

*Suffolk County Vector Control
and Wetlands Management Long Term Plan
and Generic Environmental Impact Statement
Task 12*

For the:

**Wertheim National Wildlife Refuge
Open Marsh Water Management Demonstration Project
Data Report 2003**



Submitted to:
Suffolk County Department of Public Works
Suffolk County Department of Health Services

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List of Abbreviations and Acronyms

CA	Cashin Associates
DU	Ducks Unlimited
LTP	Long Term Plan (the Suffolk County Vector Control and Wetlands Management Long-Term Plan and Generic Environmental Impact Statement)
MSRC	Marine Sciences Research Center, University at Stony Brook
OMWM	Open Marsh Water Management
PEHL	Suffolk County Department of Health Services Public and Environmental Health Laboratory
SCDHS	Suffolk County Department of Health Services
SCVC	Suffolk County Vector Control
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
WNWR	Wertheim National Wildlife Refuge

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I. Introduction

As part of the development of a Long-Term Plan (LTP) for Vector Control and Wetlands Management, Suffolk County has determined that local demonstration projects of various kinds are in order. It is widely believed that the most effective, economical, and potentially environmentally benign means of control for salt marsh mosquitoes is to manage their habitat so as to minimize breeding of larvae and so minimize the development of adult populations. Open Marsh Water Management (OMWM) is a guild of techniques that has been developed with the intention of controlling mosquito production but avoiding environmental impacts associated with traditional grid or parallel ditch maintenance. OMWM is intended to enhance habitat for the fish that consume mosquito larvae and to increase access for these fish to potential breeding sites. OMWM is intended to at least partially restore water levels to pre-ditching variability. OMWM is therefore often classified as a means of salt marsh restoration.

There have been several projects that have used OMWM principles or OMWM-like techniques in certain wetlands on Long Island. However, none of these projects have constituted a comprehensive demonstration project of standard OMWM, especially with the overt intention of demonstrating mosquito control feasibility.

Therefore, as part of the development of its LTP for vector control, Suffolk County would like to institute a wide-ranging, long-term, comprehensive demonstration project of several alternatives of OMWM. The US Fish and Wildlife Service (USFWS) has offered to allow portions of the Wertheim National Wildlife Refuge (WNWR), Shirley, to be used for this purpose (see Fig. 1-1).

In order to detect impacts from the OMWM construction projects, pre-project environmental monitoring has been undertaken to establish a data baseline. This report provides the initial round of data collection for the time period August 2003 to January 2004. The data have not been interpreted, and so this is merely a preliminary accounting of the pre-project monitoring to date.

WNWR is comprised of approximately 2,550 acres located on the south shore of Long Island at the mouth of the Carmans River. The project locations (four distinct areas, called Area 1, Area 2,

Area 3, Area 4 [see Figure 1-2]) are along the east bank of the Carmans River in the salt marshes found near its confluence with the bay. Generally, the marshes are ditched, and are comprised of nearly monotonic stands of *S. alterniflora* (low marsh) and *S. S. patens* (high marsh). Invasive *Phragmites australis* stands are found throughout the proposed project region. More *Phragmites* are found in Areas 1 and 4 (see below) along some of the mosquito control ditches, but *Phragmites* stands are also common in higher elevations of the marshes where they appear to be promoted by fresh water inflows.

Most of the mosquito control ditches were plugged at various times in the 1980s and 1990s. Many of the plugs have failed, either due to physical processes (erosion caused by tides or storms) or undermining by muskrats. However, some are still effectively retaining water within the marsh during tidal cycling. A three year monitoring project conducted between Areas 3 and 4 has just been completed by MJ James-Pirri (part of a North-East US project covering 11 different sites, sponsored by USFWS and US Geological Survey [USGS]).

The marsh is an active breeding area for salt marsh mosquitoes, although some other species breed in the refuge as well. Suffolk County Vector Control (SCVC) and USFWS conduct weekly larval monitoring at selected locations. Increases in larval counts result in aerial applications of larvicides (commonly, methoprene). WNWR has also been included in one aerial adulticide application since 1999, intended to prevent West Nile virus infestations in the Bellport-Brookhaven-Mastic-Shirley area.

Sampling has been conducted by a consortium of organizations. These include Cashin Associates (CA), the consultant to the County on the LTP, Ducks Unlimited (DU) (a subconsultant to CA), SCVC, Suffolk County Department of Health Services (SCDHS) including the Public and Environmental Health Laboratory (PEHL), and USFWS staff from WNWR. Researchers from the Goodbred and Cerrato laboratories, Marine Sciences Research Center (MSRC), University at Stony Brook, have also assisted.

It should be noted that the OMWM installations will not be judged solely on the data collected as part of this project. CA intends to incorporate information generated by the James-Pirri project as

well as prior OMWM/OMWM-like efforts conducted on the south shore in Suffolk County such as Seatuck, Sayville, William Floyd, and Fireplace Neck (Brookhaven hamlet), and perhaps use information from similar projects elsewhere on Long Island that may be relevant to understanding impacts and processes at WNWR.

1.1. Station Selection

Transects were identified across each Area, using the USFWS/USGS protocols (James-Pirri et al., 2002). Twenty-four stations were established in each of Areas 1 and 2, and 20 stations were established in Areas 3 and 4, for a total of 88 marsh surface stations. In addition, 10 ditch sampling points (“fish stations”) were established, again using the USFWS/USGS protocols. SCDHS also established four permanent Carmans River water quality monitoring stations (one associated with each Area), and two water quality monitoring stations in navigable sections of the major creeks. Station locations are represented in Figures 1-3 – 1-6.

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STATION LOCATIONS

AREA 1	AREA 2	AREA 3	AREA 4
1-00	1-00	1-00	1-00
1-40	1-40	1-40	1-40
1-80	1-80	1-80	1-80
1-120	1-120	1-120	1-120
2-00	1-160	1-160	1-160
2-40	2-00	1-200	2-00
2-80	2-40	2-00	2-40
2-120	2-80	2-40	2-80
3-00	2-120	2-80	2-120
3-40	2-160	2-120	2-160
3-80	2-200	2-160	3-00
3-120	3-00	2-200	3-40
3-160	3-40	3-00	3-80
3-200	3-80	3-40	3-120
4-00	3-120	3-80	3-160
4-40	3-160	3-120	4-00
4-80	3-200	4-00	4-40
4-120	4-00	4-40	4-80
4-160	4-40	4-80	4-120
4-200	4-80	4-120	4-160
4-240	4-120		
5-00	5-00		
5-40	5-40		
5-80	5-80		

II. Biological Parameters

2.1 Mosquito Breeding Concentration Areas

Mosquito breeding concentration areas were identified throughout the four areas of the marsh in September 2003. For a period of four weeks, the areas were visually inspected five times for small pools of stagnant water that might contain mosquito larvae using the USFWS/USGS protocols (James-Pirri et al., 2002). The pools were selected arbitrarily with a mosquito dipper. Each location containing mosquito larvae was flagged and the GPS coordinates were documented. An assessment of the data was made and the locations of concentrated areas of mosquito larvae were estimated.

2.2 Mosquito Dip Transects

The following table represents mosquito larvae that were collected during a period of six weeks in September and October. Larvae was sampled every 15-20 m along each transect in all four marsh areas using a mosquito dipper in accordance with USFWS/USGS protocols (James-Pirri et al., 2002). At each sampling location, the nearest standing water within a 3 m radius was noted. If standing water was present within a 3 m radius, the edges of the standing water were sampled with the mosquito dipper. If a full dipper of water was not possible, the volume increments inside the mosquito dipper were used to estimate the water volume collected. The larvae collected in the mosquito dipper were counted and recorded. If there were more than 100 larvae estimated to be in the dipper, the sample was coded into one of four categories (100 to 200 larvae; 200 to 300 larvae; 300 to 500 larvae; or >500 larvae).



Sampling technique used for mosquito dip samples

TABLE 2-1 MOSQUITO SAMPLING

AREA 1

Area	Date	Station #	Total # of Larvae	Dipper Volume (fifths)	Area Dipped
Area 1	9/3/2003	1-00	-	-	dry
Area 1	9/3/2003	1-20	0	1	standing water
Area 1	9/3/2003	1-40	0	3	pool
Area 1	9/3/2003	1-60	0	5	ditch
Area 1	9/3/2003	1-80	-	-	dry
Area 1	9/3/2003	1-100	0	1	standing water
Area 1	9/3/2003	1-120	-	-	dry
Area 1	9/3/2003	2-120	0	5	standing water
Area 1	9/3/2003	2-100	-	-	dry
Area 1	9/3/2003	2-80	0	2	standing water
Area 1	9/3/2003	2-60	0	1	standing water
Area 1	9/3/2003	2-40	1	2	standing water
Area 1	9/3/2003	2-20	-	-	dry
Area 1	9/3/2003	2-00	-	-	dry
Area 1	9/3/2003	3-00	0	2	standing water
Area 1	9/3/2003	3-20	-	-	dry
Area 1	9/3/2003	3-40	6	2	standing water
Area 1	9/3/2003	3-60	-	-	dry
Area 1	9/3/2003	3-80	0	4	standing water
Area 1	9/3/2003	3-100	1	1	standing water
Area 1	9/3/2003	3-120	1	1	standing water
Area 1	9/3/2003	3-140	0	1	standing water
Area 1	9/3/2003	3-160	0	0	standing water
Area 1	9/3/2003	3-180	0	1	standing water
Area 1	9/3/2003	3-200	-	-	dry
Area 1	9/3/2003	4-240	-	-	dry
Area 1	9/3/2003	4-220	10	4	standing water
Area 1	9/3/2003	4-200	-	-	dry
Area 1	9/3/2003	4-180	-	-	dry
Area 1	9/3/2003	4-160	-	-	dry
Area 1	9/3/2003	4-140	0	3	standing water
Area 1	9/3/2003	4-120	-	-	dry
Area 1	9/3/2003	4-100	-	-	dry
Area 1	9/3/2003	4-80	0	2	standing water
Area 1	9/3/2003	4-60	17	4	standing water
Area 1	9/3/2003	4-40	34	4	standing water
Area 1	9/3/2003	4-20	0	2	standing water
Area 1	9/3/2003	4-00	0	1	standing water
Area 1	9/3/2003	5-00	-	-	dry
Area 1	9/3/2003	5-20	30	5	standing water
Area 1	9/3/2003	5-40	0	3	standing water
Area 1	9/3/2003	5-60	6	2	standing water
Area 1	9/3/2003	5-80	0	1	standing water
Area 1	9/17/2003	1-00	-	-	dry

Area 1	9/17/2003	1-20	0	1	standing water
Area 1	9/17/2003	1-40	0	1	little pool
Area 1	9/17/2003	1-60	0	5	plugged ditch
Area 1	9/17/2003	1-80	-	-	dry
Area 1	9/17/2003	1-100	-	-	dry
Area 1	9/17/2003	1-120	-	-	dry
Area 1	9/17/2003	2-120	-	-	dry
Area 1	9/17/2003	2-100	-	-	dry
Area 1	9/17/2003	2-80	-	-	dry
Area 1	9/17/2003	2-60	-	-	dry
Area 1	9/17/2003	2-40	-	-	dry
Area 1	9/17/2003	2-20	-	-	dry
Area 1	9/17/2003	2-00	-	-	dry
Area 1	9/17/2003	3-00	-	-	dry
Area 1	9/17/2003	3-20	-	-	dry
Area 1	9/17/2003	3-40	-	-	dry
Area 1	9/17/2003	3-60	-	-	dry
Area 1	9/17/2003	3-80	-	-	dry
Area 1	9/17/2003	3-100	-	-	dry
Area 1	9/17/2003	3-120	-	-	dry
Area 1	9/17/2003	3-140	-	-	dry
Area 1	9/17/2003	3-160	-	-	dry
Area 1	9/17/2003	3-180	-	-	dry
Area 1	9/17/2003	3-200	-	-	dry
Area 1	9/17/2003	4-240	-	-	dry
Area 1	9/17/2003	4-220	-	-	dry
Area 1	9/17/2003	4-200	-	-	dry
Area 1	9/17/2003	4-180	-	-	dry
Area 1	9/17/2003	4-160	-	-	dry
Area 1	9/17/2003	4-140	-	-	dry
Area 1	9/17/2003	4-120	-	-	dry
Area 1	9/17/2003	4-100	-	-	dry
Area 1	9/17/2003	4-80	-	-	dry
Area 1	9/17/2003	4-60	0	1	standing water
Area 1	9/17/2003	4-40	12	1	standing water
Area 1	9/17/2003	4-20	-	-	dry
Area 1	9/17/2003	4-00	-	-	dry
Area 1	9/17/2003	5-00	-	-	dry
Area 1	9/17/2003	5-20	-	-	dry
Area 1	9/17/2003	5-40	-	-	dry
Area 1	9/17/2003	5-60	1	1	standing water
Area 1	9/17/2003	5-80	-	-	dry
Area 1	9/26/2003	1-00	0	1	standing water
Area 1	9/26/2003	1-20	-	-	dry
Area 1	9/26/2003	1-40	1	3	standing water
Area 1	9/26/2003	1-60	0	2	standing water
Area 1	9/26/2003	1-80	0	1	standing water
Area 1	9/26/2003	1-100	0	2	standing water

