, as well as, whether or not any pesticides actually reached the test organisms.

The results of this study are severely limited by unequal data collections, and by the potentially large environmental differences between the control and treatment sites. The treatment sites were in different estuaries than the control sites. The Oakdale site was in a highly degraded, tidally restricted marsh, where water quality can be expected to be substantially different from the “control” site in Southampton. These differences make it impossible to make valid comparisons between control and treatment sites. Nonetheless, the data suggest there could be a link between mosquito control pesticide exposure and fish survival and/or growth inhibition. A recommendation of the study was to conduct further research to determine if the risk to fish, and other non-target, aquatic organisms, from methoprene and pyrethroid adulticides is greater than previously reported. This was indeed a goal of the Long-Term Plan, and was undertaken in the summer, 2004 by a team of researchers led by Anne McElroy (Stony Brook University).

2. Fish Kill In Priest's Pond – 2001

In an affidavit dated April 14, 2004, Kevin McAllister, Executive Director of Peconic Baykeeper, Inc., reported that he investigated a fish kill on August 12, 2001, at the B & E Marina in Priest's Pond, adjacent to Reeves Bay, in the Peconic Estuary. McAllister reported finding a kill consisting of 50 to 60 juvenile flounder, numerous mud crabs, and thousands of grass shrimp along the shoreline of a salt water pond (The Peconic Baykeeper et al. v. Suffolk County Legislature et al., 2002).

The allegation before the court states that samples of the dead flounder and grass shrimp were collected and sent to a private laboratory, Long Island Analytical Services. It is furthermore indicated that Long Island Analytical Services held appropriate State and Federal certifications to conduct such analyses, although, generally, methods for trace analyses of pesticides in organisms have not been published. Suffolk County has noted that no water samples were collected for analysis at the time of the fish kill, nor were any measurements of dissolved oxygen (DO) taken at the time. Low DO concentrations are generally recognized to be the cause of the majority of fish kills in the Suffolk County region, especially late in the summer (USEPA, 2001). The absence of water samples has made it difficult to determine if some contaminant in the water column could have been fatal to the fish. Certainly, causes of the fish kill other than mosquito control pesticide use, such as a marine fuel spill, or possible pesticide use by B & E Marina, were not investigated.

In a public hearing on September 19, 2001, held by Suffolk County Legislator George Guldi, McAllister discussed the laboratory data. It has been alleged that the fish tissue contained a concentration of 27.6 parts per billion of pyrethrins and an unquantified amount of piperonyl butoxide (PBO).

On August 7, 2001, five days prior to the fish kill, Scourge™ had been applied by truck on adjacent, upland streets by SCVC. The active ingredients of Scourge™ are resmethrin and PBO (resmethrin is a synthetic pyrethroid). On August 10, 0.83 inches of rainfall was recorded (following a lengthy dry spell). The run-off from the rainfall has been alleged to be the cause of the elevated, and hypothetically fatal, concentrations of pyrethrins and PBO in the sampled fish.

Resmethrin is a synthetic pyrethroid. Synthetic pyrethroids are chemically similar to, but distinct from pyrethrins. Pyrethrins are the active insecticidal chemicals found in pyrethrum, which is an extract from chrysanthemums. As the analytical results quoted at the hearing have not been released to the public, it is not known whether any pyrethroids were tested for or detected in the same sample where the pyrethrins were detected.

PBO is a synergist that is used with pyrethrins and pyrethroids. Because pyrethrins and pyrethroids are quickly metabolized by organisms, and so if used on their own might not have time to have the intended fatal effect on target organisms, a synergist is used with them. The most common synergist, PBO, interferes with the biological processes that lead to the degradation of the pyrethrins and pyrethroids, and in effect extends the effective time of action for the chemicals. Therefore, PBO is found in many commonly used pesticides that contain pyrethrins or pyrethroids.

Pyrethrin/PBO combinations are found in a variety of household and garden insecticides that are widely available (Raid™ is a commonly-known pyrethrin/PBO insecticide). In fact, sometimes pyrethrin insecticides are touted by organizations as less toxic alternatives to other pesticide formulations (see Flynn and Kessler, 1992; Eartheasy, undated). Considering the paucity of information available and the apparent confusion regarding active ingredients, in correspondence regarding the public hearing with Legislator Guldi in November, the Suffolk County Department of Health Services (SCDHS) stated that although it was not possible to definitely rule out resmethrin as the cause of the fish kill, it was more plausible that the insecticide application by SCVC was “coincidental, and not causal.”

