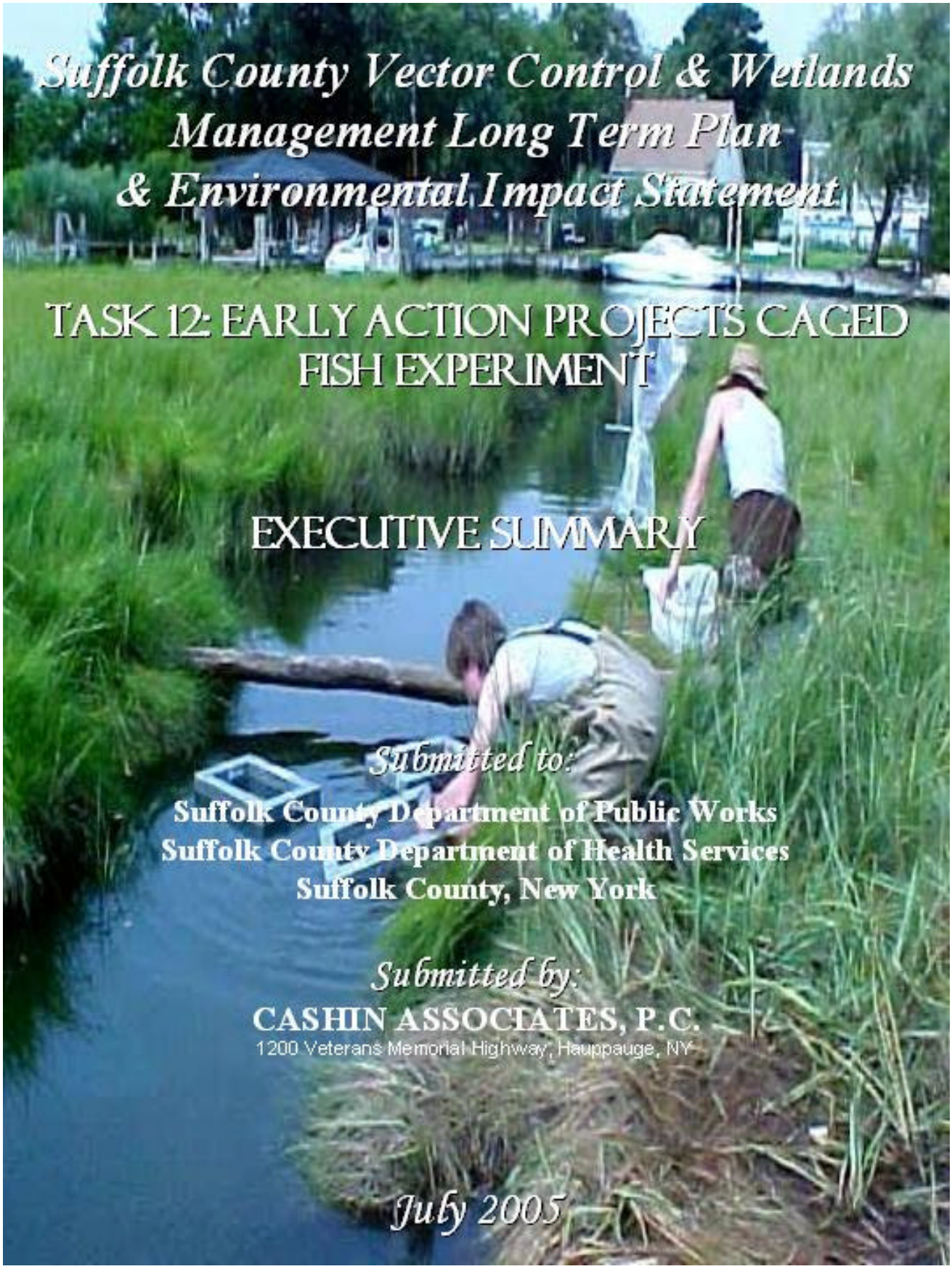

Suffolk County Vector Control & Wetlands Management Long Term Plan & Environmental Impact Statement