Area 1	9/26/2003	1-120	-	-	dry
Area 1	9/26/2003	2-120	0	2	standing water
Area 1	9/26/2003	2-100	0	2	standing water
Area 1	9/26/2003	2-80	0	3	standing water
Area 1	9/26/2003	2-60	3	5	standing water
Area 1	9/26/2003	2-40	0	2	standing water
Area 1	9/26/2003	2-20	0	3	standing water
Area 1	9/26/2003	2-00	-	-	dry
Area 1	9/26/2003	3-00	0	1	standing water
Area 1	9/26/2003	3-20	0	5	standing water
Area 1	9/26/2003	3-40	4	4	standing water
Area 1	9/26/2003	3-60	0	3	standing water
Area 1	9/26/2003	3-80	0	1	standing water
Area 1	9/26/2003	3-100	0	2	standing water
Area 1	9/26/2003	3-120	0	2	standing water
Area 1	9/26/2003	3-140	0	3	standing water
Area 1	9/26/2003	3-160	-	-	dry
Area 1	9/26/2003	3-180	0	2	standing water
Area 1	9/26/2003	3-200	0	2	standing water
Area 1	9/26/2003	4-240	-	-	dry
Area 1	9/26/2003	4-220	-	-	dry
Area 1	9/26/2003	4-200	-	-	dry
Area 1	9/26/2003	4-180	0	3	standing water
Area 1	9/26/2003	4-160	0	1	standing water
Area 1	9/26/2003	4-140	0	5	standing water
Area 1	9/26/2003	4-120	-	-	dry
Area 1	9/26/2003	4-100	-	-	dry
Area 1	9/26/2003	4-80	0	4	standing water
Area 1	9/26/2003	4-60	0	3	standing water
Area 1	9/26/2003	4-40	0	3	standing water
Area 1	9/26/2003	4-20	0	2	standing water
Area 1	9/26/2003	4-00	0	1	standing water
Area 1	9/26/2003	5-00	0	2	standing water
Area 1	9/26/2003	5-20	2	4	standing water
Area 1	9/26/2003	5-40	-	-	dry
Area 1	9/26/2003	5-60	0	3	standing water
Area 1	9/26/2003	5-80	0	2	standing water
Area 1	10/3/2003	1-00	-	-	dry
Area 1	10/3/2003	1-20	0	2	standing water
Area 1	10/3/2003	1-40	0	3	standing water
Area 1	10/3/2003	1-60	0	5	pool
Area 1	10/3/2003	1-80	-	-	dry
Area 1	10/3/2003	1-100	-	-	dry
Area 1	10/3/2003	1-120	-	-	dry
Area 1	10/3/2003	2-120	0	3	standing water
Area 1	10/3/2003	2-100	-	-	dry
Area 1	10/3/2003	2-80	0	4	standing water
Area 1	10/3/2003	2-60	0	2	standing water

Area 1	10/3/2003	2-40	-	-	dry
Area 1	10/3/2003	2-20	-	-	dry
Area 1	10/3/2003	2-00	-	-	dry
Area 1	10/3/2003	3-00	0	3	standing water
Area 1	10/3/2003	3-20	-	-	dry
Area 1	10/3/2003	3-40	0	4	standing water
Area 1	10/3/2003	3-60	-	-	dry
Area 1	10/3/2003	3-80	0	2	standing water
Area 1	10/3/2003	3-100	0	4	standing water
Area 1	10/3/2003	3-120	0	3	standing water
Area 1	10/3/2003	3-140	-	-	dry
Area 1	10/3/2003	3-160	0	3	standing water
Area 1	10/3/2003	3-180	0	4	standing water
Area 1	10/3/2003	3-200	-	-	dry
Area 1	10/3/2003	4-240	-	-	dry
Area 1	10/3/2003	4-220	1	2	standing water
Area 1	10/3/2003	4-200	0	3	standing water
Area 1	10/3/2003	4-180	-	-	dry
Area 1	10/3/2003	4-160	-	-	dry
Area 1	10/3/2003	4-140	0	3	standing water
Area 1	10/3/2003	4-120	-	-	dry
Area 1	10/3/2003	4-100	-	-	dry
Area 1	10/3/2003	4-80	0	4	standing water
Area 1	10/3/2003	4-60	0	3	standing water
Area 1	10/3/2003	4-40	0	2	standing water
Area 1	10/3/2003	4-20	0	2	standing water
Area 1	10/3/2003	4-00	0	3	standing water
Area 1	10/3/2003	5-00	-	-	dry
Area 1	10/3/2003	5-20	0	3	standing water
Area 1	10/3/2003	5-40	0	4	standing water
Area 1	10/3/2003	5-60	0	3	standing water
Area 1	10/3/2003	5-80	0	2	standing water
Area 1	10/9/2003	1-00	0	2	standing water
Area 1	10/9/2003	1-20	0	2	standing water
Area 1	10/9/2003	1-40	0	5	pool
Area 1	10/9/2003	1-60	0	5	ditch
Area 1	10/9/2003	1-80	-	-	dry
Area 1	10/9/2003	1-100	2	3	standing water
Area 1	10/9/2003	1-120	0	4	standing water
Area 1	10/9/2003	2-120	0	4	standing water
Area 1	10/9/2003	2-100	0	5	standing water
Area 1	10/9/2003	2-80	0	3	standing water
Area 1	10/9/2003	2-60	0	4	standing water
Area 1	10/9/2003	2-40	0	2	standing water
Area 1	10/9/2003	2-20	0	3	standing water
Area 1	10/9/2003	2-00	0	4	standing water
Area 1	10/9/2003	3-00	0	3	standing water
Area 1	10/9/2003	3-20	-	-	dry

Area 1	10/9/2003	3-40	0	3	standing water
Area 1	10/9/2003	3-60	-	-	dry
Area 1	10/9/2003	3-80	0	3	standing water
Area 1	10/9/2003	3-100	0	2	standing water
Area 1	10/9/2003	3-120	0	2	standing water
Area 1	10/9/2003	3-140	-	-	dry
Area 1	10/9/2003	3-160	0	1	standing water
Area 1	10/9/2003	3-180	0	2	standing water
Area 1	10/9/2003	3-200	-	-	dry
Area 1	10/9/2003	4-240	0	4	standing water
Area 1	10/9/2003	4-220	0	3	standing water
Area 1	10/9/2003	4-200	0	3	standing water
Area 1	10/9/2003	4-180	-	-	dry
Area 1	10/9/2003	4-160	-	-	dry
Area 1	10/9/2003	4-140	0	3	standing water
Area 1	10/9/2003	4-120	-	-	dry
Area 1	10/9/2003	4-100	2	4	standing water
Area 1	10/9/2003	4-80	0	3	standing water
Area 1	10/9/2003	4-60	0	2	standing water
Area 1	10/9/2003	4-40	0	3	standing water
Area 1	10/9/2003	4-20	0	3	standing water
Area 1	10/9/2003	4-00	0	1	standing water
Area 1	10/9/2003	5-00	-	-	dry
Area 1	10/9/2003	5-20	0	2	standing water
Area 1	10/9/2003	5-40	1	2	standing water
Area 1	10/9/2003	5-60	0	4	standing water
Area 1	10/9/2003	5-80	0	3	standing water
Area 1	10/17/2003	1-00	-	-	dry
Area 1	10/17/2003	1-20	-	-	dry
Area 1	10/17/2003	1-40	0	4	panne
Area 1	10/17/2003	1-60	0	5	ditch
Area 1	10/17/2003	1-80	-	-	dry
Area 1	10/17/2003	1-100	-	-	dry
Area 1	10/17/2003	1-120	-	-	dry
Area 1	10/17/2003	2-120	0	4	standing water
Area 1	10/17/2003	2-100	0	2	standing water
Area 1	10/17/2003	2-80	0	1	standing water
Area 1	10/17/2003	2-60	0	1	standing water
Area 1	10/17/2003	2-40	0	1	standing water
Area 1	10/17/2003	2-20	-	-	dry
Area 1	10/17/2003	2-00	-	-	dry
Area 1	10/17/2003	3-00	0	3	standing water
Area 1	10/17/2003	3-20	0	3	standing water
Area 1	10/17/2003	3-40	0	4	standing water
Area 1	10/17/2003	3-60	0	2	standing water
Area 1	10/17/2003	3-80	0	5	standing water
Area 1	10/17/2003	3-100	0	3	standing water
Area 1	10/17/2003	3-120	0	2	standing water

Area 1	10/17/2003	3-140	-	-	dry
Area 1	10/17/2003	3-160	-	-	dry
Area 1	10/17/2003	3-180	0	1	standing water
Area 1	10/17/2003	3-200	-	-	dry
Area 1	10/17/2003	4-240	-	-	dry
Area 1	10/17/2003	4-220	-	-	dry
Area 1	10/17/2003	4-200	-	-	dry
Area 1	10/17/2003	4-180	-	-	dry
Area 1	10/17/2003	4-160	-	-	dry
Area 1	10/17/2003	4-140	0	2	standing water
Area 1	10/17/2003	4-120	-	-	dry
Area 1	10/17/2003	4-100	0	1	standing water
Area 1	10/17/2003	4-80	0	2	standing water
Area 1	10/17/2003	4-60	0	4	panne
Area 1	10/17/2003	4-40	0	4	standing water
Area 1	10/17/2003	4-20	0	4	standing water
Area 1	10/17/2003	4-00	0	3	standing water
Area 1	10/17/2003	5-00	-	-	dry
Area 1	10/17/2003	5-20	-	-	dry
Area 1	10/17/2003	5-40	0	2	standing water
Area 1	10/17/2003	5-60	0	3	standing water
Area 1	10/17/2003	5-80	0	2	standing water

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AREA 2

Area	Date	Station #	Total # of Larvae	Dipper Volume (fifths)	Area Dipped
Area 2	9/3/2003	1-00	-	-	dry
Area 2	9/3/2003	1-20	-	-	dry
Area 2	9/3/2003	1-40	-	-	dry
Area 2	9/3/2003	1-60	0	5	plugged ditch
Area 2	9/3/2003	1-80	-	-	dry
Area 2	9/3/2003	1-100	0	1	standing water
Area 2	9/3/2003	1-120	0	1	standing water
Area 2	9/3/2003	1-140	30	4	standing water
Area 2	9/3/2003	1-160	-	-	dry
Area 2	9/3/2003	2-200	-	-	dry
Area 2	9/3/2003	2-180	0	1	standing water
Area 2	9/3/2003	2-160	-	-	dry
Area 2	9/3/2003	2-140	0	1	standing water
Area 2	9/3/2003	2-120	0	3	standing water
Area 2	9/3/2003	2-100	0	1	standing water
Area 2	9/3/2003	2-80	0	5	standing water
Area 2	9/3/2003	2-60	10	3	standing water
Area 2	9/3/2003	2-40	1	5	standing water
Area 2	9/3/2003	2-20	-	-	dry
Area 2	9/3/2003	2-00	10	3	standing water
Area 2	9/3/2003	3-00	0	5	plugged ditch
Area 2	9/3/2003	3-20	0	2	standing water
Area 2	9/3/2003	3-40	0	5	standing water
Area 2	9/3/2003	3-60	0	1	standing water
Area 2	9/3/2003	3-80	0	5	plugged ditch
Area 2	9/3/2003	3-100	0	2	standing water
Area 2	9/3/2003	3-120	-	-	dry
Area 2	9/3/2003	3-140	-	-	dry
Area 2	9/3/2003	3-160	-	-	dry
Area 2	9/3/2003	3-180	-	-	dry
Area 2	9/3/2003	4-120	-	-	dry
Area 2	9/3/2003	4-100	0	1	standing water
Area 2	9/3/2003	4-80	-	-	dry
Area 2	9/3/2003	4-60	-	-	dry
Area 2	9/3/2003	4-40	-	-	dry
Area 2	9/3/2003	4-20	-	-	dry
Area 2	9/3/2003	4-00	-	-	dry
Area 2	9/3/2003	5-00	-	-	dry
Area 2	9/3/2003	5-20	-	-	dry
Area 2	9/3/2003	5-40	-	-	dry
Area 2	9/3/2003	5-60	-	-	dry
Area 2	9/3/2003	5-80	-	-	dry
Area 2	9/16/2003	1-00	-	-	dry
Area 2	9/16/2003	1-20	-	-	dry
Area 2	9/16/2003	1-40	-	-	dry
Area 2	9/16/2003	1-60	0	5	plugged ditch

Area 2	9/16/2003	1-80	0	5	plugged ditch
Area 2	9/16/2003	1-100	-	-	dry
Area 2	9/16/2003	1-120	-	-	dry
Area 2	9/16/2003	1-140	-	-	dry
Area 2	9/16/2003	1-160	-	-	dry
Area 2	9/16/2003	2-200	-	-	dry
Area 2	9/16/2003	2-180	-	-	dry
Area 2	9/16/2003	2-160	-	-	dry
Area 2	9/16/2003	2-140	0	5	plugged ditch
Area 2	9/16/2003	2-120	0	1	standing water
Area 2	9/16/2003	2-100	-	-	dry
Area 2	9/16/2003	2-80	0	1	standing water
Area 2	9/16/2003	2-60	-	-	dry
Area 2	9/16/2003	2-40	12	1	standing water
Area 2	9/16/2003	2-20	9	3	standing water
Area 2	9/16/2003	2-00	3	2	standing water
Area 2	9/16/2003	3-00	0	5	tidal creek
Area 2	9/16/2003	3-20	11	2	standing water
Area 2	9/16/2003	3-40	8	3	standing water
Area 2	9/16/2003	3-60	-	-	dry
Area 2	9/16/2003	3-80	0	5	plugged ditch
Area 2	9/16/2003	3-100	-	-	dry
Area 2	9/16/2003	3-120	-	-	dry
Area 2	9/16/2003	3-140	-	-	dry
Area 2	9/16/2003	3-160	0	5	plugged ditch
Area 2	9/16/2003	3-180	-	-	dry
Area 2	9/16/2003	4-120	-	-	dry
Area 2	9/16/2003	4-100	-	-	dry
Area 2	9/16/2003	4-80	-	-	dry
Area 2	9/16/2003	4-60	0	5	plugged ditch
Area 2	9/16/2003	4-40	-	-	dry
Area 2	9/16/2003	4-20	-	-	dry
Area 2	9/16/2003	4-00	-	-	dry
Area 2	9/16/2003	5-00	-	-	dry
Area 2	9/16/2003	5-20	-	-	dry
Area 2	9/16/2003	5-40	-	-	dry
Area 2	9/16/2003	5-60	0	5	plugged ditch
Area 2	9/16/2003	5-80	-	-	dry
Area 2	9/26/2003	1-00	0	3	standing water
Area 2	9/26/2003	1-20	0	2	standing water
Area 2	9/26/2003	1-40	0	3	standing water
Area 2	9/26/2003	1-60	0	4	standing water
Area 2	9/26/2003	1-80	0	5	pool
Area 2	9/26/2003	1-100	0	4	standing water
Area 2	9/26/2003	1-120	0	2	standing water
Area 2	9/26/2003	1-140	0	3	standing water
Area 2	9/26/2003	1-160	0	2	standing water
Area 2	9/26/2003	2-200	0	3	standing water