After the spray event, SCVC was issued a Notice of Violation by the New York State Department of Environmental Conservation (NYSDEC), alleging that label restrictions for Scourge™ were not followed. After a follow-up investigation by NYSDEC, it was determined that there were no label violations, and no further enforcement action was taken in the matter. At no time did NYSDEC allege that SCVC had involvement in the fish kill.

It is expected these claims will be addressed in the on-going litigation.

3. Crab Deaths in Moriches/Mastic - 2001

Alfred Chiofolo, a bayman working in the South Shore Estuary in the Moriches/Mastic area, presented information regarding crab deaths occurring in 2001 to the Suffolk County Council on Environmental Quality (CEQ) on January 16, 2002. During his presentation, Chiofolo indicated that he observed dead crabs in the Moriches/Mastic area after an application of mosquito control pesticides. He also stated that, in his opinion, the pesticides used were leading to accelerated maturity and breeding of the crabs, negatively impacting their reproduction and spawning (CEQ Minutes, 2002). However, he provided no evidence to support this claim.

In an affidavit filed in 2002 in support of the Peconic Baykeeper lawsuit, Chiofolo elaborated on his CEQ testimony. He claimed that within 24 hours of a spray event, he routinely found that half of the crabs in his traps were dead. The farther his crab pots were from land, the fewer dead crabs he claims to have found. Also, for two days following this initial 24 hours, he claimed he would be unable to find any crabs in waters near sprayed lands. Chiofolo also expanded on the early maturation of the crabs in the 2002 affidavit. He claimed that in November of 2001, he caught hundreds of immature female crabs that were sexually mature. These crabs were reported to be approximately 2.5 inches wide, as compared with mature females that are typically 4.5 inches wide. Chiofolo believed that, due to the small size and youth of these crabs, they would not be able to adequately bear eggs, thus, negatively impacting the local population. Again, he provided no evidence to support his claims.

A scientific inquiry for independent verification of these claims was not conducted.

4. Lobster Die-Off in Long Island Sound - 1999

In 1999, lobstermen reported a massive die-off of mature lobsters in the Long Island Sound, especially the western portions. The die-off appeared to be concurrent with applications of pesticides used to control the initial mosquito-borne outbreak of West Nile virus. Initial reports of the event made this linkage; a lawsuit was filed, and federal funding was made available to research the cause of the event (Herszenhorn, 2000).

The results of a three-year research program concerning the mass lobster mortalities in 1999 were presented at the Long Island Sound Lobster Health Symposium held at SUNY Stony Brook on October 4, 2004. The studies indicated that an unusual conflation of environmental, oceanographic, and climatic conditions caused the widespread morbidity at a time of record high lobster populations. Storm-driven mixing resulted in elevated bottom water temperatures of more than 22° C in late summer. The high temperatures, concurrent with hypoxic conditions and the release of sulfides and ammonia from bottom sediments, severely stressed the lobsters and initiated the die-off. Many of the weakened surviving lobster population were then extremely susceptible to pathogens, and were unable to withstand an infection by a paramoeba and died.

Some of the research indicates that mosquito control chemicals may impact lobsters at lower concentrations than previously known¹. Modeling, conducted by researchers, showed that the chemicals were not present in concentrations high enough to affect the lobsters (Rather, 2004). The coincidental timing of applications of insecticides for mosquito control (methoprene, malathion, resmethrin) were ruled out as lobster stressors, and the researchers recommended further investigation of sumithrin as it was not specifically studied.

The lobster die-off in the Long Island Sound is discussed in more detail in Book 8, Part 2 of this Literature Search.

¹ The concentrations that impacted the lobsters appear to be greater than the target concentrations that label applications intend for mosquito control (D. Ninivaggi, SCVC, personal communication, 2004), and far above those measured in ambient water quality measurements after Suffolk County pesticide applications (Zulkowsky et al., draft).

5. Larvicide Impacts on Salt Marsh Biota - 1981

During the summer of 1981, Leonard Bobinchock, Resource Management Specialist, and Nicholas Popovich, Marine Biologist, of the U.S. Department of the Interior, National Park Service conducted a study that reported on the impacts of a larvicide on the Fire Island National Seashore. The primary goal of the study was to evaluate the effectiveness of the biological larvicide Teknar, which is prepared from *Bacillus thuringiensis israelensis*, in the control of salt marsh mosquitoes (*Aedes sollicitans*). Additionally, the study examined the impacts, if any, of the larvicide on select non-target organisms.