TASK 12: EARLY ACTION PROJECTS CAGED FISH EXPERIMENT

EXECUTIVE SUMMARY

Submitted to:

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

Submitted by:

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

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LIST OF ABBREVIATIONS AND ACRONYMS

NYSDEC	New York State Department of Environmental Conservation
PBO	Piperonyl butoxide

Caged Fish Summary

The workplan for the Suffolk County Vector Control and Wetlands Management Long-Term Plan project envisioned the use of field work and experimentation (Early Action Projects) to address certain data gaps and needs for demonstration projects of potential control techniques. During the Environmental Impact Statement Scoping process, the New York State Department of Environmental Conservation (NYSDEC) requested a "real-world" test of the potential for toxic impacts by vector control agents to aquatic organisms. As described in the project report, this request became the Caged Fish Experiment.

Two pesticides, methoprene (a larvicide) and resmethrin (an adulticide), were tested at two salt marshes over one month in 2004. Caged organisms (juvenile sheepshead minnows, *Cyprinodon variegatus* and adult grass shrimp, *Palaemonetes pugio*) were exposed to the pesticides, and their lethal and sublethal responses to this exposure over a four day period were measured. Measurements of certain environmental variables were made to test whether other factors might influence the results. Ancillary to this primary effort were measurements of pesticide concentrations in the air, for deposition to the ground, into the water in the marsh ditches, and in surrounding sediments. The efficacy of the pesticide applications for mosquito control was measured, and modeling of the adulticide applications was conducted. In addition, laboratory testing of shrimp using field-collected waters was accomplished.

The environment in August in mosquito ditches turns out to be harsh to caged organisms. Control and experimental organisms suffered mortalities that later analyses showed were likely due to low dissolved oxygen levels. Although testing indicated that amounts of pesticides sufficient to meet mosquito control purposes were delivered during the applications, no statistically significant effects (lethal or sublethal) from the pesticides to the test organisms were discernable. Laboratory results confirmed the field data.

The extensive testing for pesticides appears to provide a rationale for the results. Methoprene reached high initial concentrations immediately following application, but then was apparently scavenged from the water column. Low residual concentrations were measurable in the water column and sediments up to 96 hours after application, but the concentrations did not increase

with repeated applications. The initial high concentrations and residual, maintained low concentrations are apparently sufficient to inhibit mosquito maturation without impacting non-target organisms. The environmental measurements of methoprene suggest that it entirely degrades (or nearly so) in the typical one-week interval between applications.

Resmethrin apparently degrades even more rapidly following release. The initial application ratio of piperonyl butoxide (PBO) (a synergist applied with resmethrin to increase its efficacy) to resmethrin (three to one) was never detected in any environmental sample. The ratios measured in deposition or water samples were always much higher, suggesting that the resmethrin was degraded in the night-time atmosphere. There is no obvious chemical mechanism for such degradation, however (light and hydroxyl radicals – which are generated by light – are the most common causes of rapid resmethrin decay, but both should be absent under the application conditions). Resmethrin was detected in several deposition samples (immediately following applications) although most deposition samples showed no detectable amounts of the pesticide. Most water samples taken where resmethrin should have been deposited did find measurable amounts of the pesticide immediately following applications, but no samples taken after two hours following applications showed any detectable pesticide, even at the hundreds of parts per quadrillion level. Resmethrin was not detectable in sediments. The amount of resmethrin applied was sufficient to control mosquitoes at the measuring points, however, as demonstrated by caged mosquitoes that died following the applications.

The overall applicability of the Caged Fish results to the Long-Term Plan were somewhat limited by the harsh conditions in the ditches, which led to excessive test organisms mortality. The direct measurements of organism fate would have more power had conditions not been so harsh. The tests of pesticide fate and transport were very effective, however, in confirming conceptual notions that application concentrations are unlikely to have non-target impacts, while also demonstrating that mosquito control efficacy can nonetheless be realized.