Area 2	9/26/2003	2-180	0	5	standing water
Area 2	9/26/2003	2-160	0	5	standing water
Area 2	9/26/2003	2-140	-	-	dry
Area 2	9/26/2003	2-120	0	4	standing water
Area 2	9/26/2003	2-100	0	3	standing water
Area 2	9/26/2003	2-80	0	1	standing water
Area 2	9/26/2003	2-60	0	2	standing water
Area 2	9/26/2003	2-40	0	2	standing water
Area 2	9/26/2003	2-20	0	2	standing water
Area 2	9/26/2003	2-00	0	3	standing water
Area 2	9/26/2003	3-00	0	4	standing water
Area 2	9/26/2003	3-20	0	1	standing water
Area 2	9/26/2003	3-40	0	5	pool
Area 2	9/26/2003	3-60	0	2	standing water
Area 2	9/26/2003	3-80	0	3	standing water
Area 2	9/26/2003	3-100	0	2	standing water
Area 2	9/26/2003	3-120	0	3	standing water
Area 2	9/26/2003	3-140	0	3	standing water
Area 2	9/26/2003	3-160	0	2	standing water
Area 2	9/26/2003	3-180	0	3	standing water
Area 2	9/26/2003	4-120	0	2	standing water
Area 2	9/26/2003	4-100	0	3	standing water
Area 2	9/26/2003	4-80	0	3	standing water
Area 2	9/26/2003	4-60	0	4	standing water
Area 2	9/26/2003	4-40	0	2	standing water
Area 2	9/26/2003	4-20	0	1	standing water
Area 2	9/26/2003	4-00	0	3	standing water
Area 2	9/26/2003	5-00	0	2	standing water
Area 2	9/26/2003	5-20	0	2	standing water
Area 2	9/26/2003	5-40	0	3	standing water
Area 2	9/26/2003	5-60	0	4	standing water
Area 2	9/26/2003	5-80	0	5	pool
Area 2	10/3/2003	1-00	0	3	standing water
Area 2	10/3/2003	1-20	0	2	standing water
Area 2	10/3/2003	1-40	0	3	standing water
Area 2	10/3/2003	1-60	0	2	standing water
Area 2	10/3/2003	1-80	0	5	pool
Area 2	10/3/2003	1-100	0	4	standing water
Area 2	10/3/2003	1-120	0	2	standing water
Area 2	10/3/2003	1-140	0	3	standing water
Area 2	10/3/2003	1-160	0	4	standing water
Area 2	10/3/2003	2-200	0	3	standing water
Area 2	10/3/2003	2-180	0	5	standing water
Area 2	10/3/2003	2-160	0	3	standing water
Area 2	10/3/2003	2-140	-	-	dry
Area 2	10/3/2003	2-120	0	4	standing water
Area 2	10/3/2003	2-100	0	2	standing water
Area 2	10/3/2003	2-80	0	1	standing water

Area 2	10/3/2003	2-60	0	2	standing water
Area 2	10/3/2003	2-40	0	2	standing water
Area 2	10/3/2003	2-20	0	2	standing water
Area 2	10/3/2003	2-00	0	3	standing water
Area 2	10/3/2003	3-00	0	4	standing water
Area 2	10/3/2003	3-20	0	1	standing water
Area 2	10/3/2003	3-40	0	5	pool
Area 2	10/3/2003	3-60	0	2	standing water
Area 2	10/3/2003	3-80	0	3	standing water
Area 2	10/3/2003	3-100	0	2	standing water
Area 2	10/3/2003	3-120	0	3	standing water
Area 2	10/3/2003	3-140	0	4	standing water
Area 2	10/3/2003	3-160	0	2	standing water
Area 2	10/3/2003	3-180	0	3	standing water
Area 2	10/3/2003	4-120	0	1	standing water
Area 2	10/3/2003	4-100	0	3	standing water
Area 2	10/3/2003	4-80	0	3	standing water
Area 2	10/3/2003	4-60	0	2	standing water
Area 2	10/3/2003	4-40	0	2	standing water
Area 2	10/3/2003	4-20	0	1	standing water
Area 2	10/3/2003	4-00	0	4	standing water
Area 2	10/3/2003	5-00	0	2	standing water
Area 2	10/3/2003	5-20	0	2	standing water
Area 2	10/3/2003	5-40	0	2	standing water
Area 2	10/3/2003	5-60	0	4	standing water
Area 2	10/3/2003	5-80	0	5	pool
Area 2	10/9/2003	1-00	0	2	standing water
Area 2	10/9/2003	1-20	0	2	standing water
Area 2	10/9/2003	1-40	0	3	standing water
Area 2	10/9/2003	1-60	0	3	standing water
Area 2	10/9/2003	1-80	0	5	pool
Area 2	10/9/2003	1-100	0	4	standing water
Area 2	10/9/2003	1-120	0	3	standing water
Area 2	10/9/2003	1-140	0	3	standing water
Area 2	10/9/2003	1-160	0	2	standing water
Area 2	10/9/2003	2-200	0	3	standing water
Area 2	10/9/2003	2-180	0	5	standing water
Area 2	10/9/2003	2-160	0	3	standing water
Area 2	10/9/2003	2-140	-	-	dry
Area 2	10/9/2003	2-120	-	-	dry
Area 2	10/9/2003	2-100	0	3	standing water
Area 2	10/9/2003	2-80	0	1	standing water
Area 2	10/9/2003	2-60	0	2	standing water
Area 2	10/9/2003	2-40	0	2	standing water
Area 2	10/9/2003	2-20	0	4	standing water
Area 2	10/9/2003	2-00	0	3	standing water
Area 2	10/9/2003	3-00	0	4	standing water
Area 2	10/9/2003	3-20	0	2	standing water

Area 2	10/9/2003	3-40	0	5	pool
Area 2	10/9/2003	3-60	0	2	standing water
Area 2	10/9/2003	3-80	0	3	standing water
Area 2	10/9/2003	3-100	0	2	standing water
Area 2	10/9/2003	3-120	0	3	standing water
Area 2	10/9/2003	3-140	0	3	standing water
Area 2	10/9/2003	3-160	0	2	standing water
Area 2	10/9/2003	3-180	0	3	standing water
Area 2	10/9/2003	4-120	0	2	standing water
Area 2	10/9/2003	4-100	0	3	standing water
Area 2	10/9/2003	4-80	0	3	standing water
Area 2	10/9/2003	4-60	0	4	standing water
Area 2	10/9/2003	4-40	0	3	standing water
Area 2	10/9/2003	4-20	0	1	standing water
Area 2	10/9/2003	4-00	0	3	standing water
Area 2	10/9/2003	5-00	0	3	standing water
Area 2	10/9/2003	5-20	0	3	standing water
Area 2	10/9/2003	5-40	0	3	standing water
Area 2	10/9/2003	5-60	0	3	standing water
Area 2	10/9/2003	5-80	0	5	pool
Area 2	10/16/2003	1-00	0	3	standing water
Area 2	10/16/2003	1-20	0	3	standing water
Area 2	10/16/2003	1-40	0	3	standing water
Area 2	10/16/2003	1-60	0	4	standing water
Area 2	10/16/2003	1-80	0	5	pool
Area 2	10/16/2003	1-100	0	4	standing water
Area 2	10/16/2003	1-120	0	2	standing water
Area 2	10/16/2003	1-140	0	3	standing water
Area 2	10/16/2003	1-160	0	2	standing water
Area 2	10/16/2003	2-200	0	3	standing water
Area 2	10/16/2003	2-180	0	2	standing water
Area 2	10/16/2003	2-160	0	5	standing water
Area 2	10/16/2003	2-140	-	-	dry
Area 2	10/16/2003	2-120	0	4	standing water
Area 2	10/16/2003	2-100	-	-	dry
Area 2	10/16/2003	2-80	0	1	standing water
Area 2	10/16/2003	2-60	0	2	standing water
Area 2	10/16/2003	2-40	0	2	standing water
Area 2	10/16/2003	2-20	0	2	standing water
Area 2	10/16/2003	2-00	0	3	standing water
Area 2	10/16/2003	3-00	0	4	standing water
Area 2	10/16/2003	3-20	0	1	standing water
Area 2	10/16/2003	3-40	0	5	pool
Area 2	10/16/2003	3-60	0	2	standing water
Area 2	10/16/2003	3-80	0	3	standing water
Area 2	10/16/2003	3-100	0	2	standing water
Area 2	10/16/2003	3-120	0	3	standing water
Area 2	10/16/2003	3-140	0	3	standing water

Area 2	10/16/2003	3-160	0	2	standing water
Area 2	10/16/2003	3-180	0	3	standing water
Area 2	10/16/2003	4-120	0	2	standing water
Area 2	10/16/2003	4-100	0	3	standing water
Area 2	10/16/2003	4-80	0	3	standing water
Area 2	10/16/2003	4-60	0	4	standing water
Area 2	10/16/2003	4-40	0	2	standing water
Area 2	10/16/2003	4-20	0	1	standing water
Area 2	10/16/2003	4-00	0	3	standing water
Area 2	10/16/2003	5-00	0	2	standing water
Area 2	10/16/2003	5-20	0	2	standing water
Area 2	10/16/2003	5-40	0	3	standing water
Area 2	10/16/2003	5-60	0	2	standing water
Area 2	10/16/2003	5-80	0	5	pool

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AREA 3

Area	Date	Station #	Total # of Larvae	Dipper Volume (fifths)	Area Dipped
Area 3	9/3/2003	4-00	-	-	dry
Area 3	9/3/2003	4-20	-	-	dry
Area 3	9/3/2003	4-40	-	-	dry
Area 3	9/3/2003	4-60	-	-	dry
Area 3	9/3/2003	4-80	-	-	dry
Area 3	9/3/2003	4-100	-	-	dry
Area 3	9/3/2003	4-120	-	-	dry
Area 3	9/3/2003	3-120	-	-	dry
Area 3	9/3/2003	3-100	-	-	dry
Area 3	9/3/2003	3-80	-	-	dry
Area 3	9/3/2003	3-60	-	-	dry
Area 3	9/3/2003	3-40	-	-	dry
Area 3	9/3/2003	3-20	-	-	dry
Area 3	9/3/2003	3-00	-	-	dry
Area 3	9/3/2003	2-00	0	5	plugged ditch
Area 3	9/3/2003	2-20	-	-	dry
Area 3	9/3/2003	2-40	0	3	standing water
Area 3	9/3/2003	2-60	-	-	dry
Area 3	9/3/2003	2-80	0	1	pool
Area 3	9/3/2003	2-100	0	0	ditch
Area 3	9/3/2003	2-120	0	4	ditch
Area 3	9/3/2003	2-140	-	-	dry
Area 3	9/3/2003	2-160	-	-	dry
Area 3	9/3/2003	2-180	25	5	standing water
Area 3	9/3/2003	2-200	-	-	dry
Area 3	9/3/2003	1-200	0	1	standing water
Area 3	9/3/2003	1-180	0	1	standing water
Area 3	9/3/2003	1-160	0	1	standing water
Area 3	9/3/2003	1-140	0	1	standing water
Area 3	9/3/2003	1-120	0	2	standing water
Area 3	9/3/2003	1-100	-	-	dry
Area 3	9/3/2003	1-80	0	5	plugged ditch
Area 3	9/3/2003	1-60	-	-	dry
Area 3	9/3/2003	1-40	0	2	standing water
Area 3	9/3/2003	1-20	30	5	standing water
Area 3	9/3/2003	1-00	-	-	dry
Area 3	9/15/2003	4-00	-	-	dry
Area 3	9/15/2003	4-20	0	5	tidal creek
Area 3	9/15/2003	4-40	-	-	dry
Area 3	9/15/2003	4-60	0	5	tidal creek
Area 3	9/15/2003	4-80	-	-	dry
Area 3	9/15/2003	4-100	-	-	dry
Area 3	9/15/2003	4-120	-	-	dry
Area 3	9/15/2003	3-120	-	-	dry
Area 3	9/15/2003	3-100	-	-	dry
Area 3	9/15/2003	3-80	-	-	dry

Area 3	9/15/2003	3-60	-	-	dry
Area 3	9/15/2003	3-40	-	-	dry
Area 3	9/15/2003	3-20	-	-	dry
Area 3	9/15/2003	3-00	-	-	dry
Area 3	9/15/2003	2-00	0	5	plugged ditch
Area 3	9/15/2003	2-20	-	-	dry
Area 3	9/15/2003	2-40	-	-	dry
Area 3	9/15/2003	2-60	-	-	dry
Area 3	9/15/2003	2-80	0	5	panne
Area 3	9/15/2003	2-100	-	-	dry
Area 3	9/15/2003	2-120	0	5	plugged ditch
Area 3	9/15/2003	2-140	-	-	dry
Area 3	9/15/2003	2-160	-	-	dry
Area 3	9/15/2003	2-180	-	-	dry
Area 3	9/15/2003	2-200	-	-	dry
Area 3	9/15/2003	1-200	-	-	dry
Area 3	9/15/2003	1-180	-	-	dry
Area 3	9/15/2003	1-160	-	-	dry
Area 3	9/15/2003	1-140	-	-	dry
Area 3	9/15/2003	1-120	-	-	dry
Area 3	9/15/2003	1-100	-	-	dry
Area 3	9/15/2003	1-80	0	5	plugged ditch
Area 3	9/15/2003	1-60	-	-	dry
Area 3	9/15/2003	1-40	-	-	dry
Area 3	9/15/2003	1-20	4	2	standing water
Area 3	9/15/2003	1-00	-	-	dry
Area 3	9/26/2003	4-00	0	3	standing water
Area 3	9/26/2003	4-20	0	2	standing water
Area 3	9/26/2003	4-40	0	3	standing water
Area 3	9/26/2003	4-60	0	4	standing water
Area 3	9/26/2003	4-80	0	5	pool
Area 3	9/26/2003	4-100	0	4	standing water
Area 3	9/26/2003	4-120	0	4	standing water
Area 3	9/26/2003	3-120	0	3	standing water
Area 3	9/26/2003	3-100	0	3	standing water
Area 3	9/26/2003	3-80	0	5	pool
Area 3	9/26/2003	3-60	-	-	dry
Area 3	9/26/2003	3-40	0	4	standing water
Area 3	9/26/2003	3-20	0	3	standing water
Area 3	9/26/2003	3-00	0	5	pool
Area 3	9/26/2003	2-00	-	-	dry
Area 3	9/26/2003	2-20	-	-	dry
Area 3	9/26/2003	2-40	0	1	standing water
Area 3	9/26/2003	2-60	0	1	standing water
Area 3	9/26/2003	2-80	-	-	dry
Area 3	9/26/2003	2-100	0	2	standing water
Area 3	9/26/2003	2-120	-	-	dry
Area 3	9/26/2003	2-140	-	-	dry