The non-target organisms evaluated in this study were:

- grass shrimp (*Hippolyte zostericola*)
- fiddler crabs (*Uca pugnax*)
- hermit crabs (*Pagurus longicarpus*)
- killifish (*Fundulus sp.*)
- water boatman (*Trichocorixa reticulata*)
- backswimmers (*Notonecta undulata*)

All organisms evaluated were adults, with the exception of grass shrimp, of which juveniles were also assessed.

The results showed that the application of Teknar at a rate of 2 pints per acre to salt marshes did not result in the mortality of killifish, fiddler crabs, water boatman, or backswimmers. There was significant mortality within the grass shrimp and hermit crab populations. However, as there were significant levels of mortality within the control groups, the effect could not be directly linked to the application of larvicide, but may have been the result of environmental stressors (Bobinchock and Popovich, 1981).

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Appendix A – Contacts

Information regarding the impact of adulticiding and/or larviciding on the local environment was requested from the following organizations/sources:

Agency for Toxic Substances and Disease Registry (ATSDR)
American Bird Conservancy
American Veterinary Medical Association
Animal Plant Health Inspection Service (APHIS)
APHIS – Veterinary Services Emergency Program
Arbovirus Diseases Branch – CDC/NCID/DVBID
Citizens Campaign for the Environment
Cornell Cooperative Extension
Citizens Environmental Research Council
Ducks Unlimited
Eastern Fire Island Civic Association
Environmental Protection Agency (EPA) – Ecological Incident Information System
EPA Office of Research and Development
Fire Island National Seashore
Fish Unlimited
Four Harbors Audubon
Friends of the Bay
Friends of the L.I. Sound
Great South Bay Audubon Society
Greenlawn Veterinary Clinic
Group for the South Fork
Huntington Audubon Society
Lake Panamoka Civic Association
Long Island Cauliflower Association
Long Island Sierra Club
Mastic Beach Civic Association
Neighborhood Network
North American Organic Products
North Fork Audubon Society
North Shore Audubon Society
North Fork Environmental Council
NY Public Interest Research Group
NY League of Conservation Voters
NYS DEC – Natural Resources
NYS DEC – Pathology Unit
NYS DEC – Pest Management
NYS DEC – Region 1 Office
NYS Department of Agriculture and Markets
NYS Office of the Audubon Society
NY Farm Bureau – L.I. Chapter
NY State Parks

Appendix A [cont'd]

Patchogue Lake Park Civic Association
Peconic Baykeeper
Princeton University – Ecology Department
Smithsonian Environmental Research Center
Suffolk Life Archives
South Shore Estuary Reserve
Southampton College – Division of Natural Science
SUNY Stony Brook – Marine Science Resource Center
Theodore Roosevelt Sanctuary
Trout Unlimited
US Fish and Wildlife Service
US Geological Service (USGS) – NY Office
Wildlife Conservation Society

Appendix B – Respondents

Information* regarding the impact of adulticiding and/or larviciding on the local environment was received from the following organizations/sources:

Agency for Toxic Substances and Disease Registry [Carol Merkin]
American Veterinary Medical Association [Dr. Cindy Lovern/ V. Beasley]
Animal Plant Health Inspection Service (APHIS)
Arbovirus Diseases Branch – CDC/NCID/DVBID [Nicholas Komar]
Citizens Campaign for the Environment [Adreinne Esposito]
Cornell Cooperative Extension [Chris Smith]
Ducks Unlimited [Craig Kessler]
Environmental Protection Agency (EPA) – Ecological Incident Information System
EPA Office of Research and Development [Estella Waldman]
Fire Island National Seashore [Marie Lawrence]
Great South Bay Audubon Society [Jack Finkenberg]
National Center for Environmental Health
NYS DEC [Peter Scully – Div. Env. Quality; Vincent Palmer – NYSDEC Div. Solid & Hazardous Materials; Karen Chytalo, Byron Young & Kim McKown – Marine Div.]
NYS Department of Agriculture and Markets [Bob Mungari]
Princeton University – Ecology Department [David Wilcove]
Smithsonian Environmental Research Center [Peter Marra]
Suffolk Life Archives (website)
Southampton College – Division of Natural Science [Rob Turner]
SUNY Stony Brook – Marine Science Resource Center [Larry Swanson, Al Dove, Bruce Brownawell, Anne McElroy & Steve Goodbred]
Trout Unlimited [Dave Thompson]
US Geological Service (USGS) – NY Office [Stephen Terraciano]

* In addition to concrete evidence, “information” also includes suggestions for possible contacts and/or a response that the organization/source contacted has no knowledge of local impacts from adulticiding or larviciding activities.