MONITORING FOR IMPACTS FROM A WATER MANAGEMENT PROJECT, WERTHEIM NATIONAL WILDLIFE REFUGE, SHIRLEY, NY.

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Poster Presentation

In 2002, the Suffolk County (NY) Legislature determined that a re-assessment of its mosquito control program was in order. As part of this project, Suffolk County decided to test water management techniques. At the same time, the US Fish and Wildlife Service was seeking to reduce the use of pesticides in its Long Island Complex refuges, and also to address other issues it felt were impacting the marshes within these refuges.

Therefore, the Wertheim National Wildlife Refuge (Shirley, NY), a 2,500 acre site along the south shore of Long Island at the mouth of the Carmans River, was selected as a site for a water management demonstration project. A design was made based on a series of techniques detailed by the County to address mosquito control needs, but also to meet important USFWS management goals, including enhancement of habitat for migratory water fowl, suppression of invasive *Phragmites*, and removal of the grid ditch system installed in the 1930s. The New York State Department of Environmental Conservation (NYSDEC), as a requirement of permitting, made some further modifications to the design.

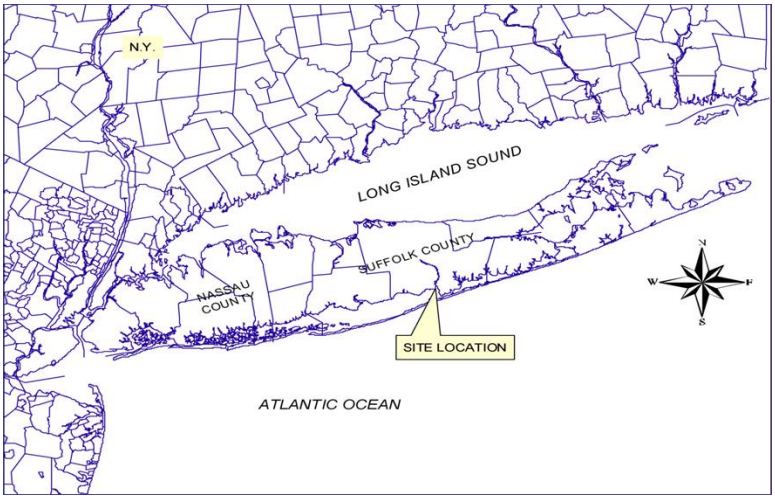

Figure 1. Site Location Map

The basic project was to modify two 40 acre portions of the approximately 600 acres of tidal marsh in the refuge. Ponds of varying sizes were to be constructed, with the spoils from the ponds being used to fill the mosquito control ditches and to eliminate hummocky areas of the marsh that supported mosquito breeding. A channel was dug around the landward side of one marsh area to increase tidal flows to spots where *Phragmites* were prevalent. Several ditches that were not filled were "naturalized" by adding curvature to their previously linear layout. All ponds were connected to tidal waters to enhance water quality to support fish.

Figure 2. Project Study Areas

To measure the effects of this project, and to determine if the goals of the project are achieved, an ambitious environmental monitoring program was set in place. Part of the program was begun in September 2003. Other elements were incorporated in 2004. Construction on one area was begun in March 2005, and further construction occurred in February-March, 2006. Therefore, at least one full season of pre-project monitoring was made for all parameters, and several parameters were monitored for two or three seasons pre-construction.

Four transects were laid out across the four areas (Area 1 and Area 2, treatment sites; Area 3 and Area 4, control sites). Transect locations and station sites were determined following James Pirri et al. (2002). In addition, 10 stations in the ditches in each area were established (these stations were relocated to ponds and other water bodies if the station was in a ditch that was filled). The monitoring regime thus encompassed 88 marsh stations and 40 "fish" stations. Six off-shore water quality stations were established: three immediately offshore from the treatment and control sites, two in the major creeks (one just south of Area 3 and one just north of Area 4), and one at the mouth of the Carmans as a control. Two clusters of groundwater monitoring wells were installed in the woods immediately east of the project site.


Figure 3. Transect Sampling Point and Monitoring Well

Parameters measured and the techniques used in sampling are detailed in Table 1.

2003-2006 sampling cost approximately $400,000, exclusive of in-kind efforts from Suffolk County and USFWS. A complete data report is expected to be available shortly.

This project was funded by the Suffolk County Legislature, as part of the Suffolk County Vector Control and Wetlands Management Long Term Plan for a Generic Environmental Impact Statement.