Area 3	9/26/2003	2-160	0	5	standing water
Area 3	9/26/2003	2-180	0	5	standing water
Area 3	9/26/2003	2-200	0	3	standing water
Area 3	9/26/2003	1-200	0	3	standing water
Area 3	9/26/2003	1-180	0	2	standing water
Area 3	9/26/2003	1-160	0	2	standing water
Area 3	9/26/2003	1-140	0	3	standing water
Area 3	9/26/2003	1-120	-	-	dry
Area 3	9/26/2003	1-100	-	-	dry
Area 3	9/26/2003	1-80	0	3	standing water
Area 3	9/26/2003	1-60	0	3	standing water
Area 3	9/26/2003	1-40	0	2	standing water
Area 3	9/26/2003	1-20	0	3	standing water
Area 3	9/26/2003	1-00	0	4	standing water
Area 3	10/3/2003	4-00	0	4	standing water
Area 3	10/3/2003	4-20	0	3	standing water
Area 3	10/3/2003	4-40	0	2	standing water
Area 3	10/3/2003	4-60	0	3	standing water
Area 3	10/3/2003	4-80	0	3	standing water
Area 3	10/3/2003	4-100	-	-	dry
Area 3	10/3/2003	4-120	-	-	dry
Area 3	10/3/2003	3-120	-	-	dry
Area 3	10/3/2003	3-100	0	2	standing water
Area 3	10/3/2003	3-80	-	-	dry
Area 3	10/3/2003	3-60	0	1	standing water
Area 3	10/3/2003	3-40	0	1	standing water
Area 3	10/3/2003	3-20	-	-	dry
Area 3	10/3/2003	3-00	-	-	dry
Area 3	10/3/2003	2-00	0	5	pool
Area 3	10/3/2003	2-20	0	3	standing water
Area 3	10/3/2003	2-40	0	4	standing water
Area 3	10/3/2003	2-60	-	-	dry
Area 3	10/3/2003	2-80	0	5	pool
Area 3	10/3/2003	2-100	0	3	standing water
Area 3	10/3/2003	2-120	0	3	standing water
Area 3	10/3/2003	2-140	-	-	dry
Area 3	10/3/2003	2-160	0	5	standing water
Area 3	10/3/2003	2-180	0	5	standing water
Area 3	10/3/2003	2-200	0	3	standing water
Area 3	10/3/2003	1-200	0	3	standing water
Area 3	10/3/2003	1-180	0	2	standing water
Area 3	10/3/2003	1-160	0	2	standing water
Area 3	10/3/2003	1-140	0	3	standing water
Area 3	10/3/2003	1-120	-	-	dry
Area 3	10/3/2003	1-100	-	-	dry
Area 3	10/3/2003	1-80	0	3	standing water
Area 3	10/3/2003	1-60	0	3	standing water
Area 3	10/3/2003	1-40	0	2	standing water

Area 3	10/3/2003	1-20	0	3	standing water
Area 3	10/3/2003	1-00	0	4	standing water
Area 3	10/9/2003	4-00	0	4	standing water
Area 3	10/9/2003	4-20	0	3	standing water
Area 3	10/9/2003	4-40	0	2	standing water
Area 3	10/9/2003	4-60	0	3	standing water
Area 3	10/9/2003	4-80	0	3	standing water
Area 3	10/9/2003	4-100	-	-	dry
Area 3	10/9/2003	4-120	-	-	dry
Area 3	10/9/2003	3-120	-	-	dry
Area 3	10/9/2003	3-100	0	2	standing water
Area 3	10/9/2003	3-80	-	-	dry
Area 3	10/9/2003	3-60	0	1	standing water
Area 3	10/9/2003	3-40	0	1	standing water
Area 3	10/9/2003	3-20	-	-	dry
Area 3	10/9/2003	3-00	-	-	dry
Area 3	10/9/2003	2-00	0	5	pool
Area 3	10/9/2003	2-20	0	3	standing water
Area 3	10/9/2003	2-40	0	4	standing water
Area 3	10/9/2003	2-60	-	-	dry
Area 3	10/9/2003	2-80	0	5	pool
Area 3	10/9/2003	2-100	0	3	standing water
Area 3	10/9/2003	2-120	0	3	standing water
Area 3	10/9/2003	2-140	-	-	dry
Area 3	10/9/2003	2-160	0	5	standing water
Area 3	10/9/2003	2-180	0	5	standing water
Area 3	10/9/2003	2-200	0	3	standing water
Area 3	10/9/2003	1-200	0	3	standing water
Area 3	10/9/2003	1-180	0	2	standing water
Area 3	10/9/2003	1-160	0	2	standing water
Area 3	10/9/2003	1-140	0	3	standing water
Area 3	10/9/2003	1-120	-	-	dry
Area 3	10/9/2003	1-100	-	-	dry
Area 3	10/9/2003	1-80	0	3	standing water
Area 3	10/9/2003	1-60	0	3	standing water
Area 3	10/9/2003	1-40	0	2	standing water
Area 3	10/9/2003	1-20	0	3	standing water
Area 3	10/9/2003	1-00	0	4	standing water
Area 3	10/16/2003	4-00	0	4	standing water
Area 3	10/16/2003	4-20	0	3	standing water
Area 3	10/16/2003	4-40	0	2	standing water
Area 3	10/16/2003	4-60	0	3	standing water
Area 3	10/16/2003	4-80	0	3	standing water
Area 3	10/16/2003	4-100	-	-	dry
Area 3	10/16/2003	4-120	-	-	dry
Area 3	10/16/2003	3-120	-	-	dry
Area 3	10/16/2003	3-100	0	2	standing water
Area 3	10/16/2003	3-80	-	-	dry

Area 3	10/16/2003	3-60	0	1	standing water
Area 3	10/16/2003	3-40	0	1	standing water
Area 3	10/16/2003	3-20	-	-	dry
Area 3	10/16/2003	3-00	-	-	dry
Area 3	10/16/2003	2-00	0	5	pool
Area 3	10/16/2003	2-20	0	3	standing water
Area 3	10/16/2003	2-40	0	4	standing water
Area 3	10/16/2003	2-60	-	-	dry
Area 3	10/16/2003	2-80	0	5	pool
Area 3	10/16/2003	2-100	0	3	standing water
Area 3	10/16/2003	2-120	0	3	standing water
Area 3	10/16/2003	2-140	-	-	dry
Area 3	10/16/2003	2-160	0	5	standing water
Area 3	10/16/2003	2-180	0	5	standing water
Area 3	10/16/2003	2-200	0	3	standing water
Area 3	10/16/2003	1-200	0	3	standing water
Area 3	10/16/2003	1-180	0	2	standing water
Area 3	10/16/2003	1-160	0	2	standing water
Area 3	10/16/2003	1-140	0	3	standing water
Area 3	10/16/2003	1-120	-	-	dry
Area 3	10/16/2003	1-100	-	-	dry
Area 3	10/16/2003	1-80	0	3	standing water
Area 3	10/16/2003	1-60	0	3	standing water
Area 3	10/16/2003	1-40	0	2	standing water
Area 3	10/16/2003	1-20	0	3	standing water
Area 3	10/16/2003	1-00	0	4	standing water

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AREA 4

Area	Date	Station #	Total # of Larvae	Dipper Volume (fifths)	Area Dipped
Area 4	9/3/2003	1-00	-	-	dry
Area 4	9/3/2003	1-20	-	-	dry
Area 4	9/3/2003	1-40	30	4	standing water
Area 4	9/3/2003	1-60	10	4	standing water
Area 4	9/3/2003	1-80	-	2	standing water
Area 4	9/3/2003	1-100	-	-	dry
Area 4	9/3/2003	1-120	-	5	plugged ditch
Area 4	9/3/2003	1-140	-	-	dry
Area 4	9/3/2003	1-160	-	1	standing water
Area 4	9/3/2003	2-160	5	2	standing water
Area 4	9/3/2003	2-140	-	3	ditch
Area 4	9/3/2003	2-120	-	1	standing water
Area 4	9/3/2003	2-100	-	1	ditch
Area 4	9/3/2003	2-80	-	-	ditch
Area 4	9/3/2003	2-60	1	2	standing water
Area 4	9/3/2003	2-40	-	-	dry
Area 4	9/3/2003	2-20	-	-	dry
Area 4	9/3/2003	2-00	-	-	dry
Area 4	9/3/2003	3-00	0	2	standing water
Area 4	9/3/2003	3-20	0	5	ditch
Area 4	9/3/2003	3-40	0	2	standing water
Area 4	9/3/2003	3-60	-	-	dry
Area 4	9/3/2003	3-80	0	3	standing water
Area 4	9/3/2003	3-100	7	2	standing water
Area 4	9/3/2003	3-120	0	4	ditch
Area 4	9/3/2003	3-140	0	1	standing water
Area 4	9/3/2003	3-160	0	4	panne
Area 4	9/3/2003	4-160	-	-	dry
Area 4	9/3/2003	4-140	0	5	ditch
Area 4	9/3/2003	4-120	0	1	standing water
Area 4	9/3/2003	4-100	0	5	ditch
Area 4	9/3/2003	4-80	0	2	standing water
Area 4	9/3/2003	4-60	15	2	standing water
Area 4	9/3/2003	4-40	-	-	dry
Area 4	9/3/2003	4-20	-	-	dry
Area 4	9/3/2003	4-00	0	1	standing water
Area 4	9/15/2003	1-00	0	0	dry
Area 4	9/15/2003	1-20	0	5	plugged ditch
Area 4	9/15/2003	1-40	-	-	dry
Area 4	9/15/2003	1-60	-	-	dry
Area 4	9/15/2003	1-80	-	-	dry
Area 4	9/15/2003	1-100	0	5	plugged ditch
Area 4	9/15/2003	1-120	0	5	plugged ditch
Area 4	9/15/2003	1-140	-	-	dry
Area 4	9/15/2003	1-160	0	3	standing water
Area 4	9/15/2003	2-160	-	-	dry

Area 4	9/15/2003	2-140	-	-	dry
Area 4	9/15/2003	2-120	-	-	dry
Area 4	9/15/2003	2-100	-	-	dry
Area 4	9/15/2003	2-80	-	-	dry
Area 4	9/15/2003	2-60	-	-	dry
Area 4	9/15/2003	2-40	0	2	plugged ditch
Area 4	9/15/2003	2-20	-	-	dry
Area 4	9/15/2003	2-00	0	4	standing water
Area 4	9/15/2003	3-00	-	-	dry
Area 4	9/15/2003	3-20	0	3	plugged ditch
Area 4	9/15/2003	3-40	-	-	dry
Area 4	9/15/2003	3-60	0	4	standing water
Area 4	9/15/2003	3-80	0	3	standing water
Area 4	9/15/2003	3-100	-	-	dry
Area 4	9/15/2003	3-120	0	3	standing water
Area 4	9/15/2003	3-140	-	-	dry
Area 4	9/15/2003	3-160	-	-	dry
Area 4	9/15/2003	4-160	0	2	standing water
Area 4	9/15/2003	4-140	0	0	dry
Area 4	9/15/2003	4-120	0	0	dry
Area 4	9/15/2003	4-100	0	5	plugged ditch
Area 4	9/15/2003	4-80	-	-	dry
Area 4	9/15/2003	4-60	-	-	dry
Area 4	9/15/2003	4-40	-	-	dry
Area 4	9/15/2003	4-20	0	1	standing water
Area 4	9/15/2003	4-00	-	-	dry
Area 4	9/26/2003	1-00	0	4	standing water
Area 4	9/26/2003	1-20	0	5	standing water
Area 4	9/26/2003	1-40	0	5	standing water
Area 4	9/26/2003	1-60	-	-	dry
Area 4	9/26/2003	1-80	0	5	standing water
Area 4	9/26/2003	1-100	0	3	standing water
Area 4	9/26/2003	1-120	0	5	standing water
Area 4	9/26/2003	1-140	0	5	standing water
Area 4	9/26/2003	1-160	0	5	pool
Area 4	9/26/2003	2-160	0	3	standing water
Area 4	9/26/2003	2-140	-	-	dry
Area 4	9/26/2003	2-120	0	3	standing water
Area 4	9/26/2003	2-100	0	5	pool
Area 4	9/26/2003	2-80	-	-	dry
Area 4	9/26/2003	2-60	0	4	standing water
Area 4	9/26/2003	2-40	0	5	standing water
Area 4	9/26/2003	2-20	0	3	standing water
Area 4	9/26/2003	2-00	0	5	standing water
Area 4	9/26/2003	3-00	0	3	standing water
Area 4	9/26/2003	3-20	0	5	pool
Area 4	9/26/2003	3-40	0	5	standing water
Area 4	9/26/2003	3-60	0	5	pool

Area 4	9/26/2003	3-80	0	3	standing water
Area 4	9/26/2003	3-100	0	3	standing water
Area 4	9/26/2003	3-120	0	5	pool
Area 4	9/26/2003	3-140	0	1	standing water
Area 4	9/26/2003	3-160	0	5	panne
Area 4	9/26/2003	4-160	0	5	pool
Area 4	9/26/2003	4-140	0	5	pool
Area 4	9/26/2003	4-120	0	1	standing water
Area 4	9/26/2003	4-100	0	5	pool
Area 4	9/26/2003	4-80	0	4	standing water
Area 4	9/26/2003	4-60	0	5	standing water
Area 4	9/26/2003	4-40	0	5	pool
Area 4	9/26/2003	4-20	0	5	pool
Area 4	9/26/2003	4-00	0	1	standing water
Area 4	10/3/2003	1-00	-	-	dry
Area 4	10/3/2003	1-20	0	5	ditch
Area 4	10/3/2003	1-40	0	3	standing water
Area 4	10/3/2003	1-60	0	2	standing water
Area 4	10/3/2003	1-80	-	-	dry
Area 4	10/3/2003	1-100	-	-	dry
Area 4	10/3/2003	1-120	-	-	dry
Area 4	10/3/2003	1-140	0	1	standing water
Area 4	10/3/2003	1-160	0	1	standing water
Area 4	10/3/2003	2-160	0	3	standing water
Area 4	10/3/2003	2-140	0	2	standing water
Area 4	10/3/2003	2-120	-	-	dry
Area 4	10/3/2003	2-100	-	-	dry
Area 4	10/3/2003	2-80	0	2	standing water
Area 4	10/3/2003	2-60	0	2	standing water
Area 4	10/3/2003	2-40	-	-	dry
Area 4	10/3/2003	2-20	-	-	dry
Area 4	10/3/2003	2-00	-	-	dry
Area 4	10/3/2003	3-00	0	2	standing water
Area 4	10/3/2003	3-20	0	3	standing water
Area 4	10/3/2003	3-40	0	4	standing water
Area 4	10/3/2003	3-60	0	5	pool
Area 4	10/3/2003	3-80	0	2	standing water
Area 4	10/3/2003	3-100	-	-	dry
Area 4	10/3/2003	3-120	0	5	ditch
Area 4	10/3/2003	3-140	0	3	standing water
Area 4	10/3/2003	3-160	0	2	panne
Area 4	10/3/2003	4-160	0	3	standing water
Area 4	10/3/2003	4-140	0	4	standing water
Area 4	10/3/2003	4-120	0	3	standing water
Area 4	10/3/2003	4-100	0	5	ditch
Area 4	10/3/2003	4-80	0	2	standing water
Area 4	10/3/2003	4-60	0	3	standing water
Area 4	10/3/2003	4-40	-	-	dry

Area 4	10/3/2003	4-20	-	-	dry
Area 4	10/3/2003	4-00	-	-	dry
Area 4	10/9/2003	1-00	-	-	dry
Area 4	10/9/2003	1-20	0	5	ditch
Area 4	10/9/2003	1-40	0	3	standing water
Area 4	10/9/2003	1-60	0	4	standing water
Area 4	10/9/2003	1-80	-	-	dry
Area 4	10/9/2003	1-100	-	-	dry
Area 4	10/9/2003	1-120	-	-	dry
Area 4	10/9/2003	1-140	-	-	dry
Area 4	10/9/2003	1-160	-	-	dry
Area 4	10/9/2003	2-160	0	3	standing water
Area 4	10/9/2003	2-140	0	2	standing water
Area 4	10/9/2003	2-120	-	-	dry
Area 4	10/9/2003	2-100	-	-	dry
Area 4	10/9/2003	2-80	-	-	dry
Area 4	10/9/2003	2-60	0	3	standing water
Area 4	10/9/2003	2-40	-	-	dry
Area 4	10/9/2003	2-20	-	-	dry
Area 4	10/9/2003	2-00	-	-	dry
Area 4	10/9/2003	3-00	0	2	standing water
Area 4	10/9/2003	3-20	0	1	standing water
Area 4	10/9/2003	3-40	0	3	standing water
Area 4	10/9/2003	3-60	0	4	pool
Area 4	10/9/2003	3-80	0	2	standing water
Area 4	10/9/2003	3-100	-	-	dry
Area 4	10/9/2003	3-120	0	5	ditch
Area 4	10/9/2003	3-140	0	3	standing water
Area 4	10/9/2003	3-160	0	2	panne
Area 4	10/9/2003	4-160	0	2	standing water
Area 4	10/9/2003	4-140	0	2	standing water
Area 4	10/9/2003	4-120	0	3	standing water
Area 4	10/9/2003	4-100	0	4	ditch
Area 4	10/9/2003	4-80	0	2	standing water
Area 4	10/9/2003	4-60	0	3	standing water
Area 4	10/9/2003	4-40	-	-	dry
Area 4	10/9/2003	4-20	-	-	dry
Area 4	10/9/2003	4-00	-	-	dry
Area 4	10/17/2003	1-00	-	-	dry
Area 4	10/17/2003	1-20	0	5	ditch
Area 4	10/17/2003	1-40	0	4	standing water
Area 4	10/17/2003	1-60	0	2	standing water
Area 4	10/17/2003	1-80	-	-	dry
Area 4	10/17/2003	1-100	-	-	dry
Area 4	10/17/2003	1-120	-	-	dry
Area 4	10/17/2003	1-140	-	-	dry
Area 4	10/17/2003	1-160	-	-	dry
Area 4	10/17/2003	2-160	0	3	standing water

Area 4	10/17/2003	2-140	0	1	standing water
Area 4	10/17/2003	2-120	-	-	dry
Area 4	10/17/2003	2-100	-	-	dry
Area 4	10/17/2003	2-80	-	-	dry
Area 4	10/17/2003	2-60	0	2	standing water
Area 4	10/17/2003	2-40	-	-	dry
Area 4	10/17/2003	2-20	-	-	dry
Area 4	10/17/2003	2-00	-	-	dry
Area 4	10/17/2003	3-00	0	3	standing water
Area 4	10/17/2003	3-20	0	4	standing water
Area 4	10/17/2003	3-40	0	2	standing water
Area 4	10/17/2003	3-60	0	2	pool
Area 4	10/17/2003	3-80	0	3	standing water
Area 4	10/17/2003	3-100	-	-	dry
Area 4	10/17/2003	3-120	0	3	ditch
Area 4	10/17/2003	3-140	0	1	standing water
Area 4	10/17/2003	3-160	0	3	panne
Area 4	10/17/2003	4-160	0	3	standing water
Area 4	10/17/2003	4-140	0	3	standing water
Area 4	10/17/2003	4-120	0	3	standing water
Area 4	10/17/2003	4-100	0	3	ditch
Area 4	10/17/2003	4-80	0	3	standing water
Area 4	10/17/2003	4-60	0	3	standing water
Area 4	10/17/2003	4-40	-	-	dry
Area 4	10/17/2003	4-20	-	-	dry
Area 4	10/17/2003	4-00	-	-	dry

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2.3 Vegetation Quadrats

In order to detect differences in the vegetative community composition and abundance, vegetation quadrats were placed at 88 stations in all four areas of the marsh, following USFWS/USGS protocols (James-Pirri et al., 2002). The vegetation was sampled once towards the end of the growing season in October, when plants were easily identifiable. The quadrats measured 1 m² and consisted of a meter stick and dowels (≤ 3 mm in diameter). The dowels were placed perpendicular to the meter stick at 0, 25, 50, 75 and 100 cm. Each dowel was one meter in length with a total of ten marks, each spaced 11.1 cm apart. Thus, the 1 m² quadrant is divided into a grid of 50 evenly spaced points. A thin rod, approximately 3 mm in diameter, was placed vertically to the first sampling point and lowered through the vegetation canopy to the sampling point on the ground. All vegetation species that came in contact with the rod were recorded. Categories other than plant species, such as “water,” “bare ground,” and “wrack and litter” were also recorded. This process was repeated for all remaining points on the sampling quadrat until all 50 points had been sampled. The total number of times each species was recorded was tallied for each quadrat. All vegetation quadrats were sampled within one to two weeks and during a period when the marsh surface was not flooded.



Mixed vegetative community in Area 3

TABLE 2-2 VEGETATION QUADRATS

AREA 1

10/22/03

Plot ID	Bare Ground	Distichlis spicata	Dis_spic (dead)	Iva frutescens	Iva_fruit young <2 in	Iva frutescens (Dead)	Salidago_spp	Limonium carolinianum	Spartina_sp	Phragmites aust (dead)	Phragmites australis	Pluchea purpurascens	Sci_olne	Sci_olne (Dead)	Spartina alterniflora	Spa_alterniflora (dead)	Spartina patens	Spartina patens (dead)	Water	Ditch	Wrack Line
1-00	50									50	50		50								
1-40																	50				
1-80	2												34				50	16			
1-120	8	28								27	2	7	34				50	18			
2-120	23						3	8		13	18		34				50				
2-80	5	31	1				2										50	20			
2-40	8	5															50	13			
2-00	50									50	50	5	43								
3-00	14	33											50								
3-40	20	5									37						50				
3-80	2	18		3													50	1			
3-120	1	4															50				
3-160	1	5										6					50				
3-200	7			17				4		50	50										
4-240				1											2		50				
4-200	8	37										4	39	4			50				
4-160				9									34				34	10			
4-120	3	19		3				1					20				50				
4-80	9	39		5							12		8				50				
4-40	2	5											7				50				
4-00	4									18	38		40	18							
5-00	4									21	26		5				50	4			
5-40	6																50				
5-80	4																50	16			

AREA 2

10/20/03

Plot ID	Bare Ground	Distichlis spicata	Dis_spic (dead)	Iva frutescens	Iva_frut young <2 in	Iva frutescens (Dead)	Salidago_spp	Limonium carolinianum	Spartina_sp	Phragmites aust (dead)	Phragmites australis	Pluchea purpurascens	Sci_olne	Sci_olne (Dead)	Spartina alterniflora	Spa_alterniflora (dead)	Spartina patens	Spartina patens (dead)	Water	Ditch	Wrack Line
5-00				1						0	2				5		50				
5-40																	50				
5-80	11			4						43	29	18					50				3
4-120	13			17						48	49		43				45				
4-80																	50	41			
4-40	23											4			50	13	50	36			
4-00																	50	32			
3-00	41											24			50						
3-40	1														8		50				
3-80	38											6			50		50				
3-120	11														29		50	1			
3-160	4											10			50	1	50	22			
3-200	25			1								9			50	8					
2-200										4	9						50	13			
2-160	10											3			36	2	50	26			
2-120																	50	37			
2-80	5																50	9			
2-40																	50	11			
2-00																	50				
1-00										46	30		43				50				8
1-40															23		50	16			
1-80																	50				
1-120	6														37		50	27			
1-160	9																50	10			

AREA 3

10/17/03

Plot ID	Bare Ground	Distichlis spicata	Dis_spic (dead)	Iva frutescens	Iva_frut young <2 in	Iva frutescens (Dead)	Salidago_spp	Limonium carolinianum	Spartina_sp	Phragmites aust (dead)	Phragmites australis	Pluchea purpurascens	Sci_olne	Sci_olne (Dead)	Spartina alterniflora	Spa_alterniflora (dead)	Spartina patens	Spartina patens (dead)	Water	Ditch	Wrack Line
4-00	13														50	19					
4-40																	50	19			
4-80															25		50				
4-120	16														44		36	4			
3-120				12					16	50	50				12						
3-80	46														50	10					
3-40																	50				
3-00															38		50				
2-00									18			2			6		44			15	
2-40																	50				
2-80										2	21	6					8		47		
2-120	8											5			34	7	50				
2-160	2																50	10			
2-200															23		50				
1-200												1			23		50				
1-160	5											1			30		50				
1-120		2											16	14			50	5			
1-80					1					16	26	7	34	3	7		50				
1-40		7															50	23			
1-00	4	18								16	23	2	38				50				

AREA 4

9/9/03

Plot ID	Bare Ground	Distichlis spicata	Dis_spic (dead)	Iva frutescens	Iva_frut young <2 in	Iva frutescens (Dead)	Salidago_spp	Limonium carolinianum	Spartina_sp	Phragmites aust (dead)	Phragmites australis	Pluchea purpurascens	Sci_olne	Sci_olne (Dead)	Spartina alterniflora	Spa_alterniflora (dead)	Spartina patens	Spartina patens (dead)	Water	Ditch	Wrack Line
1-00	41									29	20				13		50				
1-40																	50	38			
1-80	3																50				
1-120	25														45	34	40	10			
1-160	20									4	22				44	12	47	10			
2-00																	50				
2-40	1				1												50				
2-80											1						50				
2-120	4	12									2				46	10	31	2			
2-160	5									29	12				50	6					
3-00																	50				
3-40	2	9													21		50				
3-80																	50				
3-120		41	5		1					6	11						50				
3-160						1											31		33		
4-00	6									41	21		50	50			27				
4-40										24	28				2		50				
4-80		27	3														50				
4-120		2															50	24			
4-160	41									50	50	7									

2.4 Nekton Sampling

Nekton sampling was conducted in accordance with USFWS/USGS protocols (James-Pirri et al., 2002) at all fish stations located throughout the four marsh areas in October. A total of 40 samples were collected using a ditch net. The ditch net consisted of nylon netting (1.8 in. mesh). The center of the net was placed along the sides and bottom of 1 linear meter of ditch. The nets were placed in the ditches at the station locations at least 30 minutes before sampling to minimize any disturbance to the fish caused by placing the net in the ditch. Two doors located on the open ends of the net were pulled to close the net after 30 minutes. Once closed, the ditch net enclosed an area of water 1 m long and as wide as the ditch. The net was quickly removed from the water onto the marsh surface where the fish were identified, counted and measured. Water quality parameters were also conducted and recorded at each sampling location.