Monitoring efforts were accomplished by:

- Cashin Associates, P.C. (CA)
- Ducks Unlimited, as a subconsultant to CA
- SCDHS Office of Ecology

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Phil DeBlasi, SCDHS Office of Ecology
Mary Dempsey, SC Vector Control


Figure 4. Wertheim Sampling Crew

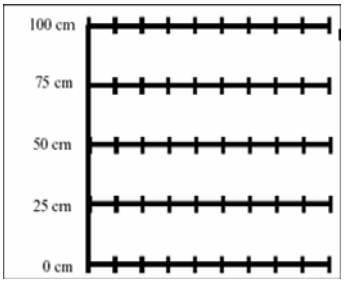

Figure 5. Vegetation Quadrat Plot Schematic


Figure 6. Live Vegetation Biomass Sampling

Nekton Sampling

Ditch nets used in ditches and 1 m2 throw traps used in ponds. Ditch nets were placed 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. Throw traps were thrown into ponds and then quickly pushed into the sediment in order to prevent escape of nekton from under the trap. Nekton was sampled three times, once in spring, summer and fall.


Figure 7. Setting Up Ditch Net


Figure 8. Getting Ready to Pull Ditch Net


Figure 9. Deploying Throw Trap


Figure 10. Conducting Water Quality Measurements at Nekton Sample Location


Figure 11. *Fundulus heteroclitus & Luciana parva*


Figure 12. *Callinectes sapidus*


Figure 13. Nekton Sampling Crew

Table 1. Parameters Monitored at WNWR as part of a Water Management Demonstration Project.

PARAMETER	SAMPLE LOCATION	FREQUENCY	TECHNIQUE
Biological Parameters			
Mosquito Breeding Concentration Areas	All four areas	Once pre-project	Traverse marsh, visually identify breeding location
Mosquito Larval Sampling	All transect stations (88 stations total)	Transects: Monthly Targeted: Weekly (April - Sept)	Transects: Samples taken every 15-20 meters along each transect (USFWS/USGS protocols) Targeted: Traverse marsh & visually inspect pools and pannes
Vegetation quadrats	All transect stations (88 stations total)	Annually (towards the end of growing season)	Point intercept method (50 point grid for speciation) (USFWS/USGS protocols)
Photo Documentation	All Areas	Annually in September	Set photo stations in each area.
Nekton sampling	All fish stations (40 stations total)	Three times per year (Spring, Summer, Fall)	Ditch nets and throw traps (USFWS/USGS protocols)
Invertebrates	Marsh surface: 26 samples (stratified by cover) Water column/benthos: 70% of fish stations	Annually	USGS surface core at transects; 1 meter net twirl at fish stations
Vegetation biomass	Surface clip (50% - 44 stns) Soil core (25% -22 stns)	Annually (towards the end of growing season)	Root & stalk within dm, dried mass
Marsh composition	All four areas	Before & after project; annually thereafter	Ground-truthed aerial photographs
Bird Surveys	All four areas	Three times in summer, once in winter	Fixed points (50 m radius) and walking route (Shriver, 2000) conducted from sunrise to 11am.
Physical Parameters			
Ditch Qualities	All 4 areas, all ditches	Once pre-project	Physical observations (width, adjacent vegetation, presence of berms, water flow direction, obstructions, etc.)
Sedimentation Rates	All transect stations (88 stations total)	Twice (before & after project; *post project yet to be sampled*)	Marker horizons at each station created with Feldspar clay, sampled by core within 2 years.
Marsh Inundation	Random marsh locations throughout all areas	Twice (before & after project)	Stakes painted with colored glue set in areas of standing water during lunar high tide. Amount of glue washed away measured inundation.
Salt Marsh Water Table Height	All transect stations (88 stations total)	Every 10-14 days (May through September)	2 inch above-ground PVC well at each station (USFWS/USGS protocols)
Chemical Parameters			
Carmans River WQ	4 stations	Quarterly	Std.; full SCDHS parameter list
Ditch salinity surveys	All ditches, all areas	Once, pre-project	Salinity readings with YSI every 50 m along ditch.
Pore water salinity	All transect stations (88 stations total)	every 10-14 days	Water obtained from soil with syringe, refractometer used to measure salinity
WQ parameters (Salinity, Temperature, Conductivity, pH, DO)	All fish stations (40 stations total)	Bi-weekly but rotated through tidal cycles	YSI meter plus pH meter


Figure 14. Mosquito Larvae Sampling

Marsh Inundation
Conducted during lunar high tide. Stakes painted with colored glue were placed in areas of standing water and banks of waterways throughout the high marsh. Amount of glue washed away measured the amount of inundation.


Figure 15. Marsh Inundation Study


Figure 16. Marsh Inundation Measurement


Figure 17. Marsh Surface Invertebrate Sampling


Figure 18. Water Column Invertebrate Sampling


Figure 19. Sorting Invertebrate Samples


Figure 20. Water Quality Analysis


Figure 21. Soft Area Engulfs Field Worker

Monitoring Protocol References:

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