Fish net set up for nekton sampling

TABLE 2-3 NEKTON SAMPLING

AREA 1 Station	D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10
Water Depth (cm)	11	9.4	15	41	10	22	5	24	13	36
Creek Depth (cm)	11	9.4	15	41	10	28	5	32	17	52
Tide	ebb	ebb	ebb	ebb	ebb	ebb	ebb	ebb	ebb	ebb
Habitat	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	open ditch	open ditch	open ditch	open ditch	open ditch
Area (m ²)	0.7718	0.8259	0.7224	0.5698	0.8336	0.7407	0.5426	0.9696	0.6433	0.4719
Water Temp (C)	15.8	15.2	12.9	14.7	16.3	14	17	12.6	15.9	14.9
Salinity (ppt)	8.9	3.3	5.5	11.1	6.2	9.3	11.2	10.6	12.6	11
DO (mg/L)	0.1	0.44	0.33	1.29	0.1	0.61	9.3	0.56	1.09	0.55
<i>Fundulus heteroclitus</i>	-	1	-	5	-	-	-	-	-	-
<i>Lucania parva</i>	-	-	-	41	-	-	-	-	2	-
<i>Fundulus luciae</i>	-	-	-	-	-	-	-	-	-	-
<i>Palaemonetes</i> spp.	-	-	-	-	-	-	-	-	-	-
Juvenile Unknown	-	-	-	-	-	-	-	-	-	-
<i>Cyprinodon variegatus</i>	-	-	-	-	-	-	-	-	-	-
<i>Pandalus montagui</i>	-	-	-	-	-	-	-	-	-	-
<i>Fundulus majalis</i>	-	-	-	-	-	-	-	-	-	-
<i>Clupea harengus</i>	-	-	-	-	-	-	-	-	-	-
<i>Uca</i> spp.	-	-	-	-	-	-	-	-	-	-
<i>Fundulus diaphanus</i>	-	-	-	-	-	-	-	-	-	-
<i>Menidia</i>	-	-	-	-	-	-	-	-	-	-
<i>Anguilla rostrata</i>	-	-	-	-	-	-	-	-	-	-
<i>Callinectes</i> spp.	-	-	-	-	-	-	-	-	-	-
<i>Pandelet</i> spp.	-	-	-	-	-	-	-	-	-	-

AREA 2 Station	D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10
Water Depth (cm)	33	28	30	10	21	20	13	14	23	36
Creek Depth (cm)	40	42	37	15	30	20	13	14	23	36
Tide	ebb	ebb	ebb	ebb	ebb	ebb	ebb	ebb	ebb	ebb
Habitat	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch
Area (m ²)	0.6923	0.8532	0.9919	0.8725	0.8557	0.8403	0.7401	0.8699	0.6574	1.1447
Water Temp (C)	14	14.2	13.1	14.2	14.8	14.3	16.7	15.3	13.7	14.3
Salinity (ppt)	13.8	14.4	15.1	11.2	10.8	14.7	18	16.7	16.7	
DO (mg/L)	0.37	0.24	0.06	0.36	0.16	0.21	0.38	4.1	5.75	1.69
<i>Fundulus heteroclitus</i>	-	-	9	-	-	-	-	44	15	7
<i>Lucania parva</i>	5	2	3	-	2	-	-	2	-	4
<i>Fundulus luciae</i>	-	-	-	-	-	-	-	-	-	-
<i>Palaemonetes spp.</i>	-	1	-	-	-	-	-	-	60	8
Juvenile Unknown	-	-	-	-	-	-	-	-	-	-
<i>Cyprinodon variegatus</i>	-	-	-	-	-	-	-	-	-	-
<i>Pandalus montagui</i>	-	-	-	-	-	-	-	-	2	-
<i>Fundulus majalis</i>	-	-	-	-	-	-	-	-	-	-
<i>Clupea harengus</i>	-	-	-	-	-	-	-	-	-	-
<i>Uca spp.</i>	-	-	-	-	-	-	-	-	-	-
<i>Fundulus diaphanus</i>	-	-	-	-	-	-	-	-	-	-
<i>Menidia</i>	-	-	-	-	-	-	-	-	-	-
<i>Anguilla rostrata</i>	-	-	-	-	-	-	-	-	-	-
<i>Callinectes spp.</i>	-	-	-	-	-	-	-	-	-	-
<i>Pandelelet spp.</i>	-	-	-	-	-	-	-	-	-	-

AREA 3 Station	D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10
Water Depth (cm)	21	17	10	5	22	18	25	26	14	38
Creek Depth (cm)	21	17	10	5	22	18	25	26	14	38
Tide	ebb	ebb	ebb	Ebb	ebb	ebb	ebb	ebb	ebb	ebb
Habitat	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch
Area (m ²)	0.8507	0.7641	0.8109	0.6234	0.8852	0.8195	0.9213	0.6323	0.8591	1.0365
Water Temp (C)	17.3	16.4	17.4	19	16.7	17.9	16.6	19.2	18.8	14.4
Salinity (ppt)	10.2	7.1	8.7	10.5	5.4	11	12.2	7.6	13.8	21.1
DO (mg/L)	0.8	0.09	0.81	0.31	1.32	0.17	0.73	5.6	1.4	5.15
<i>Fundulus heteroclitus</i>	1	1	-	-	-	-	37	1	-	5
<i>Lucania parva</i>	4	9	-	4	3	-	8	-	-	2
<i>Fundulus luciae</i>	-	-	-	-	-	-	-	-	-	-
<i>Palaemonetes spp.</i>	-	-	-	-	7	-	-	-	-	62
Juvenile Unknown	-	-	-	-	-	-	-	-	-	-
<i>Cyprinodon variegatus</i>	-	-	-	-	-	-	-	-	-	-
<i>Pandalus montagui</i>	-	-	-	-	-	-	-	-	-	-
<i>Fundulus majalis</i>	-	-	-	-	-	-	-	-	-	-
<i>Clupea harengus</i>	-	-	-	-	-	-	-	-	-	-
<i>Uca spp.</i>	-	-	-	-	-	-	-	-	-	-
<i>Fundulus diaphanus</i>	-	-	-	-	-	-	-	-	-	-
<i>Menidia</i>	-	-	-	-	-	-	-	-	-	-
<i>Anguilla rostrata</i>	-	-	-	-	-	-	-	-	-	-
<i>Callinectes spp.</i>	-	-	-	-	-	-	-	-	-	-
<i>Pandeleet spp.</i>	-	-	-	-	-	-	-	-	-	-

AREA 4 Station	D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10
Water Depth (cm)	8.5	20	70	15	14	37.5	13	27.5	7	30
Creek Depth (cm)	20	26	83	15	14	37.5	13	27.5	12	35
Tide	flood	flood	flood	ebb	ebb	ebb	ebb	ebb	flood	flood
Habitat	plugged ditch	plugged ditch	plugged ditch	plugged ditch	plugged ditch	open ditch	open ditch	open ditch	plugged ditch	plugged ditch
Area (m ²)	0.4373	0.3633	0.6787	0.6489	0.8036	0.6998	0.7771	0.7687	0.4532	0.7702
Water Temp (C)	10.9	11.3	14.6	10.5	11.5	9.9	11	10.3	14	11.8
Salinity (ppt)	20.7	15.7	22.7	8	3.4	1.7	0.8	2.1	20.8	8.2
DO (mg/L)	5.15	0.53	4.67	1.3	1.05	3.75	2.46	2.23	0.45	1.93
<i>Fundulus heteroclitus</i>	-	-	7	3	-	7	-	-	-	3
<i>Lucania parva</i>	-	3	1	-	-	-	-	-	1	1
<i>Fundulus luciae</i>	-	-	-	-	-	-	-	-	-	-
<i>Palaemonetes spp.</i>	-	-	89	-	-	-	-	-	-	-
Juvenile Unknown	-	-	-	-	-	-	-	-	-	-
<i>Cyprinodon variegatus</i>	-	-	-	-	-	-	-	-	-	-
<i>Pandalus montagui</i>	-	-	-	-	-	-	-	-	-	-
<i>Fundulus majalis</i>	-	-	-	-	-	-	-	-	-	-
<i>Clupea harengus</i>	-	-	-	-	-	-	-	-	-	-
<i>Uca spp.</i>	-	-	-	-	-	-	-	-	-	-
<i>Fundulus diaphanus</i>	-	-	-	-	-	-	-	-	-	-
<i>Menidia</i>	-	-	-	-	-	-	-	-	-	-
<i>Anguilla rostrata</i>	-	-	-	-	-	-	-	-	-	-
<i>Callinectes spp.</i>	-	-	-	-	-	-	-	-	-	-
<i>Pandeleet spp.</i>	-	-	-	-	-	-	-	-	-	-

TABLE 2-4 NEKTON MEASUREMENTS

Station	Species	Length (mm)
AREA 1		
D-2	<i>Fundulus heteroclitus</i>	21
D-4	<i>Fundulus heteroclitus</i>	34
D-4	<i>Fundulus heteroclitus</i>	25
D-4	<i>Fundulus heteroclitus</i>	31
D-4	<i>Fundulus heteroclitus</i>	28
D-4	<i>Fundulus heteroclitus</i>	34
D-4	<i>Lucania parva</i>	47
D-4	<i>Lucania parva</i>	35
D-4	<i>Lucania parva</i>	37
D-4	<i>Lucania parva</i>	28
D-4	<i>Lucania parva</i>	34
D-4	<i>Lucania parva</i>	24
D-4	<i>Lucania parva</i>	28
D-4	<i>Lucania parva</i>	35
D-4	<i>Lucania parva</i>	31
D-4	<i>Lucania parva</i>	28
D-4	<i>Lucania parva</i>	35
D-4	<i>Lucania parva</i>	27
D-4	<i>Lucania parva</i>	24
D-4	<i>Lucania parva</i>	26
D-4	<i>Lucania parva</i>	27
D-9	<i>Lucania parva</i>	20
D-9	<i>Lucania parva</i>	28
AREA 2		
D-1	<i>Lucania parva</i>	24
D-1	<i>Lucania parva</i>	21
D-1	<i>Lucania parva</i>	20
D-1	<i>Lucania parva</i>	18
D-1	<i>Lucania parva</i>	28
D-2	<i>Lucania parva</i>	21
D-2	<i>Lucania parva</i>	24
D-2	<i>Palaemonetes spp.</i>	33
D-3	<i>Fundulus heteroclitus</i>	57
D-3	<i>Fundulus heteroclitus</i>	14
D-3	<i>Fundulus heteroclitus</i>	20
D-3	<i>Fundulus heteroclitus</i>	18
D-3	<i>Fundulus heteroclitus</i>	37
D-3	<i>Fundulus heteroclitus</i>	17
D-3	<i>Fundulus heteroclitus</i>	17

D-3	<i>Fundulus heteroclitus</i>	36
D-3	<i>Fundulus heteroclitus</i>	34
D-3	<i>Lucania parva</i>	35
D-3	<i>Lucania parva</i>	25
D-3	<i>Lucania parva</i>	29
D-5	<i>Lucania parva</i>	32
D-5	<i>Lucania parva</i>	33
D-8	<i>Fundulus heteroclitus</i>	31
D-8	<i>Fundulus heteroclitus</i>	35
D-8	<i>Fundulus heteroclitus</i>	33
D-8	<i>Fundulus heteroclitus</i>	36
D-8	<i>Fundulus heteroclitus</i>	38
D-8	<i>Fundulus heteroclitus</i>	31
D-8	<i>Fundulus heteroclitus</i>	33
D-8	<i>Fundulus heteroclitus</i>	35
D-8	<i>Fundulus heteroclitus</i>	33
D-8	<i>Fundulus heteroclitus</i>	32
D-8	<i>Fundulus heteroclitus</i>	32
D-8	<i>Fundulus heteroclitus</i>	31
D-8	<i>Fundulus heteroclitus</i>	32
D-8	<i>Fundulus heteroclitus</i>	29
D-8	<i>Fundulus heteroclitus</i>	26
D-8	<i>Lucania parva</i>	24
D-8	<i>Lucania parva</i>	29
D-9	<i>Cyprinodon variegatus</i>	46
D-9	<i>Cyprinodon variegatus</i>	35
D-9	<i>Palaemonetes spp.</i>	38
D-9	<i>Palaemonetes spp.</i>	33
D-9	<i>Palaemonetes spp.</i>	32
D-9	<i>Palaemonetes spp.</i>	36
D-9	<i>Palaemonetes spp.</i>	27
D-9	<i>Palaemonetes spp.</i>	30
D-9	<i>Palaemonetes spp.</i>	33
D-9	<i>Palaemonetes spp.</i>	33
D-9	<i>Palaemonetes spp.</i>	30
D-9	<i>Palaemonetes spp.</i>	36
D-9	<i>Palaemonetes spp.</i>	31
D-9	<i>Palaemonetes spp.</i>	27
D-9	<i>Palaemonetes spp.</i>	30
D-9	<i>Palaemonetes spp.</i>	30
D-9	<i>Palaemonetes spp.</i>	32
D-9	<i>Fundulus heteroclitus</i>	46
D-9	<i>Fundulus heteroclitus</i>	54

D-9	<i>Fundulus heteroclitus</i>	50
D-9	<i>Fundulus heteroclitus</i>	44
D-9	<i>Fundulus heteroclitus</i>	55
D-9	<i>Fundulus heteroclitus</i>	39
D-9	<i>Fundulus heteroclitus</i>	42
D-9	<i>Fundulus heteroclitus</i>	34
D-9	<i>Fundulus heteroclitus</i>	36
D-9	<i>Fundulus heteroclitus</i>	35
D-9	<i>Fundulus heteroclitus</i>	30
D-9	<i>Fundulus heteroclitus</i>	32
D-9	<i>Fundulus heteroclitus</i>	24
D-9	<i>Fundulus heteroclitus</i>	25
D-9	<i>Fundulus heteroclitus</i>	37
D-10	<i>Fundulus heteroclitus</i>	42
D-10	<i>Fundulus heteroclitus</i>	25
D-10	<i>Fundulus heteroclitus</i>	30
D-10	<i>Fundulus heteroclitus</i>	36
D-10	<i>Fundulus heteroclitus</i>	25
D-10	<i>Fundulus heteroclitus</i>	26
D-10	<i>Fundulus heteroclitus</i>	22
D-10	<i>Palaemonetes spp.</i>	32
D-10	<i>Palaemonetes spp.</i>	29
D-10	<i>Palaemonetes spp.</i>	32
D-10	<i>Palaemonetes spp.</i>	35
D-10	<i>Palaemonetes spp.</i>	37
D-10	<i>Palaemonetes spp.</i>	27
D-10	<i>Palaemonetes spp.</i>	34
D-10	<i>Palaemonetes spp.</i>	36
D-10	<i>Lucania parva</i>	49
D-10	<i>Lucania parva</i>	44
D-10	<i>Lucania parva</i>	31
D-10	<i>Lucania parva</i>	26
AREA 3		
D-1	<i>Lucania parva</i>	18
D-1	<i>Lucania parva</i>	22
D-1	<i>Lucania parva</i>	20
D-1	<i>Lucania parva</i>	24
D-1	<i>Fundulus heteroclitus</i>	47
D-2	<i>Lucania parva</i>	24
D-2	<i>Lucania parva</i>	20
D-2	<i>Lucania parva</i>	20
D-2	<i>Lucania parva</i>	21
D-2	<i>Lucania parva</i>	32

D-2	<i>Lucania parva</i>	30
D-2	<i>Lucania parva</i>	20
D-2	<i>Lucania parva</i>	24
D-2	<i>Lucania parva</i>	23
D-2	<i>Fundulus heteroclitus</i>	32
D-4	<i>Lucania parva</i>	23
D-4	<i>Lucania parva</i>	29
D-4	<i>Lucania parva</i>	31
D-4	<i>Lucania parva</i>	18
D-5	<i>Lucania parva</i>	29
D-5	<i>Lucania parva</i>	21
D-5	<i>Lucania parva</i>	22
D-5	<i>Palaemonetes spp.</i>	32
D-5	<i>Palaemonetes spp.</i>	28
D-5	<i>Palaemonetes spp.</i>	32
D-5	<i>Palaemonetes spp.</i>	27
D-5	<i>Palaemonetes spp.</i>	34
D-5	<i>Palaemonetes spp.</i>	25
D-5	<i>Palaemonetes spp.</i>	36
D-7	<i>Lucania parva</i>	44
D-7	<i>Lucania parva</i>	52
D-7	<i>Lucania parva</i>	40
D-7	<i>Lucania parva</i>	46
D-7	<i>Lucania parva</i>	36
D-7	<i>Lucania parva</i>	34
D-7	<i>Lucania parva</i>	41
D-7	<i>Lucania parva</i>	32
D-7	<i>Fundulus heteroclitus</i>	45
D-7	<i>Fundulus heteroclitus</i>	50
D-7	<i>Fundulus heteroclitus</i>	40
D-7	<i>Fundulus heteroclitus</i>	44
D-7	<i>Fundulus heteroclitus</i>	31
D-7	<i>Fundulus heteroclitus</i>	33
D-7	<i>Fundulus heteroclitus</i>	42
D-7	<i>Fundulus heteroclitus</i>	31
D-7	<i>Fundulus heteroclitus</i>	41
D-7	<i>Fundulus heteroclitus</i>	34
D-7	<i>Fundulus heteroclitus</i>	36
D-7	<i>Fundulus heteroclitus</i>	37
D-7	<i>Fundulus heteroclitus</i>	39
D-8	<i>Fundulus heteroclitus</i>	31
D-10	<i>Palaemonetes spp.</i>	34
D-10	<i>Palaemonetes spp.</i>	32

D-10	<i>Palaemonetes spp.</i>	26
D-10	<i>Palaemonetes spp.</i>	32
D-10	<i>Palaemonetes spp.</i>	40
D-10	<i>Palaemonetes spp.</i>	29
D-10	<i>Palaemonetes spp.</i>	46
D-10	<i>Palaemonetes spp.</i>	27
D-10	<i>Palaemonetes spp.</i>	30
D-10	<i>Palaemonetes spp.</i>	27
D-10	<i>Palaemonetes spp.</i>	32
D-10	<i>Palaemonetes spp.</i>	31
D-10	<i>Palaemonetes spp.</i>	29
D-10	<i>Palaemonetes spp.</i>	15
D-10	<i>Palaemonetes spp.</i>	31
D-10	<i>Fundulus heteroclitus</i>	39
D-10	<i>Fundulus heteroclitus</i>	31
D-10	<i>Fundulus heteroclitus</i>	28
D-10	<i>Fundulus heteroclitus</i>	29
D-10	<i>Fundulus heteroclitus</i>	29
D-10	<i>Lucania parva</i>	37
D-10	<i>Lucania parva</i>	30
AREA 4		
D-2	<i>Lucania parva</i>	20
D-2	<i>Lucania parva</i>	28
D-2	<i>Lucania parva</i>	30
D-3	<i>Palaemonetes spp.</i>	35
D-3	<i>Palaemonetes spp.</i>	17
D-3	<i>Palaemonetes spp.</i>	28
D-3	<i>Palaemonetes spp.</i>	26
D-3	<i>Palaemonetes spp.</i>	23
D-3	<i>Palaemonetes spp.</i>	32
D-3	<i>Palaemonetes spp.</i>	35
D-3	<i>Palaemonetes spp.</i>	34
D-3	<i>Palaemonetes spp.</i>	33
D-3	<i>Palaemonetes spp.</i>	38
D-3	<i>Palaemonetes spp.</i>	27
D-3	<i>Palaemonetes spp.</i>	23
D-3	<i>Palaemonetes spp.</i>	32
D-3	<i>Palaemonetes spp.</i>	31
D-3	<i>Palaemonetes spp.</i>	30
D-3	<i>Fundulus heteroclitus</i>	34
D-3	<i>Fundulus heteroclitus</i>	35
D-3	<i>Fundulus heteroclitus</i>	25
D-3	<i>Fundulus heteroclitus</i>	28

D-3	<i>Fundulus heteroclitus</i>	22
D-3	<i>Fundulus heteroclitus</i>	40
D-3	<i>Fundulus heteroclitus</i>	28
D-3	<i>Lucania parva</i>	24
D-4	<i>Fundulus heteroclitus</i>	32
D-4	<i>Fundulus heteroclitus</i>	49
D-4	<i>Fundulus heteroclitus</i>	62
D-6	<i>Fundulus heteroclitus</i>	47
D-6	<i>Fundulus heteroclitus</i>	36
D-6	<i>Fundulus heteroclitus</i>	39
D-6	<i>Fundulus heteroclitus</i>	39
D-6	<i>Fundulus heteroclitus</i>	37
D-6	<i>Fundulus heteroclitus</i>	20
D-6	<i>Fundulus heteroclitus</i>	26
D-9	<i>Lucania parva</i>	13
D-10	<i>Lucania parva</i>	25
D-10	<i>Fundulus heteroclitus</i>	52
D-10	<i>Fundulus heteroclitus</i>	43
D-10	<i>Fundulus heteroclitus</i>	25



Cyprinodon variegatus and *Lucania parva* caught in fish nets

2.5 Invertebrates

Invertebrates commonly used as a measure of overall habitat function and health. Invertebrate samples were collected from three different areas: marsh surface; mosquito ditches (water column samples); and mosquito ditch sediments (benthic samples).

Twenty-six marsh surface samples were collected at randomly selected stations in October (the stations were stratified by area, and then again by vegetation type: *Phragmites*, low marsh (LM), high marsh (HM), with one *Phragmites* and two samples each from high marsh and low marsh taken from Areas 2 and 3, and two *Phragmites* and three samples each from high and low marsh taken in Areas 1 and 4). A circular metal frame, 30 cm in diameter, was used to define the sampling area. Mobile insects were trapped in the plastic bag attached to the frame. The frame was inserted into the surface of the marsh to a depth of approximately 5 cm. Soil and root mass within the frame were excavated using a machete, and the mass was collected in the plastic bag. Each marsh surface sample was initially processed in a sorting tray. Plant detritus material was examined to ensure that sessile species were included in the sample. Samples were then rinsed and sieved through a 0.5 mm screen to further separate invertebrates. All specimens caught were preserved in 91% alcohol for later identification.

The water column was sampled at 28 fish stations in November (seven randomly selected stations in each area). Samples were collected using a D-frame sweep net (500 micron mesh) using the USFWS/USGS protocols (James-Pirri et al., 2002). Twelve net-sweeps were performed along a one-meter length segment above the benthos at each sampling station. The contents of the net were emptied individually into five-gallon buckets and transported to a lab where they were processed in sorting trays. Dense samples were split in half or thirds. Each sorting tray was examined under light and dense matter was searched and separated from the tray. The trays were examined for a minimum of 15 minutes if no organisms were observed. The invertebrates that had been observed were captured and stored in 91% alcohol.



Water column sampling at fish stations

Benthic samples were collected from the same 28 fish stations in early December. A screened dipper, 10 cm in diameter (0.5 mm mesh), was used to collect samples at the top 5 cm of benthos. Three replicate samples were taken from every station and stored in individual plastic bags. The samples were taken to a lab where they were processed in sorting trays. Concentrated sugar water (one five-pound bag of sugar per gallon of water) was poured into each sorting tray containing the sample, for better identification (Lewis 2000). Organic material in the tray floated to the surface of the sugar water. All invertebrates observed were removed and preserved in 91% alcohol for later identification.

2.6 Invertebrate Analysis

Specimens collected from each invertebrate sample (marsh surface, water column, and benthos) were identified by a taxonomist with the use of a dissecting microscope and magnifying glass. Each invertebrate was identified to the family level using various reference guides (Weiss 1995; Borrer and White, 1970; Emerton, 1961). Assistance was also received from the Cerrato Laboratory, MSRC. The identification of water column and benthic invertebrates has not yet been completed.

TABLE 2-5 VEGETATION INVERTEBRATE IDENTIFICATION

AREA 1				
Station	Class	Order	Family	Quantity
T2-40-HM	Gastropoda		Melampodidae	1
	Gastropoda	Stylommatophora	Succineidae	17
	Crustacea	Isopoda	Oniscidae	33
	Crustacea	Amphipoda	Talitridae	5
	Arachnida	Ananeae	Lycosidae	7
	Arachnida	Ananeae	Clubionidae	1
	Arachnida	Ananeae	Micryphantidae	1
	Insecta	Hemiptera	Hebridae	1
T3-160-HM	Crustacea	Isopoda	Oniscidae	12
	Crustacea	Amphipoda	Talitridae	18
	Arachnida	Ananeae	Lycosidae	4
	Arachnida	Ananeae	Clubionidae	2
	Insecta	Hemiptera	Hebridae	1
	Insecta	Diptera	Tabinidae (larva)	1
T5-40-HM	Gastropoda	Stylommatophora	Succineidae	5
	Crustacea	Isopoda	Oniscidae	66
	Crustacea	Amphipoda	Talitridae	24
	Arachnida	Ananeae	Lycosidae	24
	Arachnida	Ananeae	Clubionidae	9
	Arachnida	Ananeae	Salticidae	1
	Insecta	Hemiptera	Hebridae	6
	Insecta	Coleoptera	Anthicidae	2
	Insecta	Coleoptera	Chrysomelidae	1
	Insecta	Lepidoptera	Pyralidae (larva)	1
	Insecta	Coleoptera	Heteroceridae (larva)	1
T1-80-LM	Gastropoda		Melampodidae	14
	Gastropoda	Stylommatophora	Succineidae	23
	Crustacea	Isopoda	Oniscidae	62
	Crustacea	Amphipoda	Talitridae	71
	Crustacea		Nematoda	2
	Arachnida	Ananeae	Lycosidae	17
	Arachnida	Ananeae	Clubionidae	10
	Insecta	Hemiptera	Hebridae	2
	Insecta	Hymenoptera	Formicidae	8
	Insecta	Diptera	Tabanidae (larva)	2
	Insecta	Diptera	Dolichopodidae (larva)	1
	Insecta	Coleoptera	Chrysomelidae (larva)	1

T4-160-LM	Gastropoda		Melampodidae	1
	Gastropoda	Stylommatophora	Succineidae	7
	Crustacea	Isopoda	Oniscidae	64
	Crustacea	Amphipoda	Talitridae	13
	Arachnida	Ananeae	Lycosidae	11
	Arachnida	Ananeae	Clubionidae	2
	Insecta	Hemiptera	Hebridae	1
T1-120-LM	Gastropoda	Stylommatophora	Succineidae	3
	Crustacea	Isopoda	Oniscidae	16
	Crustacea	Amphipoda	Talitridae	4
	Arachnida	Ananeae	Lycosidae	3
	Arachnida	Ananeae	Clubionidae	1
	Insecta	Diptera	Tabanidae (larva)	1
T3-200-Phrag	Crustacea	Isopoda	Oniscidae	24
	Crustacea	Amphipoda	Talitridae	24
	Gastropoda		Melampodidae	2
	Gastropoda	Stylommatophora	Succineidae	1
T4-00-Phrag	Crustacea	Isopoda	Oniscidae	3
	Crustacea	Amphipoda	Talitridae	1
	Arachnida	Ananeae	Clubionidae	1
	Arachnida	Ananeae	Micryphantidae	2
	Insecta	Lepidoptera	Pyralidae (larva)	1
	Insecta	Diptera	Sciomyzidae	1

AREA 2				
Station	Class	Order	Family	Quantity
T3-40-HM	Crustacea	Isopoda	Oniscidae	2
	Arachnida	Ananeae	Lycosidae	6
	Arachnida	Ananeae	Clubionidae	3
	Insecta	Hemiptera	Hebridae	2
	Insecta	Diptera	Tabanidae (larva)	1
T2-40-HM	Gastropoda	Stylommatophora	Succineidae	9
	Crustacea	Isopoda	Oniscidae	4
	Crustacea	Amphipoda	Talitridae	7
	Arachnida	Ananeae	Lycosidae	9
	Arachnida	Ananeae	Clubionidae	1
	Arachnida	Ananeae	Tetragnathidae	1
	Insecta	Hemiptera	Hebridae	5
T4-80-LM	Crustacea	Isopoda	Oniscidae	1
	Crustacea	Amphipoda	Talitridae	7
	Arachnida	Ananeae	Lycosidae	8
	Arachnida	Ananeae	Micryphantidae	2
	Arachnida	Ananeae	Salticidae	1
T3-120-LM	Crustacea	Isopoda	Oniscidae	25
	Crustacea	Amphipoda	Talitridae	26
	Arachnida	Ananeae	Lycosidae	3
	Arachnida	Ananeae	Clubionidae	1
	Arachnida	Ananeae	Micryphantidae	1
	Insecta	Coleoptera	Staphylinidae	4
	Insecta	Hymenoptera	Formicidae	1
	Insecta	Coleoptera	Cantharidae	1
	Insecta	Diptera	Tabanidae (larva)	1
T1-80-Phrag	Gastropoda		Melampodidae	1
	Gastropoda	Stylommatophora	Succineidae	1
	Crustacea	Isopoda	Oniscidae	1
	Crustacea	Amphipoda	Talitridae	4
	Arachnida	Ananeae	Lycosidae	1
	Arachnida	Ananeae	Clubionidae	1

AREA 3				
Station	Class	Order	Family	Quantity
T3-40-HM	Gastropoda	Stylommatophora	Succineidae	6
	Crustacea	Isopoda	Oniscidae	3
	Crustacea	Amphipoda	Talitridae	9
	Arachnida	Ananeae	Lycosidae	22
	Arachnida	Ananeae	Clubionidae	2
	Arachnida	Ananeae	Tetragnathidae	1
	Insecta	Diptera	Tabanidae (larva)	2
T3-120-HM	Crustacea	Isopoda	Oniscidae	4
	Crustacea	Amphipoda	Talitridae	11
	Arachnida	Ananeae	Lycosidae	5
	Insecta	Diptera	Tabanidae (larvae)	2
	Insecta	Coleoptera	Carabidae	1
	Insecta	Coleoptera	Heteroceridae (larva)	1
T3-160-LM	Gastropoda		Melampodidae	3
	Crustacea	Isopoda	Oniscidae	24
	Crustacea	Amphipoda	Talitridae	9
	Arachnida	Ananeae	Lycosidae	17
	Arachnida	Ananeae	Clubionidae	2
	Insecta	Hemiptera	Hebridae	4
	Insecta	Diptera	Tabanidae (larva)	1
	Insecta	Lepidoptera	Pyralidae (larva)	1
	Insecta	Diptera	Dolichopodidae (larva)	1
T4-40-LM	Gastropoda		Melampodidae	1
	Crustacea	Isopoda	Oniscidae	2
	Arachnida	Ananeae	Lycosidae	4
	Arachnida	Ananeae	Clubionidae	1
	Insecta	Hemiptera	Hebridae	5
T5-80-Phrag	Crustacea	Isopoda	Oniscidae	4
	Arachnida	Ananeae	Micryphantidae	1
	Insecta	Lepidoptera	Pyralidae (larva)	1

AREA 4				
Station	Class	Order	Family	Quantity
T4-80-HM	Gastropoda		Melampodidae	1
	Gastropoda	Stylommatophora	Succineidae	20
	Crustacea	Isopoda	Oniscidae	43
	Crustacea	Amphipoda	Talitridae	6
	Arachnida	Ananeae	Lycosidae	10
	Arachnida	Ananeae	Clubionidae	3
	Arachnida	Ananeae	Tetragnathidae	1
	Insecta	Hemiptera	Hebridae	1
	Insecta	Diptera	Tabanidae (larva)	1
	Insecta	Coleoptera	Heteroceridae (larva)	1
	Insecta	Hymenoptera	Formicidae	1
T3-80-HM	Gastropoda	Stylommatophora	Succineidae	16
	Crustacea	Isopoda	Oniscidae	2
	Crustacea	Amphipoda	Talitridae	1
	Arachnida	Ananeae	Lycosidae	6
	Arachnida	Ananeae	Micryphantidae	1
	Insecta	Coleoptera	Chrysomelidae	2
	Insecta	Hymenoptera	Formicidae	1
T3-00-HM	Gastropoda	Stylommatophora	Succineidae	2
	Crustacea	Isopoda	Oniscidae	16
	Crustacea	Amphipoda	Talitridae	37
	Arachnida	Acarina	Suborder Trombidiformes	1
	Arachnida	Ananeae	Lycosidae	4
	Arachnida	Ananeae	Tetragnathidae	1
T1-120-LM	Gastropoda		Melampodidae	3
	Gastropoda	Stylommatophora	Succineidae	4
	Crustacea	Isopoda	Oniscidae	29
	Crustacea	Amphipoda	Talitridae	4
	Arachnida	Acarina	Sub order Trombidiformes	1
	Arachnida	Ananeae	Lycosidae	6
	Arachnida	Ananeae	Clubionidae	5
	Insecta	Coleoptera	Chrysomelidae	1
	Insecta	Diptera	Tabanidae (larva)	1
	Insecta	Coleoptera	Curcolionidae	1
T2-00-LM	Gastropoda		Melampodidae	9
	Gastropoda	Stylommatophora	Succineidae	2
	Crustacea	Isopoda	Oniscidae	172
	Crustacea	Amphipoda	Talitridae	8
	Arachnida	Acarina	Suborder Trombidiformes	2
	Arachnida	Ananeae	Lycosidae	14

	Arachnida	Ananeae	Clubionidae	5
	Arachnida	Ananeae	Micryphantidae	4
	Arachnida	Ananeae	Tetragnathidae	2
	Insecta	Hemiptera	Hebridae	3
	Insecta	Coleoptera	Chrysomelidae	1
	Insecta	Coleoptera	Heteroceridae (larva)	1
T1-160-LM	Gastropoda		Melampodidae	8
	Gastropoda	Stylommatophora	Succineidae	3
	Crustacea	Amphipoda	Talitridae	5
	Arachnida	Ananeae	Lycosidae	7
	Arachnida	Ananeae	Clubionidae	5
T2-120-Phrag	Gastropoda		Melampodidae	1
	Crustacea	Isopoda	Oniscidae	33
	Crustacea	Amphipoda	Talitridae	8
	Arachnida	Ananeae	Lycosidae	4
	Arachnida	Ananeae	Clubionidae	4
	Arachnida	Ananeae	Micryphantidae	1
	Insecta	Diptera	Tabanidae (larvae)	3
T4-00-Phrag	Crustacea	Amphipoda	Talitridae	1
	Insecta	Coleoptera	Chrysomelidae	1

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TABLE 2-6 WATER COLUMN INVERTEBRATE IDENTIFICATION

AREA 1				
Station	Class	Order	Family	Quantity
D-1	Oligochaeta		Megascolecidae	6
	Amphipoda		Gammaridae	2
	Amphipoda		Talitridae	1
	Insecta	Hymenoptera	Formicidae	1
D-3	Ostracoda			1
	Oligochaeta		Naididae	1
	Amphipoda		Talitridae	4
D-4	Polychaeta		Ampharetidae	5
	Insecta	Diptera	Chironomidae	1
D-6	Polychaeta		Ampharetidae	1
	Ostracoda			1
	Insecta	Diptera	Ceratopogonidae	1
D-8	Ostracoda			2
	Oligochaeta		Megascolecidae	1
	Amphipoda		Gammaridae	1
	Arachnida		Clubionidae	1
	Insecta		Chironomidae	2
D-9	Insecta	Hemiptera	Corixidae	6
D-10	Insecta	Hemiptera	Corixidae	3

AREA 2				
Station	Class	Order	Family	Quantity
D-1	Oligochaeta		Naididae	2
	Amphipoda		Aoridae	1
D-2	Amphipoda		Gammaridae	2
D-3	Insecta	Hemiptera	Corixidae	4
	Insecta	Diptera	Tabanidae	1
	Insecta	Diptera	Chironomidae	1
D-5	Oligochaeta		Naididae	1
D-6	Polychaeta		Ampharetidae	3
	Oligochaeta		Megascolecidae	2
	Arachnida		Lycosidae	1
D-7	Polychaeta		Ampharetidae	44
	Amphipoda		Gammaridae	1
	Arachnida		Clubionidae	1
	Insecta	Diptera	Chironomidae	1
D-8	Polychaeta		Ampharetidae	1
	Amphipoda		Gammaridae	12
	Isopoda		Idoteidae	1

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AREA 3				
Station	Class	Order	Family	Quantity
D-1	Insecta	Trichoptera	Limnephilidae	3
	Insecta	Hemiptera	Corixidae	5
	Insecta	Diptera	Culicidae	1
D-2	Crustacea	Decapoda	Palaemonidae	6
D-3	Polychaeta		Ampharetidae	20
	Oligochaeta		Megascolecidae	22
	Arachnida		Lycosidae	2
	Insecta	Hemiptera	Belostomatidae	1
	Insecta	Diptera	Chironomidae	1
	Insecta	Coleoptera	Staphylinidae	1
D-5	Oligochaeta		Naididae	3
	Arachnida		Lycosidae	1
	Insecta		Chironomidae	2
D-6	Polychaeta		Ampharetidae	19
	Oligochaeta		Naididae	13
	Oligochaeta		Megascolecidae	1
	Ostracoda			3
	Gastropoda		Succineidae	1
	Arachnida		Clubionidae	2
	Insecta	Diptera	Chironomidae	17
	Insecta		Ceratopogonidae	3
	Insecta	Coleoptera	Hydrophilidae	1
	Insecta	Odonata	Libellulidae	1
	D-7	Polychaeta		Ampharetidae
Oligochaeta			Megascolecidae	5
Anthozoa		Ceriantharia		3
Amphipoda			Gammaridae	2
Insecta		Hemiptera	Corixidae	3
D-8	Polychaeta		Ampharetidae	3
	Polychaeta		Ampharetidae	3
	Oligochaeta		Megascolecidae	4
	Ostracoda			2
	Amphipoda		Gammaridae	1
	Insecta	Odonata	Coenagrionidae	1
	Insecta	Diptera	Chironomidae	6

AREA 4				
Station	Class	Order	Family	Quantity
D-1	Anthozoa	Ceriantharia		4
	Amphipoda		Gammaridae	1
	Amphipoda		Talitridae	2
	Crustacea	Decapoda	Palaemonidae	1
	Insecta	Hemiptera	Corixidae	7
	Insecta	Diptera	Culicidae	1
	Insecta	Odonata	Libellulidae	2
	Insecta	Coleoptera	Hydrophilidae	1
D-2	Gastropoda		Succineidae	1
	Insecta	Hemiptera	Corixidae	2
	Insecta	Diptera	Syrphidae	1
D-3	Amphipoda		Gammaridae	5
	Insecta	Diptera	Chironomidae	5
D-4	Anthozoa	Ceriantharia		1
	Amphipoda		Talitridae	1
D-6	Polychaeta		Ampharetidae	6
	Oligochaeta		Naididae	1
	Insecta	Diptera	Tipulidae	3
D-7	Polychaeta		Ampharetidae	2
	Entognatha		Poduridae	1
	Insecta	Trichoptera	Polycentropodidae	1
D-8	Isopoda		Asellidae	2
	Insecta	Coleoptera	Staphilinidae	1
	Insecta	Coleoptera	Dysticidae	2
	Insecta	Odonata	Libellulidae	1

TABLE 2-7 BENTHIC INVERTEBRATE IDENTIFICATION

AREA 1						
Station	Sample	Class	Sub Class	Order	Family	Quantity
D-1	R-1	Polychaeta			Ampharetidae	1
	R-2	-				-
	R-3	-				-
D-3	R-1	Polychaeta			Ampharetidae	1
	R-2	Polychaeta			Ampharetidae	1
	R-3	-				-
D-8	R-1	Crustacea	Ostracoda			1
	R-2	Crustacea	Ostracoda			9
		Insecta		Diptera	Ceratopogonidae	1
		Polychaeta			Ampharetidae	22
		Oligochaeta			Naididae	3
		Oligochaeta			Megascolecidae	1
		Crustacea		Amphipoda	Gammaridae	1
	R-3	Crustacea	Ostracoda			2
		Insecta		Diptera	Ceratopogonidae	5
		Polychaeta			Ampharetidae	12
		Oligochaeta			Naididae	5
		Oligochaeta			Megascolecidae	2
D-10	R-1	Polychaeta			Ampharetidae	1
		Oligochaeta			Naididae	2
	R-2	-				-
	R-3	Oligochaeta			Naididae	1
D-4	R-1	Polychaeta			Ampharetidae	3
	R-2	Polychaeta			Ampharetidae	17
		Oligochaeta			Naididae	2
		Insecta		Diptera	Ceratopogonidae	1
	R-3	Polychaeta			Ampharetidae	2
		Oligochaeta			Naididae	1
		Oligochaeta			Megascolecidae	1
		Insecta		Diptera	Ceratopogonidae	1
		Insecta		Coleoptera	Hydrophilidae	1
D-6	R-1	Polychaeta			Ampharetidae	4
		Polychaeta			Ampharetidae	1

		Oligochaeta			Megascolecidae	1
	R-2	Polychaeta			Ampharetidae	3
		Oligochaeta			Naididae	4
		Insecta		Diptera	Ceratopogonidae	1
	R-3	Oligochaeta			Naididae	8
D-9	R-1	Polychaeta			Ampharetidae	4
		Oligochaeta			Megascolecidae	1
		Crustacea		Amphipoda	Gammaridae	1
		Crustacea		Isopoda	Idoteidae	3
		Insecta		Diptera	Ceratopogonidae	2
	R-2	Crustacea	Ostracoda			1
		Polychaeta			Ampharetidae	3
		Crustacea		Isopoda	Idoteidae	4
		Insecta		Diptera	Ceratopogonidae	1
	R-3	Crustacea		Isopoda	Idoteidae	3
		Crustacea		Amphipoda	Gammaridae	2
		Insecta		Hemiptera	Corixidae	2

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AREA 2						
Station	Sample	Class	Sub Class	Order	Family	Quantity
D-1	R-1	-				-
	R-2	-				-
	R-3	Polychaeta			Ampharetidae	3
		Oligochaeta			Naididae	2
D-2	R-1	-				-
	R-2	-				-
	R-3	-				-
D-3	R-1	-				-
	R-2	Ostracoda				2
		Oligochaeta			Naididae	2
		Insecta		Diptera	Ceratopogonidae	3
		Insecta		Diptera	Chironomidae	1
	R-3	Polychaeta			Ampharetidae	3
D-5	R-1	Polychaeta			Ampharetidae	2
		Oligochaeta			Naididae	1
	R-2	-				-
	R-3	-				-
D-6	R-1	-				-
	R-2	-				-
	R-3	-				-
D-8	R-1	-				-
	R-2	Crustacea		Amphipoda	Gammaridae	1
		Crustacea		Decapoda	Palaemonidae	1
	R-3	Insecta		Diptera	Ceratopogonidae	1

AREA 3						
Station	Sample	Class	Sub Class	Order	Family	Quantity
D-1	R-1	-				-
	R-2	Amphipoda			Aoridae	1
		Insecta		Diptera	Chironomidae	1
	R-3	-				-
D-3	R-1	Polychaeta			Ampharetidae	9
		Oligochaeta			Megascolecidae	2
		Insecta		Diptera	Chironomidae	1
		Insecta		Diptera	Ceratopogonidae	1
	R-2	Polychaeta			Ampharetidae	3
	R-3	Polychaeta			Ampharetidae	2
		Insecta		Diptera	Chironomidae	1
D-5	R-1	-				-
	R-2	Polychaeta			Ampharetidae	3
		Oligochaeta			Megascolecidae	3
		Oligochaeta			Naididae	1
	R-3	-				-
D-6	R-1	Polychaeta			Ampharetidae	29
	R-2	Polychaeta			Ampharetidae	8
		Oligochaeta			Megascolecidae	1
	R-3	Polychaeta			Ampharetidae	1
		Ostracoda				1
D-7	R-1	Oligochaeta			Megascolecidae	1
	R-2	-				-
	R-3	-				-
D-8	R-1	Polychaeta			Ampharetidae	1
	R-2	-				-
	R-3	-				-